From: Lauer, Michael (NIH/OD) [E] [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=90FE9CAE30C64CFBB67ABD568E882796-LAUERM]
Sent: 5/16/2021 2:49:12 PM
To: Embry, Alan (NIH/NIAID) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=882a18a10a134c49acac21cb83fd599d-embrya]
CC: Tabak, Lawrence (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=02e22836b5ff4e9988e3770cfc7ee770-tabakl]; Lauer, Michael (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=90fe9cae30c64cfbb67abd568e882796-lauerm]
Subject: Re: Statement
Attachments: 110964 Daszak GoF Determination Letter 7-7-201.pdf

Excellent, Alan, thanks very much. Could you make sure this gets into the Grant Folder?

Mike

From: "Embry, Alan (NIH/NIAID) [E]" (b) (6)
Date: Sunday, May 16, 2021 at 10:03 AM
To: "Lauer, Michael (NIH/OD) [E]" (b) (6)
Cc: "Tabak, Lawrence (NIH/OD) [E]" (b) (6)
Subject: RE: Statement

Hi Mike,

Although it took me a bit of help to find it, the letter (attached) is in the 2016 grant folder.

Thanks,
Alan

From: Lauer, Michael (NIH/OD) [E] (b) (6)
Sent: Saturday, May 15, 2021 11:03 PM
To: Embry, Alan (NIH/NIAID) [E] (b) (6)
Cc: Lauer, Michael (NIH/OD) [E] (b) (6); Tabak, Lawrence (NIH/OD) [E] (b) (6)
Subject: Statement

Hi Alan – in the draft statement, there is a line that reads, (b) (5) (b) (5)

I couldn't find documentation in the grant folder, though maybe I missed it.

Could you send me the documentation that experts reviewed the grant back in October 2014 regarding the GOF policy?

Many thanks, Mike

Michael S Lauer, MD
NIH Deputy Director for Extramural Research
One Center Drive, Building 1, Room 144

Bethesda, MD 20892
(b) (6)
(b) (6)

DEPARTMENT OF HEALTH & HUMAN SERVICES Public Health Service

National Institutes of Health
National Institute of Allergy
and Infectious Diseases
Bethesda, Maryland 20892

July 7, 2016

Mr. Aleksei Chmura
Senior Coordinator of Operations
EcoHealth Alliance
460 W. 34th Street – 17th Floor
New York, NY 10001

RE: 5 R01AI110964-03

Dear Mr. Chmura:

Thank you for your correspondence of June 28th, 2016, regarding the October 17, 2014 White House announcement of a U.S. Government-wide pause on certain gain-of-function (GoF) experiments and its potential impact on your research (http://www.whitehouse.gov/blog/2014/10/17/doing-diligence-assess-risks-and-benefits-life-sciences-gain-function-research). The research funding pause pertains to GoF research projects that may be reasonably anticipated to confer attributes to influenza, MERS, or SARS viruses such that the resulting virus would have enhanced pathogenicity and/or transmissibility in mammals via the respiratory route.

NIAID reviewed the original grant application, and the additional information provided by you, and made the following assessments regarding Aim 3 of the above-referenced grant:

- NIAID is in agreement that the work proposed under Aim 3 to generate MERS-like or SARS-like chimeric coronaviruses (CoVs) is not subject to the GoF research funding pause. This determination is based on the following: (1) the chimeras will contain only S glycoprotein genes from phylogenetically distant bat CoVs; and (2) recently published work demonstrating that similar chimeric viruses exhibited reduced pathogenicity. Therefore it is not reasonably anticipated that these chimeric viruses will have enhanced pathogenicity and/or transmissibility in mammals via the respiratory route.
- NIAID acknowledges that if any of the MERS-like or SARS-like chimeras generated under this grant show evidence of enhanced virus growth greater than 1 log over the parental backbone strain, Dr. Daszak will immediately stop all experiments with these viruses and provide the NIAID Program Officer and Grants Management Specialist, and Wuhan Institute of Virology Institutional Biosafety Committee, with the relevant data and information related to these unanticipated outcomes.

Please remember that the institution must comply in full with all terms and conditions placed on this grant. As indicated above, NIAID determinations are based on information from multiple sources, but primarily on our communication with you about the details of your proposed experiments and your research results. Should NIAID's determination change based on information obtained through the U.S. Government GoF deliberative process, described here http://www.phe.gov/s3/dualuse/Documents/gain-of-function.pdf, you will be notified; however, until such time, or until the GoF research funding pause is lifted, NIAID's determination, indicated above, is final.

Please let us know if you have any questions, or if you require additional information.

Sincerely,

(b) (6)

Jenny Greer
Grants Management Specialist
NIAID/NIH/DHHS

(b) (6)

Erik J. Stemmy, Ph.D.
Program Officer
Division of Microbiology and Infectious Diseases
NIAID/NIH/DHHS

CC: Dr. Peter Daszak
Ms. Mary Kirker
Dr. Irene Glowinski
Dr. Andrew Ford

From: Lauer, Michael (NIH/OD) [E] [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=90FE9CAE30C64CFBB67ABD568E882796-LAUERM]
Sent: 5/16/2021 4:39:04 PM
To: Jacobs, Anna (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e76eeb11df9a4024b53864ffac4c4c56-jacobsal]
CC: Lauer, Michael (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=90fe9cae30c64cfbb67abd568e882796-lauerm]; Bulls, Michelle G. (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b366f1a4382d44c1bde626e7730c3dd4-bullsmg]
Subject: Re: Gift
Attachments: 110964 Daszak GoF Determination Letter 7-7-201.pdf; EcoHealth analysis - table and outstanding NIH asks jsrev-MGB final.docx

GoF Determination Letter is the same attachment was page 3

Hi Anna – Sounds like a great idea!

I like the idea of you, me, and Michelle discussing next steps. Please work with Melanie. We'll probably need 45 minutes.

Thanks, Mike

From: "Jacobs, Anna (NIH/OD) [E]" (b) (6)
Date: Sunday, May 16, 2021 at 12:35 PM
To: "Lauer, Michael (NIH/OD) [E]" (b) (6)
Cc: "Lauer, Michael (NIH/OD) [E]" (b) (6)
Subject: Re: Gift

Thanks, Mike. That second bullet point piqued my interest. (b) (5)

Now that NIH has been made aware of concerns about WIV's potential conduct of GOF research, we should (b) (5)

Maybe we can set up a time next week (5/24–5/27) to discuss? I'm happy to connect with Melanie to find some times for us and Michelle (and whoever else you'd like).

Anna L. Jacobs, J.D., M.S.
Senior Attorney
HHS Office of the General Counsel
Public Health Division, NIH Branch
31 Center Drive, Bldg. 31, Rm. 2B-50
Bethesda, MD 20892
(b) (6) (main)
301-402-1034 (fax)
(b) (6)

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disseminate, or otherwise use this information. Also, please notify the sender that you have received this communication in error. Your receipt of this message is not intended to waive any applicable privilege.

From: Lauer, Michael (NIH/OD) [E] (b) (6)
Sent: Sunday, May 16, 2021 10:47:14 AM
To: Jacobs, Anna (NIH/OD) [E] (b) (6)
Cc: Lauer, Michael (NIH/OD) [E] (b) (6)
Subject: Gift

Hi Anna – FYI, Mike

From: "Lauer, Michael (NIH/OD) [E]" (b) (6)
Date: Sunday, May 16, 2021 at 10:40 AM
To: "Tucker, Jessica (NIH/OD) [E]" (b) (6), "Jorgenson, Lyric (NIH/OD) [E]" (b) (6)
Cc: "Lauer, Michael (NIH/OD) [E]" (b) (6)
Subject: FW: Statement

From: "Embry, Alan (NIH/NIAID) [E]" (b) (6)
Date: Sunday, May 16, 2021 at 10:03 AM
To: "Lauer, Michael (NIH/OD) [E]" (b) (6)
Cc: "Tabak, Lawrence (NIH/OD) [E]" (b) (6)
Subject: RE: Statement

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From: Lauer, Michael (NIH/OD) [E] (b) (6)
Sent: Saturday, May 15, 2021 11:03 PM
To: Embry, Alan (NIH/NIAID) [E] (b) (6)
Cc: Lauer, Michael (NIH/OD) [E] (b) (6); Tabak, Lawrence (NIH/OD) [E] (b) (6)
Subject: Statement

Hi Alan – in the draft statement, there is a line that reads, (b) (5)
(b) (5)

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Could you send me the documentation that experts reviewed the grant back in October 2014 regarding the GOF policy?

Many thanks, Mike

Michael S Lauer, MD
NIH Deputy Director for Extramural Research
One Center Drive, Building 1, Room 144
Bethesda, MD 20892
(b) (6)
(b) (6)

Analysis of EcoHealth Response to NIH Follow-up Request dated 4/13/2021

Background:

- OER requested documentation from EcoHealth on October 23, 2020 and again on April 13, 2021, based on concerns that:
  - WIV had not satisfied safety requirements under the award
  - EcoHealth Alliance had not satisfied its obligations to monitor the activities of its subrecipient to ensure compliance
    - specifically, with respect to biosafety monitoring
- EcoHealth provided documentation in response to OER request on April 23, 2021

OPERA Analysis of EcoHealth Documentation:

(b) (5)

Recommendation:

(b) (5)

NIH Request (April 13, 2021)	Eco Health Response (April 23, 2021)	Analysis (OPERA)	Additional Need from EcoHealth
1. Copies of all EcoHealth Alliance – WIV subrecipient agreements	EcoHealth Alliance –WIV contracts, invoice and subrecipient agreements for years 1-5 of the award	(b) (5)	

		(b) (5)
2. Any and all other documents and information describing how EcoHealth Alliance monitored WIV's compliance with the terms and conditions of award, including with respect to biosafety. • For years 1-5 of the award, since no year 6 subaward • substantial documentation of Ecohealth oversight of WIV subaward activities during years 1 through 5.	EcoHealth Alliance 2016-2019 Subrecipient Monitoring Forms for WIV Federal Funding Accountability & Transparency Act Reports for WIV from 2015 – 2019 2006-2018 WIV Annual Reports Annual Single Audit Reports from 2014-2019	

		(b) (5)
• Copies of all biosafety reports; we would expect that as part of your oversight you would have copies of all such reports through -05 year	• Inter-Institutional Agreements from DHHS for WIV 2014 & 2019 • WIV's annual reports to EcoHealth	

From: Lauer, Michael (NIH/OD) [E] [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=90FE9CAE30C64CFBB67ABD568E882796-LAUERM]
Sent: 5/16/2021 2:58:36 PM
To: Hallett, Adrienne (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f1705e2e7c254b84a77f058dbf75b31b-hallettaa]; Jacobs, Anna (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e76eeb11df9a4024b53864ffac4c4c56-jacobsal]
CC: Lauer, Michael (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=90fe9cae30c64cfbb67abd568e882796-lauerm]
Subject: Re: Proposed Response to Cathy McMorris Rodgers letter
Attachments: Proposed Response to Cathy McMorris Rodgers letter

Thanks Adrienne – makes sense. [redacted] (b) (5)

Mike

From: "Hallett, Adrienne (NIH/OD) [E]" [redacted] (b) (6)
Date: Friday, May 14, 2021 at 9:53 AM
To: "Lauer, Michael (NIH/OD) [E]" [redacted] (b) (6), "Jacobs, Anna (NIH/OD) [E]" [redacted] (b) (6)
Subject: Proposed Response to Cathy McMorris Rodgers letter

Hey Mike and Anna,

[redacted] (b) (5)

Also, I drafted a few sentences to justify that approach. The draft response is attached. Please let me know what you think!

Adrienne

From: Hallett, Adrienne (NIH/OD) [E] [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=F1705E2E7C254B84A77F058DBF75B31B-HALLETTAA]
Sent: 5/14/2021 1:53:42 PM
To: Lauer, Michael (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=90fe9cae30c64cfbb67abd568e882796-lauerm]; Jacobs, Anna (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e76eeb11df9a4024b53864ffac4c4c56-jacobsal]
Subject: Proposed Response to Cathy McMorris Rodgers letter
Attachments: Draft Response to CMR letter.docx; 2021.03.16 - NIH Letter on WIV[2].pdf

Hey Mike and Anna,

(b) (5)

Also, I drafted a few sentences to justify that approach. The draft response is attached. Please let me know what you think!

Adrienne

Draft Response to CMR letter

(b) (5)

FRANK PALLONE, JR., NEW JERSEY
CHAIRMAN

CATHY McMORRIS RODGERS, WASHINGTON
RANKING MEMBER

ONE HUNDRED SEVENTEENTH CONGRESS

Congress of the United States

House of Representatives

COMMITTEE ON ENERGY AND COMMERCE

2125 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-6115
Majority (202) 225-2927
Minority (202) 225-3641

March 18, 2021

The Honorable Francis Collins, M.D., Ph.D.
Director
National Institutes of Health
9000 Rockville Pike
Bethesda, MD 20892

Dear Dr. Collins,

We write to request information, assistance, and needed-leadership from the National Institutes of Health (NIH) to advance an independent, scientific investigation into the origins of the COVID-19 pandemic.

The COVID-19 pandemic has been the worst public health crisis in the U.S. in about a hundred years. Over a year has passed since the deadly virus reached our shores and yet, the origin of the virus has yet to be determined. An independent, expert investigation of the origin of COVID-19 is of paramount importance to public health and biosecurity. As noted by Stanford Medical School Professor David Relman:

> A more complete understanding of the origins of COVID-19 clearly serves the interests of every person in every country on this planet. It will limit further recriminations and diminish the likelihood of conflict; it will lead to more effective responses to this pandemic, as well as efforts to anticipate and prevent the next one. It will also advance our discussions about risky science. And it will do something else: Delineating COVID-19's origin story will help elucidate the nature of our very precarious coexistence within the biosphere.[1]

Recently, the World Health Organization (WHO) attempted to investigate the origin of COVID-19. The WHO said that this investigative mission would be guided by the science, be

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[1] David A. Relman, *Opinion: To stop the next pandemic, we need to unravel the origins of COVID-19*, PNAS (Nov. 2020), *available at* https://www.pnas.org/content/117/47/29246.

"open-minded," and "not exclude[e] any hypothesis."[2] Unfortunately, China did not provide complete access or independence for the critical WHO mission. On February 13, 2021, National Security Advisor Jake Sullivan issued the following statement:

> We have deep concerns about the way in which the early findings of the COVID-19 investigation were communicated and questions about the process used to reach them. It is imperative that this report be independent, with expert findings free from intervention or alteration by the Chinese government. To better understand this pandemic and prepare for the next one, China must make available its data from the earliest days of the outbreak.[3]

Because of rising tensions between the U.S. and China, the WHO scrapped plans for an interim report.[4] An international group of science experts, including specialists in virology, microbiology, and zoology, asked for a new review.[5]

The NIH, as a premier scientific institution, must lead in order to foster a transparent, independent, and science-based investigation into the origin of the COVID-19 pandemic. Such an effort must meet the WHO's stated goals of an open-minded investigation that does not exclude any plausible hypothesis.[6] In addition, the NIH is well-positioned to gather and provide information through oversight of its grants and other federal awards. Thus, the NIH is in a unique position to investigate the possibility that the pandemic stemmed from a laboratory accident or leak, especially regarding the Wuhan Institute of Virology (WIV).

NIH raised concerns over a possible link between WIV and the COVID-19 outbreak during its review of federal awards to EcoHealth Alliance, a global environmental health nonprofit organization dedicated to protecting wildlife and public health from the emergence of disease. Of the $13.7 million in federal awards that NIH authorized for EcoHealth Alliance, 17

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[2] Smriti Mallapaty, *Where did COVID come from? WHO investigation begins but faces challenges*, NATURE (Nov. 11, 2020), *available at* https://www.nature.com/articles/d41586-020-03165-9.

[3] The White House, Statement of National Security Advisor Jake Sullivan (Feb. 13, 2021), *available at* https://www.whitehouse.gov/briefing-room/statements-releases/2021/02/13/statement-by-national-security-advisor-jake-sullivan/.

[4] Betsy McKay, Drew Hinshaw and Jeremy Page, *WHO Investigators to Scrap Plans for Interim Report on Probe of Covid-19 Origins*, THE WALL STREET JOURNAL (Mar. 4, 2021), *available at* https://www.wsj.com/articles/who-investigators-to-scrap-interim-report-on-probe-of-covid-19-origins-11614865067?mod=latest_headlines

[5] Jaime Metzl, et al, *Call for a Full and Unrestricted International Forensic Investigation into the Origins of COVID-19* (March 4, 2021), *available at* https://s.wsj.net/public/resources/documents/COVID%20OPEN%20LETTER%20FINAL%20030421%20(1).pdf. The co-organizer of the letter and a WHO advisor on human genome editing, Jaime Metzl, PhD, said there is an eighty-five percent chance the pandemic started with an accidental leak from the WIV or Wuhan CDC laboratory, *available at* https://jamiemetzl.com/origins-of-sars-cov-2/. ("I have no definitive way of proving this thesis but the evidence is, in my view, extremely convincing. If forced to place odds on the confidence of my hypothesis, I would say there's an 85% chance the pandemic started with an accidental leak from the Wuhan Institute of Virology or Wuhan CDC and a 15% chance it began in some other way (in fairness, here is an article making the case for a zoonotic jump "in the wild"). If China keeps preventing a full and unrestricted international forensic investigation into the origins of the pandemic, I believe it is fair to deny Beijing the benefit of the doubt.")

[6] Washington Post Editorial Board, *We're still missing the origin story of this pandemic. China is sitting on the answers*, THE WASHINGTON POST (Feb. 5, 2021), *available at* https://www.washingtonpost.com/opinions/2021/02/05/coronavirus-origins-mystery-china/?arc404=true.

projects sponsored by the National Institute of Allergy and Infectious Disease (NIAID) have provided over $7.9 million in federal awards for research of viral emergence from bats in Southeast Asia.[7] EcoHealth Alliance passed some of its funding to the WIV, and in 2020, NIH made efforts to obtain information from EcoHealth Alliance about WIV related to concerns about the origins of COVID-19. In April 2020, NIH wrote to EcoHealth Alliance and Columbia University about an NIH-funded project entitled, "Understanding the Risk of Bat Coronavirus Emergency:"

> It is our understanding that one of the sub-recipients of the grant funds is the Wuhan Institute of Virology ('WIV'). It is our understanding that WIV studies the interaction between corona viruses and bats. The scientific community believes that the coronavirus causing COVID-19 jumped from bats to humans likely in Wuhan where the COVID-19 pandemic began. There are now allegations that the current crisis was precipitated by the release from WIV of the coronavirus responsible for COVID-19. Given these concerns, we are pursuing suspension of WIV from participation in Federal programs. It is in the public interest that NIH ensure that a sub-recipient has taken all appropriate precautions to prevent the release of pathogens that it is studying. This suspension of the sub-recipient does not affect the remainder of your grant assuming that no grant funds are provided to WIV following receipt of this email during the period of suspension.[8]

In January 2021, the U.S. Department of State issued a fact sheet about the activity at the WIV.[9] Among other revelations, it reported the following:

- The U.S. government has reason to believe that several researchers inside the WIV became sick in autumn 2019, before the first identified case of the outbreak, with symptoms consistent with both COVID-19 and common seasonal illnesses. This raises questions about the credibility of WIV senior researcher Shi Zhengli's public claim that there was "zero infection" among the WIV's staff and students of SARS-CoV-2 or SARS-related viruses.[10]

- Starting in at least 2016, WIV researchers conducted experiments involving RaTG13, the bat coronavirus identified by the WIV in January 2020 as the closest sample to SARS-CoV-2 (96.2 percent similar).[11] There was no indication that this research was suspended at any time prior to the COVID-19 outbreak.

- The WIV has a published record of conducting "gain-of-function" research to engineer chimeric viruses.[12] But the WIV has not been transparent or consistent about its record of

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[7] NIH RePORTER, *Research Portfolio Online Reporting Tools* (queried Mar. 4, 2021), *available at* https://reporter.nih.gov/search/qlYUeI9DIk2JfWUdCcWxcA/projects/charts.
[8] Mark Moore, *NIH investigating Wuhan lab at center of coronavirus pandemic*, NEW YORK POST (Apr. 28, 2020), *available at* https://nypost.com/2020/04/28/nih-investigating-wuhan-lab-at-center-of-coronavirus-pandemic/.
[9] U.S. Department of State, *Fact Sheet: Activity at the Wuhan Institute of Virology*, Office of the Spokesperson (Jan. 15, 2021), *available at* https://2017-2021.state.gov/fact-sheet-activity-at-the-wuhan-institute-of-virology//index.html.
[10] *Id.*
[11] *Id.*
[12] *Id.*

studying viruses similar to the COVID-19 virus, including "RaTG13," which was sampled from a cave in Yunnan Province in 2013 after several miners died of SARS-like illness.[13]

- WHO investigators must have access to the records of the WIV's work on bat and other coronaviruses before the COVID-19 outbreak. As part of a thorough inquiry, they must have a full accounting of why the WIV altered and then removed online records of its work with RaTG13 and other viruses.[14]

- Despite the WIV presenting itself as a civilian institution, the U.S. has determined that the WIV has collaborated on projects with China's military.[15] The WIV has engaged in classified research, including laboratory animal experiments, on behalf of the Chinese military since at least 2017.[16]

- The U.S. and other donors who funded or collaborated on civilian research at the WIV have a right and obligation to determine whether any of our research funding was diverted to secret Chinese military projects at the WIV.[17]

Notably, the State Department's former lead investigator who oversaw the Task Force into the COVID-19 virus origin stated recently that he not only believes the virus escaped from the WIV, but that it may have been the result of research that the Chinese military, or People's Liberation Army, was doing on a bioweapon.[18]

Accordingly, it is imperative to determine not only where SARS-CoV-2 originated, but also how and if NIH's funding and research to projects at the WIV could have contributed to SARS CoV-2. To assist our requests and inquiry, please provide the following by April 19, 2021:

1. An assessment from a classified U.S. Defense Intelligence Agency (DIA) report included the possibility that the origins of SARS CoV-2 could have emerged accidentally from a laboratory in Wuhan, China due to unsafe laboratory practices.[19] The DIA report cited U.S. government and Chinese researchers who found "about 33 percent of the original 41 identified cases did not have direct exposure" to the market.[20] That, along with what is known of the WIV's work in past few years, raised reasonable suspicion that the

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[13] *Id.*
[14] *Id.*
[15] *Id.*
[16] *Id.*
[17] *Id.*

[18] Jennifer Griffin, Former top State Dept. investigator says COVID-19 outbreak may have resulted from bioweapons research accident, Fox News (March 13, 2021), *available at* https://www.foxnews.com/world/top-state-official-coronavirus-bioweapon-accident

[19] Fred Guterl, Naveed Jamali and Tom O'Connor, *The Controversial Experiments ad Wuhan Lab Suspected of Starting the Coronavirus Pandemic*, NEWSWEEK (Apr. 27, 2020), *available at* https://www.newsweek.com/controversial-wuhan-lab-experiments-that-may-have-started-coronavirus-pandemic-1500503.
[20] *Id.*

pandemic may have been caused by a lab error, not a wet market.[21] Further, a WHO inspector on the recent mission noted that "we know not all of those first 174 early COVID-19 cases visited the market, including the man diagnosed in December 2019 with the earliest onset date."[22] What information does the NIH have on the earliest COVID-19 cases?

2. According to an editorial on February 23, 2021, in *The Wall Street Journal* by former Secretary of State Mike Pompeo and Miles Yu, "[China's] army of scientists claim to have discovered almost 2,000 new viruses in a little over a decade."[23] How many of these discovered viruses does the NIH have information on and were any of these viruses discovered at the WIV?

3. According to *The Wall Street Journal* editorial mentioned in the previous question, some have alleged that the WIV's virus-carrying animals were sold as pets and may even show up at local wet markets.[24] Is the NIH aware of these allegations? If so, please provide any information the NIH has related to these allegations.

4. Please provide all information that NIH has about laboratory accidents and/or biosafety practices at the WIV since January 1, 2015.

5. Please provide all information that NIH has from NIH staff, grantees, sub-grantees, contractors, or subcontractors about communications and events at the WIV from August 2019 to the present.

6. Please provide all information that NIH has from NIH staff, grantees, sub-grantees, contractors, or subcontractors about their communications with China-based NIH, Chinese National Science Foundation, CDC, and China CDC about events at the WIV from August 2019 to the present.

State Department Cables

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[21] *Id.*

[22] Dominic Dwyer, I was the Australian doctor on the WHO's COVID-19 mission to China. Here's what we found about the origins of the coronavirus, THE CONVERSATION (Feb. 21, 2021), *available at*https://www.theguardian.com/commentisfree/2021/feb/22/i-was-on-the-whos-covid-mission-to-china-heres-what-we-found. *See also* Jeremy Page and Drew Hinshaw, *China Refuses to Give WHO Raw Data on Early Covid-19 Cases*, THE WALL STREET JOURNAL (Feb. 12, 2021), *available at* https://www.wsj.com/articles/china-refuses-to-give-who-raw-data-on-early-covid-19-cases-11613150580#:~:text=BEIJING%E2%80%94Chinese%20authorities%20refused%20to,over%20the%20lack%20of%20detail. ("Chinese authorities refused to provide World Health Organization investigators with raw, personalized data on early Covid-19 cases that could help them determine how and when the coronavirus first began to spread in China, according to WHO investigators who described heated exchanges over the lack of detail. The Chinese authorities turned down requests to provide such data on 174 cases of Covid-19 that they have identified from the early phase of the outbreak in the Chinese city of Wuhan in December 2019. Investigators are part of a WHO team that this week completed a monthlong mission in China aimed at determining the origins of the pandemic.")

[23] *Id.*

[24] Mike Pompeo and Miles Yu, *NIH Presses U.S. Nonprofit for Information on Wuhan Virology Lab,* THE WALL STREET JOURNAL (Feb. 23, 2021), available at https://www.wsj.com/articles/chinas-reckless-labs-put-the-world-at-risk-11614102828.

7. What information does NIH have about the WIV's responses to the 2018 U.S. Department of State cables (attached to this letter) regarding safety concerns?

8. The April 2018 cable from the U.S. Department of State stated that the WIV planned to invite University of Texas Medical Branch Galveston (UTMBG) researchers to do research in Wuhan's labs. Please provide any information NIH received that indicates whether the WIV invited UTMBG researchers, and whether UTMBG researchers conducted any research in Wuhan's labs.

    a. If there was such research, please provide information and any documents related to this research.

9. Why was it pertinent to the NIH investigation that the "nonprofit [EcoHealth Alliance] must provide the "WIV's responses to the 2018 Department of State cables regarding safety concerns"?[25]

    a. Did EcoHealth Alliance provide this information? If so, how did NIH use the information to further its investigation?

EcoHealth Alliance, Columbia University Health Sciences

10. Was the 2019 NIH federal award to EcoHealth Alliance reviewed and approved by the HHS Potential Pandemic Pathogen Care and Oversight (P3CO) committee?[26]

    a. If so, please provide the documentation with the committee's decision.

    b. Please also provide the names of the individuals who were members of the committee at the time.

11. Please provide all correspondence and communications between NIH and EcoHealth Alliance, since January 1, 2020, related to federal funding involving the WIV. The documentation should include, but not be limited to, correspondence between NIH and EcoHealth Alliance dated sometime in April 2020, on July 8, 2020, and sometime in August 2020.

12. In April 2020, NIH suspended a 2019 federal award to EcoHealth Alliance, in part, because NIH did not believe the work aligned with "program goals and agency priorities."[27] Please specify the work that was done by the EcoHealth Alliance that did

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[25] Meredith Wadman, *NIH imposes 'outrageous' conditions on resuming coronavirus grant targeted by Trump*, SCIENCEMAG (Aug. 19, 2020), *available at* https://www.sciencemag.org/news/2020/08/nih-imposes-outrageous-conditions-resuming-coronavirus-grant-targeted-trump.
[26] National Institutes of Health, *Notice Announcing the Removal of the Funding Pause for Gain-of-Function Research Project* (Dec. 19, 2017), *available at* https://grants.nih.gov/grants/guide/notice-files/NOT-OD-17-071.html.
[27] *Id.*

not align with the agency's program goals and priorities, and when that work was conducted.

a. Was an evaluation of EcoHealth Alliance's work and whether it aligned with the agency's program goals and priorities conducted by the NIH before the award was issued? If yes, please provide any related documentation. If not, why not?

13. In April 2020 correspondence with EcoHealth Alliance, NIH wrote that it "received reports that the Wuhan Institute of Virology…has been conducting research at its facilities in China that pose serious bio-safety concerns."[28] What are the sources for those reports to NIH and what were the specific allegations reported?

14. Why did the NIH request that EcoHealth Alliance provide a sample of the pandemic coronavirus that the WIV used to determine its genetic sequence for SARS CoV-2?[29]

a. Why is this information important to NIH's investigation?

b. Has NIH obtained the sample and if so, what evaluations have been done, and for what purpose?

c. If NIH has not yet obtained the sample, what are the planned studies and evaluations NIH will conduct with the sample when it is obtained?

15. What is the nature of NIH's concerns about purported restrictions at the WIV including "diminished cell-phone traffic in October 2019, and the evidence that there may have been roadblocks surrounding the facility from October 14-19, 2019[,]" about the WIV lab or virus origin?[30]

a. What is the basis of information to NIH about the purported restrictions at the WIV?

b. What are the other purported restrictions at the WIV in October 2019?

16. After terminating EcoHealth Alliance's 2019 project entitled "Understanding the Risk of Bat Coronavirus Emergence," the NIH later offered to reinstate the EcoHealth Alliance funding in July 2020 if EcoHealth Alliance agreed to meet certain conditions.[31]

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[28] Betsy McKay, *NIH Presses U.S. Nonprofit for Information on Wuhan Virology Lab*, THE WALL STREET JOURNAL (Aug. 19. 2020), *available at* https://www.wsj.com/articles/nih-presses-u-s-nonprofit-for-information-on-wuhan-virology-lab-11597829400.

[29] Meredith Wadman, *NIH imposes 'outrageous' conditions on resuming coronavirus grant targeted by Trump*, SCIENCEMAG (Aug. 19, 2020), *available at* https://www.sciencemag.org/news/2020/08/nih-imposes-outrageous-conditions-resuming-coronavirus-grant-targeted-trump.

[30] *Id.*

[31] Betsy McKay, *NIH Presses U.S. Nonprofit for Information on Wuhan Virology Lab*, THE WALL STREET JOURNAL (Aug. 19. 2020), *available at* https://www.wsj.com/articles/nih-presses-u-s-nonprofit-for-information-on-wuhan-virology-lab-11597829400.

a. Please provide all of the information presented to NIH from EcoHealth Alliance in response to NIH's conditions for reinstatement.

b. What actions did NIH take based upon the information received? How has the information been used in NIH's investigation?

c. One condition for the federal award reinstatement was for EcoHealth Alliance to arrange for an outside inspection of the WIV and its records, "with specific attention to addressing the question of whether WIV staff had SARS-CoV-2their possession prior to December 2019."[32] Why is it pertinent to the NIH's investigation if staff at WIV had SARS-CoV-2 in their possession prior to December 2019? What is the potential significance if the staff did have the virus in their possession prior to December 2019?

d. What information does NIH have that was used for the basis of requesting that the EcoHealth Alliance "must 'explain the apparent disappearance' of a scientist who worked in the Wuhan lab," and on social media was rumored to be "patient zero" of the pandemic?[33]

    i. What is the potential significance about the whereabouts of this scientist and the photo being removed from the website?

17. Please provide all correspondence and communications between NIH and Columbia University related to federal funding involving the WIV, including email correspondence in April 2020 between Dr. Michael Lauer, Deputy Director of extramural research, and Naomi Schrag of Columbia University.

    a. In an April 2020 email, Dr. Lauer advised Naomi Schrag of Columbia University that it would be helpful for NIH "to know about all China-based participants in this work since the Type 1 grant started in 2014 - who they were and how much money they received."[34] Why did NIH request that Columbia University provide information about all of the China-based participants?

        i. What is the pertinence of the timeframe starting in 2014 for the requested information?

        ii. Did Columbia University provide the NIH with the requested information about all of the China-based participants from all grantees since 2014? If so, please provide the information1. If not, why not?

Federal Funding Records

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[32] *Id.*
[33] *Id.*
[34] Meredith Wadman and Jon Cohen, *NIH's axing of bat coronavirus grant a 'horrible precedent' and might break rules, critics say*, SCIENCEMAG (Apr. 30, 2020), *available at* https://www.sciencemag.org/news/2020/04/nih-s-axing-bat-coronavirus-grant-horrible-precedent-and-might-break-rules-critics-say.

18. Please provide ledgers or any accounting for dispersion of all NIH federal funding awards that EcoHealth Alliance has sent to the WIV, including through contracts, grants, donations, cooperative agreements, staffing, or any other support or means. In addition, please provide the results and outcomes from the funding and support.[35]

19. What is the total amount of NIH federal funding per year from 2017 through 2021 that has directly or indirectly supported the WIV scientists or research through grant recipients, including to EcoHealth Alliance; Wildlife Trust, Inc.; Columbia University Health Sciences; Trustees of Columbia University; University of North Carolina Chapel Hill; Vanderbilt University; University of Virginia; and Oregon Health and Science University?[36]

20. According to a report in *The Washington Post* on April 14, 2020, the WIV issued a news release in English about the final visit from U.S. Embassy scientist diplomats in Beijing, which occurred on March 27, 2018.[37] Does the NIH have a copy of this news release? If so, please provide a copy.

21. For NIH award recipients that have provided support to the WIV since January 1, 2012, please provide annual reports, trip reports related to the WIV, documentation of any survey or field trips by the WIV, and interim data summaries from the WIV.

22. Please provide copies of all grantee annual reports, progress reports, projects, studies, and observations since 2014 where foreign sites for all Type 1 and Type 2 awards have been documented as involving the WIV.

23. Please provide copies of all grantee annual reports, progress reports, projects, studies, and observations since 2014 for NIH domestic grantee awards with a foreign component involving the WIV.

24. Please provide the name(s) of the NIH program manager(s) or officer(s) responsible for overseeing the grants to EcoHealth Alliance and time period(s) of responsibility.

25. Please provide the name(s) of the NIH Scientific Review Officers responsible for reviewing and approving any NIH financial awards to EcoHealth Alliance and any other funding recipients that supported the WIV.

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[35] Betsy McKay, *NIH Presses U.S. Nonprofit for Information on Wuhan Virology Lab*, THE WALL STREET JOURNAL (Aug. 19. 2020), *available at* https://www.wsj.com/articles/nih-presses-u-s-nonprofit-for-information-on-wuhan-virology-lab-11597829400.

[36] National Institutes of Health, Research Portfolio online Reporting Tools, NIH RePorter *available at* https://report.nih.gov/ (last accessed March 6, 2020).

[37] Josh Rogin, *Opinion: State Department cables warned of safety issues at Wuhan lab studying bat coronaviruses*, THE WASHINGTON POST (Apr. 14, 2020), *available at* https://www.washingtonpost.com/opinions/2020/04/14/state-department-cables-warned-safety-issues-wuhan-lab-studying-bat-coronaviruses/.

26. According to an editorial in *The Wall Street Journal*, the WIV housed tens of thousands of bat samples and laboratory animals in 2019.[38] Please provide any information the NIH has on the number of bat samples and animals at the WIV.

    a. Did any NIH scientists who are fluent in Mandarin review the Chinese scientific literature on the WIV research related to coronaviruses that is dated before February 1, 2020?

27. Does the NIH have the unpublished sequences of bat coronaviruses that were maintained in the WIV database before December 30, 2019, or before the database was removed from the internet?[39] Does NIH have the full sequences of the eight viruses sampled in the Yunnan province on an EcoHealth Alliance bat-virus sampling trip in 2015?

    a. Please provide NIH's analysis if the sequences have been analyzed.

    b. If NIH does not have the sequences, can NIH get this information from the EcoHealth Alliance or from other NIH-funded sources?

28. Please provide the original version of "Origin and cross-species transmission of bat coronaviruses in China" that was submitted to *Nature* by EcoHealth Alliance on October 6, 2019, published August 25, 2020, and funded in part by NIAID (award number R01AI110964).[40] If NIH does not have the October 6, 2019 report, can NIH obtain it from EcoHealth Alliance for this response? If so, please provide the report.

29. Have NIH, EcoHealth Alliance, or other NIH award recipient(s) been denied permission or access to results of any WIV research, which indirectly received financial support from NIH awards? If so, please provide the date(s), individuals involved, and circumstances of each denial.

We request that the NIH provide the requested documents and information in a coordinated response from all stakeholders and the appropriate divisions within NIH, including but not limited to subject matter experts from NIH's Division of Security and Emergency Response, the Office of Management Assessment, the Center for Scientific Review, the National Institute of Allergy and Infectious Diseases, and the Office of Extramural Research. After the requested information has been provided, we ask that the NIH provide a briefing to the Minority Committee staff to discuss the information that the NIH has related to the origins of SARS-CoV-2, including any potential links to the WIV. Finally, we request that you appoint an NIH working group representing an appropriate diversity of scientific disciplines to collect data and

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[38] Mike Pompeo and Miles Yu, *NIH Presses U.S. Nonprofit for Information on Wuhan Virology Lab*, THE WALL STREET JOURNAL (Feb. 23, 2021), *available at* https://www.wsj.com/articles/chinas-reckless-labs-put-the-world-at-risk-11614102828.

[39] Washington Post Editorial Board, *We're still missing the origin story of this pandemic. China is sitting on the answers*, THE WASHINGTON POST (Feb. 5, 2021), *available at* https://www.washingtonpost.com/opinions/2021/02/05/coronavirus-origins-mystery-china/?arc404=true.

[40] Latinne, A., Hu, B., Olival, K.J. et al,. *Origin and cross-species transmission of bat coronaviruses in China*, Nature (Aug. 25, 2020), *available at* https://www.nature.com/articles/s41467-020-17687-3#Ack1.

information related to COVID-19 origins (including the WIV), and that the NIH working group coordinate and consult with foreign scientific agencies involved in similar work.

Your assistance with this request is greatly appreciated. If you have any questions, please contact Alan Slobodin or Diane Cutler of the Minority Committee staff.

Sincerely,

Cathy McMorris Rodgers
Republican Leader
Committee on Energy and Commerce

Brett Guthrie
Republican Leader
Subcommittee on Health

H. Morgan Griffith
Republican Leader
Subcommittee on Oversight and Investigations

Attachment

Cc: The Honorable Frank Pallone, Chairman
The Honorable Diana DeGette, Chair, Subcommittee on Oversight and Investigations
The Honorable Anna Eshoo, Chair, Subcommittee on Health

From: Lauer, Michael (NIH/OD) [E] [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=90FE9CAE30C64CFBB67ABD568E882796-LAUERM]
Sent: 5/19/2021 2:49:22 AM
To: Tabak, Lawrence (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=02e22836b5ff4e9988e3770cfc7ee770-tabakl]; Hallett, Adrienne (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f1705e2e7c254b84a77f058dbf75b31b-hallettaa]
CC: Lauer, Michael (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=90fe9cae30c64cfbb67abd568e882796-lauerm]; Bundesen, Liza (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cded900576a49aea461d26e93bddac3-lbundese]
Subject: FW: ACTION: By 12pm 6/2, Please respond to GAO's follow-up request on "Scientific Integrity at NIH" (104613)
Attachments: FY21_ALL_STAFF-#611820-v7-104613__NIH_DATA_INFORMATION_REQUEST_#2_(MAY_14__2021).DOCX

Hi Larry and Adrienne – looks like GAO is now in the act, forwarding along many of the same questions. We should discuss strategy.

Many thanks, Mike

From: "Bundesen, Liza (NIH/OD) [E]" (b) (6)
Date: Tuesday, May 18, 2021 at 11:15 AM
To: "Bulls, Michelle G. (NIH/OD) [E]" (b) (6), "Ta, Kristin (NIH/OD) [E]" (b) (6) "Snyderman, Joel (NIH/OD) [E]" (b) (6), "Valdez, Patricia (NIH/OD) [E]" (b) (6), "Lauer, Michael (NIH/OD) [E]" (b) (6)
Cc: "Showe, Melanie (NIH/OD) [E]" (b) (6)
Subject: FW: ACTION: By 12pm 6/2, Please respond to GAO's follow-up request on "Scientific Integrity at NIH" (104613)

Good morning,

I'm looping OPERA into this engagement, which has been underway for a bit. (b) (5) . Please let me know if we should set up a meeting to discuss, or if OPERA is ok with getting started on these. NIAID will probably need to be looped in too.

Thanks,
Liza

From: Simanich, Sasha (NIH/OD) [E] (b) (6)
Sent: Tuesday, May 18, 2021 8:56 AM
To: Wyatt, Richard G (NIH/OD) [E] (b) (6); Lauer, Michael (NIH/OD) [E] (b) (6); Zayas Caban, Teresa (NIH/NLM) [E] (b) (6); Bundesen, Liza (NIH/OD) [E] (b) (6); Spady, Tyrone (NIH/OD) [E] (b) (6) Partin, Kathryn (NIH/OD) [E] (b) (6); Kearse, Deborah (NIH/OD) [E] (b) (6); Chakraborty, Trisha (NIH/OD) [E] (b) (6); Gottesman, Michael (NIH/OD) [E] (b) (6)
Cc: Butler, Benjamin (NIH/OD) [E] (b) (6); Mackenzie, James (NIH/OD) [E] (b) (6); Stein, Meredith (NIH/OD) [E] (b) (6); McBurney, Margaret (NIH/OD) [E] (b) (6); Jaffe, Holli Beckerman (NIH/OD) [E] (b) (6); Valdez, Patricia (NIH/OD) [E] (b) (6); Funk, Kathryn (NIH/NLM/NCBI) [E]

(b) (6); Harrah, Annette (NIH/OD) [E] (b) (6)
Subject: ACTION: By 12pm 6/2, Please respond to GAO's follow-up request on "Scientific Integrity at NIH" (104613)

Good Morning,

Subject – By 12pm, Wednesday, June 2 – Provide written responses and supporting documentation on GAO's review *"Scientific Integrity at NIH"* (104613)

From – OMA

To – NLM, OER, OIR, OSP

Cc – OD, OLPA, OGC

Action – Provide responses and documentation to GAO's information request

Requestor – GAO

Background – The GAO is continuing their review on *"Scientific Integrity at NIH"* (104613) and provided follow-up information request. Please review and provide responses by 12pm, June 2.

POCs – Please provide responses to Sasha Simanich (b) (6)

Timeline –

NIH Receipt Date	SME Response to OMA Due Date	OD Office Review Date	NIH Final Response Due Date
5/18/2021	6/2/2021	6/3/2021	6/4/2021

Additional Instructions – Please let me know whether additional offices/individuals should be involved in this review.

- Use the provided word document file to complete the data request

Attachments –

- GAO's NIH information request

Thanks,

Sasha Simanich
Audit Liaison, OIG/GAO Review
NIH/OD/OMA/RMAL
6011 Executive Blvd, Suite 108
Rockville, MD 20852-7669

Email: (b) (6)

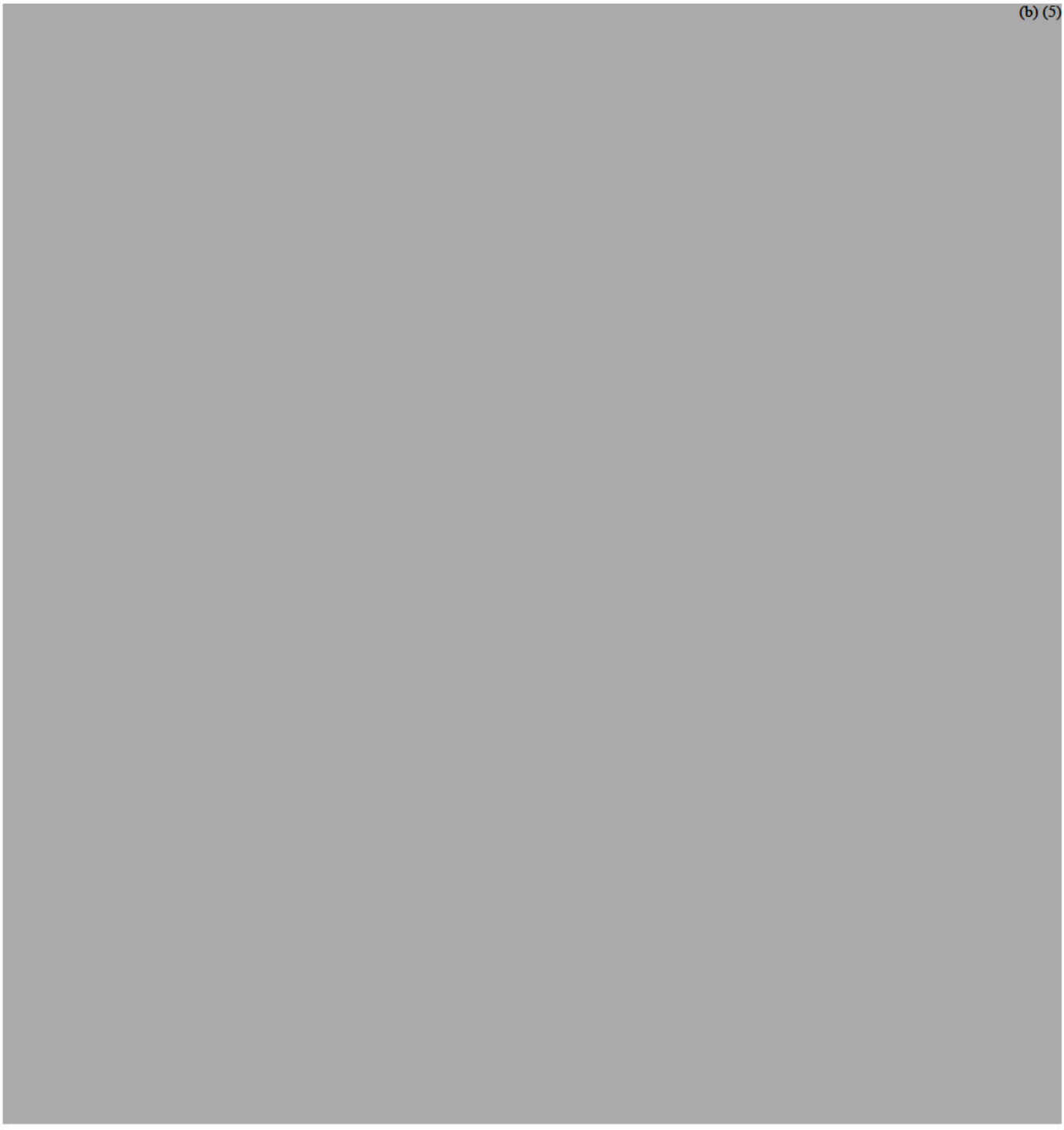
GAO ENGAGEMENT: 104613—Scientific Integrity

REQUEST #: 2

DATE REQUESTED: May 14, 2021

DUE DATE: June 4, 2021

(b) (5)



(b) (5)

[redacted]

GAO Data Request for the National Institutes of Health (NIH)
Scientific Integrity Engagement 104613

(b) (5)

From: Lauer, Michael (NIH/OD) [E] [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=90FE9CAE30C64CFBB67ABD568E882796-LAUERM]
Sent: 5/21/2021 3:39:54 AM
To: Bundesen, Liza (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cded900576a49aea461d26e93bddac3-lbundese]
CC: Lauer, Michael (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=90fe9cae30c64cfbb67abd568e882796-lauerm]
Subject: FW: ACTION: By 12pm 6/2, Please respond to GAO's follow-up request on "Scientific Integrity at NIH" (104613)
Attachments: FY21_ALL_STAFF-#611820-v7-104613__NIH_DATA_INFORMATION_REQUEST_#2_(MAY_14__2021).DOCX; RE: ACTION: By 12pm 6/2, Please respond to GAO's follow-up request on "Scientific Integrity at NIH" (104613)

Thanks Liza – might be best to discuss at our next 1:1.

Mike

From: "Bundesen, Liza (NIH/OD) [E]" (b) (6)
Date: Wednesday, May 19, 2021 at 2:59 PM
To: "Lauer, Michael (NIH/OD) [E]" (b) (6), "Bulls, Michelle G. (NIH/OD) [E]" (b) (6), "Ta, Kristin (NIH/OD) [E]" (b) (6), "Snyderman, Joel (NIH/OD) [E]" (b) (6), "Valdez, Patricia (NIH/OD) [E]" (b) (6)
Subject: FW: ACTION: By 12pm 6/2, Please respond to GAO's follow-up request on "Scientific Integrity at NIH" (104613)

Hi—a little more background from Sasha in the attached email.

From: Bundesen, Liza (NIH/OD) [E]
Sent: Tuesday, May 18, 2021 11:16 AM
To: Bulls, Michelle G. (NIH/OD) [E] (b) (6); Ta, Kristin (NIH/OD) [E] (b) (6); Snyderman, Joel (NIH/OD) [E] (b) (6); Valdez, Patricia (NIH/OD) [E] (b) (6); Lauer, Michael (NIH/NHLBI) [E] (b) (6)
Cc: Showe, Melanie (NIH/OD) [E] (b) (6)
Subject: FW: ACTION: By 12pm 6/2, Please respond to GAO's follow-up request on "Scientific Integrity at NIH" (104613)

Good morning,

I'm looping OPERA into this engagement, which has been underway for a bit. (b) (5) . Please let me know if we should set up a meeting to discuss, or if OPERA is ok with getting started on these. NIAID will probably need to be looped in too.

Thanks,
Liza

From: Simanich, Sasha (NIH/OD) [E] (b) (6)
Sent: Tuesday, May 18, 2021 8:56 AM
To: Wyatt, Richard G (NIH/OD) [E] (b) (6); Lauer, Michael (NIH/OD) [E] (b) (6); Zayas Caban, Teresa (NIH/NLM) [E] (b) (6); Bundesen, Liza

(NIH/OD) [E] (b) (6); Spady, Tyrone (NIH/OD) [E] (b) (6); Partin, Kathryn (NIH/OD) [E] (b) (6); Kearse, Deborah (NIH/OD) [E] (b) (6); Chakraborty, Trisha (NIH/OD) [E] (b) (6); Gottesman, Michael (NIH/OD) [E] (b) (6)
Cc: Butler, Benjamin (NIH/OD) [E] (b) (6); Mackenzie, James (NIH/OD) [E] (b) (6); Stein, Meredith (NIH/OD) [E] (b) (6); McBurney, Margaret (NIH/OD) [E] (b) (6); Jaffe, Holli Beckerman (NIH/OD) [E] (b) (6) Valdez, Patricia (NIH/OD) [E] (b) (6); Funk, Kathryn (NIH/NLM/NCBI) [E] (b) (6); Harrah, Annette (NIH/OD) [E] (b) (6)
Subject: ACTION: By 12pm 6/2, Please respond to GAO's follow-up request on "Scientific Integrity at NIH" (104613)

Good Morning,

Subject – By 12pm, Wednesday, June 2 – Provide written responses and supporting documentation on GAO's review *"Scientific Integrity at NIH"* (104613)

From – OMA

To – NLM, OER, OIR, OSP

Cc – OD, OLPA, OGC

Action – Provide responses and documentation to GAO's information request

Requestor – GAO

Background – The GAO is continuing their review on *"Scientific Integrity at NIH"* (104613) and provided follow-up information request. Please review and provide responses by 12pm, June 2.

POCs – Please provide responses to Sasha Simanich (b) (6)

Timeline –

NIH Receipt Date	SME Response to OMA Due Date	OD Office Review Date	NIH Final Response Due Date
5/18/2021	6/2/2021	6/3/2021	6/4/2021

Additional Instructions – Please let me know whether additional offices/individuals should be involved in this review.

- Use the provided word document file to complete the data request

Attachments –

- GAO's NIH information request

Thanks,

Sasha Simanich
Audit Liaison, OIG/GAO Review
NIH/OD/OMA/RMAL
6011 Executive Blvd, Suite 108
Rockville, MD 20852-7669

Email: (b) (6)

GAO Data Request for the National Institutes of Health (NIH)
Scientific Integrity Engagement 104613

GAO ENGAGEMENT: 104613—Scientific Integrity

REQUEST #: 2

DATE REQUESTED: May 14, 2021

DUE DATE: June 4, 2021

(b) (5)

[redacted]

(b) (5)

[redacted]

GAO Data Request for the National Institutes of Health (NIH)
Scientific Integrity Engagement 104613

(b) (5)

From: Simanich, Sasha (NIH/OD) [E] [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=62114870DC66475A8C0CE0047413ED92-SIMANICHS2]
Sent: 5/19/2021 4:46:09 PM
To: Bundesen, Liza (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cded900576a49aea461d26e93bddac3-lbundese]
CC: Stein, Meredith (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e3324d143a8c4975b4f1d405d1a54d14-steinme]
Subject: RE: ACTION: By 12pm 6/2, Please respond to GAO's follow-up request on "Scientific Integrity at NIH" (104613)
Attachments: NIH Responses to FY21_ALL_STAFF-#451922-v5-104613_NIH_DATA_REQUEST_(MAR_2021).docx; NIH Response to FY21_ALL_STAFF-#486038-v6-104613__QUESTIONS_ON_NIH_CLEARANCE_PROCESSES.docx

Hi Liza,

We reached out to GAO to get some additional context to their questions – please see below:

"The GAO Scientific Integrity engagement is seeking to answer four key questions, which have changed only slightly since our entrance conference. They are:

1. (b) (5)
2.
3.
4.

To help answer objectives 2 and 4, (b) (5)

I hope this helps. I'm also attaching NIH's responses we provided earlier in May. Let me know if you have any other questions or concerns.

Thanks,
Sasha

From: Bundesen, Liza (NIH/OD) [E] (b) (6)
Sent: Tuesday, May 18, 2021 9:19 AM
To: Simanich, Sasha (NIH/OD) [E] (b) (6)
Cc: Stein, Meredith (NIH/OD) [E] (b) (6)
Subject: RE: ACTION: By 12pm 6/2, Please respond to GAO's follow-up request on "Scientific Integrity at NIH" (104613)

Hi Sasha,

(b) (5) I just want to make sure I have the full context when I loop in other staff in OER.

Thanks,
Liza

From: Simanich, Sasha (NIH/OD) [E] (b) (6)
Sent: Tuesday, May 18, 2021 8:56 AM
To: Wyatt, Richard G (NIH/OD) [E] (b) (6); Lauer, Michael (NIH/OD) [E] (b) (6); Zayas Caban, Teresa (NIH/NLM) [E] (b) (6); Bundesen, Liza (NIH/OD) [E] (b) (6); Spady, Tyrone (NIH/OD) [E] (b) (6); Partin, Kathryn (NIH/OD) [E] (b) (6) Kearse, Deborah (NIH/OD) [E] (b) (6); Chakraborty, Trisha (NIH/OD) [E] (b) (6); Gottesman, Michael (NIH/OD) [E] (b) (6)
Cc: Butler, Benjamin (NIH/OD) [E] (b) (6); Mackenzie, James (NIH/OD) [E] (b) (6); Stein, Meredith (NIH/OD) [E] (b) (6) McBurney, Margaret (NIH/OD) [E] (b) (6); Jaffe, Holli Beckerman (NIH/OD) [E] (b) (6); Valdez, Patricia (NIH/OD) [E] (b) (6); Funk, Kathryn (NIH/NLM/NCBI) [E] (b) (6); Harrah, Annette (NIH/OD) [E] (b) (6)
Subject: ACTION: By 12pm 6/2, Please respond to GAO's follow-up request on "Scientific Integrity at NIH" (104613)

Good Morning,

Subject – By 12pm, Wednesday, June 2 – Provide written responses and supporting documentation on GAO's review *"Scientific Integrity at NIH"* (104613)

From – OMA

To – NLM, OER, OIR, OSP

Cc – OD, OLPA, OGC

Action – Provide responses and documentation to GAO's information request

Requestor – GAO

Background – The GAO is continuing their review on *"Scientific Integrity at NIH"* (104613) and provided follow-up information request. Please review and provide responses by 12pm, June 2.

POCs – Please provide responses to Sasha Simanich (b) (6)

Timeline –

NIH Receipt Date	SME Response to OMA Due Date	OD Office Review Date	NIH Final Response Due Date
5/18/2021	6/2/2021	6/3/2021	6/4/2021

Additional Instructions – Please let me know whether additional offices/individuals should be involved in this review.

- Use the provided word document file to complete the data request

Attachments –

- GAO's NIH information request

Thanks,

Sasha Simanich
Audit Liaison, OIG/GAO Review
NIH/OD/OMA/RMAL

6011 Executive Blvd, Suite 108
Rockville, MD 20852-7669

Email: (b) (6)

GAO Data Request for the National Institutes of Health (NIH)
Scientific integrity 104613
March 2021

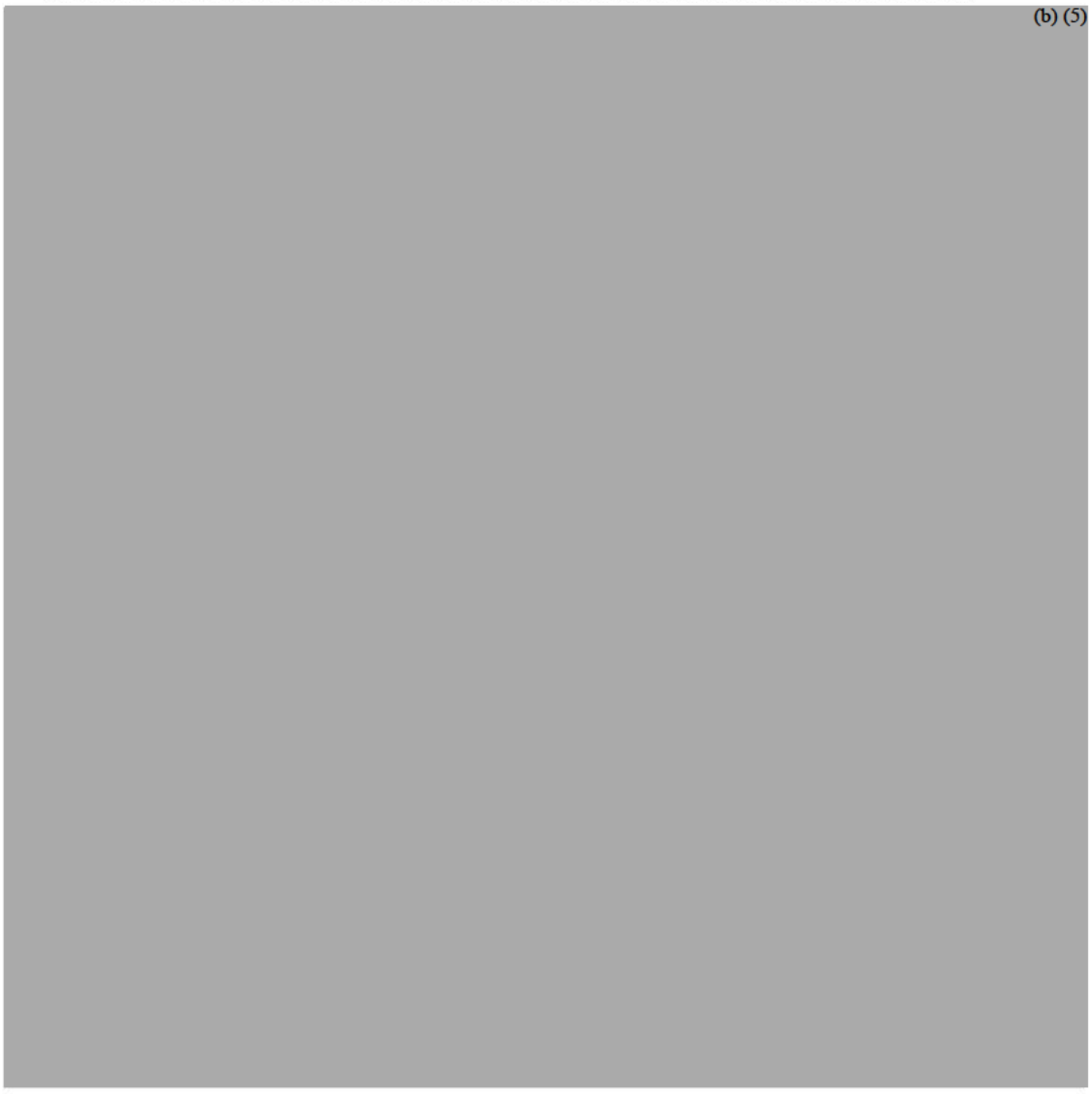
GAO ENGAGEMENT: 104613—Scientific Integrity

REQUEST #: 1

DATE REQUESTED: March 30, 2021

DUE DATE: April 20, 2021

(b) (5)

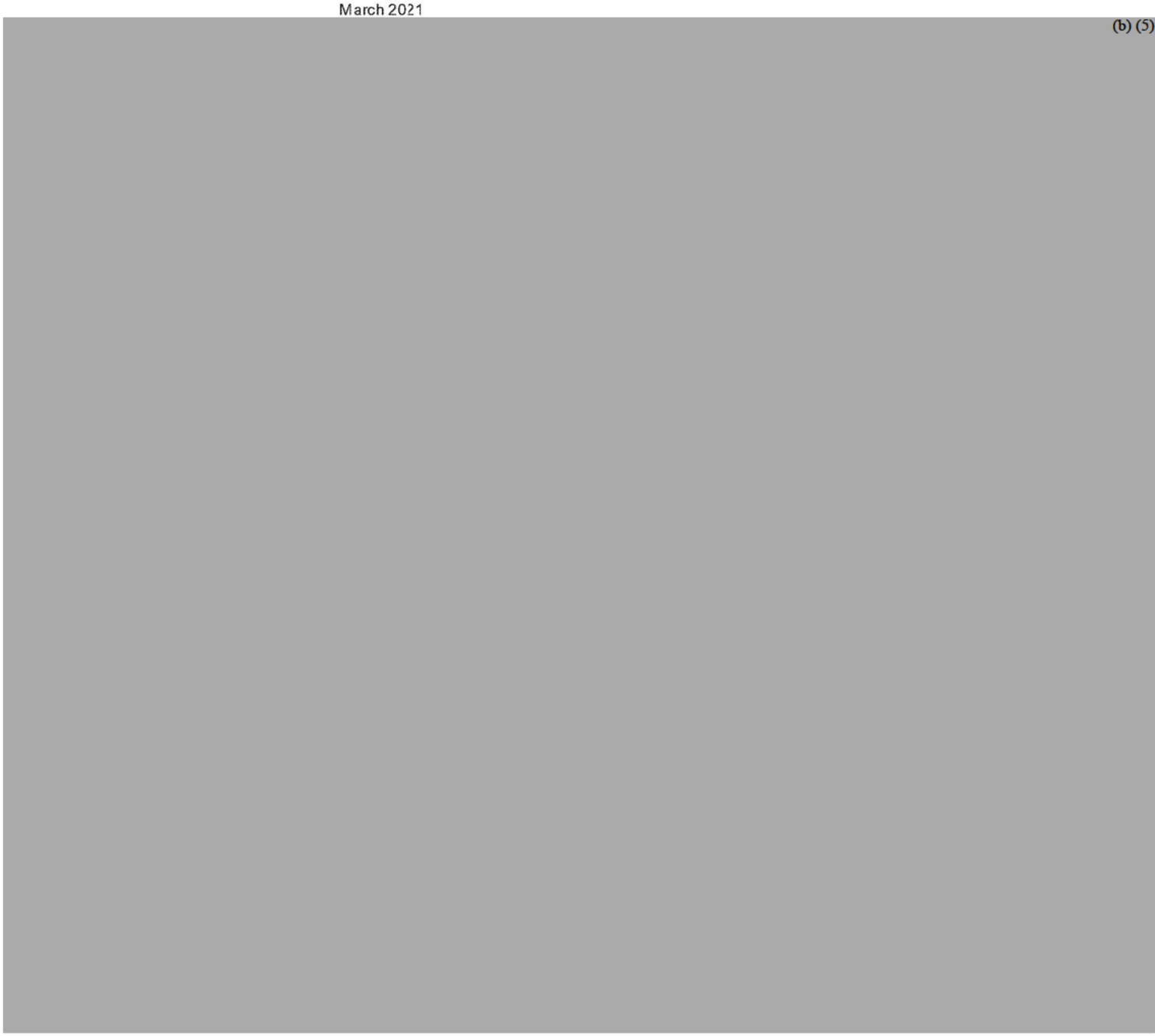


GAO Data Request for the National Institutes of Health (NIH)
Scientific integrity 104613
March 2021

(b) (5)

GAO Data Request for the National Institutes of Health (NIH)
Scientific integrity 104613
March 2021

(b) (5)



GAO Data Request for the National Institutes of Health (NIH)
Scientific integrity 104613
March 2021

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GAO Data Request for the National Institutes of Health (NIH)
Scientific integrity 104613
March 2021

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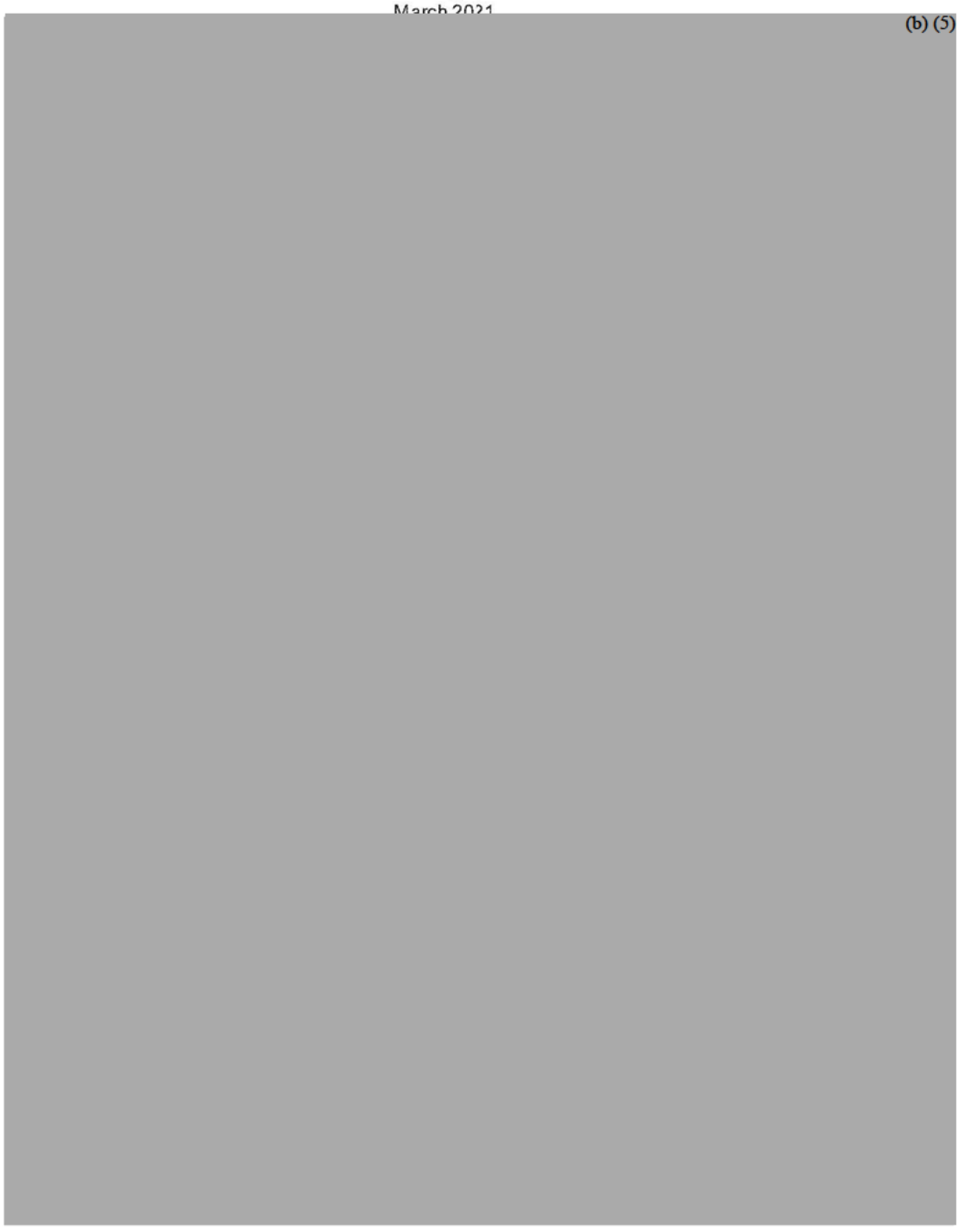

GAO Data Request for the National Institutes of Health (NIH)
Scientific integrity 104613
March 2021

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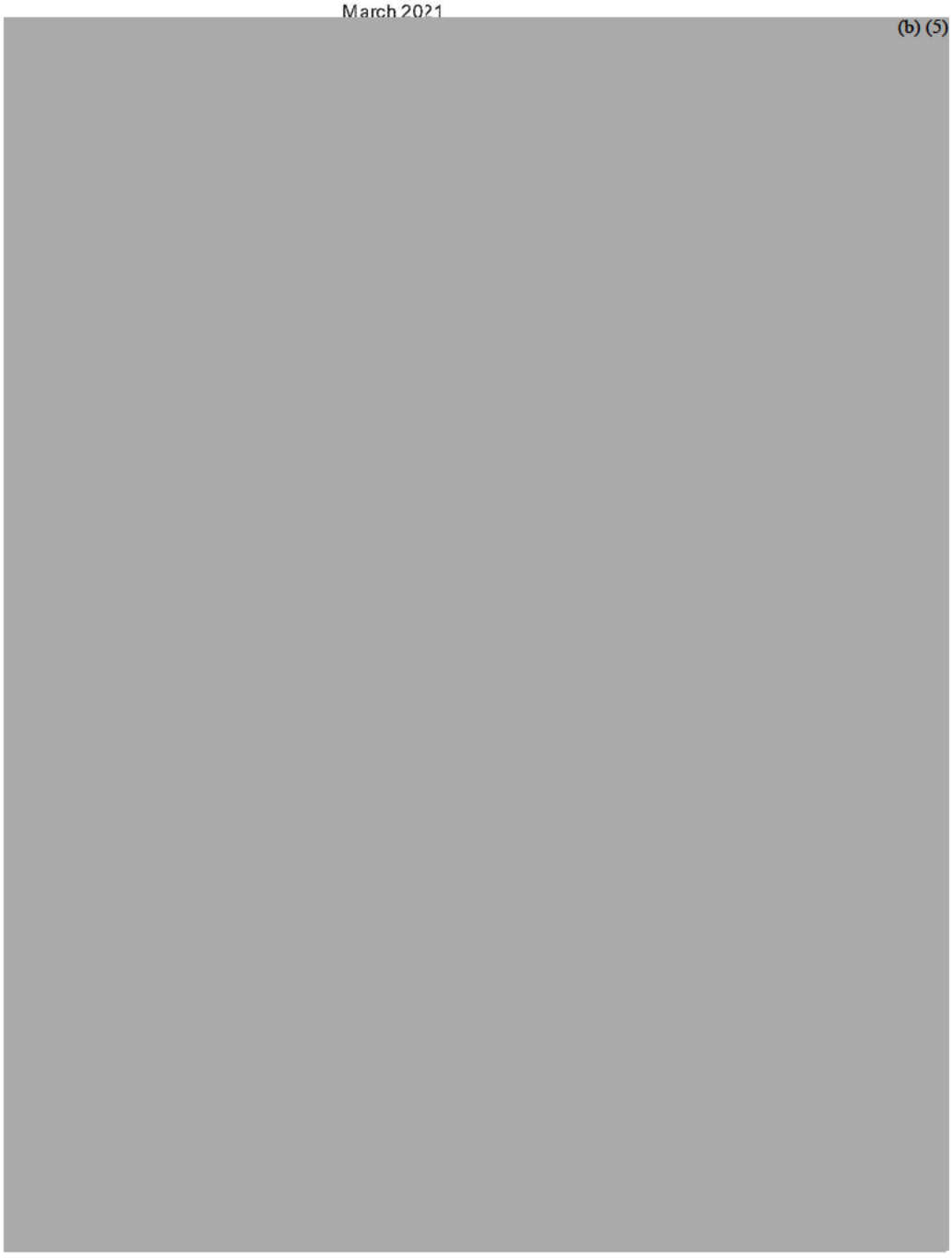

GAO Data Request for the National Institutes of Health (NIH)
Scientific integrity 104613
March 2021

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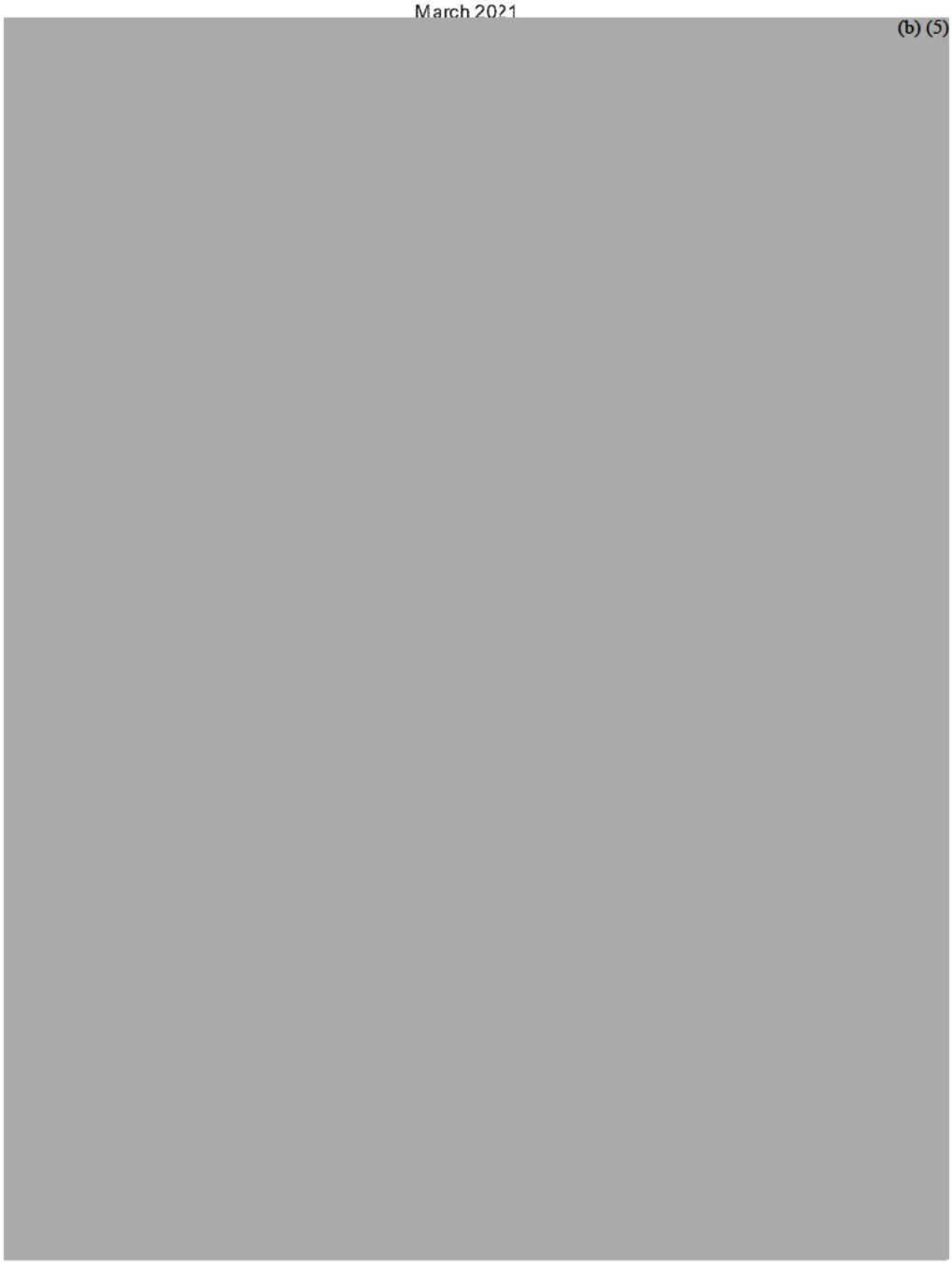

GAO Data Request for the National Institutes of Health (NIH)
Scientific integrity 104613
March 2021

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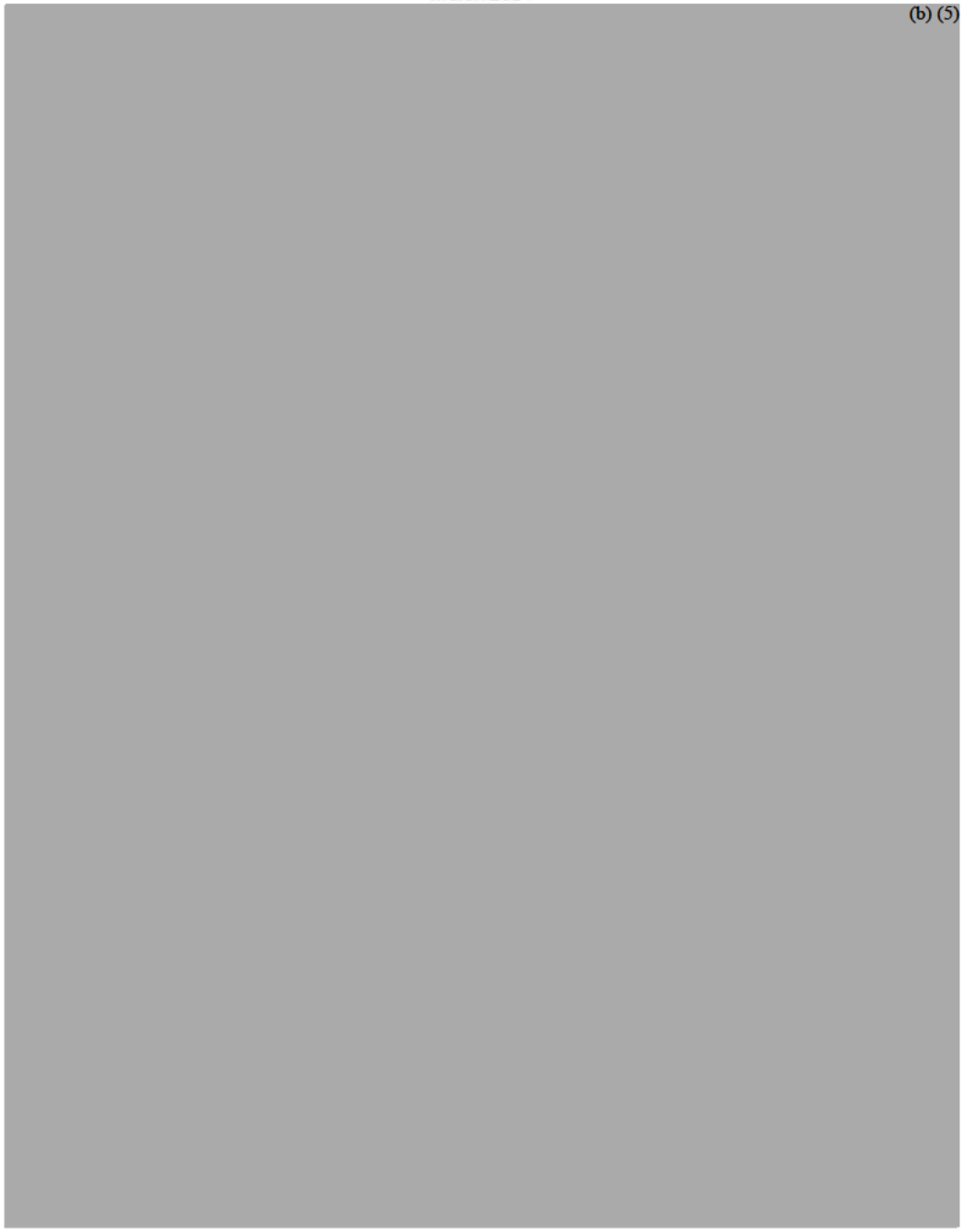

GAO Data Request for the National Institutes of Health (NIH)
Scientific integrity 104613
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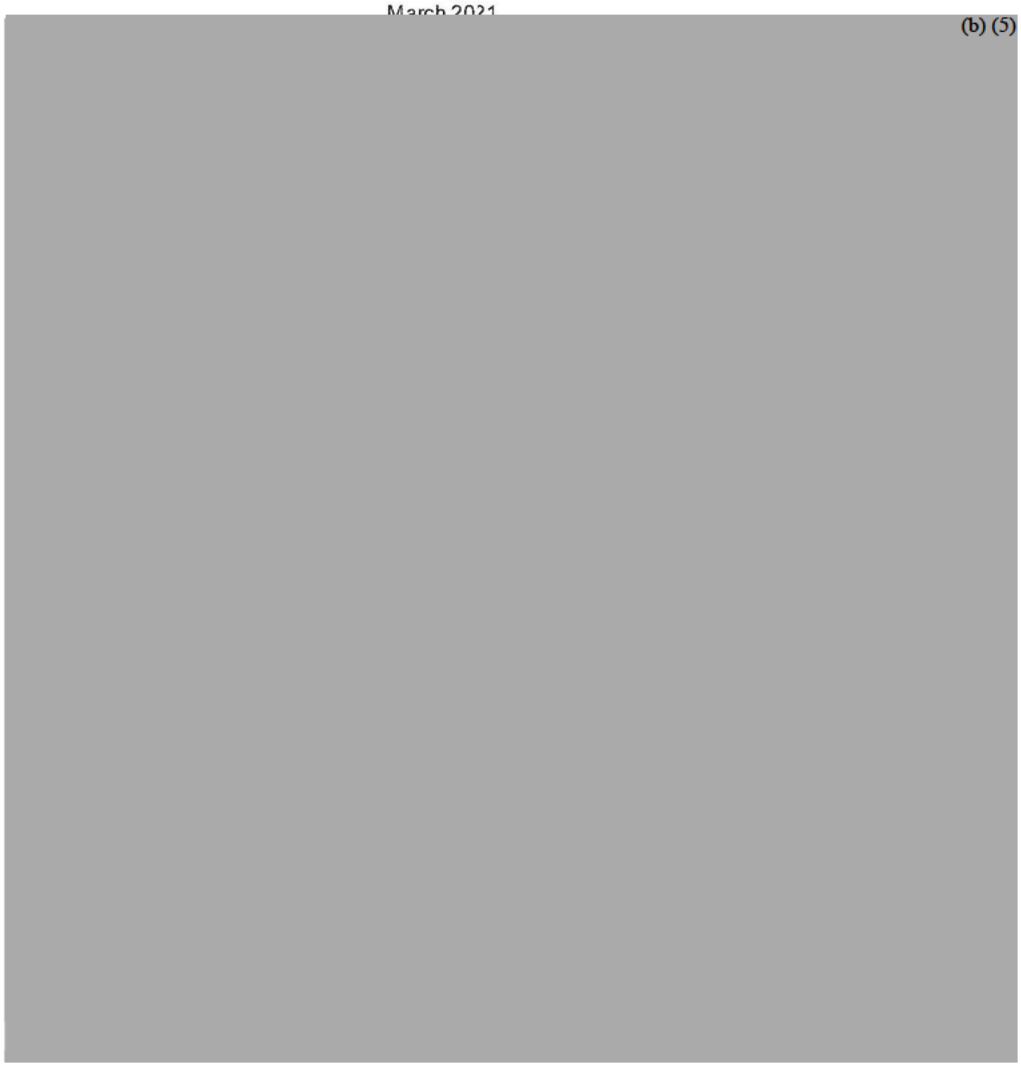

GAO Questions for the National Institutes of Health (NIH)
Scientific Integrity 104613
March 2021

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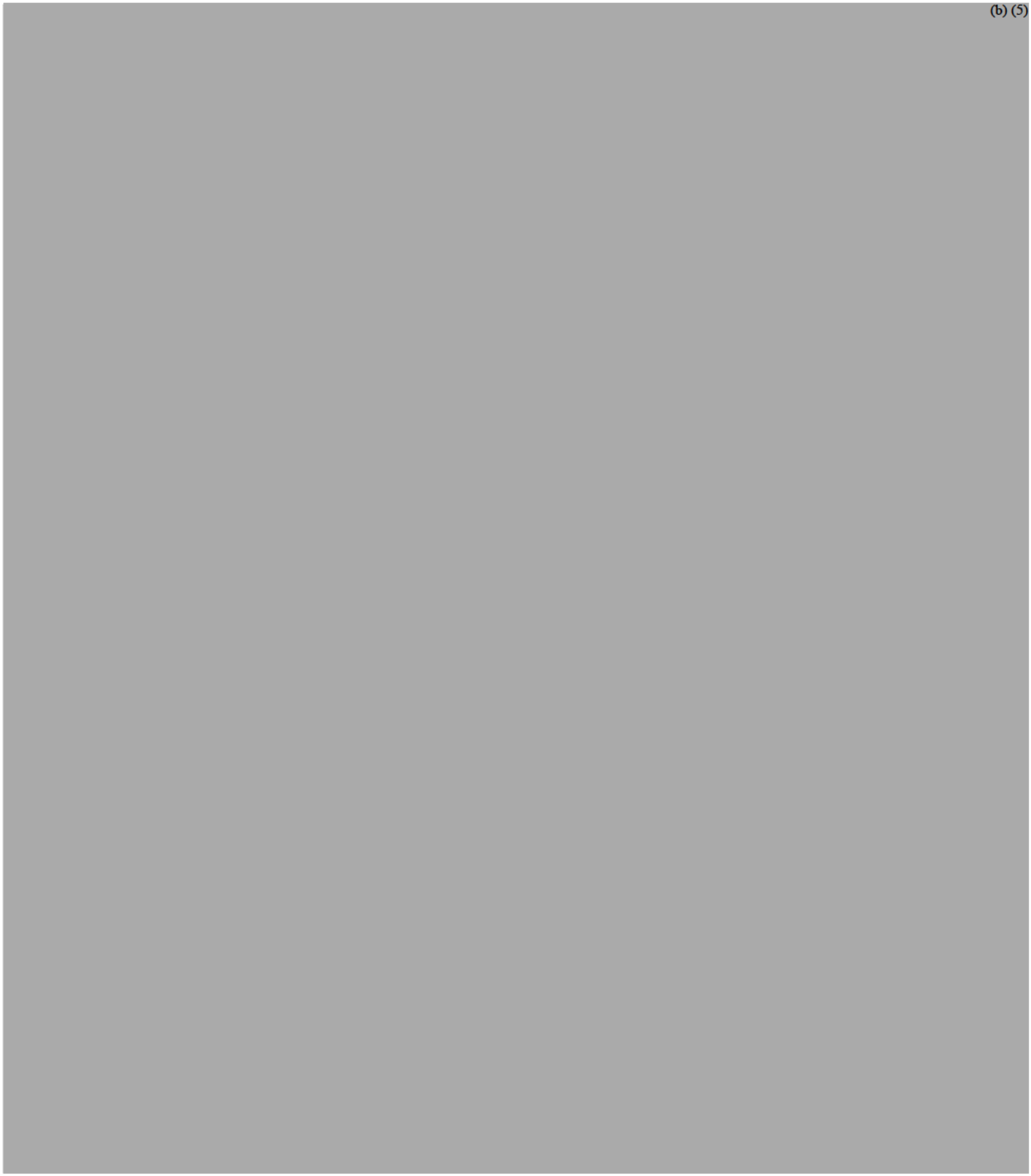

GAO Questions for the National Institutes of Health (NIH)
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March 2021

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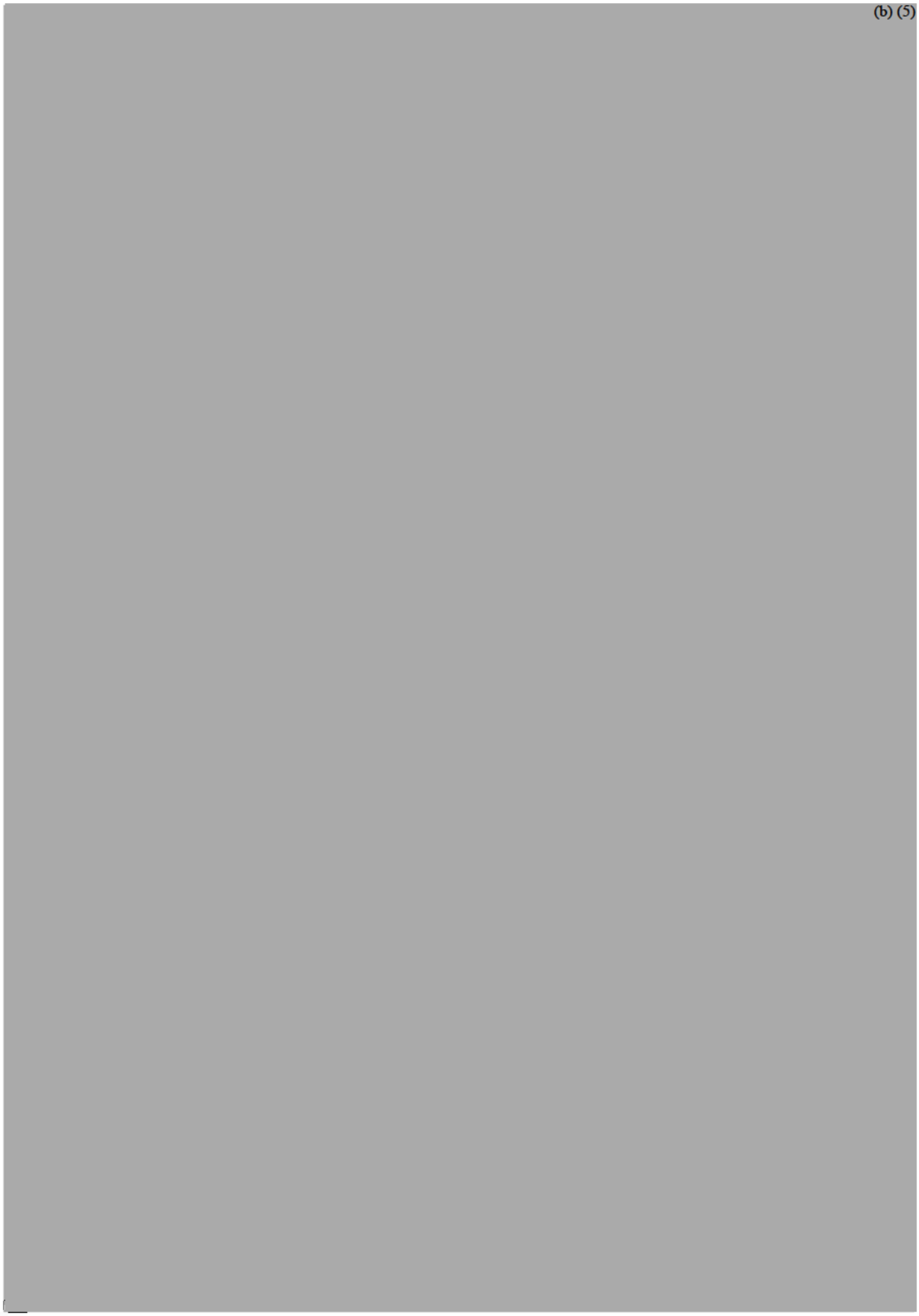

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March 2021

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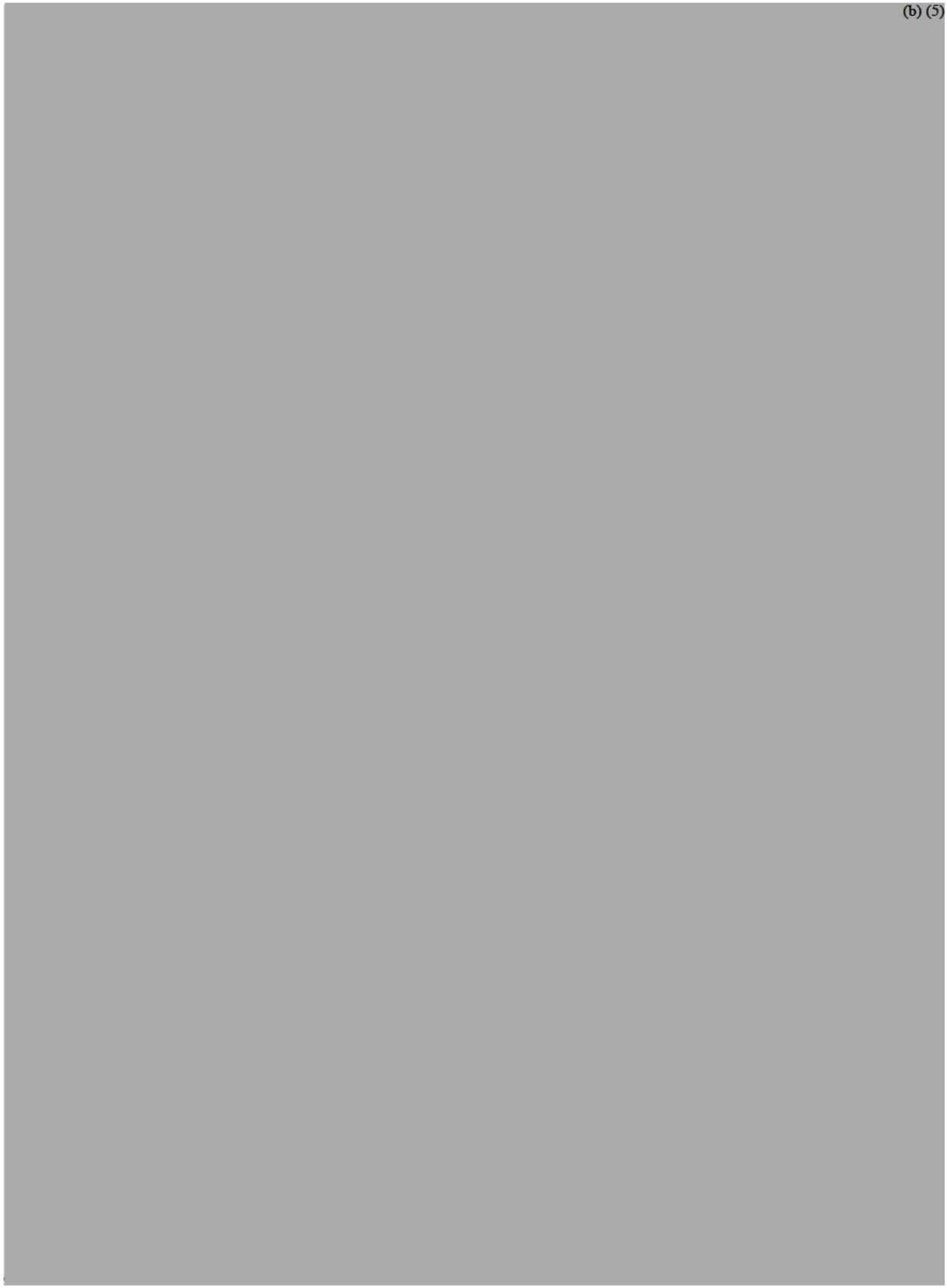

GAO Questions for the National Institutes of Health (NIH)
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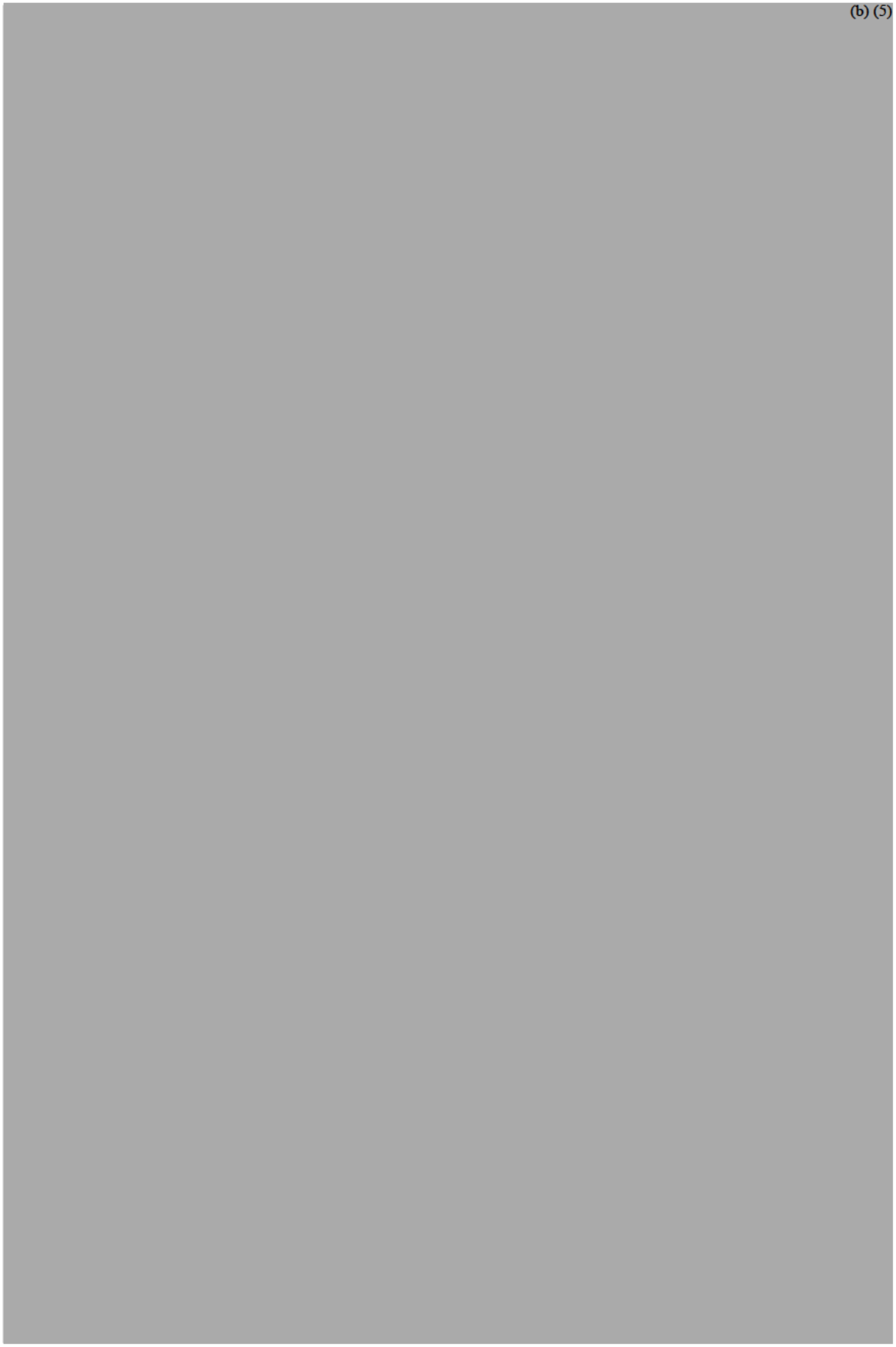

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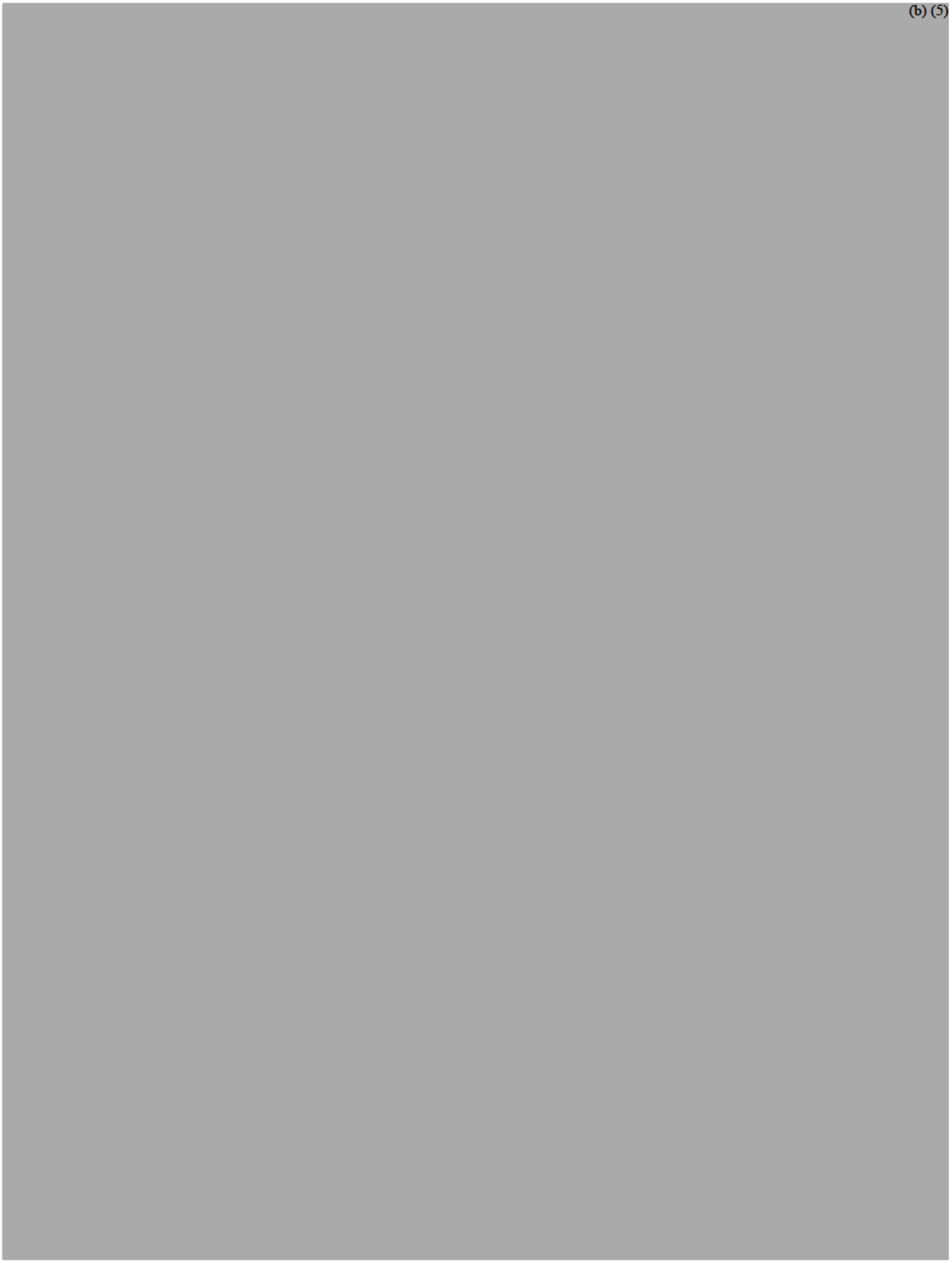

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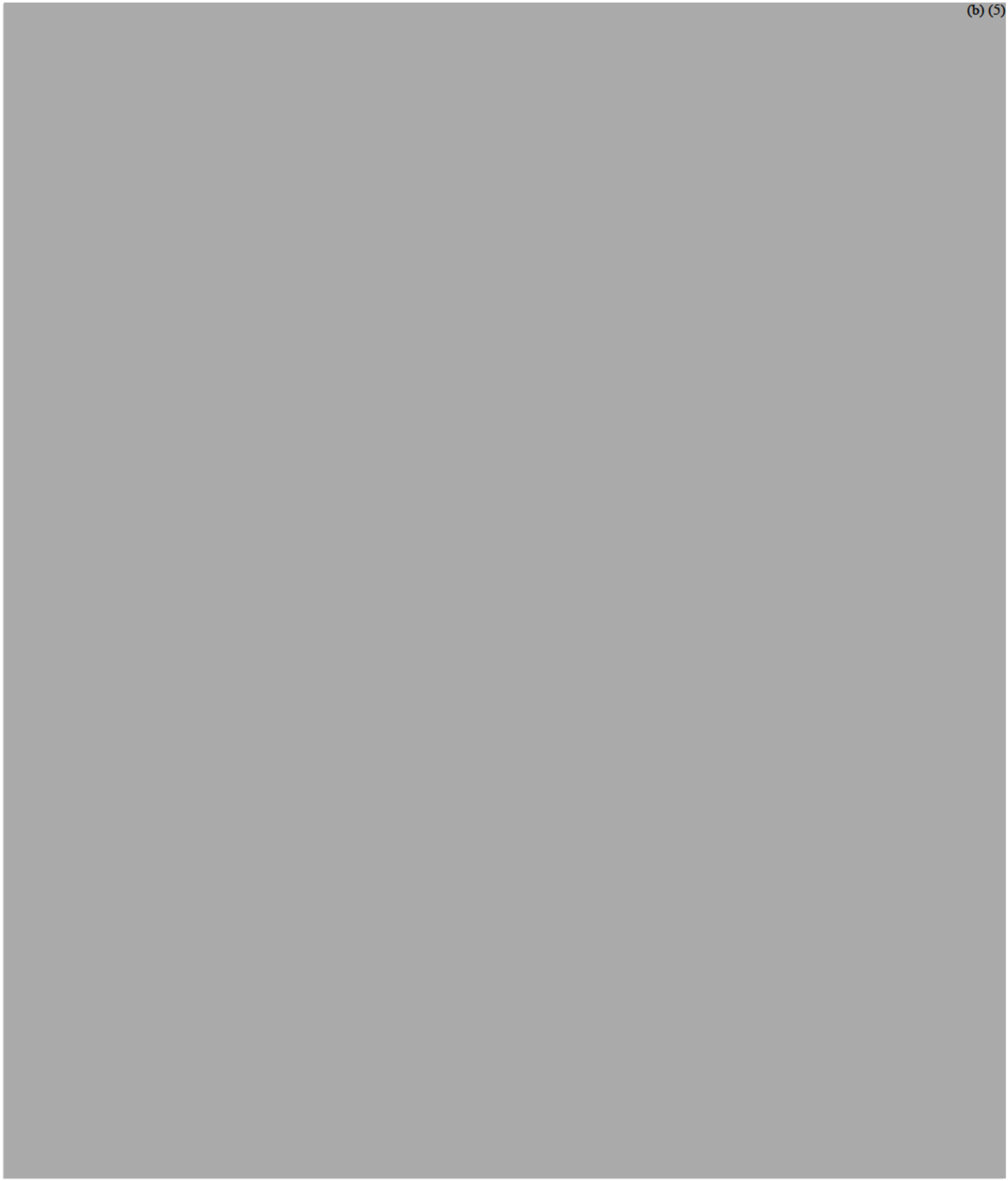

GAO Questions for the National Institutes of Health (NIH)
Scientific Integrity 104613
March 2021

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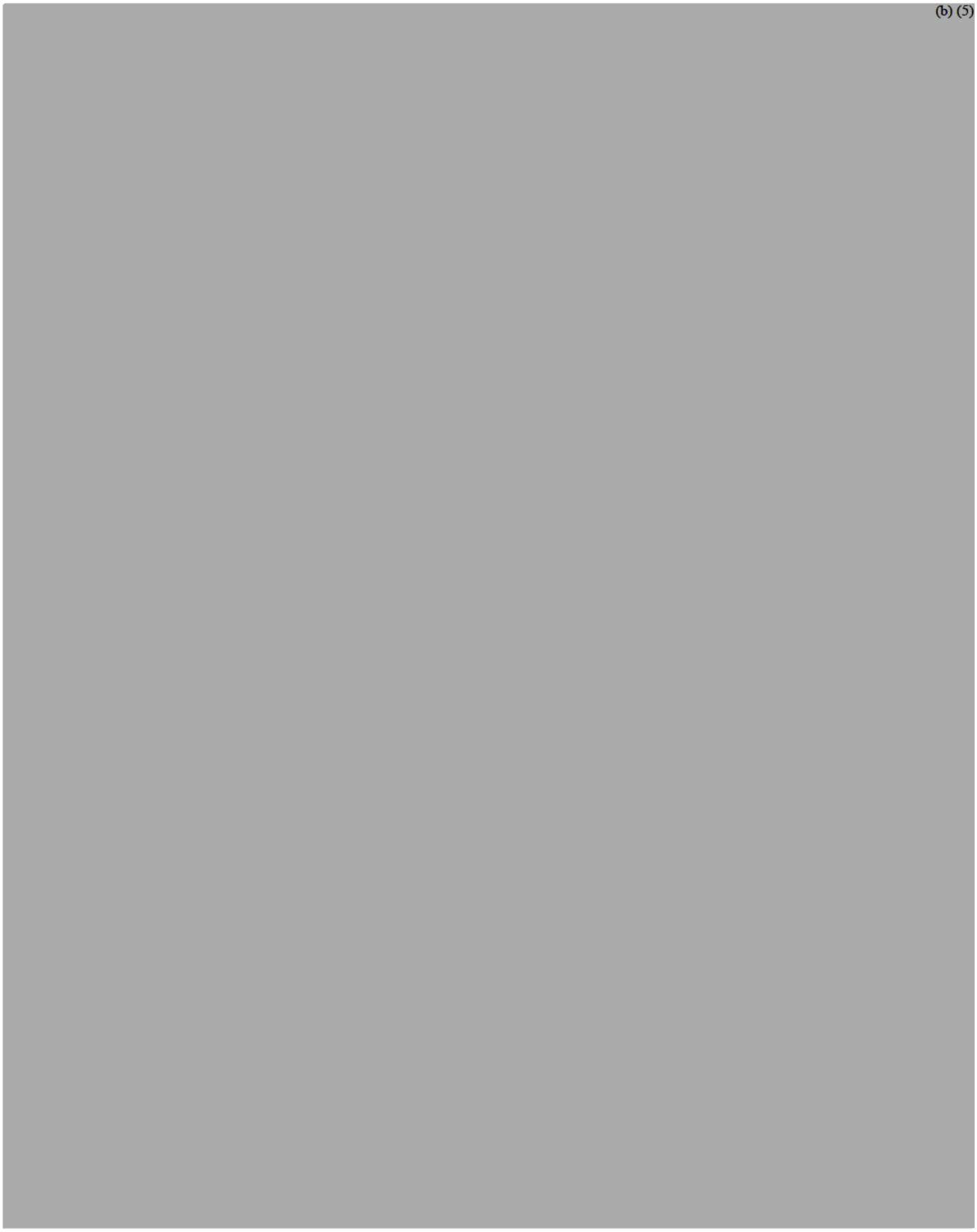
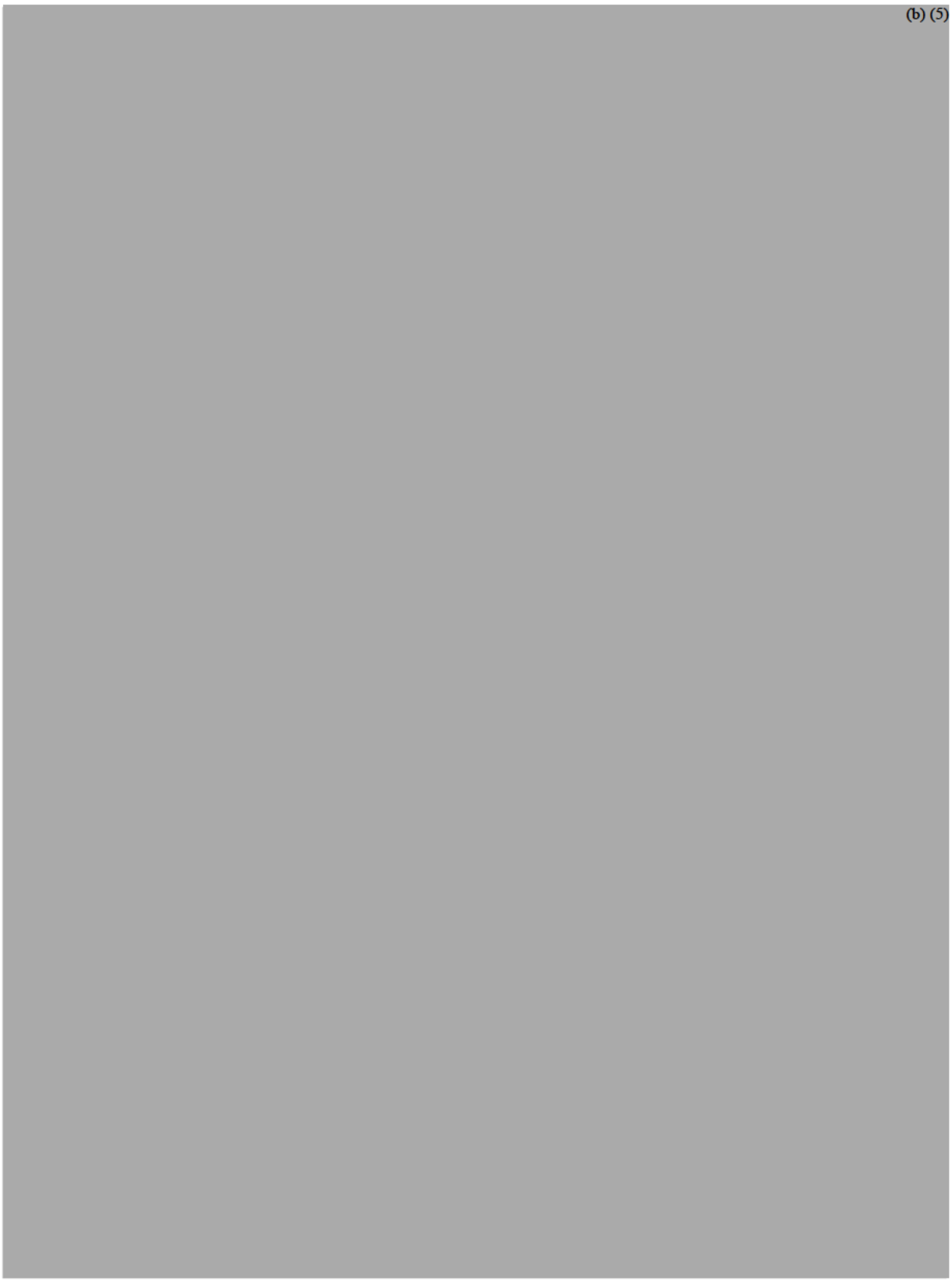


GAO Questions for the National Institutes of Health (NIH)
Scientific Integrity 104613
March 2021



From: Lauer, Michael (NIH/OD) [E] [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=90FE9CAE30C64CFBB67ABD568E882796-LAUERM]
Sent: 5/24/2021 6:29:11 PM
To: Burklow, John (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2e57f267323b43c08be856acb5b964ca-burklowj]
CC: Lauer, Michael (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=90fe9cae30c64cfbb67abd568e882796-lauerm]; Tabak, Lawrence (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=02e22836b5ff4e9988e3770cfc7ee770-tabakl]
Subject: Re: letter to EcoHealth
Attachments: October 23 2020 NIH Response to EcoHealth Response to Suspension_10_23_20.pdf; July 8 2020 Daszak 7 8 20.pdf

Hi John

Here are the letters.

(b) (5)

Many thanks and happy to chat.

Mike

From: "Burklow, John (NIH/OD) [E]" (b) (6)
Date: Monday, May 24, 2021 at 2:13 PM
To: "Lauer, Michael (NIH/OD) [E]" (b) (6)
Subject: letter to EcoHealth

Hi, Mike—

I was just talking with FC. He asked me for a copy of the letter you sent to EcoHealth last summer that included a number of questions for them to answer. (b) (5)

Do you recall?

He wants to be ready to respond tomorrow during the hearing, in case it comes up.

Thanks!

John

John Burklow
Acting Chief of Staff
Office of the Director
National Institutes of Health
(b) (6)


I GOT MY
COVID-19 VACCINE

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

National Institutes of Health
National Institute of Allergy
and Infectious Diseases
Bethesda, Maryland 20892

23 October 2020

Drs. Aleksei Chmura and Peter Daszak
EcoHealth Alliance, Inc.
460 W 34th St
Suite 1701
New York, NY 10001

Re: NIH Grant R01AI110964

Dear Drs. Chmura and Daszak:

I am following up on Mr. Krinsky's August 13, 2020, letter on behalf of EcoHealth Alliance, Inc. ("EcoHealth") responding to NIH's suspension of grant R01AI110964, which funds the project *Understanding the Risk of Bat Coronavirus Emergence* (the "Project"). Per my letter of July 8, 2020, NIH reinstated the grant but suspended all award activities because we have concerns that the Wuhan Institute of Virology (WIV), which previously served as a subrecipient of the Project, had not satisfied safety requirements that applied to its subawards with EcoHealth, and that EcoHealth had not satisfied its obligations to monitor the activities of its subrecipient to ensure compliance. EcoHealth objected to the suspension on the grounds that WIV has no *current* connection to the Project or EcoHealth's research, and EcoHealth had not issued any subawards in connection with the Grant *at the time of the suspension*.

The fact that EcoHealth does not currently have a subrecipient relationship with WIV and had not issued subawards to WIV at the time of suspension does not absolve EcoHealth of any past non-compliance with the terms and conditions of award for grant R01AI110964. While EcoHealth did not issue a subaward to WIV for year 6 of the grant, WIV served as a subrecipient for years 1 through 5. NIH awarded EcoHealth grant R01AI110964 in 2014, with a project period of June 1, 2014, through June 30, 2024, as renewed. In EcoHealth's grant application, EcoHealth listed Drs. Zheng Li Shi and Xing Yi Ge of WIV as co-investigators and senior/key personnel. It stated that "Drs. Shi, Zhang, and Daszak have collaborated together since 2002 and have been involved in running joint conferences, and shipping samples into and out of China." EcoHealth listed WIV as a Project/Performance Site Location. In describing WIV's facilities, EcoHealth described WIV as China's premier institute for virological research" and touted WIV's "fully equipped biosafety level 3 laboratory" and "a newly opened BLS-4 laboratory." In support of the application, Dr. Zheng Li Shi's personal statement indicated that "My lab will be responsible for diagnosis, genomics and isolation of coronavirus from wild and domestic animals in Southern China and for analyzing their receptor binding domains." The application stated that "Wuhan Institute of Virology and the Wuhan University Center for Animal Experiment BSL-3

lab have an Internal Biosafety Committee and are accredited BSL-2 and BSL 3 laboratories. All experimental work using infectious material will be conducted under appropriate biosafety standards. Disposal of hazardous materials will be conducted according to the institutional biosafety regulations."

EcoHealth requested funding specifically for activities to be carried out by WIV. NIH awarded EcoHealth a total of $749,976 for WIV's work in the following annual amounts for years 1 through 5:

	-Yr 1	-Yr 2	-Yr 3	-Yr 4	-Yr 5
Total Direct Costs	$123,699	$128,718	$147,335	$147,335	$147,335
F&A Costs @ 8%	$9,896	$10,297	$11,787	$11,787	$11,787
TOTAL COSTS	$133,595	$139,015	$159,122	$159,122	$159,122

As stated in the Notices of Award for each budget period of the grant, the awards were subject to terms and conditions, which include the NIH Grants Policy Statement (GPS) and applicable HHS grant regulations. As I indicated in my letter of July 8, 2020, as a term and condition of award EcoHealth was required to "monitor the activities of the subrecipient as necessary to ensure that the subaward is used for authorized purposes, in compliance with Federal statutes, regulations, and the terms and conditions of the subaward . . ." 45 C.F.R. § 75.352(d). See also, 45 C.F.R. § 75.342(a) ("The non-Federal entity is responsible for oversight of the operations of the Federal award supported activities."). Moreover, EcoHealth was required to "Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award[.]" 45 C.F.R. § 75.303(a). The Notice of Award stated that as a term and condition of award, "Research funded under this grant must adhere to the [CDC/NIH Biosafety in Microbiological and Biomedical Laboratories (BMBL)]." Moreover, the NIH GPS provides that NIH grant recipients are expected to provide safe working conditions for their employees and foster work environments conducive to high-quality research. NIH GPS, Section 4. The terms and conditions of the grant award flow down to subawards to subrecipients, so these terms applied to WIV. 45 C.F.R. § 75.101.

As I stated, NIH has concerns of non-compliance with terms and conditions of award—namely, that WIV had not satisfied safety requirements under the award and that EcoHealth Alliance had not satisfied its obligations to monitor the activities of its subrecipient to ensure compliance. Accordingly, NIH suspended all activities related to R01AI110964, pursuant to 45 C.F.R. § 75.371, Remedies for Noncompliance, which permits suspension of award activities in cases of non-compliance, and the NIH GPS, Section 8.5.2, which permits NIH to take immediate action to suspend a grant when necessary to protect the public health and welfare.

In my letter of July 8, 2020, I provided EcoHealth with the opportunity to object and to provide information and documentation challenging the suspension. Specifically, I sought information and materials that speak to WIV's lab safety and EcoHealth's oversight of its subrecipient, and an inspection of WIV's laboratory records and facilities. I indicated that as a specific condition of award, during the period of suspension, EcoHealth Alliance may not allow research under this

project to be conducted and that no funds from grant R01AI110964 may be provided to or expended by EcoHealth Alliance or any subrecipients.

EcoHealth objected to the requests on the grounds that "NIAID is not authorized under 45 CFR§§ 75.371, 75.205, and 75.207, entitled *Specific Award Conditions*, to impose, *inter alia*, conditions that consist of demands for information regarding entities that are neither subrecipients of grant funds nor project affiliates."

These provisions are irrelevant to NIH's requests. NIH is required to permit the opportunity for recipients to object and provide information and documentation challenging a suspension, 45 C.F.R. § 75.374, so we specifically gave EcoHealth the opportunity to provide information that speaks to NIH's concerns. Moreover, as a granting agency, NIH is required to "manage and administer the Federal award in a manner so as to ensure that Federal funding is expended and associated programs are implemented in full accordance with U.S. statutory and public policy requirements: Including, but not limited to, those protecting public welfare [and] the environment[.]" 45 C.F.R. § 75.300(a). In addition to seeking information that speaks to compliance with terms and conditions of award, NIH is entitled to "make site visits as warranted by program needs." 45 C.F.R. § 75.342. As a term and condition of award, NIH "must have the right of access to any documents, papers, or other records of the non-Federal entity which are pertinent to the Federal award, in order to make audits, examinations, excerpts, and transcripts" (45 C.F.R. § 75.364); and must have "timely and reasonable access to the non-Federal entity's personnel for the purpose of interview and discussion related to such documents" (id.). These requirements flow down to subawards to subrecipients. 45 C.F.R. § 75.101. "Non-Federal entities must comply with requirements in [45 C.F.R. Part 75] regardless of whether the non-Federal entity is a recipient or subrecipient of a Federal award." 45 C.F.R. 75.101. As the grantee, EcoHealth was required to have in place, "A requirement that the subrecipient permit the pass-through entity and auditors to have access to the subrecipient's records and financial statements as necessary for the pass-through entity to meet the requirements of this part." 45 C.F.R. § 75.352(a)(5). For each of these reasons, NIH is justified in seeking the materials, information, and a site visit specified in my letter of July 8, 2020.

In addition to objecting to NIH's authority to seek the materials, information, and a site visit, EcoHealth has responded that it lacks knowledge or information regarding the requests; that it is not in possession, custody, or control of the specified items; and that it has no authority to grant NIAID and the U.S. National Academy of Sciences access to WIV's facility to conduct an inspection. EcoHealth's responses have not satisfied NIH's concerns that EcoHealth had failed to adequately monitor the compliance of its subrecipient, and that the subrecipient, WIV, had failed to comply with safety requirements.

Notwithstanding this, NIH is providing an additional opportunity for EcoHealth to provide information and documentation challenging these concerns of non-compliance. Accordingly, in addition to reiterating our prior requests (1) through (6) per our letter of July 8, 2020, NIH requests the following information and materials, which must be complete and accurate:

1. Provide copies of all EcoHealth Alliance – WIV subrecipient agreements as well as any other documents and information describing how EcoHealth Alliance monitored WIV's compliance with the terms and conditions of award, including with respect to biosafety.
2. Describe EcoHealth's efforts to evaluate WIV's risk of noncompliance with Federal statutes, regulations, and the terms and conditions of the subaward.
3. Provide copies of all WIV biosafety reports from June 1, 2014 through May 31, 2019.

During the ongoing period of suspension, NIH will continue to review the activities under this award, taking into consideration information provided by EcoHealth Alliance, to further assess whether EcoHealth Alliance and WIV complied with the terms and conditions of award, including compliance with other terms and conditions of award that may be implicated. We remind you that during the period of suspension, EcoHealth Alliance may not allow research under this project to be conducted. Further, no funds from grant R01AI110964 may be provided to or expended by EcoHealth Alliance or any subrecipients; all such charges are unallowable. It is EcoHealth Alliance's responsibility as the recipient of this grant award to ensure that the terms of this suspension are communicated to and understood by all subrecipients. EcoHealth Alliance must provide adequate oversight to ensure compliance with the terms of the suspension. Any noncompliance of the terms of this suspension must be immediately reported to NIH. EcoHealth Alliance will receive a revised Notice of Award from NIAID indicating the continued suspension of these research activities and funding restrictions as a specific condition of award.

Please note that this action does not preclude NIH from taking additional corrective or enforcement actions pursuant to 45 C.F.R. Part 75, including, but not limited to, terminating the grant award or disallowing costs. NIH may also take other remedies that may be legally available if NIH discovers other violations of terms and conditions of award on the part of EcoHealth Alliance or WIV.

Sincerely,

Michael S. Lauer -S Digitally signed by Michael S. Lauer -S
Date: 2020.10.23 13:34:25 -04'00'

Michael S Lauer, MD
NIH Deputy Director for Extramural Research
Email: (b) (6)

cc: Dr. Erik Stemmy (NIAID)
Ms. Emily Linde (NIAID)

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

National Institutes of Health
National Institute of Allergy
and Infectious Diseases
Bethesda, Maryland 20892

8 July 2020

Drs. Aleksei Chmura and Peter Daszak
EcoHealth Alliance, Inc.
460 W 34th St
Suite 1701
New York, NY 10001

Re: NIH Grant R01AI110964

Dear Drs. Chmura and Daszak:

In follow-up to my previous letter of April 24, 2020, I am writing to notify you that the National Institute of Allergy and Infectious Diseases (NIAID), an Institute within the National Institutes of Health (NIH), under the Department of Health and Human Services (HHS), has withdrawn its termination of grant R01AI110964, which supports the project *Understanding the Risk of Bat Coronavirus Emergence*. Accordingly, the grant is reinstated.

However, as you are aware, the NIH has received reports that the Wuhan Institute of Virology (WIV), a subrecipient of EcoHealth Alliance under R01AI110964, has been conducting research at its facilities in China that pose serious bio-safety concerns and, as a result, create health and welfare threats to the public in China and other countries, including the United States. Grant award R01AI110964 is subject to biosafety requirements set forth in the NIH Grants Policy Statement (e.g., NIH GPS, Section 4.1.24 "Public Health Security") and the Notice of Award (e.g., requiring that "Research funded under this grant must adhere to the [CDC/NIH Biosafety in Microbiological and Biomedical Laboratories (BMBL)]."). Moreover, NIH grant recipients are expected to provide safe working conditions for their employees and foster work environments conducive to high-quality research. NIH GPS, Section 4. The terms and conditions of the grant award flow down to subawards to subrecipients. 45 C.F.R. § 75.101.

As the grantee, EcoHealth Alliance was required to "monitor the activities of the subrecipient as necessary to ensure that the subaward is used for authorized purposes, in compliance with Federal statutes, regulations, and the terms and conditions of the subaward . . ." 45 C.F.R. § 75.352(d). We have concerns that WIV has not satisfied safety requirements under the award, and that EcoHealth Alliance has not satisfied its obligations to monitor the activities of its subrecipient to ensure compliance.

Moreover, as we have informed you through prior Notices of Award, this award is subject to the Transparency Act subaward and executive compensation reporting requirement of 2 C.F.R. Part

170. To date you have not reported any subawards in the Federal Subaward Reporting System.

Therefore, effective the date of this letter, July 8, 2020, NIH is suspending all activities related to R01AI110964, until such time as these concerns have been addressed to NIH's satisfaction. This suspension is taken in accordance with 45 C.F.R. § 75.371, Remedies for Noncompliance, which permits suspension of award activities in cases of non-compliance, and the NIH GPS, Section 8.5.2, which permits NIH to take immediate action to suspend a grant when necessary to protect the public health and welfare. This action is not appealable in accordance with 42 C.F.R. § 50.404 and the NIH GPS Section 8.7, Grant Appeals Procedures. However, EcoHealth Alliance has the opportunity to provide information and documentation demonstrating that WIV and EcoHealth Alliance have satisfied the above-mentioned requirements.

Specifically, to address the NIH's concerns, EcoHealth must provide the NIH with the following information and materials, which must be complete and accurate:

1. Provide an aliquot of the actual SARS-CoV-2 virus that WIV used to determine the viral sequence.
2. Explain the apparent disappearance of Huang Yanling, a scientist / technician who worked in the WIV lab but whose lab web presence has been deleted.
3. Provide the NIH with WIV's responses to the 2018 U.S. Department of State cables regarding safety concerns.
4. Disclose and explain out-of-ordinary restrictions on laboratory facilities, as suggested, for example, by diminished cell-phone traffic in October 2019, and the evidence that there may have been roadblocks surrounding the facility from October 14-19, 2019.
5. Explain why WIV failed to note that the RaTG13 virus, the bat-derived coronavirus in its collection with the greatest similarity to SARS-CoV-2, was actually isolated from an abandoned mine where three men died in 2012 with an illness remarkably similar to COVID-19, and explain why this was not followed up.
6. Additionally, EcoHealth Alliance must arrange for WIV to submit to an outside inspection team charged to review the lab facilities and lab records, with specific attention to addressing the question of whether WIV staff had SARS-CoV-2 in their possession prior to December 2019. The inspection team should be granted full access to review the processes and safety of procedures of all of the WIV field work (including but not limited to collection of animals and biospecimens in caves, abandoned man-made underground cavities, or outdoor sites). The inspection team could be organized by NIAID, or, if preferred, by the U.S. National Academy of Sciences.
7. Lastly, EcoHealth Alliance must ensure that all of its subawards are fully reported in the Federal Subaward Reporting System

During this period of suspension, NIH will continue to review the activities under this award, taking into consideration information provided by EcoHealth Alliance, to further asses compliance by EcoHealth Alliance and WIV, including compliance with other terms and conditions of award that may be implicated. Additionally, during the period of suspension, EcoHealth Alliance may not allow research under this project to be conducted. Further, no funds from grant R01AI110964 may be provided to or expended by EcoHealth Alliance or any subrecipients; all such charges are unallowable. It is EcoHealth Alliance's responsibility as the

recipient of this grant award to ensure that the terms of this suspension are communicated to and understood by all subrecipients. EcoHealth Alliance must provide adequate oversight to ensure compliance with the terms of the suspension. Any noncompliance of the terms of this suspension must be immediately reported to NIH. Once the original award is reinstated, NIH will take additional steps to restrict all funding in the HHS Payment Management System in the amount of $369,819. EcoHealth Alliance will receive a revised Notice of Award from NIAID indicating the suspension of these research activities and funding restrictions as a specific condition of award.

Please note that this action does not preclude NIH from taking additional corrective or enforcement actions pursuant to 45 CFR Part 75, including, but not limited to, terminating the grant award. NIH may also take other remedies that may be legally available if NIH discovers other violations of terms and conditions of award on the part of EcoHealth Alliance or WIV.

.

Sincerely,

Michael S. Lauer -S Digitally signed by Michael S. Lauer -S
Date: 2020.07.08 21:43:41 -04'00'

Michael S Lauer, MD
NIH Deputy Director for Extramural Research
Email: (b) (6)

cc: Dr. Erik Stemmy
Ms. Emily Linde

From: Lauer, Michael (NIH/OD) [E] [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=90FE9CAE30C64CFBB67ABD568E882796-LAUERM]
Sent: 5/27/2021 2:39:11 AM
To: OER Executive Secretariat [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=de64692fb5a049adabeed7a64fb2c9de-OERExecutiv]
CC: Bundesen, Liza (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3cded900576a49aea461d26e93bddac3-lbundese]; Kosub, David (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3e3eccf57f4e4fcfaecaa7885f39bee5-kosubd]; Joshi, Pritty (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3c86da34052e41ccab1b25f9e344ec7d-joship]; Showe, Melanie (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=fbbbc74184e64f7e8a12d9faf8deb58f-showem]; Lauer, Michael (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=90fe9cae30c64cfbb67abd568e882796-lauerm]
Subject: Re: EXPEDITED Clearance Requested - Grants to EcoHealth - Due by 4pm Thursday, May 27th (WF399431)
Attachments: D02 Gallagher NIAID DRAFT Revised for NIH OD[2].docx; Gallagher Letter_COVID Origins_5.5.21.pdf

Thanks Aesha – this is fine. And the figure of ~600K is correct.

Mike

From: OER Executive Secretariat (b) (6)
Date: Wednesday, May 26, 2021 at 4:42 PM
To: "Lauer, Michael (NIH/OD) [E]" (b) (6)
Cc: "Bundesen, Liza (NIH/OD) [E]" (b) (6), "Kosub, David (NIH/OD) [E]" (b) (6), "Joshi, Pritty (NIH/OD) [E]" (b) (6), "Showe, Melanie (NIH/OD) [E]" (b) (6)
Subject: EXPEDITED Clearance Requested - Grants to EcoHealth - Due by 4pm Thursday, May 27th (WF399431)

Hi Dr. Lauer –
Please see the attached draft response to Representative Mike Gallagher who writes to Dr. Fauci requesting answers to specific questions regarding the cause of the COVID-19 pandemic, which OER has been asked to review and clear. Would you please provide your clearance and/or comments to me by 4pm tomorrow, May 27th. Please note (per Exec Sec):

- There is a comment at the top of page 2 requesting confirmation. Please confirm or revise as appropriate.
- (b) (5)

Please let me know if you have any questions or feel this should be assigned to another SME for review and clearance.

Best,
Aesha

From: Lauer, Michael (NIH/OD) [E] (b) (6)
Sent: Wednesday, May 19, 2021 12:54 PM
To: OER Executive Secretariat (b) (6)
Cc: Bundesen, Liza (NIH/OD) [E] (b) (6); Kosub, David (NIH/OD) [E] (b) (6); Joshi, Pritty (NIH/OD) [E] (b) (6); Showe, Melanie (NIH/OD) [E] (b) (6); Lauer, Michael (NIH/OD) [E] (b) (6)
Subject: Re: Clearance Requested - Grants to EcoHealth - Due by 4pm Thursday, May 20th (WF399431)

Hi Aesha – I'm fine with this. However, we had conversations with Adrienne yesterday, and I understand that OLPA is working towards a uniform response for all these Congressional letters we're getting regarding EcoHealth.

Many thanks, Mike

From: OER Executive Secretariat (b) (6)
Date: Wednesday, May 19, 2021 at 10:50 AM
To: "Lauer, Michael (NIH/OD) [E]" (b) (6)
Cc: "Bundesen, Liza (NIH/OD) [E]" (b) (6), "Kosub, David (NIH/OD) [E]" (b) (6), "Joshi, Pritty (NIH/OD) [E]" (b) (6), "Showe, Melanie (NIH/OD) [E]" <showem@od.nih.gov>
Subject: Clearance Requested - Grants to EcoHealth - Due by 4pm Thursday, May 20th (WF399431)

Hi Dr. Lauer –
Please see the attached letter from Representative Mike Gallagher who writes to Dr. Fauci requesting answers to specific questions regarding the cause of the COVID-19 pandemic. He specifically mentions NIH grants to EcoHealth Alliance that may have helped fund research at the Wuhan Institute of Virology and the possibility that this funding may have played a role in the outbreak of COVID-19. NIAID has drafted a response and OER has been asked to review and clear.

Would you please provide your clearance and/or comments to me by 4pm Thursday, May 20th. Let me know if you have any questions or feel this should be assigned to another SME for review and clearance.
Thanks and have a great day!

Best Regards,
Aesha Brandy, MBA
Management and Program Analyst
NIH Office of Extramural Research
Immediate Office of the Director

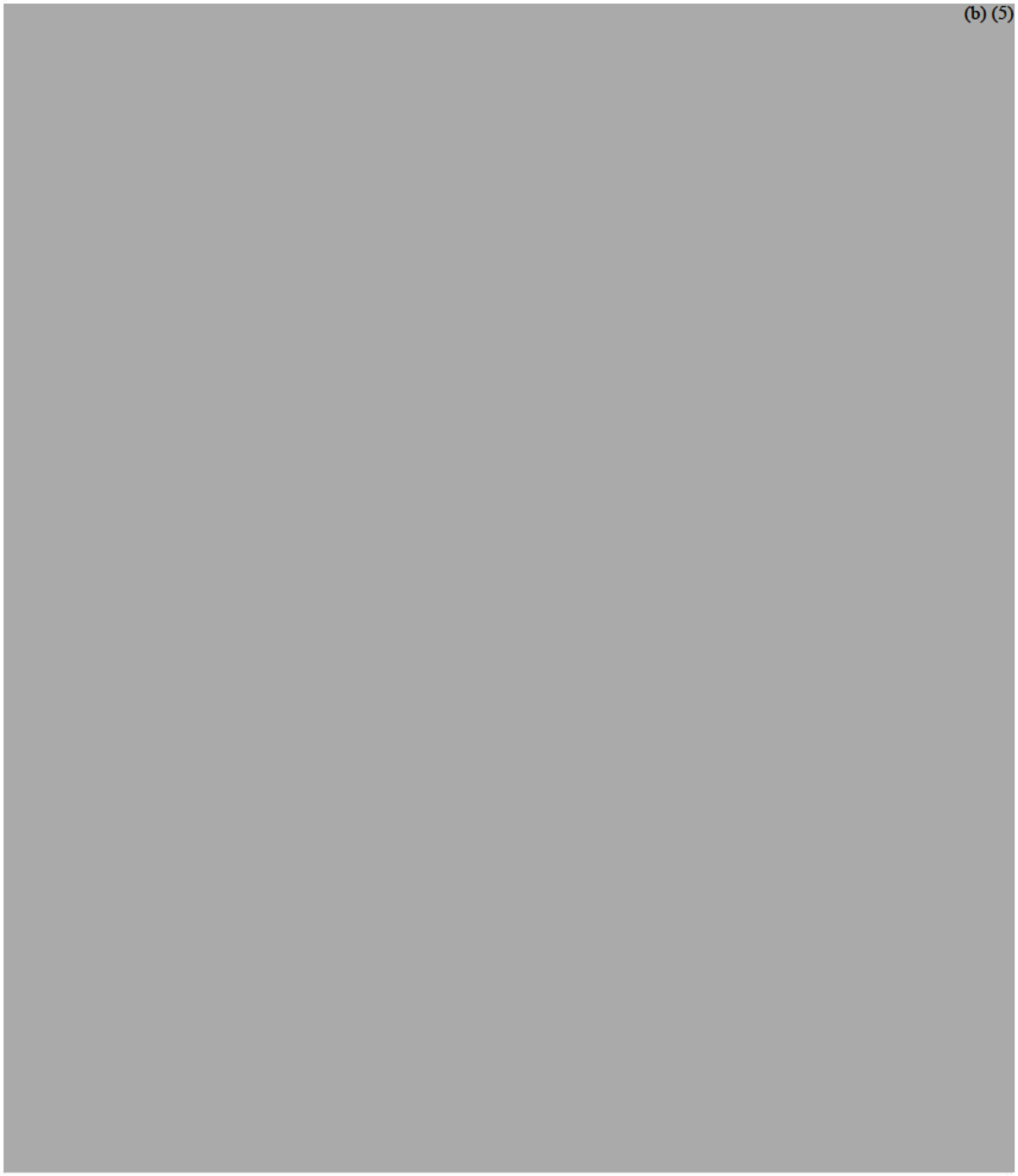
Building 1, Room 150
Bethesda, MD 20814
(b) (6)
(b) (6)

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

National Institutes of Health
Bethesda, Maryland 20892

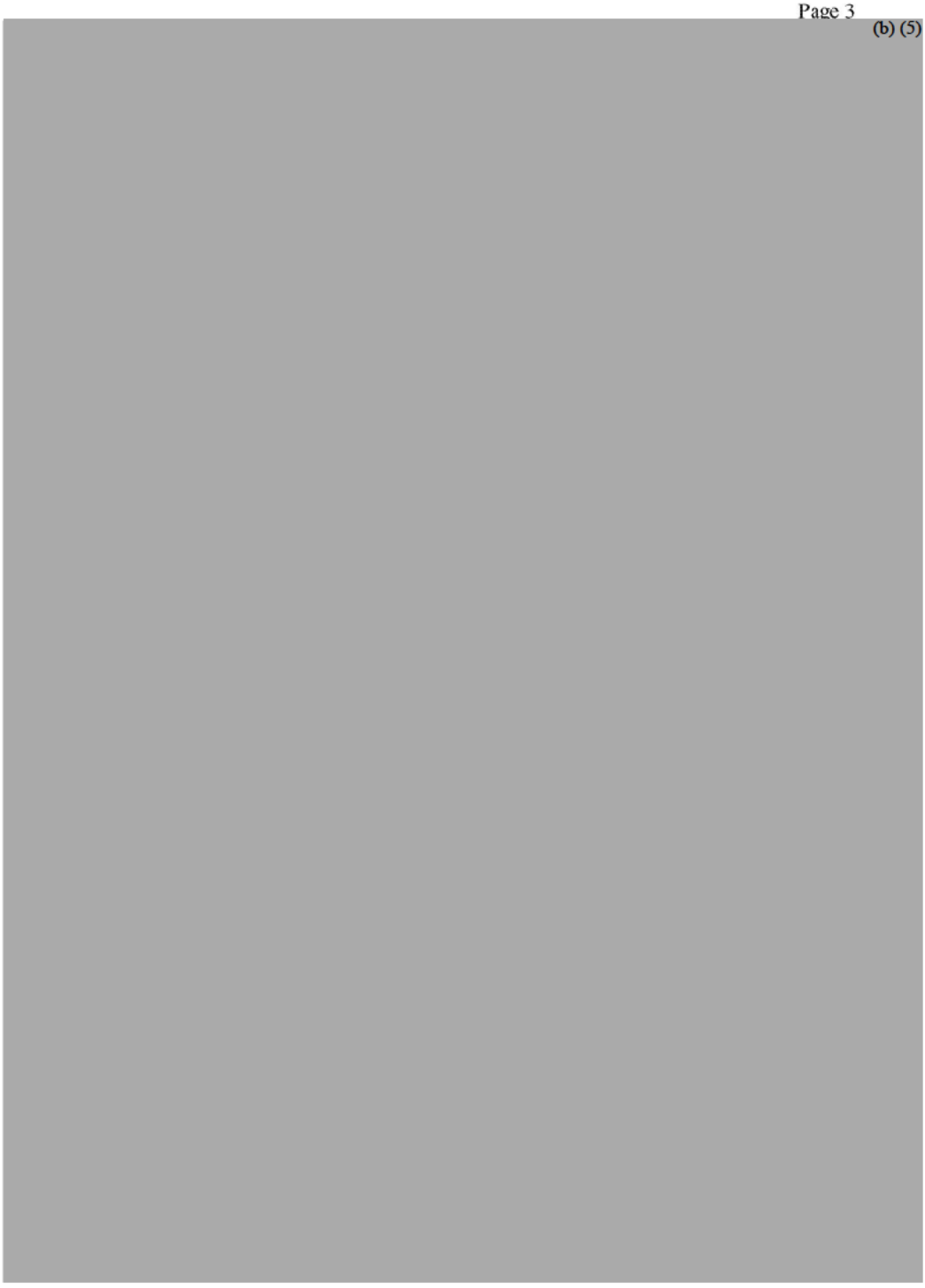
(b) (5)



(b) (5)

[redacted]

(b) (5)



MIKE GALLAGHER
8th District, Wisconsin

1728 Longworth House Office Building
Washington, DC 20515
Phone: (202) 225-5665

District Office
1740 Stephenson Plaza
Suite 8
Sturtevant, WI 53177
Phone: (262) 681-1380

Congress of the United States
House of Representatives

COMMITTEE ON ARMED SERVICES
Subcommittee
Seapower and Projection Forces
Intelligence and Emerging Threats

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
Subcommittee
Highways and Transit
Aviation
Coast Guard and Maritime Transportation

May 5, 2021

Dr. Anthony S. Fauci
Director
National Institute of Allergy & Infectious Diseases
5601 Fishers Lane, MSC 9806
Bethesda, Maryland 20892-9806

Dear Dr. Fauci,

Over the past year, nearly 600,000 Americans and more than 3 million people worldwide have died from COVID-19. Across the globe, there have been more than 150 million confirmed cases of this disease, costing trillions in economic damage. Daily life has been upended and countless businesses destroyed. Understanding the cause of this pandemic—and ensuring that something like it never happens again—is the most important question facing the world today.

Given the stakes, we cannot afford to settle for a limited, blinkered, or politicized understanding of the origin of this terrible disease. While many in the scientific community were quick to dismiss the possibility that the COVID-19 outbreak originated with a laboratory leak in Wuhan, China, information initially released by the Trump State Department and later confirmed by the Biden administration suggests much closer examination is needed.[1] The State Department has detailed several concerning revelations, including that the U.S. government has reason to believe several researchers at the Wuhan Institute of Virology (WIV) became sick in autumn 2019 with symptoms consistent with COVID-19, before the first public cases emerged in that community. Viruses have frequently leaked from labs over the years in China and elsewhere, including from accidentally infected researchers.

In fact, after World Health Organization (WHO) investigators were stymied as part of their joint report alongside Chinese officials, WHO Chief Dr. Tedros Adhanom Ghebreyesus called for further investigation of the lab leak theory, stating that it "requires further investigation,

---

[1] "Fact Sheet: Activity at the Wuhan Institute of Virology," Office of the Spokesperson, Department of State, last modified January 15, 2021, https://2017-2021.state.gov/fact-sheet-activity-at-the-wuhan-institute-of-virology/index.html;
Rogin, Josh, "The Biden administration confirms some but not all of Trump's Wuhan lab claims." *Washington Post,* March 9, 2021, https://www.washingtonpost.com/opinions/2021/03/09/biden-administration-confirms-some-trump-wuhan-lab-claims/.

potentially with additional missions involving specialist experts" and, "as far as WHO is concerned all hypotheses remain on the table."[2]

Through National Institutes of Health grants to the New York-based organization EcoHealth Alliance, the U.S. government helped fund research at the Wuhan Institute of Virology (WIV).[3] While this funding was no doubt well-intentioned, taxpayers deserve a detailed understanding of whether federal resources supported dangerous "gain-of-function" research, and whether this might have played a role in the outbreak of the pandemic. As the world seeks to recover from this pandemic, Americans deserve to understand not only how this catastrophe came about, but that their government is learning and internalizing lessons to ensure it does not happen again.

With that in mind, I respectfully ask for answers to the following questions:

1. Do you agree with Dr. Tedros that that the lab leak possibility "requires further investigation, potentially with additional missions involving specialist experts?" Should any further investigations include the case of the sick researchers inside the WIV in autumn 2019? Why or why not?

2. Have you scrutinized all that the U.S. government knows about the sick researchers at the WIV, including the facts released by the State Department in January and any additional underlying intelligence or other information? If so, how so? If not, why not?

3. How much U.S. government funding has gone to the WIV over time, and how much of that supported gain-of-function research? Did U.S. government funding go to the WIV even during the 2014-2017 U.S. moratorium on funding gain-of-function research?

4. In light of the Chinese Communist Party's extensive coverup and lack of transparency, surrounding the origins of the pandemic, even to this day, how should the U.S. government modify or reconsider scientific exchanges with Chinese entities?

5. You have argued over the years that gain-of-function research is a risk worth taking, given the potential benefits for the creation of vaccines and therapeutics.[4] Does the COVID-19 pandemic and the possibility of a leak from the WIV raise questions about the future prudence of gain-of-function research? How can we quantify the risks associated with this type of research in the future, particularly when it comes to non-transparent countries like China, and at what point does this research simply become too risky?

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[2] "WHO Director-General's remarks at the Member State Briefing on the report of the international team studying the origins of SARS-CoV-2," Director-General Speeches, World Health Organization, last modified March 30, 2021, https://www.who.int/director-general/speeches/detail/who-director-general-s-remarks-at-the-member-state-briefing-on-the-report-of-the-international-team-studying-the-origins-of-sars-cov-2.

[3] Aizenman, Nurith, "Why The U.S. Government Stopped Funding A Research Project On Bats And Coronaviruses," *National Public Radio,* April 29, 2020, https://www.npr.org/sections/goatsandsoda/2020/04/29/847948272/why-the-u-s-government-stopped-funding-a-research-project-on-bats-and-coronaviru.

[4] Fauci, Anthony, Nabel, Gary and Collins, Francis, "A flu virus risk worth taking," *Washington Post,* December 30, 2011, https://www.washingtonpost.com/opinions/a-flu-virus-risk-worth-taking/2011/12/30/gIQAM9sNRP_story.html.

Thank you for your consideration in this important matter. I look forward to your response and to working with you to help ensure the health and safety of the American public, now and in the future.

Sincerely,

Mike Gallagher
Member of Congress

From: Hallett, Adrienne (NIH/OD) [E] [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=F1705E2E7C254B84A77F058DBF75B31B-HALLETTAA]
Sent: 5/27/2021 2:05:07 PM
To: Collins, Francis (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=410e1ca313f44ced9938e50d2ff0b6c2-collinsf]; Tabak, Lawrence (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=02e22836b5ff4e9988e3770cfc7ee770-tabakl]; Lauer, Michael (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=90fe9cae30c64cfbb67abd568e882796-lauerm]; Burklow, John (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2e57f267323b43c08be856acb5b964ca-burklowj]
Subject: Grassley response to last week's letter (COVID Origins Follow Up)
Attachments: 2021-05-26 CEG to HHS NIH (COVID Origins Follow Up).pdf

Not as bad as it could have been.

United States Senate

WASHINGTON, DC 20510

May 26, 2021

VIA ELECTRONIC TRANSMISSION

The Honorable Xavier Becerra
Secretary
Department of Health and Human Services

Dr. Francis Collins
Director
National Institutes of Health

Dear Secretary Becerra and Dr. Collins:

On March 8, 2021, I wrote to the Department of Health and Human Services and the Director of National Intelligence requesting records relating to the efforts undertaken by both agencies to determine the origins of SARS-CoV-2 ("coronavirus"). In response, I received intelligence product that causes very serious concern and further supports my belief that the Biden administration must engage in an all-hands-on-deck investigation with respect to the origins of the coronavirus. We must also get to the bottom of the communist Chinese government's potential role. Although I received intelligence product, the Director of National Intelligence failed to provide a full and complete response.

On May 21, 2021, I received a letter response from the Department of Health and Human Services. Your letter also failed to provide a full and complete response; namely it failed to provide any data relating to scientific research performed by the government to better understand the origins of the coronavirus; failed to describe the steps the Department of Health and Human Services has taken to further incorporate itself into the Intelligence Community; and failed to describe the steps the Department of Health and Human Services took to oversee the research done at the Wuhan Institute of Virology in light of it being funded by the taxpayer. If your agencies are not privy to certain intelligence information that you require to answer my questions, Congress needs to know.

Furthermore, your letter noted that the National Institutes of Health awarded a grant to EcoHealth Alliance, which made sub-awards to the Wuhan Institute of Virology and "other

institutions based in East Asia" where coronaviruses are prevalent.[1] The project was called "Understanding the Risk of Bat Coronavirus Emergence."[2] Your letter also noted that the project was intended to study several coronavirus characteristics:

> The research proposed in the grant application sought to understand how bat coronaviruses evolve naturally in the environment to become transmissible to the human population. This included studying viral diversity in bat reservoirs, surveying people who work in live animal markets or other jobs with high exposure to wildlife for evidence of bat-coronavirus infection, and analyzing data to predict which newly discovered viruses pose the greatest threat to human health.[3]

According to the link provided in your letter, the project dates to 2014 and the administering agency was the National Institute of Allergy and Infectious Diseases. The project ended in 2019 and total spending was $3,748,715.[4] However, your letter failed to note what steps were taken to oversee that spending and research.

It's been well-understood for many years that the communist Chinese government is a bad actor and cannot be trusted. With millions of dollars sent to the Chinese government, the taxpayer and Congress expects you to perform aggressive oversight of that spending and its resulting research projects to ensure that they are not used for malign activities, especially when the funded research involves highly infectious and deadly viruses. Furthermore, if no oversight was performed, then that would call into question the government's confidence that no gain of function research was supported by taxpayer dollars.

Over 500,000 Americans have lost their lives and the federal government has spent trillions of dollars due to the pandemic. If the National Institute of Allergy and Infectious Diseases failed to perform any oversight of the grants used to study bat coronaviruses and similar viruses – money that was given to the Wuhan Institute of Virology – the American people have a right to know.

---

[1] Understanding the Risk of Bat Coronavirus Emergence, Project Number 2R01AI110964-06. https://reporter.nih.gov/project-details/9819304
[2] Understanding the Risk of Bat Coronavirus Emergence, Project Number 2R01AI110964-06. https://reporter.nih.gov/project-details/9819304
[3] *Id.*
[4] *Id.* It's been reported that the Wuhan Institute of Virology received approximately $600,000 of this funding. *See* Samuel Chamberlain, *Fauci admits 'modest' NIH funding of Wuhan lab but denies 'gain of function'*, New York Post (May 25, 2021).

In light of your failure to fully respond to my March 8, 2021, letter please provide a more detailed response no later than June 9, 2021. Specifically, I request that you address each question with a corresponding answer with an emphasis on what, if any, oversight was done on the relevant grants to track where the money went and the type of research that was performed.

Sincerely,

Charles E. Grassley
Ranking Member
Committee on the Judiciary

From: Jacobs, Anna (NIH/OD) [E] [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=E76EEB11DF9A4024B53864FFAC4C4C56-JACOBSAL]
Sent: 5/28/2021 11:18:34 AM
To: Lauer, Michael (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=90fe9cae30c64cfbb67abd568e882796-lauerm]; Tabak, Lawrence (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=02e22836b5ff4e9988e3770cfc7ee770-tabakl]; Cha, Stephen (HHS/IOS) [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=29869d2e37164007be337d64db707c4a-Stephen.Cha]; Lankford, David (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=4f29a9bef672409d967e3aa5fb36e96a-lankford]
CC: McGarey, Barbara (HHS/OGC) [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5c181d87dc474cf2b3fe49b6060c2040-Barbara.Mcg]
Subject: RE: Dear Principal Deputy Inspector General Grimm OGC comments reconciled 052721 11 pm
Attachments: EcoHealth Alliance grant R01AI110964 timeline 5 28 21_OGC edits.docx

In the event the Timeline is shared with the broader group and/or OIG, we have offered edits to the Timeline to clarify a few key points.
Best,

Anna L. Jacobs, J.D., M.S.
Senior Attorney
HHS Office of the General Counsel
Public Health Division, NIH Branch
31 Center Drive, Bldg. 31, Rm.2B-50
Bethesda, MD 20892
(b) (6) *(phone)*
301-402-1034 (fax)
(b) (6)

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From: Lauer, Michael (NIH/OD) [E] (b) (6)
Sent: Friday, May 28, 2021 6:23 AM
To: Tabak, Lawrence (NIH/OD) [E] (b) (6); Cha, Stephen (HHS/IOS) (b) (6); Lankford, David (NIH/OD) [E] (b) (6); Jacobs, Anna (NIH/OD) [E] (b) (6)
Cc: McGarey, Barbara (HHS/OGC) (b) (6); Lauer, Michael (NIH/OD) [E] (b) (6)
Subject: Re: Dear Principal Deputy Inspector General Grimm OGC comments reconciled 052721 11 pm

Thank you – my edits attached, plus some other materials you might find helpful.

Mike

From: "Tabak, Lawrence (NIH/OD) [E]" (b) (6)
Date: Friday, May 28, 2021 at 5:36 AM
To: "Cha, Stephen (HHS/IOS)" (b) (6), "Lankford, David (NIH/OD) [E]" (b) (6), "Jacobs, Anna (NIH/OD) [E]" (b) (6), "Lauer,

Michael (NIH/OD) [E]" (b) (6)
Cc: "McGarey, Barbara (HHS/OGC)" (b) (6)
Subject: Re: Dear Principal Deputy Inspector General Grimm OGC comments reconciled 052721 11 pm

Adding Mike Lauer

From: "Cha, Stephen (HHS/IOS)" (b) (6)
Date: Thursday, May 27, 2021 at 11:04 PM
To: "Tabak, Lawrence (NIH/OD) [E]" (b) (6), "Lankford, David (NIH/OD) [E]" (b) (6), "Jacobs, Anna (NIH/OD) [E]" (b) (6)
Cc: "McGarey, Barbara (HHS/OGC)" (b) (6)
Subject: Dear Principal Deputy Inspector General Grimm OGC comments reconciled 052721 11 pm

See highlights for areas where I think NIH may know the answer—Larry (or David)—can you help fill in the gaps here?

EcoHealth Alliance grant R01AI110964 timeline
Mike Lauer (OER)
May 28, 2021

(b) (5)

[redacted]

From: Jacobs, Anna (NIH/OD) [E] [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=E76EEB11DF9A4024B53864FFAC4C4C56-JACOBSAL]
Sent: 5/28/2021 11:21:20 AM
To: Lauer, Michael (NIH/OD) [E] [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=90fe9cae30c64cfbb67abd568e882796-lauerm]
Subject: FW: Dear Principal Deputy Inspector General Grimm OGC comments reconciled 052721 11 pm
Attachments: Dear Principal Deputy Inspector General Grimm OGC comments reconciled 052721 11 pm msl.docx; ASST_R01AI110964_2021-05-28_H10M02S54043357.zip; EcoHealth Alliance grant R01AI110964 timeline 5 28 21.docx

Good edits!

Anna L. Jacobs, J.D., M.S.
Senior Attorney
HHS Office of the General Counsel
Public Health Division, NIH Branch
31 Center Drive, Bldg. 31, Rm. 2B-50
Bethesda, MD 20892
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From: Lauer, Michael (NIH/OD) [E] (b) (6)
Sent: Friday, May 28, 2021 6:23 AM
To: Tabak, Lawrence (NIH/OD) [E] (b) (6); Cha, Stephen (HHS/IOS) (b) (6); Lankford, David (NIH/OD) [E] (b) (6); Jacobs, Anna (NIH/OD) [E] (b) (6)
Cc: McGarey, Barbara (HHS/OGC) (b) (6); Lauer, Michael (NIH/OD) [E] (b) (6)
Subject: Re: Dear Principal Deputy Inspector General Grimm OGC comments reconciled 052721 11 pm

Thank you – my edits attached, plus some other materials you might find helpful.

Mike

From: "Tabak, Lawrence (NIH/OD) [E]" (b) (6)
Date: Friday, May 28, 2021 at 5:36 AM
To: "Cha, Stephen (HHS/IOS)" (b) (6), "Lankford, David (NIH/OD) [E]" (b) (6), "Jacobs, Anna (NIH/OD) [E]" (b) (6), "Lauer, Michael (NIH/OD) [E]" (b) (6)
Cc: "McGarey, Barbara (HHS/OGC)" (b) (6)
Subject: Re: Dear Principal Deputy Inspector General Grimm OGC comments reconciled 052721 11 pm

Adding Mike Lauer

From: "Cha, Stephen (HHS/IOS)" (b) (6)
Date: Thursday, May 27, 2021 at 11:04 PM
To: "Tabak, Lawrence (NIH/OD) [E]" (b) (6), "Lankford, David (NIH/OD) [E]" (b) (6), "Jacobs, Anna (NIH/OD) [E]" (b) (6)
Cc: "McGarey, Barbara (HHS/OGC)" (b) (6)
Subject: Dear Principal Deputy Inspector General Grimm OGC comments reconciled 052721 11 pm

See highlights for areas where I think NIH may know the answer—Larry (or David)—can you help fill in the gaps here?


(b) (5)


(b) (5)

owning_agency_name	reporting_agency_name	submission_period	allocation_transfer_agency_identifier_code	agency_identifier_code	beginning_period_of_availability	ending_period_of_availability	availability_type_code	main_account_code	sub_account_code	treasury_account_symbol	treasury_account_name	agency_identifier_name	allocation_transfer_agency_identifier_name	budget_function	budget_subfunction	federal_account_symbol	federal_account_name	program_activity_code	program_activity_name	object_class_code	object_class_name
Department of Health and Human Services	Department of Health and Human Services	FY2018Q3		75	2018	2018		885		075-2018/2018-0 0885-000	National Institute of Allergy and Infectious Diseases National Institutes of Health Health and Human Services	Department of Health and Human Services		Health	Health research and training	075-0885	National Institute of Allergy and Infectious Diseases National Institutes of Health Health and Human Services			41	Grants subsidies and contributions
Department of Health and Human Services	Department of Health and Human Services	FY2019Q4		75	2019	2019		885		075-2019/2019-0 0885-000	National Institute of Allergy and Infectious Diseases National Institutes of Health Health and Human Services	Department of Health and Human Services		Health	Health research and training	075-0885	National Institute of Allergy and Infectious Diseases National Institutes of Health Health and Human Services			41	Grants subsidies and contributions
Department of Health and Human Services	Department of Health and Human Services	FY2019Q4		75	2019	2019		885		075-2019/2019-0 0885-000	National Institute of Allergy and Infectious Diseases National Institutes of Health Health and Human Services	Department of Health and Human Services		Health	Health research and training	075-0885	National Institute of Allergy and Infectious Diseases National Institutes of Health Health and Human Services			41	Grants subsidies and contributions
Department of Health and Human Services	Department of Health and Human Services	FY2020P07		75	2019	2019		885		075-2019/2019-0 0885-000	National Institute of Allergy and Infectious Diseases National Institutes of Health Health and Human Services	Department of Health and Human Services		Health	Health research and training	075-0885	National Institute of Allergy and Infectious Diseases National Institutes of Health Health and Human Services			41	Grants subsidies and contributions
Department of Health and Human Services	Department of Health and Human Services	FY2020P10		75	2019	2019		885		075-2019/2019-0 0885-000	National Institute of Allergy and Infectious Diseases National Institutes of Health Health and Human Services	Department of Health and Human Services		Health	Health research and training	075-0885	National Institute of Allergy and Infectious Diseases National Institutes of Health Health and Human Services			41	Grants subsidies and contributions
Department of Health and Human Services	Department of Health and Human Services	FY2017Q3		75	2017	2017		885		075-2017/2017-0 0885-000	National Institute of Allergy and Infectious Diseases National Institutes of Health Health and Human Services	Department of Health and Human Services		Health	Health research and training	075-0885	National Institute of Allergy and Infectious Diseases National Institutes of Health Health and Human Services			41	Grants subsidies and contributions

direct_or_reimbursable_funding_source	disaster_emergency_fund_code	disaster_emergency_fund_name	transaction_obligated_amount	gross_outlay_amount_fyb_to_period_end	downward_adj_prior_yr_ppaid_undelig_refunds_cpe	downward_adj_prior_yr_paid_delivered_orders_oblig_refunds_cpe	award_unique_key	award_id_piid	parent_award_id_piid	award_id_fain	award_id_uri	award_base_action_date	award_base_action_date_fiscal_year	award_latest_action_date	award_latest_action_date_fiscal_year	period_of_performance_start_date	period_of_performance_current_end_date	ordering_period_end_date	award_type_code	award_type	idv_type_code	idv_type	award_description
			581646				ASST_NON_R01AI110964_7529			R01AI110964		5/27/2014	2014	7/13/2020	2020	6/1/2014	6/30/2025		4	PROJECT GRANT (B)			UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE
D			-71770	0	0	0	ASST_NON_R01AI110964_7529			R01AI110964		5/27/2014	2014	7/13/2020	2020	6/1/2014	6/30/2025		4	PROJECT GRANT (B)			UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE
D			733750	0	0	0	ASST_NON_R01AI110964_7529			R01AI110964		5/27/2014	2014	7/13/2020	2020	6/1/2014	6/30/2025		4	PROJECT GRANT (B)			UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE
D	Q		-369819				ASST_NON_R01AI110964_7529			R01AI110964		5/27/2014	2014	7/13/2020	2020	6/1/2014	6/30/2025		4	PROJECT GRANT (B)			UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE
D	Q		369819				ASST_NON_R01AI110964_7529			R01AI1 096 4		5/27/2014	2014	7/13/2020	2020	6/1/2014	6/30/2025		4	PROJECT GRANT (B)			UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE
			597112				ASST_NON_R01AI110964_7529			R01AI1 096 4		5/27/2014	2014	7/13/2020	2020	6/1/2014	6/30/2025		4	PROJECT GRANT (B)			UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE

awarding_agency_code	awarding_agency_name	awarding_subagency_code	awarding_subagency_name	awarding_office_code	awarding_office_name	funding_agency_code	funding_agency_name	funding_sub_agency_code	funding_sub_agency_name	funding_office_code	funding_office_name	recipient_duns	recipient_name	recipient_parent_duns	recipient_parent_name	recipient_country	recipient_state	recipient_county	recipient_city	recipient_congressional_district	recipient_zip_code	primary_place_of_performance_country	primary_place_of_performance_state
75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	77090066	ECOHEALTH ALLIANCE INC.	77090066	ECOHEALTH ALLIANCE INC.	USA	NY	NEW YORK	NEW YORK	10	100012317	UNITED STATES	NEW YORK
75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	77090066	ECOHEALTH ALLIANCE INC.	77090066	ECOHEALTH ALLIANCE INC.	USA	NY	NEW YORK	NEW YORK	10	100012317	UNITED STATES	NEW YORK
75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	77090066	ECOHEALTH ALLIANCE INC.	77090066	ECOHEALTH ALLIANCE INC.	USA	NY	NEW YORK	NEW YORK	10	100012317	UNITED STATES	NEW YORK
75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	77090066	ECOHEALTH ALLIANCE INC.	77090066	ECOHEALTH ALLIANCE INC.	USA	NY	NEW YORK	NEW YORK	10	100012317	UNITED STATES	NEW YORK
75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	77090066	ECOHEALTH ALLIANCE INC.	77090066	ECOHEALTH ALLIANCE INC.	USA	NY	NEW YORK	NEW YORK	10	100012317	UNITED STATES	NEW YORK
75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	77090066	ECOHEALTH ALLIANCE INC.	77090066	ECOHEALTH ALLIANCE INC.	USA	NY	NEW YORK	NEW YORK	10	100012317	UNITED STATES	NEW YORK

primary_place_of_performance_county	primary_place_of_performance_congressional_district	primary_place_of_performance_zip_code	cfda_number	cfda_title	product_or_service_code	product_or_service_code_description	naics_code	naics_description	national_interest_action_code	national_interest_action	usaspending_permalink	last_modified_date
NEW YORK	10	10001-2320	93.855	ALLERGY AND INFECTIOUS DISEASES RESEARCH							https://www.usaspending.gov/award/ASST_NON_R01AI1 0964_7529/	8/14/2018
NEW YORK	10	10001-2320	93.855	ALLERGY AND INFECTIOUS DISEASES RESEARCH							https://www.usaspending.gov/award/ASST_NON_R01AI1 0964_7529/	11/14/2019
NEW YORK	10	10001-2320	93.855	ALLERGY AND INFECTIOUS DISEASES RESEARCH							https://www.usaspending.gov/award/ASST_NON_R01AI1 0964_7529/	11/14/2019
NEW YORK	10	10001-2320	93.855	ALLERGY AND INFECTIOUS DISEASES RESEARCH							https://www.usaspending.gov/award/ASST_NON_R01AI1 0964_7529/	8/17/2020
NEW YORK	10	10001-2320	93.855	ALLERGY AND INFECTIOUS DISEASES RESEARCH							https://www.usaspending.gov/award/ASST_NON_R01AI1 0964_7529/	8/28/2020
NEW YORK	10	10001-2320	93.855	ALLERGY AND INFECTIOUS DISEASES RESEARCH							https://www.usaspending.gov/award/ASST_NON_R01AI1 0964_7529/	8/14/2017

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ASST_NON_R01A 110964_7 529	R01A 110964	3378896				5/26/2017	2014	7/13/2020	2020	6/1/2014	6/30/2025	75	Depa tment of Health and Human Se v ces (HHS)	7529	Nat onal In t tutes of Hea th			75
ASST_NON_R01A 110964_7 529	R01A 110964	3378896				5/26/2017	2014	7/13/2020	2020	6/1/2014	6/30/2025	75	Depa tment of Health and Human Se v ces (HHS)	7529	Nat onal In t tutes of Hea th			75
ASST_NON_R01A 110964_7 529	R01A 110964	3378896				5/26/2017	2014	7/13/2020	2020	6/1/2014	6/30/2025	75	Depa tment of Health and Human Se v ces (HHS)	7529	Nat onal In t tutes of Hea th			75
ASST_NON_R01A 110964_7 529	R01A 110964	3378896				5/26/2017	2014	7/13/2020	2020	6/1/2014	6/30/2025	75	Depa tment of Health and Human Se v ces (HHS)	7529	Nat onal In t tutes of Hea th			75
ASST_NON_R01A 110964_7 529	R01A 110964	3378896				5/26/2017	2014	7/13/2020	2020	6/1/2014	6/30/2025	75	Depa tment of Health and Human Se v ces (HHS)	7529	Nat onal In t tutes of Hea th			75
ASST_NON_R01A 110964_7 529	R01A 110964	3378896				5/26/2017	2014	7/13/2020	2020	6/1/2014	6/30/2025	75	Depa tment of Health and Human Se v ces (HHS)	7529	Nat onal In t tutes of Hea th			75
ASST_NON_R01A 110964_7 529	R01A 110964	3378896				5/26/2017	2014	7/13/2020	2020	6/1/2014	6/30/2025	75	Depa tment of Health and Human Se v ces (HHS)	7529	Nat onal In t tutes of Hea th			75

p me_awa d_fund ng_ agency name	p me_awa d_ und ng_sub_ag ency code	p me_awa d_fund ng_ sub agency name	p me_awa d_fund ng_ off ce code	p me_awa d_fund ng o f ce name	p me_awa d_t easu y_a ccounts_fund ng_th s_aw a d	p me_awa d_fede al_ accounts_fund ng_th s_ awa d	p me_awa d_object_cl asses_fund ng_th s_aw a d	p me_awa d_p og am_ act v t es_fund ng_th s_a wa d	p me_awa dee_ duns	p me_awa dee_ name	p me_awa dee dba name	me_awa dee_pa ent_d ns	p me_awa dee_p a ent name	me_awa dee_count y_c de	p me_awa dee_ count y name	p me_awa dee add ess l ne 1	p me_awa dee c ty name	p me_awa dee_county_ name	p me_awa dee_ state code	p me_awa dee_ state name	p me_awa dee_ z p code
HEALTH AND HUMAN SERVICES, DEPARTMENT OF (7500)					075 2017/2017 0885-000 075-2018/2018-0885 000 075-2019/2019-0885 000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.		77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL	NEW YORK	NEW YORK	NY	New Yo k	100012317
HEALTH AND HUMAN SERVICES, DEPARTMENT OF (7500)					075 2017/2017 0885-000 075-2018/2018-0885 000 075-2019/2019-0885 000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.		77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL	NEW YORK	NEW YORK	NY	New Yo k	100012317
HEALTH AND HUMAN SERVICES, DEPARTMENT OF (7500)					075 2017/2017 0885-000 075-2018/2018-0885 000 075-2019/2019-0885 000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.		77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL	NEW YORK	NEW YORK	NY	New Yo k	100012317
HEALTH AND HUMAN SERVICES, DEPARTMENT OF (7500)					075 2017/2017 0885-000 075-2018/2018-0885 000 075-2019/2019-0885 000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.		77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL	NEW YORK	NEW YORK	NY	New Yo k	100012317
HEALTH AND HUMAN SERVICES, DEPARTMENT OF (7500)					075 2017/2017 0885-000 075-2018/2018-0885 000 075-2019/2019-0885 000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.		77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL	NEW YORK	NEW YORK	NY	New Yo k	100012317
HEALTH AND HUMAN SERVICES, DEPARTMENT OF (7500)					075 2017/2017 0885-000 075-2018/2018-0885 000 075-2019/2019-0885 000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.		77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL	NEW YORK	NEW YORK	NY	New Yo k	100012317
HEALTH AND HUMAN SERVICES, DEPARTMENT OF (7500)					075 2017/2017 0885-000 075-2018/2018-0885 000 075-2019/2019-0885 000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.		77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL	NEW YORK	NEW YORK	NY	New Yo k	100012317

p me_awa dee_ cong ess onal_d d ct	me_awa dee_fo e gn_ ostal code	p me_awa dee_ bus ness types	p me_awa d_p ma y_p lace_of_pe fo mance_sc ope	p me_awa d_p ma y_place_of pe fo mance c ty name	p me_awa d_p ma y_p lace_of_pe fo mance_st ate code	p me_awa d_p ma y_place_o f_pe fo mance state name	p me_awa d_p ma y_p lace_of_pe fo mance_add ess_z p_co de	me_awa d_p ma y_ lace_of_pe fo mance_ ong ess onal d st ct	p me_awa d_p ma y_ place_of_pe fo mance_ count y code	p me_awa d_p ma y_place_of_ pe fo mance count y name	p me_awa d desc pt on	p me_awa d ifdia_numbe s_ and t tles	subawa d_ type	subawa d_fs s_ epo t d	subawa d_fs s_ yea	subawa d_fs s_ epo t month	subawa d numbe	subawa d_a mount	subawa d_act on_ date	subawa d_a st on_date_ fiscal yea	subawa dee duns
B		Nonp of t w th 501C3 IRS Status (Othe then Inst tut on of Hghe Educat on)	SINGLE ZIP CODE	NEW YORK	NY	New Yo k	100012320	B	USA	UNITED STATES	Unde stand n g the R sk of Bat Co onav us Eme gence	93 855 ALLERGY AND INFECTIOUS D SEASES RESEARCH 93 855 ALLERGY, IMMUNOLOGY AND TRANSPLANTAT ION RESEARCH	sub-g ant	027035599edbd d7677547d9de 859fb	2018	5	1R01AI110964-01	133000	5/31/201	2018	529027474
B		Nonp of t w th 501C3 IRS Status (Othe then Inst tut on of Hghe Educat on)	SINGLE ZIP CODE	NEW YORK	NY	New Yo k	100012320	B	USA	UNITED STATES	Unde stand n g the R sk of Bat Co onav us Eme gence	93 855 ALLERGY AND INFECTIOUS D SEASES RESEARCH 93 855 ALLERGY, IMMUNOLOGY AND TRANSPLANTAT ION RESEARCH	sub-g ant	39cfed818570 69d9f9cde63d ef1bd	2019	5	1R01AI110964-01	66500	5/31/201	2019	529027474
B		Nonp of t w th 501C3 IRS Status (Othe then Inst tut on of Hghe Educat on)	SINGLE ZIP CODE	NEW YORK	NY	New Yo k	100012320	B	USA	UNITED STATES	Unde stand n g the R sk of Bat Co onav us Eme gence	93 855 ALLERGY AND INFECTIOUS D SEASES RESEARCH 93 855 ALLERGY, IMMUNOLOGY AND TRANSPLANTAT ION RESEARCH	sub-g ant	a8659af925b07 7162010ee8ce 4e7ed	2016	5	1R01AI110964-01	41875	5/31/201	2016	529049295
B		Nonp of t w th 501C3 IRS Status (Othe then Inst tut on of Hghe Educat on)	SINGLE ZIP CODE	NEW YORK	NY	New Yo k	100012320	B	USA	UNITED STATES	Unde stand n g the R sk of Bat Co onav us Eme gence	93 855 ALLERGY AND INFECTIOUS D SEASES RESEARCH 93 855 ALLERGY, IMMUNOLOGY AND TRANSPLANTAT ION RESEARCH	sub-g ant	3eafa6efcdf79 f85d6d03b2ead c583	2017	5	1R01AI110964-01	133000	5/31/201	2017	529027474
B		Nonp of t w th 501C3 IRS Status (Othe then Inst tut on of Hghe Educat on)	SINGLE ZIP CODE	NEW YORK	NY	New Yo k	100012320	B	USA	UNITED STATES	Unde stand n g the R sk of Bat Co onav us Eme gence	93 855 ALLERGY AND INFECTIOUS D SEASES RESEARCH 93 855 ALLERGY, IMMUNOLOGY AND TRANSPLANTAT ION RESEARCH	sub-g ant	3eafa6efcdf79 f85d6d03b2ead c583	2017	5	1R01AI110964-01	159342.1	5/31/201	2017	529049295
B		Nonp of t w th 501C3 IRS Status (Othe then Inst tut on of Hghe Educat on)	SINGLE ZIP CODE	NEW YORK	NY	New Yo k	100012320	B	USA	UNITED STATES	Unde stand n g the R sk of Bat Co onav us Eme gence	93 855 ALLERGY AND INFECTIOUS D SEASES RESEARCH 93 855 ALLERGY, IMMUNOLOGY AND TRANSPLANTAT ION RESEARCH	sub-g ant	a8659af925b07 7162010ee8ce 4e7ed	2016	5	1R01AI110964-01	133000	5/31/201	2016	529027474
B		Nonp of t w th 501C3 IRS Status (Othe then Inst tut on of Hghe Educat on)	SINGLE ZIP CODE	NEW YORK	NY	New Yo k	100012320	B	USA	UNITED STATES	Unde stand n g the R sk of Bat Co onav us Eme gence	93 855 ALLERGY AND INFECTIOUS D SEASES RESEARCH 93 855 ALLERGY, IMMUNOLOGY AND TRANSPLANTAT ION RESEARCH	sub-g ant	005d6fd2c5a7 92c3f3684bbaf 8a64	2015	5	1R01AI110964-01	133000	5/29/201	2015	529027474

subawa dee name	subawa dee dba name	subawa dee_p a ent duns	subawa dee_p a ent name	subawa dee_count y_ code	ubawa dee_count y name	subawa dee_a dd ess l ne 1	ubawa dee_c ty name	subawa dee_ state code	subawa dee_s tate name	ubawa dee_ p code	subawa dee_c ong ess onal_ d st ct	subawa dee_fo e gn_ postal code	subawa dee_bus ness_ty pes	subawa d_p ma y_place_of_b e fo mance add ess l ne 1	subawa d_p ma y_place_of_ pe fo mance c ty name	ubawa d_p ma y_place_of_ e fo mance state code	subawa d_p ma y_place_of_ pe fo mance state name	subawa d_p ma y_place_of_pe fo mance_a dd ess z p code	subawa d_p ma y_place_of_ pe fo mance_cong ess onal_d st ct
WUHAN INSTITUTE OF VIROLOGY CHINESE ACADEMY OF SCIENCES CAPITAL CONSTRUCTION				CN		NO.44, XIAOHONGSH AN M DDLE AREA	WUHAN	0				43007	Non-P of t O gan zat on Educat ona l Inst tut on,State Cont o led Inst tut on of H ghe Lea n ng		Wuhan	0			
WUHAN INSTITUTE OF VIROLOGY CHINESE ACADEMY OF SCIENCES CAPITAL CONSTRUCTION				CN		NO.44, XIAOHONGSH AN M DDLE AREA	WUHAN	0				43007	Non-P of t O gan zat on Educat ona l Inst tut on,State Cont o led Inst tut on of H ghe Lea n ng		Wuhan	0			
WUHAN UNIVERSITY SCHOOL OF PUBL C HEALTH				CN		NO.185, DONGHU RD.	HUBEI	0					Fo e gn Owned,Othe Not Fo P of t O gan zat on Educat ona l Inst tut on		Hube	0			
WUHAN INSTITUTE OF VIROLOGY CHINESE ACADEMY OF SCIENCES CAPITAL CONSTRUCTION				CN		NO.44, XIAOHONGSH AN M DDLE AREA	WUHAN	0				43007	Non-P of t O gan zat on Educat ona l Inst tut on,State Cont o led Inst tut on of H ghe Lea n ng		Wuhan	0			
WUHAN UNIVERSITY SCHOOL OF PUBL C HEALTH				CN		NO.185, DONGHU RD.	HUBEI	0				43007	Fo e gn Owned,Othe Not Fo P of t O gan zat on Educat ona l Inst tut on		Hube	0			
WUHAN INSTITUTE OF VIROLOGY CHINESE ACADEMY OF SCIENCES CAPITAL CONSTRUCTION				CN		NO.44, XIAOHONGSH AN M DDLE AREA	WUHAN	0					Non-P of t O gan zat on Educat ona l Inst tut on,State Cont o led Inst tut on of H ghe Lea n ng		Wuhan	0			
WUHAN INSTITUTE OF VIROLOGY CHINESE ACADEMY OF SCIENCES CAPITAL CONSTRUCTION				CN		NO.44, XIAOHONGSH AN M DDLE AREA	WUHAN	0					Non-P of t O gan zat on Educat ona l Inst tut on,State Cont o led Inst tut on of H ghe Lea n ng		Wuhan	0			

subawa d_p ma y_place_of_pe fo mance count y code	subawa d_p ma y_place_of_pe fo mance_count y_name	ubawa d desc pt on	subawa dee_h ghly_compensated_off ce_1 name	subawa dee_h ghly_compensated_off ce_1_amount	subawa dee_h ghly_compensated_o f ce _2 name	subawa dee_h ghly_compensated_o f ce 2 amount	subawa dee_h ghly_compensated_off ce 3 name	subawa dee_h ghly_compensated_off ce 3 amount	subawa dee_h ghly_compensated_4 name	subawa dee_h ghly_compensated_off ce _4 amount	subawa dee_h ghly_compensated_of f ce 5 name	ubawa dee_h ghly_compensated_off ce 5 amount	usaspend ng pe mal nk	subawa d_fis s _epo t_last_mod f ed date
ON		onduct h gh-qual ty esti ng, sequenc ng, and nalyses of f eld samples ma ntenance of colid-cha ns om f eld to lab ensu ng ual ty cont ol of sample to age and test ng o labo at ng on sc ent f c ubl cat ons and og ammat c epo t ng.											https //www.usaspending.gov/awa d/ASST_NON_R01AI110964_7529/	2020-07 13 16 57 12 00
ON		onduct h gh-qual ty esti ng, sequenc ng, and nalyses of f eld samples ma ntenance of colid-cha ns om f eld to lab ensu ng ual ty cont ol of sample to age and test ng o labo at ng on sc ent f c ubl cat ons and og ammat c epo t ng.											https //www.usaspending.gov/awa d/ASST_NON_R01AI110964_7529/	2020-07 13 17 40 37 00
ON		onduct ta geted s te-nalyses, human behav o al u ve lance nclud ng ual tat ve and quant tat ve u veys analyses of data o labo at ng on sc ent f c ubl cat ons and og ammat c epo t ng.											https //www.usaspending.gov/awa d/ASST_NON_R01AI110964 7529/	2020-07 13 18 04 56 00
ON		onduct h gh-qual ty esti ng, sequenc ng, and nalyses of f eld samples ma ntenance of colid-cha ns om f eld to lab ensu ng ual ty cont ol of sample to age and test ng o labo at ng on sc ent f c ubl cat ons and og ammat c epo t ng.											https //www.usaspending.gov/awa d/ASST_NON_R01AI110964 7529/	2020-07 13 16 10 31 00
ON		onduct ta geted s te-nalyses, human behav o al u ve lance nclud ng ual tat ve and quant tat ve u veys analyses of data o labo at ng on sc ent f c ubl cat ons and og ammat c epo t ng.											https //www.usaspending.gov/awa d/ASST_NON_R01AI110964 7529/	2020-07 13 16 10 31 00
ON		onduct h gh-qual ty esti ng, sequenc ng, and nalyses of f eld samples ma ntenance of colid-cha ns om f eld to lab ensu ng ual ty cont ol of sample to age and test ng o labo at ng on sc ent f c ubl cat ons and og ammat c epo t ng.											https //www.usaspending.gov/awa d/ASST_NON_R01AI110964 7529/	2020-07 13 16 04 56 00
ON		onduct h gh-qual ty esti ng, sequenc ng, and nalyses of f eld samples ma ntenance of colid-cha ns om f eld to lab ensu ng ual ty cont ol of sample to age and test ng o labo at ng on sc ent f c ubl cat ons and og ammat c epo t ng											https //www.usaspending.gov/awa d/ASST_NON_R01AI110964 7529/	2020-07 13 13 52 38 00

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7529_R01AI110964_R01 AI110964- 236927158_93.855_001	ASST_NON_R01AI 110964_7529	R01A 110964	1	R01AI110964- 236927158	SAI UNAVAILABLE	369819	3748715	0	0			0	0	Q Excluded f om t ack ng (uses non-eme gency/non-d saste des gnated app op at ons)			7/13/2020	2020	6/1/2014	6/30/2025	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH
7529_R01AI110964_R01 AI110964- 1548787081_93 855_00 0	ASST_NON_R01AI 110964_7529	R01A 110964	0	R01AI110964- 1548787081	SAI UNAVAILABLE	-369819	3748715	0	0			0	0	Q Excluded f om t ack ng (uses non-eme gency/non-d saste des gnated app op at ons)			4/27/2020	2020	6/1/2014	6/30/2025	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH
7529_R01AI110964_R01 AI110964- 2724294570_93.855_00 0	ASST_NON_R01AI 110964_7529	R01AI110964	0	R01AI110964- 2724294570	SAI UNAVAILABLE	733750	3748715	0	0			0	0				7/24/2019	2019	6/1/2014	6/30/2025	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH
7529_R01AI110964_R01 AI110964- 1667898916_93.855_00 1	ASST_NON_R01AI 110964_7529	R01AI110964	1	R01AI110964- 1667898916	SAI UNAVAILABLE	-71770	3748715	0	0			0	0				8/5/2019	2019	6/1/2014	6/30/2025	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH
7529_R01AI110964_75- 104-R01AI110964-000-1- 2014-93855-75-0885- NON_93.855_000	ASST_NON_R01AI 110964_7529	R01A 110964	0	75-104- R01AI110964- 000-1-2014- 93855-75- 0885-NON	SAI UNAVAILABLE	666442	3748715	0	0	0	0	0	0				5/27/2014	2014	6/1/2014	5/31/2019	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH
7529_R01AI110964_752 9-104-R01AI110964-000- 4-2017-93855-75-0885- NON 93.855 000	ASST_NON_R01AI 110964 7529	R01A 110964	0	7529-104- R01AI110964- 000-4-2017- 93855-75- 0885-NON	SAI UNAVAILABLE	597112	3748715	0	0	0	0	0	0				5/26/2017	2017	6/1/2014	5/31/2019	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH
7529_R01AI110964_75- 104-R01AI110964-000-3- 2016-93855-75-0885- NON_93.855_000	ASST_NON_R01AI 110964_7529	R01A 110964	0	75-104- R01AI110964- 000-3-2016- 93855-75- 0885-NON	SAI UNAVAILABLE	611090	3748715	0	0	0	0	0	0				7/22/2016	2016	6/1/2014	5/31/2019	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH
7529_R01AI110964_75- 104-R01AI110964-000-2- 2015-93855-75-0885- NON_93.855_000	ASST_NON_R01AI 110964_7529	R01A 110964	0	75-104- R01AI110964- 000-2-2015- 93855-75- 0885-NON	SAI UNAVAILABLE	630445	3748715	0	0	0	0	0	0				6/10/2015	2015	6/1/2014	5/31/2019	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH
7529_R01AI110964_752 9-104-R01AI110964-000- 5-2018-93855-75-0885- NON 93.855 000	ASST_NON_R01AI 110964 7529	R01A 110964	0	7529-104- R01AI110964- 000-5-2018- 93855-75- 0885-NON	SAI UNAVAILABLE	581646	3748715	0	0			0	0				6/18/2018	2018	6/1/2014	5/31/2019	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH

awa d ng_off ce_code	awa d ng_off ce_name	fund ng_agency_code	fund ng_agency_name	fund ng_sub_agency code	fund ng_sub_agency_name	fund ng_off ce_code	fund ng_off ce_name	t easu y_accounts_fund ng_th s awa d	fede al_accounts_fund ng_th s awa d	object_classes_fund ng_th s awa d	p og am_act v t es_fund ng_th s awa d	ec p ent_duns	ec p ent name	ec p ent_pa ent_duns	ec p ent_pa ent_name	ec p ent_count y_code	ec p ent_count y_name	ec p ent_add ess_l ne 1	ec p ent_add ess_l ne 2	ec p ent_c ty_code	ec p ent_c ty_name	ec p ent_county_code	ec p ent_county_name	ec p ent_state_code	ec p ent_state_name	ec p ent z p code	ec p ent_z p_last_4 code
75NM00	NIH NAT ONAL INSTITUTE OF ALLERGY AND INFECT OUS DISEASES	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	075-2017/2017-0885-000 075-2018/2018-0885-000 075-2019/2019-0885-000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.	77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL		51000	NEW YORK	61	NEW YORK	NY	NEW YORK	10001	2317
75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECT OUS DISEASES	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	075-2017/2017-0885-000 075-2018/2018-0885-000 075-2019/2019-0885-000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.	77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL		51000	NEW YORK	61	NEW YORK	NY	NEW YORK	10001	2317
75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECT OUS DISEASES	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	075-2017/2017-0885-000 075-2018/2018-0885-000 075-2019/2019-0885-000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.	77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL		51000	NEW YORK	61	NEW YORK	NY	NEW YORK	10001	2317
75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	75	DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	7529	NATIONAL INSTITUTES OF HEALTH	75NM00	NIH NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	075-2017/2017-0885-000 075-2018/2018-0885-000 075-2019/2019-0885-000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.	77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL		51000	NEW YORK	61	NEW YORK	NY	NEW YORK	10001	2317
								075-2017/2017-0885-000 075-2018/2018-0885-000 075-2019/2019-0885-000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC	77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	1200 LINCOLN AVENUE		62792	PROSPECT PARK	45	DELAWARE	PA	PENNSYLVANIA	19076	2016
		75	HEALTH AND HUMAN SERVICES, DEPARTMENT OF (7500)					075-2017/2017-0885-000 075-2018/2018-0885-000 075-2019/2019-0885-000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.	77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL			NEW YORK	61	NEW YORK	NY	NEW YORK	10001	2317
								075-2017/2017-0885-000 075-2018/2018-0885-000 075-2019/2019-0885-000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC	77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	1200 LINCOLN AVENUE		62792	PROSPECT PARK	45	DELAWARE	PA	PENNSYLVANIA	19076	2016
								075-2017/2017-0885-000 075-2018/2018-0885-000 075-2019/2019-0885-000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC	77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	1200 LINCOLN AVENUE		62792	PROSPECT PARK	45	DELAWARE	PA	PENNSYLVANIA	19076	2016
								075-2017/2017-0885-000 075-2018/2018-0885-000 075-2019/2019-0885-000	075-0885	41.0 G ants, subs d es, and cont but ons		77090066	ECOHEALTH ALLIANCE INC.	77090066	ECOHEALTH ALLIANCE INC.	USA	UNITED STATES	460 W 34TH ST 17TH FL		51000	NEW YORK	61	NEW YORK	NY	NEW YORK	10001	2317

ec p ent_cong ess onal_d st ct	ec p ent_fo e gn_c ty name	ec p ent_fo e gn_p ov nce_n ame	ec p ent_fo e gn_ postal code	p ma y_place_of_pe fo mance_sc ope	p ma y_place_of_pe fo mance_c ount y code	p ma y_place_of_pe fo mance_c ount y name	p ma y_place_of_pe fo mance code	p ma y_place_of_pe fo mance_c ty_na me	p ma y_place_of_pe fo mance_c ounty code	p ma y_place_of_pe fo mance_co unty name	p ma y_place_of_pe fo mance_s tate name	p ma y_place_of_pe fo mance_z p 4	p ma y_place_of_pe fo mance_c ong ess onal d st ct	p ma y_place_of_pe fo mance_f o e gn locat on	cfda numbe	cfda t tle	ass stance_type_c ode	ass stance_type_d esc pt on	awa d desc pt on	bus ness_funds_ nd cato code
10				SINGLE ZIP CODE	USA	UNITED STATES	NY51000	NEW YORK	61	NEW YORK	NEW YORK	10001-2320	10		93.855	ALLERGY AND INFECTIOUS DISEASES RESEARCH	4	PROJECT GRANT (B)	UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE	NON
10				SINGLE ZIP CODE	USA	UNITED STATES	NY51000	NEW YORK	61	NEW YORK	NEW YORK	10001-2320	10		93.855	ALLERGY AND INFECTIOUS DISEASES RESEARCH	4	PROJECT GRANT (B)	UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE	NON
10				SINGLE ZIP CODE	USA	UNITED STATES	NY51000	NEW YORK	61	NEW YORK	NEW YORK	10001-2320	10		93.855	ALLERGY AND INFECTIOUS DISEASES RESEARCH	4	PROJECT GRANT (B)	UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE	NON
10				SINGLE ZIP CODE	USA	UNITED STATES	NY51000	NEW YORK	61	NEW YORK	NEW YORK	10001-2320	10		93.855	ALLERGY AND INFECTIOUS DISEASES RESEARCH	4	PROJECT GRANT (B)	UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE	NON
7					USA	UNITED STATES	3651000	NEW YORK	61	NEW YORK	NEW YORK	100012320	10		93.855	ALLERGY, IMMUNOLOGY AND TRANSPLANTATION RESEARCH	4		UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE	NON
10				SINGLE ZIP CODE	USA	UNITED STATES	NY51000	NEW YORK	61	NEW YORK	NEW YORK	100012320	10		93.855	ALLERGY, IMMUNOLOGY AND TRANSPLANTATION RESEARCH	4		UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE	NON
7					USA	UNITED STATES	3651000	NEW YORK	61	NEW YORK	NEW YORK	100012320	10		93.855	ALLERGY, IMMUNOLOGY AND TRANSPLANTATION RESEARCH	4		UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE	NON
7					USA	UNITED STATES	3651000	NEW YORK	61	NEW YORK	NEW YORK	100012320	10		93.855	ALLERGY, IMMUNOLOGY AND TRANSPLANTATION RESEARCH	4		UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE	NON
10				S ngle ZIP Code	USA	UNITED STATES	NY51000	NEW YORK	61	NEW YORK	NEW YORK	10001-2320	10		93.855	ALLERGY AND INFECTIOUS DISEASES RESEARCH	4	PROJECT GRANT (B)	UNDERSTANDING THE RISK OF BAT CORONAVIRUS EMERGENCE	NON

bus ness_funds_ nd cato _desc_pt on	bus ness_types code	bus ness_types_desc_pt on	co ect on_delete_nd cato code	co ect on_delete_ nd cato _desc_pt on	act on_type code	act on_type desc_pt on	eco d_type_code	eco d_type_desc_pt on	h ghly_compensated_off ce 1 name	h ghly_compensated_off ce 1 amount	h ghly_compensated_off ce 2 name	h ghly_compensated_off ce 2 amount	h ghly_compensated_off ce 3 name	h ghly_compensated_off ce 3 amount	h ghly_compensated_off ce 4 name	h ghly_compensated_off ce 4 amount	h ghly_compensated_off ce 5 name	h ghly_compensated_off ce 5 amount	usaspend ng_pe mal nk	last_mod f ed_date		
NOT RECOVERY ACT	M	NONPROFIT WITH 501C3 IRS STATUS (OTHER THAN AN INSTITUT ON OF HIGHER EDUCATION)			B	CONTINUATION	2	NON-AGGREGATE RECORD											https //www.usaspend ng.gov/awa d/ASST_NON_R01AI110964_7529/	2020-07-20 15 20 07.788775 00		
NOT RECOVERY ACT	M	NONPROFIT WITH 501C3 IRS STATUS (OTHER THAN AN INSTITUT ON OF HIGHER EDUCATION)	C	CORRECT AN EXISTING RECORD	B	CONTINUATION	2	NON-AGGREGATE RECORD											https //www.usaspend ng.gov/awa d/ASST_NON_R01AI110964_7529/	2020-07-20 15 31 56.732167 00		
NOT RECOVERY ACT	M	NONPROFIT WITH 501C3 IRS STATUS (OTHER THAN AN INSTITUT ON OF HIGHER EDUCATION)	C	CORRECT AN EXISTING RECORD	B	CONTINUATION	2	NON-AGGREGATE RECORD											https //www.usaspend ng.gov/awa d/ASST_NON_R01AI110964 7529/	2020-09-25 14 05 49.835377 00		
NOT RECOVERY ACT	M	NONPROFIT WITH 501C3 IRS STATUS (OTHER THAN AN INSTITUT ON OF HIGHER EDUCATION)	C	CORRECT AN EXISTING RECORD	B	CONTINUATION	2	NON-AGGREGATE RECORD											https //www.usaspend ng.gov/awa d/ASST_NON_R01AI110964_7529/	2020-09-25 14 05 49.835377 00		
	R	SMALL BUSINESS	C		A		2												https //www.usaspend ng.gov/awa d/ASST_NON_R01AI110964_7529/	2016-02-29 00 00 00 00		
	M	NONPROFIT WITH 501C3 IRS STATUS (OTHER THEN INSTITUT ON OF HIGHER EDUCATION)			B		2												https //www.usaspend ng.gov/awa d/ASST_NON_R01AI110964 7529/	2017-06-05 00 00 00 00		
	R	SMALL BUSINESS			B		2												https //www.usaspend ng.gov/awa d/ASST_NON_R01AI110964_7529/	2016-08-05 00 00 00 00		
	R	SMALL BUSINESS			B		2												https //www.usaspend ng.gov/awa d/ASST_NON_R01AI110964_7529/	2015-07-17 00 00 00 00		
NOT RECOVERY ACT	M	NONPROFIT WITH 501C3 IRS STATUS (OTHER THAN AN INSTITUT ON OF HIGHER EDUCATION)			B	CONTINUATION	2	NON-AGGREGATE RECORD											https //www.usaspend ng.gov/awa d/ASST_NON_R01AI110964 7529/	2018-06-22 01 00 04.704664 00		

DATA Act Information Model Schema (DAIMS)
Data Element Crosswalk (DEC)

DAIMS-DEC v2.0
Revision Date: 2020-05-06

DATA Act Information Model Schema (DAIMS) Data Element Crosswalk (DEC) Overview

Purpose of the DEC

This document specifies how data elements are labelled across different environments, from the DAIMS to the USAspending Downloads and Legacy USAspending. The DEC also displays the name and type of file that can be found. For USAspending Downloads the different types of files are Award, Subaward, and Account. For Legacy USAspending, the DEC keeps track of the Award File name.

File Overview

The DEC is entirely generated from the DAIMS, which has a number of columns that keeps track of relevant information from USAspending Downloads, and Legacy USAspending.

Content Detail for Schema Data Label & Description, USA Spending Downloads and Legacy USA Spending

The following detail what the columns convey in each section below:

Schema Data Label & Description

Element – A unique label for each data element.

Definition – Contains the business definition of the data element.

FPDS Data Dictionary Element – Contains the business definition from the FPDS Data Dictionary.

USA Spending Downloads

Award File– The name of the CSV award file where the data element can be found in.

Award Element- The corresponding name of the data element within the CSV award file.

Subaward File– The name of the CSV subaward file where the data element can be found in.

Subward Element- The corresponding name of the data element within the CSV subaward file.

Account File– The name of the CSV account file where the data element can be found in.

Account Element- The corresponding name of the data element within the CSV award file.

Legacy USA Spending

Award File– The name of the award file where the legacy award element resides.

Award Element- The corresponding name of the award data element within the legacy file.

Subward Element- The corresponding name of the subaward data element within the legacy file.

DEC Change Log

Version	Date	File	Change Description
1.3.1	**12/28/2018**	**Public**	**Initial release as part of the DAIMS release version v1.3.1**
2.0	**5/1/2020**	**Public**	**Added Grouping column**

Schema Data Label & Description				USA Spending Downloads						Database Download		Legacy USA Spending		
Element	Definition	FPDS Data Dictionary Element	Grouping	Award File	Award Element	Subaward File	Subaward Element	Account File	Account Element	Table	Element	Award File	Award Element	Subaward Element
1862 Land Grant College	https://www.sam.gov	1862 Land Grant College	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	1862_land_grant_college	N/A	N/A	N/A	N/A	LegalEntity	c1862_land_grant_college	Contracts	is1862landgrantcollege	N/A
1890 Land Grant College	https://www.sam.gov	1890 Land Grant College	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	1890_land_grant_college	N/A	N/A	N/A	N/A	LegalEntity	c1890_land_grant_college	Contracts	is1890landgrantcollege	N/A
1994 Land Grant College	https://www.sam.gov	1994 Land Grant College	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	1994_land_grant_college	N/A	N/A	N/A	N/A	LegalEntity	c1994_land_grant_college	Contracts	is1994landgrantcollege	N/A
8a Program Participant	List characteristic of the contractor such as whether the selected contractor is an 8(a) Program Participant Organization or not. It can	8(a) Program Participant	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	c8a_program_participant	N/A	N/A	N/A	N/A	LegalEntity	c8a_program_participant	Contracts	firm8aflag	N/A
A-76 FAIR Act Action	Indicates whether the contract action has resulted from an A-76/Fair Act competitive sourcing process.	A-76 (FAIR Act) Action	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	a76_fair_act_action_code	N/A	N/A	N/A	N/A	TransactionFPDS	a_76_fair_act_action	Contracts	a76action	N/A
A-76 FAIR Act Action Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the A-76 FAIR Act Action Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	a76_fair_act_action	N/A	N/A	N/A	N/A	TransactionFPDS	a_76_fair_act_action_desc	Contracts	a76action	N/A
AccountTitle	A descriptive name of the Treasury Account Symbol (TAS).	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	federal_account_name	FederalAccount, TreasuryAppropriationAccount	account_title	Assistance, Contracts	account_title	prime_award_program_title
ActionDate	The date the action being reported was issued / signed by the Government or a binding agreement was reached.	Date Signed	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	action_date, award_base_action_date	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_base_action_date	###_treasury_account_account_breakdown_by_award_1.csv,	award_base_action_date	BrokerSubaward, TransactionFABS, TransactionFPDS, TransactionNormalized	action_date, action_date, action_date, action_date,	Assistance, Contracts	obligation_action_date, signeddate	prime_award_date_signed
ActionDateFiscalYear	The fiscal year in which the ActionDate occurs. Note that the Federal fiscal year begins on October 1 and ends on September 30, thus	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	action_date_fiscal_year, award_base_action_date_fiscal_year	N/A	N/A	###_treasury_account_account_breakdown_by_award_1.csv,	award_base_action_date_fiscal_year	N/A	N/A	N/A	N/A	N/A
ActionType	Description (and corresponding code) that provides information on any changes made to the Federal prime award. There are typically multiple	Reason for Modification	Award Attribute	all_assistance_prime_transactions_1.csv, all_contracts_prime_transactions_1.csv	action_type_code	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv	N/A	TransactionFABS, TransactionFPDS, TransactionNormalized	action_type	Assistance, Contracts	action_type, reasonformodification	N/A
ActionTypeDescriptionTag	Description tag that explains the meaning of the code provided in the ActionType Field.	N/A	Award Attribute	all_assistance_prime_transactions_1.csv, all_contracts_prime_transactions_1.csv	action_type_description, action_type	N/A	N/A	N/A	N/A	TransactionFPDS, TransactionNormalized	action_type_description	Assistance, Contracts	action_type, reasonformodification	N/A
Additional Reporting	This data element allows the user to select the additional reporting requirements that apply to the contract action. Multiple values can	Additional Reporting	Award Attribute	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AdjustmentsToUnobligatedBalanceBroughtForward_CPE	The definition for this element appears in Appendix F of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Resources	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	adjustments_to_unobligated_balance_brought_forward	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	adjustments_to_unobligated_balance_brought_forward_cpe	N/A	N/A	N/A
AgencyIdentifier	The agency code identifies the department or agency that is responsible for the account.	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_treasury_ac	agency_identifier_code	TreasuryAppropriationAccount	agency_id	N/A	N/A	N/A
AgencyIdentifierName	The agency name is the department or agency that is responsible for the account.	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	agency_identifier_name	N/A	N/A	N/A	N/A	N/A
Airport Authority	https://www.sam.gov	Airport Authority	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	airport_authority	N/A	N/A	N/A	N/A	LegalEntity	airport_authority	Contracts	isairportauthority	N/A

Alaskan Native Corporation Owned Firm	https://www.sam.gov	Alaskan Native Corporation Owned Firm	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	alaskan_native_corporation_owned_firm	N/A	N/A	N/A	N/A	LegalEntity	alaskan_native_owned_corporation_or_firm	Contracts	isalaskannativeownedcorporationorfirm	N/A
Alaskan Native Servicing Institution	https://www.sam.gov	Alaskan Native Servicing Institution	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	alaskan_native_servicing_institution	N/A	N/A	N/A	N/A	LegalEntity	alaskan_native_servicing_institution	N/A	N/A	N/A
All Awards	https://www.sam.gov	All Awards	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	receives_contracts_and_financial_assistance	N/A	N/A	N/A	N/A	LegalEntity	receives_contracts_and_grants	Contracts	receivescontractsandgrants	N/A
AllocationTransferAgencyIdentifier	The allocation agency identifies the department or agency that is receiving funds through an allocation (non-expenditure) transfer.	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_treasury_ac	allocation_transfer_agency_identifier_code	TreasuryAppropriationAccount, RefProgramActivity	allocation_transfer_agency_id	N/A	N/A	N/A
AllocationTransferAgencyName	The allocation transfer agency name is the name of the department or agency that is receiving funds through an allocation (non-	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_treasury_ac	allocation_transfer_agency_identifier_name	N/A	N/A	N/A	N/A	N/A
American Indian Owned Business	List characteristic of the contractor such as whether the selected contractor is an American Indian Owned Business or not. It can be	American Indian Owned Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	american_indian_owned_business	N/A	N/A	N/A	N/A	LegalEntity	american_indian_owned_business	Contracts	aiobflag	N/A
Asian Pacific American Owned Business	List characteristic of the contractor such as whether the selected contractor is an Asian-Pacific American Owned Business or not. It	Asian Pacific American Owned business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	asian_pacific_american_owned_business	N/A	N/A	N/A	N/A	LegalEntity	asian_pacific_american_owned_business	Contracts	apaobflag	N/A
AssistanceTransactionUniqueKey	System-generated database key used to uniquely identify each financial assistance transaction record and facilitate record lookup,	N/A	Award Attribute	all_assistance_prime_transactions_1.csv	assistance_transaction_unique_key	N/A	N/A	N/A	N/A	TransactionFABS	afa_generated_unique	N/A	N/A	N/A
AssistanceType	The type of assistance provided by the award.	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	assistance_type_code	N/A	N/A	###_treasury_account_account_breakdown_by_award_1.csv,	award_type_code	TransactionFABS	assistance_type	Assistance	assistance_type	N/A
AssistanceTypeDescriptionTag	Description tag (by way of the DATA Act Broker) that explains the meaning of the code provided in the AssistanceType Field.	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	assistance_type_description	N/A	N/A	N/A	N/A	TransactionFABS	assistance_type_desc	N/A	N/A	N/A
AvailabilityTypeCode	In appropriations accounts, the availability type code identifies an unlimited period to incur new obligations; this is denoted by the	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_treasury_ac	availability_type_code	TreasuryAppropriationAccount	availability_type_code	N/A	N/A	N/A
Award Or IDV Flag	Flag indicating whether the record was pulled from the award Atom feed or the IDV (Indefinite Delivery Vehicle) Atom Feed provided by	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	award_or_idv_flag	N/A	N/A	N/A	N/A	TransactionFPDS, Subaward	award_or_idv_flag, pulled_from pulled_from	N/A	N/A	N/A
AwardDescription	A brief description of the purpose of the award.	Description of Requirement	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	award_description	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_description	###_federal_account_account_breakdown_by_award_1.csv,	award_description	BrokerSubaward, Award, TransactionFABS, TransactionFPDS	award_description, description, award_description, award_description	Assistance, Contracts	project_description, DescriptionOfContractRequirement	prime_award_project_description
AwardLatestActionDate	Represents the award latest action date.	N/A	N/A	all_assistance_prime_awards_1.csv, all_contracts_prime_awards_1.csv,	award_latest_action_date	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_latest_action_date	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AwardLatestActionDateFiscalYear	Represents the award latest action date for the fiscal year.	N/A	N/A	all_assistance_prime_awards_1.csv, all_contracts_prime_awards_1.csv,	award_latest_action_date_fiscal_year	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_latest_action_date_fiscal_year	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AwardModificationAmendmentNumber	The identifier of an action being reported that indicates the specific subsequent change to the initial award.	Modification Number	Award Attribute	all_assistance_prime_transactions_1.csv, all_contracts_prime_transactions_1.csv	modification_number	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS, TransactionNormalized	award_modification_amendme, award_modification_amendme,	Assistance, Contracts	federal_award_mod, modnumber	N/A
AwardeeOrRecipientLegalEntityName	The name of the awardee or recipient that relates to the unique identifier. For U.S. based companies, this name is what the business ordinarily files in	Vendor Name	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_name	###_federal_account_account_breakdown_by_award_1.csv,	recipient_name	BrokerSubaward, TransactionFABS, TransactionFPDS	awardee_or_recipient_legal	Assistance, Contracts	recipient_name, VendorName	N/A

AwardeeOrRecipientUniqueIdentifier	The unique identification number for an awardee or recipient. Currently the identifier is the 9-digit number assigned by Dun and Bradstreet	DUNS Number	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_duns	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_dun s	###_federal_account_account_breakdown_by_award_1.csv,	recipient_duns	BrokerSubaward, TransactionFABS, TransactionFPDS	awardee_or_recipient_uniqu	Assistance, Contracts	duns_no, dunsnumber	N/A
AwardingAgencyCode	A department or establishment of the Government as used in the Treasury Account Fund Symbol (TAFS).	N/A	Award Source	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	awarding_agency_code	all_contracts_subawards_1.csv	prime_award_awarding_agency_code	###_federal_account_account_breakdown_by_award_1.csv,	awarding_agency_code	BrokerSubaward, TransactionFABS, TransactionFPDS, ToptierAgency,	awarding_agency_code, awarding_agency_code,	Assistance, Contracts	maj_agency_cat	prime_award_contracting_major_agency_id
AwardingAgencyName	The name associated with a department or establishment of the Government as used in the Treasury Account Fund Symbol (TAFS).	N/A	Award Source	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	awarding_agency_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_awarding_agency_name	###_federal_account_account_breakdown_by_award_1.csv,	awarding_agency_name	BrokerSubaward, TransactionFABS, TransactionFPDS, ToptierAgency	awarding_agency_name, awarding_agency_name,	Assistance, Contracts	maj_agency_cat	prime_award_contracting_major_agency_name
AwardingOfficeCode	Identifier of the level n organization that awarded, executed or is otherwise responsible for the transaction.	Contracting Office Code	Award Source	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	awarding_office_code	all_contracts_subawards_1.csv	prime_award_awarding_office_code	###_treasury_account_account_breakdown_by_award_1.csv,	awarding_office_code	BrokerSubaward, TransactionFABS, TransactionFPDS, OfficeAgency	awarding_office_code, awarding_office_code,	Contracts	contractingofficeid	prime_award_contracting_office_id
AwardingOfficeName	Name of the level n organization that awarded, executed or is otherwise responsible for the transaction.	N/A	Award Source	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	awarding_office_name	all_contracts_subawards_1.csv	prime_award_awarding_office_name	###_treasury_account_account_breakdown_by_award_1.csv,	awarding_office_name	BrokerSubaward, TransactionFABS, TransactionFPDS, OfficeAgency	awarding_office_name, awarding_office_name,	Contracts	contractingofficeid	prime_award_contracting_office_name
AwardingSubTierAgencyCode	Identifier of the level 2 organization that awarded, executed or is otherwise responsible for the transaction.	Contracting Agency Code	Award Source	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	awarding_sub_agency_code	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_awarding_sub_agency_code	###_federal_account_account_breakdown_by_award_1.csv,	awarding_subagency_code	BrokerSubaward, TransactionFABS, TransactionFPDS, SubtierAgency	awarding_sub_tier_agency_c, awarding_sub_tier_agency_c,	Assistance, Contracts	agency_code, contractingofficeagencyid	prime_award_contracting_agency_id
AwardingSubTierAgencyName	Name of the level 2 organization that awarded, executed or is otherwise responsible for the transaction.	N/A	Award Source	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	awarding_sub_agency_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_awarding_sub_agency_name	###_federal_account_account_breakdown_by_award_1.csv,	awarding_subagency_name	BrokerSubaward, TransactionFABS, TransactionFPDS, SubtierAgency	awarding_sub_tier_agency_n, awarding_sub_tier_agency_n,	Assistance, Contracts	agency_name, contractingofficeagencyid	prime_award_contracting_agency_name
BaseAndAllOptionsValue	The change (from this transaction only) to the potential contract value (i.e., the base contract and any exercised or unexercised options).	Base And All Options Value	Award Spending	all_contracts_prime_transactions_1.csv	base_and_all_options_value	N/A	N/A	N/A	N/A	Award, TransactionFPDS	base_and_all_options_value	Contracts	baseandalloptionsvalue	N/A
BaseAndExercisedOptionsValue	The change (from this transaction only) to the current contract value (i.e., the base contract and any options that have been exercised).	Base And Exercised Options Value	Award Spending	all_contracts_prime_transactions_1.csv	base_and_exercised_options_value	N/A	N/A	N/A	N/A	TransactionFPDS	base_exercised_options_val	Contracts	baseandexercisedoptionsValue	N/A
BeginningPeriodOfAvailability	In annual and multi-year funds, the beginning period of availability identifies the first year of availability under law that an appropriation	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_treasury_ac	beginning_period_of_availability	TreasuryAppropriationAccount	beginning_period_of_availability	N/A	N/A	N/A
Black American Owned Business	List characteristic of the contractor such as whether the selected contractor is a Black American Owned Business or not. It can be	Black American Owned Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	black_american_owned_business	N/A	N/A	N/A	N/A	LegalEntity	black_american_owned_business	Contracts	baobflag	N/A
BorrowingAuthorityAmountTotal_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Resources	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	borrowing_authority_amount	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	borrowing_authority_amount_total_cpe	N/A	N/A	N/A
BudgetAuthorityAppropriatedAmount_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Resources	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	budget_authority_appropriated_amount	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	budget_authority_appropriated_amount_cpe	N/A	N/A	N/A
BudgetAuthorityUnobligatedBalanceBroughtForward_FYB	The definition for this element appears in Appendix F of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Resources	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	budget_authority_unobligated_balance_brought_forward	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	budget_authority_unobligated_balance_brought_forward_fyb	N/A	N/A	N/A
BudgetFunctionTitle	Represents the name or title of the budget function code (e.g. Agriculture, National Defense, Income Security).	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	budget_function	TreasuryAppropriationAccount	budget_function_title	N/A	N/A	N/A
BudgetSubFunctionTitle	Represents the name or title of the sub function code (e.g. Farm incoming stabilization, Agriculture research and services).	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	budget_subfunction	TreasuryAppropriationAccount	budget_subfunction_title	N/A	N/A	N/A
BusinessFundsIndicator	The Business Funds Indicator sometimes abbreviated BFI. Code indicating the award's applicability to the Recovery Act.	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	business_funds_indicator_code	N/A	N/A	N/A	N/A	TransactionFABS	business_funds_indicator	Assistance	rec_flag	N/A

BusinessFundsIndicatorDescriptionTag	Description tag (by way of the DATA Act Broker) that explains the meaning of the code provided in the BusinessFundsIndicator Field.	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	business_funds_indicator_description	N/A	N/A	N/A	N/A	TransactionFABS	business_funds_ind_desc	N/A	N/A	N/A
BusinessTypes	A collection of indicators of different types of recipients based on socio-economic status and organization / business areas.	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	business_types_code	N/A	N/A	N/A	N/A	LegalEntity	business_types	Assistance	recipient_type	N/A
BusinessTypesDescriptionTag	Description tag (by way of the DATA Act Broker) that explains the meaning of the code provided in the BusinessType Field.	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	business_types_description	N/A	N/A	N/A	N/A	TransactionFABS, LegalEntity	business_types_desc, business_types_description	N/A	N/A	N/A
ByDirectReimbursableFundingSource	Holds an attribute flag which specifies that the funding source of the associated data value is either a Direct or Reimbursable Funding	N/A	Account Breakdown	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	direct_or_reimbursable_funding_source	ObjectClass	direct_reimbursable	N/A	N/A	N/A
CAGE Code	The CAGE Code of the contractor. Used as a key to SAM. Maps to the DUNS.	CAGE Code	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	cage_code	N/A	N/A	N/A	N/A	TransactionFPDS	cage_code	N/A	N/A	N/A
CFDA_Number	The number assigned to a Federal area of work in the Catalog of Federal Domestic Assistance (CFDA).	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	cfda_number	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	cfda_number	TransactionFABS	cfda_number	Assistance	cfda_program_num	N/A
CFDA_Numbers	A comma-separated list of the code(s) identifying the area of work assigned to the prime award, as defined in the Catalog of Federal	N/A	Award Attribute	N/A	N/A	all_assistance_subawards_1.csv	prime_award_cfda_number	N/A	N/A	BrokerSubaward	cfda_numbers	N/A	N/A	prime_award_cfda_program_number_title_codes
CFDA_Title	The title of the area of work under which the Federal award was funded in the Catalog of Federal Domestic Assistance (CFDA).	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	cfda_title	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	cfda_title	TransactionFABS	cfda_title	Assistance	cfda_program_title	N/A
CFDA_Titles	A comma-separated list of the title(s) corresponding to the CFDA Number(s) assigned to the prime award, as defined in the Catalog for	N/A	Award Attribute	N/A	N/A	all_assistance_subawards_1.csv	prime_award_cfda_title	N/A	N/A	BrokerSubaward	cfda_titles	N/A	N/A	prime_award_cfda_program_number_title_codes
City Local Government	https://www.sam.gov	City Local Government	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	city_local_government	N/A	N/A	N/A	N/A	LegalEntity	city_local_government	Contracts	iscitylocalgovernment	N/A
Clinger-Cohen Act Planning Compliance	A code indicating the funding office has certified that the information technology purchase meets the planning requirements in 40 USC	Clinger-Cohen Act Planning Compliance	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	clinger_cohen_act_planning_code	N/A	N/A	N/A	N/A	TransactionFPDS	clinger_cohen_act_planning	Contracts	clingercohenact	N/A
Clinger-Cohen Act Planning Compliance Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Clinger-Cohen Act Planning	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	clinger_cohen_act_planning	N/A	N/A	N/A	N/A	TransactionFPDS	clinger_cohen_act_pla_desc	Contracts	clingercohenact	N/A
Commercial Item Acquisition Procedures	Designates whether the solicitation used the special requirements for the acquisition of commercial items (or other supplies or services authorized	Commercial Item Acquisition Procedures	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	commercial_item_acquisition_procedures_code	N/A	N/A	N/A	N/A	TransactionFPDS	commercial_item_acquisitio	Contracts	commercialitemacquisitionprocedures	N/A
Commercial Item Acquisition Procedures Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Commercial Item Acquisition	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	commercial_item_acquisition_procedures	N/A	N/A	N/A	N/A	TransactionFPDS	commercial_item_acqui_desc	Contracts	commercialitemacquisitionprocedures	N/A
Commercial Item Test Program Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Commercial Item Test Program Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	simplified_procedures_for_certain_commercial_items	N/A	N/A	N/A	N/A	TransactionFPDS	commercial_item_test_desc	Contracts	commercialitemtestprogram	N/A
Community Developed Corporation Owned Firm	https://www.sam.gov	Community Developed Corporation Owned Firm	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	community_developed_corporation_owned_firm	N/A	N/A	N/A	N/A	LegalEntity	community_developed_corporation_owned_firm	Contracts	iscommunitydevelopedcorporationowned firm	N/A
Community Development Corporation	https://www.sam.gov	Community Development Corporation	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	community_development_corporation	N/A	N/A	N/A	N/A	LegalEntity	community_development_corporation	Contracts	iscommunitydevelopmentcorporation	N/A

Consolidated Contract	Consolidation, "consolidation of contract requirements," "consolidated contract," or "consolidated requirement"- (1) Means a solicitation	Consolidated Contract	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	consolidated_contract_code	N/A	N/A	N/A	N/A	TransactionFPDS	consolidated_contract	Contracts	consolidatedcontract	N/A
Consolidated Contract Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Consolidated Contract Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	consolidated_contract	N/A	N/A	N/A	N/A	TransactionFPDS	consolidated_contract_desc	Contracts	consolidatedcontract	N/A
Construction Wage Rate Requirements	Indicates whether the transaction is subject to the Construction Wage Rate Requirements. The clause is 52.222-6 "Construction Wage Rate	Construction Wage Rate Requirements	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	construction_wage_rate_requirements_code	N/A	N/A	N/A	N/A	TransactionFPDS	construction_wage_rate_req	Contracts	davisbaconact	N/A
Construction Wage Rate Requirements Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Wage Rate Requirements	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	construction_wage_rate_requirements	N/A	N/A	N/A	N/A	TransactionFPDS	construction_wage_rat_desc	Contracts	davisbaconact	N/A
Contract Bundling	"Bundling" or "bundled contract" (1) Means the consolidating or combining of two or more requirements for supplies or services, previously	Contract Bundling	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	contract_bundling_code	N/A	N/A	N/A	N/A	TransactionFPDS	contract_bundling	Contracts	ContractBundling	N/A
Contract Bundling Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Contract Bundling Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	contract_bundling	N/A	N/A	N/A	N/A	TransactionFPDS	contract_bundling_descrip	Contracts	ContractBundling	N/A
Contract Financing	Type of financing used to effect payment (progress payments, advance payments, etc.).	Contract Financing	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	contract_financing_code	N/A	N/A	N/A	N/A	TransactionFPDS	contract_financing	Contracts	ContractFinancing	N/A
Contract Financing Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Contract Financing Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	contract_financing	N/A	N/A	N/A	N/A	TransactionFPDS	contract_financing_descrip	Contracts	ContractFinancing	N/A
ContractAuthorityAmountTotal_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Resources	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_account_account_balances_1.csv,	contract_authority_amount	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	contract_authority_amount_total_cpe	N/A	N/A	N/A
ContractAwardType	The type of award being entered by this transaction. Types of awards include Purchase Orders (PO), Delivery Orders (DO), Blanket	Award Type	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	award_type_code	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	award_type_code	TransactionFPDS	contract_award_type	Contracts	contractactiontype	N/A
ContractAwardTypeDescriptionTag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the ContractAwardType Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	award_type	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	award_type	TransactionFPDS	contract_award_type_desc	Contracts	contractactiontype	N/A
ContractTransactionUniqueKey	Derived element and system-generated database key used to uniquely identify each contract transaction record and facilitate	N/A	Award Attribute	all_contracts_prime_transactions_1.csv	contract_transaction_unique_key	N/A	N/A	N/A	N/A	TransactionFPDS	detached_award_proc_unique	N/A	N/A	N/A
Contracting Officer's Determination of Business Size	The Contracting Officer's determination of whether the selected contractor meets the small business size standard for award to a small	Contracting Officer's Determination of Business Size	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	contracting_officers_determination_of_business_size_code	N/A	N/A	N/A	N/A	TransactionFPDS	contracting_officers_deter	Contracts	contractingofficerbusinesssizedetermination	N/A
Contracting Officer's Determination of Business Size Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Contracting Officer's Determination of	N/A	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	contracting_officers_determination_of_business_size	N/A	N/A	N/A	N/A	TransactionFPDS	contracting_officers_desc	Contracts	contractingofficerbusinesssizedetermination	N/A
Contracts	https://www.sam.gov	Contracts	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	receives_contracts	N/A	N/A	N/A	N/A	LegalEntity	contracts	Contracts	receivescontracts	N/A
Corporate Entity Not Tax Exempt	https://www.sam.gov	Corporate Entity, Not Tax Exempt	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	corporate_entity_not_tax_exempt	N/A	N/A	N/A	N/A	LegalEntity	corporate_entity_not_tax_exempt	Contracts	iscorporateentitynottaxexempt	N/A
Corporate Entity Tax Exempt	https://www.sam.gov	Corporate Entity, tax Exempt	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	corporate_entity_tax_exempt	N/A	N/A	N/A	N/A	LegalEntity	corporate_entity_tax_exempt	Contracts	iscorporateentitytaxexempt	N/A

CorrectionDeleteIndicator	A code to indicate how the record should be processed: correction to an existing record; deletion of a record; new record.	N/A	Award Attribute	all_assistance_prime_transactions_1.csv	correction_delete_indicator_code	N/A	N/A	N/A	N/A	TransactionFABS	correction_delete_indicatr	Assistance	correction_late_ind	N/A
CorrectionDeleteIndicatorDescriptionTag	Description tag (by way of the DATA Act Broker) that explains the meaning of the code provided in the CorrectionLateDeleteIndicator Field.	N/A	Award Attribute	all_assistance_prime_transactions_1.csv	correction_delete_indicator_description	N/A	N/A	N/A	N/A	TransactionFABS	correction_delete_ind_desc	N/A	N/A	N/A
Cost Accounting Standards Clause	Indicates whether the contract includes a Cost Accounting Standards clause.	Cost Accounting Standards Clause	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	cost_accounting_standards_clause_code	N/A	N/A	N/A	N/A	TransactionFPDS	cost_accounting_standards	Contracts	CostAccountingStandardsClause	N/A
Cost Accounting Standards Clause Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Cost Accounting Standards Clause	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	cost_accounting_standards_clause	N/A	N/A	N/A	N/A	TransactionFPDS	cost_accounting_stand_desc	Contracts	CostAccountingStandardsClause	N/A
Cost or Pricing Data	A designator that indicates if cost or pricing was obtained, not obtained or waived.	Cost or Pricing Data	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	cost_or_pricing_data_code	N/A	N/A	N/A	N/A	TransactionFPDS	cost_or_pricing_data	Contracts	CostOrPricingData	N/A
Cost or Pricing Data Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Cost or Pricing Data Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	cost_or_pricing_data	N/A	N/A	N/A	N/A	TransactionFPDS	cost_or_pricing_data_desc	Contracts	CostOrPricingData	N/A
Council of Governments	https://www.sam.gov	Council of Governments	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	council_of_governments	N/A	N/A	N/A	N/A	LegalEntity	council_of_governments	Contracts	iscouncilofgovernments	N/A
Country of Product or Service Origin	Identifies the country of product or service origin.	Country of Product or Service Origin	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	country_of_product_or_service_origin_code	N/A	N/A	N/A	N/A	TransactionFPDS	country_of_product_or_serv	Contracts	countryoforigin	N/A
Country of Product or Service Origin Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Country of Product or Service Origin	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	country_of_product_or_service_origin	N/A	N/A	N/A	N/A	TransactionFPDS	country_of_product_or_desc	Contracts	countryoforigin	N/A
County Local Government	https://www.sam.gov	County Local Government	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	county_local_government	N/A	N/A	N/A	N/A	LegalEntity	county_local_government	Contracts	iscountylocalgovernment	N/A
CurrentTotalValueOfAward	For procurement, the total amount obligated to date on a contract, including the base and exercised options.	Total Base and Exercised Options Value	Award Spending	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	current_total_value_of_award	N/A	N/A	N/A	N/A	TransactionFPDS	current_total_value_award	N/A	N/A	N/A
DOD Acquisition Program	Two codes that together identify the program and weapons system or equipment purchased by a DoD agency. The first character is a	DOD Acquisition Program	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	dod_acquisition_program_code	N/A	N/A	N/A	N/A	TransactionFPDS	program_system_or_equipmen	Contracts	systemequipmentcode	N/A
DOD Acquisition Program Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the DOD Acquisition Program field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	dod_acquisition_program_description	N/A	N/A	N/A	N/A	TransactionFPDS	program_system_or_equ_desc	Contracts	systemequipmentcode	N/A
DeobligationsRecoveriesRefundsByTAS_CPE	The amount of downward adjustments to obligations and outlays resulting from deobligations, recoveries, or refunds collected,	N/A	Account Status	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	deobligations_or_recoveries_or_refunds_from_prior_year	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	deobligations_recoveries_refunds_by_tas_cpe	N/A	N/A	N/A
DeobligationsRecoveriesRefundsOfPriorYearByAward_CPE	The amount of downward adjustments to obligations and outlays incurred resulting from deobligations, recoveries, or refunds	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards	deobligations_recoveries_refunds_of_prior_year_by_award_cpe	N/A	N/A	N/A
DeobligationsRecoveriesRefundsOfPriorYearByProgramObjectClass_CPE	The amount of downward adjustments to obligations and outlays incurred resulting from deobligations, recoveries, or refunds	N/A	Account Breakdown	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_program_activity_ob	deobligations_or_recoveries_or_refunds_from_prior_year	FinancialAccountsByProgramActivityObjectClass	deobligations_recoveries_refund_pri_program_object_class_cpe	N/A	N/A	N/A
DisasterEmergencyFundCode	Distinguishes whether the budgetary resources, obligations incurred, unobligated and obligated balances, and outlays are classified as disaster,	N/A	Account Status	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	disaster_emergency_fund_codes, disaster_emergency_fund_codes_for_ov	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_disaster_emergency_fund_codes	###_treasury_account_account_breakdown_by_program_activity_o	disaster_emergency_fund_code			N/A	N/A	N/A

DisasterEmergencyFundName	The title of the Disaster Emergency Fund Code	N/A	Account Status	N/A	N/A	N/A	N/A	###_treasury_account_account_breakdown_by_program_activity_o	disaster_emergency_fund_name			N/A	N/A	N/A
DoD Claimant Program Code	A claimant program number designates a grouping of supplies, construction, or other services.	DoD Claimant Program Code	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	dod_claimant_program_code	N/A	N/A	###_federal_account_account_breakdown_by_program_activity_ob	N/A	TransactionFPDS	dod_claimant_program_code	Contracts	claimantprogramcode	N/A
DoD Claimant Program Code Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the DoD Claimant Program Code Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	dod_claimant_program_description	N/A	N/A	###_treasury_account_account_breakdown_by_award_1.csv,	N/A	TransactionFPDS	dod_claimant_prog_cod_desc	Contracts	claimantprogramcode	N/A
DoT Certified Disadvantaged Business Enterprise	https://www.sam.gov	DoT Certified Disadvantaged Business Enterprise	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	dot_certified_disadvantage	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv	N/A	LegalEntity	dot_certified_disadvantage	Contracts	isdotcertifieddisadvantagedbusinessenterprise	N/A
Domestic Shelter	https://www.sam.gov	Domestic Shelter	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	domestic_shelter	N/A	N/A	N/A	N/A	LegalEntity	domestic_shelter	Contracts	isdomesticshelter	N/A
Domestic or Foreign Entity	Code that indicates vendor entity.	Domestic or Foreign Entity	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	domestic_or_foreign_entity_code	N/A	N/A	N/A	N/A	LegalEntity	domestic_or_foreign_entity	Contracts	manufacturingorganizationtype	N/A
Domestic or Foreign Entity Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Domestic or Foreign Entity Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	domestic_or_foreign_entity	N/A	N/A	N/A	N/A	TransactionFPDS	domestic_or_foreign_e_desc	Contracts	manufacturingorganizationtype	N/A
EPA-Designated Product	The Resource Conservation and Recovery Act (RCRA), Section 6002, and Executive Order 13101 require the purchase of Environmental	EPA-Designated Product(s)	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	epa_designated_product_code	N/A	N/A	N/A	N/A	TransactionFPDS	epa_designated_product	Contracts	useofepadesignatedproducts	N/A
EPA-Designated Product Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the EPA-Designated Product Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	epa_designated_product	N/A	N/A	N/A	N/A	TransactionFPDS	epa_designated_produc_desc	Contracts	useofepadesignatedproducts	N/A
Economically Disadvantaged Women Owned Small Business	https://www.sam.gov OR List characteristic of the contractor such as whether the selected contractor is an Economically Disadvantaged	Economically Disadvantaged Women Owned Small Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	economically_disadvantaged_women_owned_small_business	N/A	N/A	N/A	N/A	LegalEntity	economically_disadvantaged_women_owned_small_business	Contracts	isecondisadvwomenownedsmallbusiness	N/A
Educational Institution	List characteristic of the contractor such as whether the selected contractor is an Educational Institution or not. It can be derived	Educational Institution	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	educational_institution	N/A	N/A	N/A	N/A	LegalEntity	educational_institution	Contracts	educationalinstitutionflag	N/A
Emergency Acquisition	A designator of contract actions that support a declared contingency operation, a declared humanitarian or peacekeeping operation, or a	Emergency Acquisition	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	contingency_humanitarian_or_peacekeeping_operation_code	N/A	N/A	N/A	N/A	TransactionFPDS	contingency_humanitarian_o	Contracts	contingencyhumanitarianpeacekeepingoperation	N/A
Emergency Acquisition Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Emergency Acquisition Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	contingency_humanitarian_or_peacekeeping_operation	N/A	N/A	N/A	N/A	TransactionFPDS	contingency_humanitar_desc	Contracts	contingencyhumanitarianpeacekeepingoperation	N/A
Emerging Small Business	List characteristic of the contractor such as whether the selected contractor is an Emerging Small Business Organization or not. It can	Emerging Small Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	emerging_small_business	N/A	N/A	N/A	N/A	LegalEntity	emerging_small_business	Contracts	emergingsmallbusinessflag	N/A
EndingPeriodOfAvailability	In annual and multi-year funds, the end period of availability identifies the last year of funds availab lity under law that an appropriation account	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_treasury_ac	ending_period_of_availability	TreasuryAppropriationAccount	ending_period_of_availability	N/A	N/A	N/A
Evaluated Preference	The designator for type of preference determined for the contract action.	Evaluated Preference	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	evaluated_preference_code	N/A	N/A	N/A	N/A	TransactionFPDS	evaluated_preference	Contracts	evaluatedpreference	N/A
Evaluated Preference Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Evaluated Preference Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	evaluated_preference	N/A	N/A	N/A	N/A	TransactionFPDS	evaluated_preference_desc	Contracts	evaluatedpreference	N/A

Extent Competed	A code that represents the competitive nature of the contract.	Extent Competed	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	extent_competed_code	N/A	N/A	N/A	N/A	TransactionFPDS	extent_competed	Contracts	extentcompeted	N/A
Extent Competed Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Extent Competed Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	extent_competed	N/A	N/A	N/A	N/A	TransactionFPDS	extent_compete_description	Contracts	extentcompeted	N/A
FAIN	The Federal Award Identification Number (FAIN) is the unique ID within the Federal agency for each (non-aggregate) financial assistance	N/A	Award Attribute	all_assistance_prime_awards_1.csv	award_id_fain	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	award_id_fain	Award, FinancialAccountsByAwards, TransactionFABS	fain	Assistance	federal_award_id	prime_award_federal_award_id
FaceValueOfDirectLoanOrLoanGuarantee	The face value of the direct loan or loan guarantee.	N/A	Award Spending	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	face_value_of_loan	N/A	N/A	N/A	N/A	TransactionFABS	face_value_loan_guarantee	Assistance	face_loan_guran	N/A
Fair Opportunity Limited Sources	The type of statutory exception to Fair Opportunity.	Fair Opportunity/Limited Sources	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	fair_opportunity_limited_sources_code	N/A	N/A	N/A	N/A	TransactionFPDS	fair_opportunity_limited_s	Contracts	statutoryexceptiontofairopportunity	N/A
Fair Opportunity Limited Sources Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Fair Opportunity Limited Sources	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	fair_opportunity_limited_sources	N/A	N/A	N/A	N/A	TransactionFPDS	fair_opportunity_limi_desc	Contracts	statutoryexceptiontofairopportunity	N/A
FedBizOpps	Indicates whether the synopsis requirements of FAR Subpart 5.2. have been observed.	FedBizOpps	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	fed_biz_opps_code	N/A	N/A	N/A	N/A	TransactionFPDS	fed_biz_opps	Contracts	fedbizopps	N/A
FedBizOppsDescriptionTag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the FedBizOpps Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	fed_biz_opps	N/A	N/A	N/A	N/A	TransactionFPDS	fed_biz_opps_description	Contracts	fedbizopps	N/A
Federal Agency	https://www.sam.gov	Federal Agency	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	federal_agency	N/A	N/A	N/A	N/A	Cfda, LegalEntity	federal_agency	Contracts	isfederalgovernmentagency	N/A
Federal Assistance Awards	https://www.sam.gov	Federal Assistance Awards	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	receives_financial_assistance	N/A	N/A	N/A	N/A	LegalEntity	grants	Contracts	receivesgrants	N/A
FederalAccountSymbol	The Federal Account Symbol is derived from concatenating the agency identifier and the main account code.	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	federal_account_symbol	FederalAccount	federal_account_symbol	N/A	N/A	N/A
FederalAccountsFundingThisAward	A single field with associated federal accounts in order of funding dollars.	N/A	Treasury Account	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	federal_accounts_funding_this_award	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_federal_accounts_funding_this_award	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FederalActionObligation	Amount of Federal government's obligation, de-obligation, or liability, in dollars, for an award transaction.	Action Obligation	Award Spending	all_assistance_prime_transactions_1.csv, all_contracts_prime_transactions_1.csv	federal_action_obligation	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS, TransactionNormalized	federal_action_obligation	Assistance, Contracts	fed_funding_amount, dollarsobligated	N/A
Federally Funded Research and Development Corp	https://www.sam.gov	Federally Funded Research and Development Corp	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	federally_funded_research_and_development_corp	N/A	N/A	N/A	N/A	LegalEntity	federally_funded_research_and_development_corp	Contracts	isfederallyfundedresearchanddevelopmentcorp	N/A
For Profit Organization	List characteristic of the contractor such as whether the selected contractor is a Profit Organization or not. It can be derived from the SAM	For Profit Organization	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	for_profit_organization	N/A	N/A	N/A	N/A	LegalEntity	for_profit_organization	Contracts	isforprofitorganization	N/A
Foreign Funding	Indicates that a foreign government, international organization, or foreign military organization bears some of the cost of the acquisition.	Foreign Funding	Award Source	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	foreign_funding	N/A	N/A	N/A	N/A	TransactionFPDS	foreign_funding	Contracts	fundedbyforeignentity	N/A
Foreign Funding Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Foreign Funding Field.	N/A	Award Source	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	foreign_funding_description	N/A	N/A	N/A	N/A	TransactionFPDS	foreign_funding_desc	N/A	N/A	N/A

Foreign Government	https://www.sam.gov	Foreign Government	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	foreign_government	N/A	N/A	N/A	N/A	LegalEntity	foreign_government	Contracts	isforeigngovernment	N/A
Foreign Owned	https://www.sam.gov	Foreign Owned	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	foreign_owned	N/A	N/A	N/A	N/A	LegalEntity	foreign_owned_and_located	Contracts	isforeignownedandlocated	N/A
Foundation	https://www.sam.gov	Foundation	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	foundation	N/A	N/A	N/A	N/A	LegalEntity	foundation	Contracts	isfoundation	N/A
FundingAgencyCode	The 3-digit CGAC agency code of the department or establishment of the Government that provided the preponderance of the funds for an	N/A	Award Source	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	funding_agency_code	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_funding_agency_code	###_treasury_account_account_breakdown_by_award_1.csv,	funding_agency_code	BrokerSubaward, TransactionFABS, TransactionFPDS, ToptierAgency,	funding_agency_code, funding_agency_code,	Contracts	maj_fund_agency_cat	N/A
FundingAgencyName	Name of the department or establishment of the Government that provided the preponderance of the funds for an award and/or individual	N/A	Award Source	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	funding_agency_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_funding_agency_name	###_treasury_account_account_breakdown_by_award_1.csv,	funding_agency_name	BrokerSubaward, TransactionFABS, TransactionFPDS, ToptierAgency	funding_agency_name, funding_agency_name,	Contracts	maj_fund_agency_cat	N/A
FundingOfficeCode	Identifier of the level n organization that provided the preponderance of the funds obligated by this transaction.	Program/Funding Office - Code	Award Source	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	funding_office_code	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_funding_office_code	###_treasury_account_account_breakdown_by_award_1.csv,	funding_office_code	BrokerSubaward, TransactionFABS, TransactionFPDS, OfficeAgency	funding_office_code, funding_office_code, funding_office_code, aac_code	Contracts	fundingrequestingofficeid	prime_award_funding_office_id
FundingOfficeName	Name of the level n organization that provided the preponderance of the funds ob igated by this transaction.	N/A	Award Source	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	funding_office_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_funding_office_name	###_treasury_account_account_breakdown_by_award_1.csv,	funding_office_name	BrokerSubaward, TransactionFABS, TransactionFPDS, OfficeAgency	funding_office_name, funding_office_name, funding_office_name, name	Contracts	fundingrequestingofficeid	prime_award_funding_office_name
FundingSubTierAgencyCode	Identifier of the level 2 organization that provided the preponderance of the funds obligated by this transaction.	Program/Funding Agency - Code	Award Source	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	funding_sub_agency_code	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_funding_sub_agency_code	###_treasury_account_account_breakdown_by_award_1.csv,	funding_sub_agency_code	BrokerSubaward, TransactionFABS, TransactionFPDS, SubtierAgency	funding_sub_tier_agency_co, funding_sub_tier_agency_co,	Contracts	fundingrequestingagencyid	prime_award_funding_agency_id
FundingSubTierAgencyName	Name of the level 2 organization that provided the preponderance of the funds ob igated by this transaction.	N/A	Award Source	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	funding_sub_agency_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_funding_sub_agency_name	###_treasury_account_account_breakdown_by_award_1.csv,	funding_sub_agency_name	BrokerSubaward, TransactionFABS, TransactionFPDS, SubtierAgency	funding_sub_tier_agency_na, funding_sub_tier_agency_na,	Contracts	fundingrequestingagencyid	prime_award_funding_agency_name
GeneralLedgerPostDate	The date the financial transaction was posted in the Agency's General Ledger. Example: If an award transaction	Date Signed	Award Attribute	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Government Furnished Property (GFP)	The contract uses equipment or property furnished by the government, pursuant to FAR 45.	Government Furnished Property (GFP)	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	government_furnished_property_code	N/A	N/A	N/A	N/A	TransactionFPDS	government_furnished_prope	Contracts	GFE_GFP	N/A
Government Furnished Property GFP Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Government Furnished Property GFP	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	government_furnished_property	N/A	N/A	N/A	N/A	TransactionFPDS	government_furnished_desc	Contracts	GFE_GFP	N/A
GrossOutlayAmountByAward_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	gross_outlay_amount_fyb_to_period_end	FinancialAccountsByAwards	gross_outlay_amount_by_award_cpe	N/A	N/A	N/A
GrossOutlayAmountByAward_FYB	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards	gross_outlay_amount_by_award_fyb	N/A	N/A	N/A
GrossOutlayAmountByProgramObjectClass_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_program_activity_ob	gross_outlay_amount	FinancialAccountsByProgramActivityObjectClass	gross_outlay_amount_by_program_object_class_cpe	N/A	N/A	N/A
GrossOutlayAmountByProgramObjectClass_FYB	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByProgramActivityObjectClass	gross_outlay_amount_by_program_object_class_fyb	N/A	N/A	N/A
GrossOutlayAmountByTAS_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Status	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	gross_outlay_amount	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	gross_outlay_amount_by_tas_cpe	N/A	N/A	N/A

GrossOutlaysDeliveredOrdersPaidTotal_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	gross_outlays_delivered_orders_paid_total_cpe	N/A	N/A	N/A
GrossOutlaysDeliveredOrdersPaidTotal_FYB	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	gross_outlays_delivered_orders_paid_total_fyb	N/A	N/A	N/A
GrossOutlaysUndeliveredOrdersPrepaidTotal_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	gross_outlays_undelivered_orders_prepaid_total_cpe	N/A	N/A	N/A
GrossOutlaysUndeliveredOrdersPrepaidTotal_FYB	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	gross_outlays_undelivered_orders_prepaid_total_fyb	N/A	N/A	N/A
HighCompOfficer1Amount	The cash and noncash dollar value earned by the one of the five most highly compensated “Executives” during the awardee's preceding fiscal	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	highly_compensated_officer_1_amount	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS	officer_1_amount	Assistance, Contracts	exec1_amount, prime_awardee_executive1_compensation	prime_awardee_executive1_compensation
HighCompOfficer1FullName	The name of an individual identified as one of the five most highly compensated "Executives." "Executive" means officers, managing	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	highly_compensated_officer_1_name	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS	officer_1_name	Assistance, Contracts	exec1_fullname, prime_awardee_executive1	prime_awardee_executive1
HighCompOfficer2Amount	The cash and noncash dollar value earned by the one of the five most highly compensated “Executives” during the awardee's preceding fiscal	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	highly_compensated_officer_2_amount	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS	officer_2_amount	Assistance, Contracts	exec2_amount, prime_awardee_executive2_compensation	prime_awardee_executive2_compensation
HighCompOfficer2FullName	The name of an individual identified as one of the five most highly compensated "Executives." "Executive" means officers, managing	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	highly_compensated_officer_2_name	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS	officer_2_name	Assistance, Contracts	exec2_fullname, prime_awardee_executive2	prime_awardee_executive2
HighCompOfficer3Amount	The cash and noncash dollar value earned by the one of the five most highly compensated “Executives” during the awardee's preceding fiscal	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	highly_compensated_officer_3_amount	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS	officer_3_amount	Assistance, Contracts	exec3_amount, prime_awardee_executive3_compensation	prime_awardee_executive3_compensation
HighCompOfficer3FullName	The name of an individual identified as one of the five most highly compensated "Executives." "Executive" means officers, managing	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	highly_compensated_officer_3_name	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS	officer_3_name	Assistance, Contracts	exec3_fullname, prime_awardee_executive3	prime_awardee_executive3
HighCompOfficer4Amount	The cash and noncash dollar value earned by the one of the five most highly compensated “Executives” during the awardee's preceding fiscal	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	highly_compensated_officer_4_amount	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS	officer_4_amount	Assistance, Contracts	exec4_amount, prime_awardee_executive4_compensation	prime_awardee_executive4_compensation
HighCompOfficer4FullName	The name of an individual identified as one of the five most highly compensated "Executives." "Executive" means officers, managing	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	highly_compensated_officer_4_name	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS	officer_4_name	Assistance, Contracts	exec4_fullname, prime_awardee_executive4	prime_awardee_executive4
HighCompOfficer5Amount	The cash and noncash dollar value earned by the one of the five most highly compensated “Executives” during the awardee's preceding fiscal	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	highly_compensated_officer_5_amount	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS	officer_5_amount	Assistance, Contracts	exec5_amount, prime_awardee_executive5_compensation	prime_awardee_executive5_compensation
HighCompOfficer5FullName	The name of an individual identified as one of the five most highly compensated "Executives." "Executive" means officers, managing	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	highly_compensated_officer_5_name	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS	officer_5_name	Assistance, Contracts	exec5_fullname, prime_awardee_executive5	prime_awardee_executive5
Hispanic American Owned Business	List characteristic of the contractor such as whether the selected contractor is a Hispanic American Owned Business or not. It can be	Hispanic American Owned Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	hispanic_american_owned_business	N/A	N/A	N/A	N/A	LegalEntity	hispanic_american_owned_business	Contracts	haobflag	N/A
Hispanic Servicing Institution	https://www.sam.gov	Hispanic Servicing Institution	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	hispanic_servicing_institution	N/A	N/A	N/A	N/A	LegalEntity	hispanic_servicing_institution	Contracts	ishispanicservicinginstitution	N/A
Historically Black College or University	List characteristic of the contractor such as whether the selected contractor is a Historically Black College or University or not. It can be	Historically Black College or University	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	historically_black_college	N/A	N/A	N/A	N/A	LegalEntity	historically_black_college	Contracts	hbcuflag	N/A

Historically Underutilized Business Zone HUBZone Firm	List characteristic of the contractor such as whether the selected contractor is a Historically Underutilized Business Zone	Historically Underutilized Business Zone (HUBZone) Firm	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	historically_underutilized_business_zone_hubzone_firm	N/A	N/A	N/A	N/A	LegalEntity	historically_underutilized_business_zone	Contracts	hubzoneflag	N/A
Hospital Flag	List characteristic of the contractor such as whether the selected contractor is a Hospital or not. It can be derived from the SAM data	Hospital Flag	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	hospital_flag	N/A	N/A	N/A	N/A	LegalEntity	hospital_flag	Contracts	hospitalflag	N/A
Housing Authorities Public/Tribal	https://www.sam.gov	Housing Authorities Public/Tribal	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	housing_authorities_public_tribal	N/A	N/A	N/A	N/A	LegalEntity	housing_authorities_public_tribal	Contracts	ishousingauthoritiespublicortribal	N/A
IDV_Type	The type of Indefinite Delivery Vehicle being (IDV) loaded by this transaction. IDV Types include Government-Wide Acquisition	IDV Type	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	idv_type_code	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	idv_type_code	TransactionFPDS	idv_type	Contracts	contractactiontype	N/A
IDV_Type Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the IDV_Type Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	idv_type	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	idv_type	TransactionFPDS	idv_type_description	Contracts	contractactiontype	N/A
Indian Tribe Federally Recognized	https://www.sam.gov	Indian Tribe (Federally Recognized)	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	indian_tribe_federally_recognized	N/A	N/A	N/A	N/A	LegalEntity	indian_tribe_federally_recognized	Contracts	isindiantribe	N/A
Information Technology Commercial Item Category	A code that designates the commercial availability of an information technology product or service.	Information Technology Commercial Item Category	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	information_technology_commercial_item_category_code	N/A	N/A	N/A	N/A	TransactionFPDS	information_technology_com	Contracts	informationtechnologycommercialitemcategory	N/A
Information Technology Commercial Item Category Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Information Technology Commercial	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	information_technology_commercial_item_category	N/A	N/A	N/A	N/A	TransactionFPDS	information_technolog_desc	Contracts	informationtechnologycommercialitemcategory	N/A
Inherently Governmental Functions	Indicates the type of the "Inherently Governmental Function" used on the action.	Inherently Governmental Functions	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	inherently_governmental_functions	N/A	N/A	N/A	N/A	TransactionFPDS	inherently_governmnt_func	N/A	N/A	N/A
Inherently Governmental Functions Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Inherently Governmental Functions	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	inherently_governmental_functions_description	N/A	N/A	N/A	N/A	TransactionFPDS	inherently_governmnt_desc	N/A	N/A	N/A
Inter-Municipal Local Government	https://www.sam.gov	Inter-Municipal Local Government	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	inter_municipal_local_government	N/A	N/A	N/A	N/A	LegalEntity	inter_municipal_local_government	Contracts	isintermunicipallocalgovernment	N/A
Interagency Contracting Authority	Indicates whether the transaction is an Economy Act or Statutory Authority.	Interagency Contracting Authority	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	interagency_contracting_authority_code	N/A	N/A	N/A	N/A	TransactionFPDS	interagency_contracting_au	Contracts	interagencycontractingauthority	N/A
Interagency Contracting Authority Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Interagency Contracting Authority	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	interagency_contracting_authority	N/A	N/A	N/A	N/A	TransactionFPDS	interagency_contract_desc	Contracts	interagencycontractingauthority	N/A
International Organization	https://www.sam.gov	International Organization	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	international_organization	N/A	N/A	N/A	N/A	LegalEntity	international_organization	Contracts	isinternationalorganization	N/A
Interstate Entity	https://www.sam.gov	Interstate Entity	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	interstate_entity	N/A	N/A	N/A	N/A	LegalEntity	interstate_entity	Contracts	isinterstateentity	N/A
Joint Venture Economically Disadvantaged Women Owned Small Business	https://www.sam.gov OR List characteristic of the contractor such as whether the selected contractor is a Joint Venture Economically	Joint Venture Economically Disadvantaged Women Owned Small Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	joint_venture_economic_disadvantaged_women_owned_small_bus	N/A	N/A	N/A	N/A	LegalEntity	joint_venture_economic_disadvantaged_women_owned_small_bus	Contracts	isjointventureecondisadvwomenownedsmallbusiness	N/A
Joint Venture Women Owned Small Business	https://www.sam.gov OR List characteristic of the contractor such as whether the selected contractor is a Joint Venture Woman Owned Small	Joint Venture Women Owned Small Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	joint_venture_women_owned_small_business	N/A	N/A	N/A	N/A	LegalEntity	joint_venture_women_owned_small_business	Contracts	isjointventurewomenownedsmallbusiness	N/A

Labor Standards	Indicates whether the transaction is subject to the Labor Standards. The clause for Labor Standards is 52.222-41 "Labor Standards" - that goes with	Labor Standards	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	labor_standards_code	N/A	N/A	N/A	N/A	TransactionFPDS	labor_standards	Contracts	servicecontractact	N/A
Labor Standards Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Service Contract Labor Standards	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	labor_standards	N/A	N/A	N/A	N/A	TransactionFPDS	labor_standards_descrip	Contracts	servicecontractact	N/A
Labor Surplus Area Firm	https://www.sam.gov	Labor Surplus Area Firm	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	labor_surplus_area_firm	N/A	N/A	N/A	N/A	LegalEntity	labor_surplus_area_firm	Contracts	islaborsurplusareafirm	N/A
LastModifiedDate	The last modified date captures the change date.	Date/Time Stamp Accepted	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	last_modified_date	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	last_modified_date	AppropriationAccountBalances, Award, FinancialAccountsByFederalAccount, TreasuryAppropriationAccount	last_modified_date, last_modified_date, last_modified_date, last_modified,	Assistance, Contracts	last_modified_date	N/A
LastReportedSubmissionPeriod	The last reported submission period.	N/A	Submission Attribute	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	last_reported_submission_period, submission_period		last_reported_submission_period	N/A	N/A	N/A
LegalEntityAddressLine1	First line of the awardee or recipient's legal business address where the office represented by the Unique Entity Identifier (as registered in the	Vendor Address Line 1	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_address_line_1	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_address_line_1	N/A	N/A	BrokerSubaward, TransactionFABS, TransactionFPDS, Location	legal_entity_address_line1, legal_entity_address_line1,	Assistance, Contracts	receip_addr1, streetaddress	N/A
LegalEntityAddressLine2	Second line of awardee or recipient's legal business address.	Vendor Address Line 2	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_address_line_2	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS, Location	legal_entity_address_line2, legal_entity_address_line2,	Assistance, Contracts	receip_addr2, streetaddress2	N/A
LegalEntityCityCode	Five position city code from the validation authoritative list.	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	recipient_city_code	N/A	N/A	N/A	N/A	TransactionFABS, Location, RefCityCountyCode	legal_entity_city_code, city_code, city_code	Assistance	recipient_city_code	N/A
LegalEntityCityName	Name of the city in which the awardee or recipient's legal business address is located.	Vendor Address City	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_city_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_city_name	###_federal_account_account_breakdown_by_award_1.csv,	recipient_city	BrokerSubaward, TransactionFABS, TransactionFPDS, Location,	legal_entity_city_name, legal_entity_city_name,	Assistance, Contracts	recipient_city_name, city	N/A
LegalEntityCongressionalDistrict	The congressional district in which the awardee or recipient is located. This is not a required data element for non-U.S. addresses.	Congressional District - Contractor	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_congressional_district	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_congressional_district	###_federal_account_account_breakdown_by_award_1.csv,	recipient_congressional_district	BrokerSubaward, TransactionFABS, TransactionFPDS, Location	legal_entity_congressional, legal_entity_congressional,	Assistance, Contracts	recipient_cd, vendor_cd	N/A
LegalEntityCountryCode	Code for the country in which the awardee or recipient is located, using the International Standard for country codes (ISO) 3166-1 Alpha-3 GENC	Vendor Country Code	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_country_code	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_country_code	###_treasury_account_account_breakdown_by_award_1.csv,	recipient_country	BrokerSubaward, TransactionFABS, TransactionFPDS, Location,	legal_entity_country_code, legal_entity_country_code,	Assistance, Contracts	recipient_country_code, vendorcountrycode	N/A
LegalEntityCountryName	The name corresponding to the country code.	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_country_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_country_name	###_federal_account_account_breakdown_by_award_1.csv,	recipient_country	BrokerSubaward, TransactionFABS, TransactionFPDS, Location,	legal_entity_country_name, legal_entity_country_name,	N/A	N/A	N/A
LegalEntityCountyCode	Three-position numeric code for county from InterNational Committee for Information Technology Standards (ANSI INCITS) county codes.	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	recipient_county_code	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS, Location, RefCityCountyCode	legal_entity_county_code, legal_entity_county_code,	Assistance	recipient_county_code	N/A
LegalEntityCountyName	Name of the county in which the awardee or recipient's legal business address is located.	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	recipient_county_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_county_name	###_federal_account_account_breakdown_by_award_1.csv,	recipient_county	TransactionFABS, TransactionFPDS, Location, RefCityCountyCode	legal_entity_county_name, legal_entity_county_name,	Assistance	recipient_county_name	N/A
LegalEntityForeignCityName	For foreign recipients only: name of the city in which the awardee or recipient's legal business address is located.	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	recipient_foreign_city_name	N/A	N/A	N/A	N/A	TransactionFABS, Location	legal_entity_foreign_city, foreign_city_name	N/A	N/A	N/A
LegalEntityForeignPostalCode	For foreign recipients only: foreign postal code in which the awardee or recipient's legal business address is located.	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	recipient_foreign_postal_code	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_foreign_postal_code	N/A	N/A	BrokerSubaward, TransactionFABS, Location	legal_entity_foreign_posta, legal_entity_foreign_posta,	N/A	N/A	N/A
LegalEntityForeignProvinceName	For foreign recipients only: name of the state or province in which the awardee or recipient's legal business address is located.	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	recipient_foreign_province_name	N/A	N/A	N/A	N/A	TransactionFABS, Location	legal_entity_foreign_provi, foreign_province	N/A	N/A	N/A

LegalEntityStateCode	United States Postal Service (USPS) two-letter abbreviation for the state or territory in which the awardee or recipient's legal business address is	Vendor Address State	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_state_code	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_state_code	###_treasury_account_account_breakdown_by_award_1.csv,	recipient_state	BrokerSubaward, TransactionFABS, TransactionFPDS, Location,	legal_entity_state_code, legal_entity_state_code,	Assistance, Contracts	recipient_state_code, state	N/A
LegalEntityStateDescription	The name, abbreviation or other address label for the state, territory, non-domestic state or province in which the award recipient's legal	Vendor Address State	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_state_name	N/A	N/A	N/A	N/A	TransactionFPDS, Location	legal_entity_state_descrip, state_description	N/A	N/A	N/A
LegalEntityStateName	State where the awardee or recipient is located.	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_state_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_state_name	###_federal_account_account_breakdown_by_award_1.csv,	recipient_state	BrokerSubaward, TransactionFABS, Location	legal_entity_state_name, legal_entity_state_name,	N/A	N/A	N/A
LegalEntityZIP+4	USPS zoning code associated with the awardee or recipient's legal business address. For domestic recipients only.	Vendor Zip Code	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	recipient_zip_4_code	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_zip_code	###_federal_account_account_breakdown_by_award_1.csv,	recipient_zip_code	BrokerSubaward, TransactionFPDS, Location	legal_entity_zip, legal_entity_zip4, zip4	Contracts	zipcode	N/A
LegalEntityZIP5	USPS five digit zoning code associated with the awardee or recipient's legal business address. This field must be blank for non-US	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	recipient_zip_code	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS, Location	legal_entity_zip5, legal_entity_zip5, zip5	Assistance, Contracts	recipient_zip, zipcode	N/A
LegalEntityZIPLast4	USPS four digit extension code associated with the awardee or recipient's legal business address. This must be blank for non-US	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	recipient_zip_last_4_code	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS, Location	legal_entity_zip_last4, legal_entity_zip_last4,	Assistance	recipient_zip	N/A
Limited Liability Corporation	https://www.sam.gov	Limited Liability Corporation	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	limited_liability_corporation	N/A	N/A	N/A	N/A	LegalEntity	limited_liability_corporation	Contracts	islimitedliabilitycorporation	N/A
Local Area Set Aside	When awarding emergency response contracts during the term of a major disaster or emergency declaration by the President of the United States	Local Area Set Aside	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	local_area_set_aside_code	N/A	N/A	N/A	N/A	TransactionFPDS	local_area_set_aside	Contracts	localareasetaside	N/A
Local Area Set Aside Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Local Area Set Aside Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	local_area_set_aside	N/A	N/A	N/A	N/A	TransactionFPDS	local_area_set_aside_desc	Contracts	localareasetaside	N/A
Local Government Owned	https://www.sam.gov	Local Government Owned	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	local_government_owned	N/A	N/A	N/A	N/A	LegalEntity	local_government_owned	Contracts	islocalgovernmentowned	N/A
MainAccountCode	The main account code identifies the account in statute.	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_treasury_ac	main_account_code	TreasuryAppropriationAccount, RefProgramActivity	main_account_code	N/A	N/A	N/A
Major program	The agency determined code for a major program within the agency. For an Indefinite Delivery Vehicle, this may be the name of a GWAC (e.g.,	Major program	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	major_program	N/A	N/A	N/A	N/A	TransactionFPDS	major_program	Contracts	MajorProgramCode	N/A
Manufacturer of Goods	https://www.sam.gov	Manufacturer of Goods	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	manufacturer_of_goods	N/A	N/A	N/A	N/A	LegalEntity	manufacturer_of_goods	Contracts	ismanufacturerofgoods	N/A
Materials, Supplies, Articles & Equip	Indicates whether the transaction is subject to the Materials, Supplies, Articles, & Equip. The clause is 52.222-20 "Contracts for Materials,	Materials, Supplies, Articles & Equip	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	materials_supplies_articles_equipment_code	N/A	N/A	N/A	N/A	TransactionFPDS	materials_supplies_article	Contracts	walshhealyact	N/A
Materials, Supplies, Articles & Equip Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Contracts for Materials, Supplies,	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	materials_supplies_articles_equipment	N/A	N/A	N/A	N/A	TransactionFPDS	materials_supplies_descrip	Contracts	walshhealyact	N/A
Minority Institution	List characteristic of the contractor such as whether the selected contractor is a Minority Institution or not. It can be derived from the SAM	Minority Institution	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	minority_institution	N/A	N/A	N/A	N/A	LegalEntity	minority_institution	Contracts	minorityinstitutionflag	N/A
Minority Owned Business	https://www.sam.gov	Minority Owned Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	minority_owned_business	N/A	N/A	N/A	N/A	LegalEntity	minority_owned_business	Contracts	minorityownedbusinessflag	N/A

Multi Year Contract	A multi-year contract means a contract for the purchase of supplies or services for more than 1, but not more than 5, program years. Such	Multi Year Contract	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	multi_year_contract_code	N/A	N/A	N/A	N/A	TransactionFPDS	multi_year_contract	Contracts	MultiYearContract	N/A
Multi Year Contract Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Multi Year Contract Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	multi_year_contract	N/A	N/A	N/A	N/A	TransactionFPDS	multi_year_contract_desc	Contracts	MultiYearContract	N/A
Multiple or Single Award IDV	Indicates whether the contract is one of many that resulted from a single solicitation, all of the contracts are for the same or similar items, and	Multiple or Single Award IDV	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	multiple_or_single_award_idv_code	N/A	N/A	N/A	N/A	TransactionFPDS	multiple_or_single_award_i	Contracts	Multipleorsingleawardidc	N/A
Multiple or Single Award IDV Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Multiple or Single Award IDV Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	multiple_or_single_award_idv	N/A	N/A	N/A	N/A	TransactionFPDS	multiple_or_single_aw_desc	Contracts	Multipleorsingleawardidc	N/A
Municipality Local Government	https://www.sam.gov	Municipality Local Government	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	municipality_local_government	N/A	N/A	N/A	N/A	LegalEntity	municipality_local_govern ment	Contracts	ismunicipalitylocalgovernment	N/A
NAICS	The identifier that represents the North American Industrial Classification System (NAICS) Code assigned to the solicitation and	NAICS	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	naics_code	all_contracts_subawards_1.csv	prime_award_naics_code	###_federal_account_account_breakdown_by_award_1.csv,	naics_code	BrokerSubaward, TransactionFPDS	naics	Contracts	PrincipalNAICSCode	prime_award_principal_naics_code
NAICS_Description	The title associated with the NAICS Code.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	naics_description	all_contracts_subawards_1.csv	prime_award_naics_description	###_federal_account_account_breakdown_by_award_1.csv,	naics_description	BrokerSubaward, TransactionFPDS	naics_description	N/A	N/A	prime_award_principal_naics_desc
National Interest Action	A code that represents the national interest for which the contract is created.	National Interest Action	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	national_interest_action_code	all_contracts_subawards_1.csv	national_interest_action_code	###_treasury_account_account_breakdown_by_award_1.csv,	national_interest_action_code	TransactionFPDS	national_interest_action	Contracts	nationalinterestactioncode	N/A
National Interest Action Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the National Interest Action Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	national_interest_action	all_contracts_subawards_1.csv	national_interest_action	###_treasury_account_account_breakdown_by_award_1.csv,	national_interest_action	TransactionFPDS	national_interest_desc	Contracts	nationalinterestactioncode	N/A
Native American Owned Business	List characteristic of the contractor such as whether the selected contractor is a Native American Owned Business or not. It can be	Native American Owned Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	native_american_owned_business	N/A	N/A	N/A	N/A	LegalEntity	native_american_owned_business	Contracts	naobflag	N/A
Native Hawaiian Organization Owned Firm	https://www.sam.gov	Native Hawaiian Organization Owned Firm	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	native_hawaiian_organization_owned_firm	N/A	N/A	N/A	N/A	LegalEntity	native_hawaiian_owned_business	Contracts	isnativehawaiianownedorganizationorfirm	N/A
Native Hawaiian Servicing Institution	https://www.sam.gov	Native Hawaiian Servicing Institution	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	native_hawaiian_servicing_institution	N/A	N/A	N/A	N/A	LegalEntity	native_hawaiian_servicing_institution	N/A	N/A	N/A
NonFederalFundingAmount	The amount of the award funded by non-Federal source(s), in dollars. Program Income (as defined in 2 CFR § 200.80) is not included until	N/A	Award Spending	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	non_federal_funding_amount	N/A	N/A	N/A	N/A	TransactionFABS	non_federal_funding_amount	Assistance	non_fed_funding_amount	N/A
Nonprofit Organization	List characteristic of the contractor such as whether the selected contractor is a Nonprofit Organization or not. It can be derived from the	Nonprofit Organization	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	nonprofit_organization	N/A	N/A	N/A	N/A	LegalEntity	nonprofit_organization	Contracts	nonprofitorganizationflag	N/A
Number of Actions	The number input by the agency that identifies number of actions that are reported in one modification.	Number of Actions	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	number_of_actions	N/A	N/A	N/A	N/A	TransactionFPDS	number_of_actions	Contracts	numberofactions	N/A
Number of Offers Received	The number of actual offers/bids received in response to the solicitation.	Number of Offers Received	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	number_of_offers_received	N/A	N/A	N/A	N/A	TransactionFPDS	number_of_offers_received	Contracts	numberofoffersreceived	N/A
ObjectClass	The definition for this element appears in Section 83 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	object_class_code	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	object_class	N/A	N/A	N/A

ObjectClassName	The definition for this element appears in Section 83 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	object_class_name	ObjectClass	object_class_name	N/A	N/A	N/A
ObjectClassesFundingThisAward	A single field with associated object classes in order of funding dollars.	N/A	Treasury Account	all_assistance_prime_awards_1.csv, all_contracts_prime_awards_1.csv,	object_classes_funding_this_award	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_object_classes_funding_this_award	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ObligatedAmountFundedByCOVID19Supplementals	Represents the obligated amount funded by COVID-19 supplementals.	N/A	N/A	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	obligated_amount_funded_by_COVID-19_supplementals, obligated_amount_f	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_obligated_amount_funded_by_COVID-19_supplementals	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ObligationsDeliveredOrdersUnpaidTotal_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	obligations_delivered_orders_unpaid_total_cpe	N/A	N/A	N/A
ObligationsDeliveredOrdersUnpaidTotal_FYB	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	obligations_delivered_orders_unpaid_total_fyb	N/A	N/A	N/A
ObligationsIncurredByProgramObjectClass_CPE	The definition for this element appears in Appendix F of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_program_activity_ob	obligations_incurred	FinancialAccountsByProgramActivityObjectClass	obligations_incurred_by_program_object_class_cpe	N/A	N/A	N/A
ObligationsIncurredTotalBy Award_CPE	The definition for this element appears in Appendix F of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards	obligations_incurred_total_by_award_cpe	N/A	N/A	N/A
ObligationsIncurredTotalBy TAS_CPE	The definition for this element appears in Appendix F of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Status	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	obligations_incurred	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	obligations_incurred_total_by_tas_cpe	N/A	N/A	N/A
ObligationsUndeliveredOrdersUnpaidTotal_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	obligations_undelivered_orders_unpaid_total_cpe	N/A	N/A	N/A
ObligationsUndeliveredOrdersUnpaidTotal_FYB	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	obligations_undelivered_orders_unpaid_total_fyb	N/A	N/A	N/A
OrderingPeriodEndDate	For procurement, the date on which, for the award referred to by the action being reported, no additional orders referring to it may be placed. This	Indefinite Delivery Vehicle Last Date to Order	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	ordering_period_end_date	N/A	N/A	###_treasury_account_account_breakdown_by_award_1.csv,	ordering_period_end_date	TransactionFPDS	ordering_period_end_date	Contracts	lastdatetoorder	N/A
OrganizationalType	The structure of the entity as defined by the IRS.	N/A	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	organizational_type	N/A	N/A	N/A	N/A	TransactionFPDS	organizational_type	Contracts	organizationaltype	N/A
OriginalLoanSubsidyCost	The estimated long-term cost to the Government of a direct loan or loan guarantee, or modification thereof, calculated on a net present value	N/A	Award Spending	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	original_loan_subsidy_cost	N/A	N/A	N/A	N/A	TransactionFABS	original_loan_subsidy_cost	Assistance	orig_sub_guran	N/A
Other Minority Owned Business	https://www.sam.gov	Other Minority Owned Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	other_minority_owned_business	N/A	N/A	N/A	N/A	LegalEntity	other_minority_owned_business	Contracts	isotherminorityowned	N/A
Other Not For Profit Organization	https://www.sam.gov	Other Not For Profit Organization	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	other_not_for_profit_organization	N/A	N/A	N/A	N/A	LegalEntity	other_not_for_profit_organization	Contracts	isothernotforprofitorganization	N/A
Other Statutory Authority	Indicates whether the transaction is subject to other statutory authority. If "Interagency Contracting Authority" is "Other Statutory Authority" then an	Other Statutory Authority	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	other_statutory_authority	N/A	N/A	N/A	N/A	TransactionFPDS	other_statutory_authority	Contracts	otherstatutoryauthority	N/A
Other than Full and Open Competition	The designator for solicitation procedures other than full and open competition pursuant to FAR 6.3.	Other than Full and Open Competition	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	other_than_full_and_open_competition_code	N/A	N/A	N/A	N/A	TransactionFPDS	other_than_full_and_open_c	Contracts	reasonnotcompeted	N/A

Other than Full and Open Competition Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Other than Full and Open	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	other_than_full_and_open_competition	N/A	N/A	N/A	N/A	TransactionFPDS	other_than_full_and_o_desc	Contracts	reasonnotcompeted	N/A
OtherBudgetaryResources Amount_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Resources	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	total_other_budgetary_resources_amount	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	other_budgetary_resources_amount_cpe	N/A	N/A	N/A
OutlayedAmountFundedByCOVID19Supplementals	Represents the outlayed amount funded by COVID-19 supplementals.	N/A	N/A	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	outlayed_amount_funded_by_COVID-19_supplementals, outlayed_amount_fu	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_outlayed_amount_funded_by_COVID-19_supplementals	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OwningAgencyName	Represents the name associated with the Owning Agency Code that is responsible for the account.	N/A	Submission Attribute	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	owning_agency_name	N/A	N/A	N/A	N/A	N/A
PIID	The unique identifier of the specific award being reported.	Procurement Instrument Identifier	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	award_id_piid	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_piid	###_federal_account_account_breakdown_by_award_1.csv,	award_id_piid	BrokerSubaward, Award, FinancialAccountsByAwards,	award_id, piid, piid, piid	Contracts	piid	prime_award_piid
ParentAwardID	The identifier of the procurement award under which the specific award is issued, such as a Federal Supply Schedule. This data element	Referenced PIID	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	parent_award_id_piid	all_contracts_subawards_1.csv	prime_award_parent_piid	###_federal_account_account_breakdown_by_award_1.csv,	parent_award_id_piid	BrokerSubaward, FinancialAccountsByAwards, TransactionFPDS,	parent_award_id, parent_award_id, parent_award_id, parent_award_piid	Contracts	idvpiid	prime_award_idvpiid
Partnership or Limited Liability Partnership	https://www.sam.gov	Partnership or Limited Liability Partnership	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	partnership_or_limited_liability_partnership	N/A	N/A	N/A	N/A	LegalEntity	partnership_or_limited_liability_partnership	Contracts	ispartnershiporlimitedliabilitypartnership	N/A
Performance-Based Service Acquisition	Indicates whether the contract action is a PBA of services as defined by FAR 37.601. A PBSA: a. Describes the requirements in terms of results	Performance-Based Service Acquisition	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	performance_based_service_acquisition_code	N/A	N/A	N/A	N/A	TransactionFPDS	performance_based_service	Contracts	performancebasedservicecontract	N/A
Performance-Based Service Acquisition Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Performance-Based Service	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	performance_based_service_acquisition	N/A	N/A	N/A	N/A	TransactionFPDS	performance_based_se_desc	Contracts	performancebasedservicecontract	N/A
PeriodOfPerformanceCurrentEndDate	The current date on which, for the award referred to by the action being reported, awardee effort completes or the award is otherwise ended.	Current Completion Date	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	period_of_performance_current_end_date	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_period_of_performance_current_end_date	###_treasury_account_account_breakdown_by_award_1.csv,	period_of_performance_current_end_date	Award, TransactionFABS, TransactionFPDS, TransactionNormaliz	period_of_performance_current_end_date, period_of_performan	Assistance, Contracts	ending_date, currentcompletiondate	N/A
PeriodOfPerformancePotentialEndDate	For procurement, the date on which, for the award referred to by the action being reported if all potential pre-determined or pre-negotiated options	Ultimate Completion Date	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	period_of_performance_potential_end_date	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	period_of_performance_potential_end_date	N/A	N/A	TransactionFPDS	period_of_perf_potential_e	Contracts	ultimatecompletiondate	N/A
PeriodOfPerformanceStartDate	The date on which, for the award referred to by the action being reported, awardee effort begins or the award is otherwise effective.	Effective Date	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	period_of_performance_start_date	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_period_of_performance_start_date	###_treasury_account_account_breakdown_by_award_1.csv,	period_of_performance_start_date	Award, TransactionFABS, TransactionFPDS, TransactionNormaliz	period_of_performance_start_date, period_of_performance_star,	Assistance, Contracts	starting_date, effectivedate	N/A
Place of Manufacture	Represents whether the end products procured by the contract are manufactured inside or outside the U.S. in accordance with the Buy	Place of Manufacture	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	place_of_manufacture_code	N/A	N/A	N/A	N/A	TransactionFPDS	place_of_manufacture	Contracts	placeofmanufacture	N/A
Place of Manufacture Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Place of Manufacture Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	place_of_manufacture	N/A	N/A	N/A	N/A	TransactionFPDS	place_of_manufacture_desc	Contracts	placeofmanufacture	N/A
Planning Commission	https://www.sam.gov	Planning Commission	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	planning_commission	N/A	N/A	N/A	N/A	LegalEntity	planning_commission	Contracts	isplanningcommission	N/A
Port Authority	https://www.sam.gov	Port Authority	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	port_authority	N/A	N/A	N/A	N/A	LegalEntity	port_authority	Contracts	isportauthority	N/A
PotentialTotalValueOfAward	For procurement, the total amount that could be obligated on a contract, if the base and all options are exercised.	Total Base and All Options Value	Award Spending	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	potential_total_value_of_award	N/A	N/A	N/A	N/A	Award, TransactionFPDS	potential_total_value_of_award, potential_total_value_awar	N/A	N/A	N/A

Price Evaluation Adjustment Preference Percent Difference	The percent difference between the award price and the lowest priced offer from a responsive, responsible non-HUBZone or non-SDB.	Price Evaluation Adjustment/Preference Percent Difference	Award Attribute	all_contracts_prime_transactions_1.csv	price_evaluation_adjustment_preference_percent_difference	N/A	N/A	N/A	N/A	TransactionFPDS	price_evaluation_adjustmen	Contracts	priceevaluationpercentdifference	N/A
PrimaryPlaceOfPerformanceCityName	The name of the city where the predominant performance of the award will be accomplished.	Principal Place of Performance Name	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	primary_place_of_performance_city_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_primary_place_of_performance_city_name	N/A	N/A	BrokerSubaward, TransactionFPDS, Location, RefCityCountyCode	place_of_perform_city_name, place_of_perform_city_name,	Assistance, Contracts	principal_place_cc, PlaceofPerformanceCity	prime_award_principal_place_city
PrimaryPlaceOfPerformanceCode	A numeric code indicating where the predominant performance of the award will be accomplished.	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	primary_place_of_performance_code	N/A	N/A	N/A	N/A	TransactionFABS	place_of_performance_code	N/A	N/A	N/A
PrimaryPlaceOfPerformanceCongressionalDistrict	U.S. Congressional district where the predominant performance of the award will be accomplished.	Congressional District - Place of Performance	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	primary_place_of_performance_congressional_district	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_primary_place_of_performance_congressional_district	###_federal_account_account_breakdown_by_award_1.csv,	primary_place_of_performance_congressional_district	BrokerSubaward, TransactionFABS, TransactionFPDS	place_of_perform_congressio, place_of_performance_congr,	Assistance, Contracts	principal_place_cd, pop_cd	prime_award_principal_place_district
PrimaryPlaceOfPerformanceCountryCode	Country code where the predominant performance of the award will be accomplished.	Principal Place of Performance	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	primary_place_of_performance_country_code	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_primary_place_of_performance_country_code	N/A	N/A	BrokerSubaward, TransactionFABS, TransactionFPDS	place_of_perform_country_co, place_of_perform_country_c,	Assistance, Contracts	principal_place_country_code, placeofperformance countrycode	prime_award_principal_place_country
PrimaryPlaceOfPerformanceCountryName	Name of the country represented by the country code where the predominant performance of the award will be accomplished.	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	primary_place_of_performance_country_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_primary_place_of_performance_country_name	###_federal_account_account_breakdown_by_award_1.csv,	primary_place_of_performance_country	BrokerSubaward, TransactionFABS, TransactionFPDS	place_of_perform_country_na, place_of_perform_country_n,	N/A	N/A	N/A
PrimaryPlaceOfPerformanceCountyCode	Three-position numeric code for county from InterNational Committee for Information Technology Standards (ANSI INCITS) county codes.	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	primary_place_of_performance_county_code	N/A	N/A	N/A	N/A	TransactionFABS, TransactionFPDS, Location, RefCityCountyCode	place_of_perform_county_co, place_of_perform_county_co,	N/A	N/A	N/A
PrimaryPlaceOfPerformanceCountyName	The name of the county where the predominant performance of the award will be accomplished.	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	primary_place_of_performance_county_name	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	primary_place_of_performance_county	TransactionFABS, TransactionFPDS, Location, RefCityCountyCode	place_of_perform_county_na, place_of_perform_county_na,	Assistance	principal_place_code	N/A
PrimaryPlaceOfPerformanceForeignLocationDescription	For foreign places of performance: identify where the predominant performance of the award will be accomplished, describing it as	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	primary_place_of_performance_foreign_location	N/A	N/A	N/A	N/A	TransactionFABS, Location	place_of_performance_forei, foreign_location_description	N/A	N/A	N/A
PrimaryPlaceOfPerformanceScope	A description of the geographic area to which the predominant performance of the award is applicable.	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	primary_place_of_performance_scope	all_assistance_subawards_1.csv	prime_award_primary_place_of_performance_scope	N/A	N/A	Award, TransactionNormalized	place_of_performance	N/A	N/A	N/A
PrimaryPlaceOfPerformanceStateCode	United States Postal Service (USPS) two-letter abbreviation for the state or territory indicating where the predominant performance of the	Principal Place of Performance	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	primary_place_of_performance_state_code	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_primary_place_of_performance_state_code	N/A	N/A	BrokerSubaward, TransactionFABS, Location, RefCityCountyCode	place_of_perform_state_code, place_of_perfor_state_code,	Assistance, Contracts	principal_place_state_code, pop_state_code	prime_award_principal_place_state
PrimaryPlaceOfPerformanceStateName	The name of the state or territory where the predominant performance of the award will be accomplished.	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	primary_place_of_performance_state_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_primary_place_of_performance_state_name	###_federal_account_account_breakdown_by_award_1.csv,	primary_place_of_performance_state	BrokerSubaward, TransactionFABS, TransactionFPDS, Location	place_of_perform_state_name, place_of_perform_state_nam,	Assistance, Contracts	principal_place_state, pop_state_code	N/A
PrimaryPlaceOfPerformanceZIP 4	United States ZIP code (five digits) concatenated with the additional 4 digits, identifying where the predominant performance of the	Zip Code - Place of Performance	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	primary_place_of_performance_zip_4	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_primary_place_of_performance_address_zip_code	###_federal_account_account_breakdown_by_award_1.csv,	primary_place_of_performance_zip_code	BrokerSubaward, TransactionFABS, TransactionFPDS, Location	place_of_performance_zip, place_of_performance_zip4a,	Assistance, Contracts	principal_place_zip, placeofperformance zipcode	prime_award_principal_place_zip
PrimeAwardAmount	The total amount awarded to the prime award recipient.	N/A	Award Spending	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_amount	N/A	N/A	BrokerSubaward	award_amount	N/A	N/A	prime_award_amount
PrimeAwardFiscalYear	The fiscal year in which the ActionDate of the prime award occurs. Note that the Federal fiscal year begins on October 1 and ends	N/A	Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_base_action_date_fiscal_year	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PrimeAwardID	The unique identifying Award ID of the prime award (PIID or FAIN).	N/A	Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_fain	N/A	N/A	BrokerSubaward	award_id	N/A	N/A	prime_award_federal_award_id, prime_award_piid
PrimeAwardProjectTitle	Information about the purpose of the prime contract award entered by the prime recipient in the form of a project title.	N/A	Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_project_title	N/A	N/A	BrokerSubaward	program_title	N/A	N/A	N/A

PrimeAwardUniqueKey	Derived unique record key used by the Broker to identify the prime award. Note that this element is different from the	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	contract_award_unique_key, assistance_award_unique_key	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_unique_key	###_treasury_account_account_breakdown_by_award_1.csv,	award_unique_key	BrokerSubaward, Award, TransactionFABS, TransactionFPDS	unique_award_key, generated_unique_award_id, generated_unique_a	N/A	N/A	N/A
PrimeAwardeeBusinessTypes	Comma separated list representing prime-contractor business types pulled from Federal Procurement Data System - Next Generation	N/A	Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_business_types	N/A	N/A	BrokerSubaward	business_types	N/A	N/A	N/A
Private University or College	https://www.sam.gov	Private University or College	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	private_university_or_college	N/A	N/A	N/A	N/A	LegalEntity	private_university_or_college	Contracts	isprivateuniversityorcollege	N/A
Product or Service Code	The code that best identifies the product or service procured. Codes are defined in the Product and Service Codes Manual.	Product or Service Code	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	product_or_service_code	N/A	N/A	###_treasury_account_account_breakdown_by_award_1.csv,	product_or_service_code	TransactionFPDS	product_or_service_code	Contracts	ProductOrServiceCode	N/A
Product or Service Code Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Product or Service Code Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	product_or_service_code_description	N/A	N/A	###_treasury_account_account_breakdown_by_award_1.csv,	product_or_service_code_description	TransactionFPDS	product_or_service_co_desc	Contracts	ProductOrServiceCode	N/A
Program Acronym	The short name or title used for a GWAC or other contracting program. Examples include COMMITS, ITOPS, SEWP.	Program Acronym	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	program_acronym	N/A	N/A	N/A	N/A	TransactionFPDS	program_acronym	Contracts	ProgramAcronym	N/A
ProgramActivitiesFundingThisAward	A single field with associated program activities in order of funding dollars.	N/A	Treasury Account	all_assistance_prime_awards_1.csv, all_contracts_prime_awards_1.csv,	program_activities_funding_this_award	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_program_activities_funding_this_award	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ProgramActivityCode	The definition for this element appears in Section 200 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	program_activity_code	RefProgramActivity	program_activity_code	N/A	N/A	N/A
ProgramActivityName	The definition for this element appears in Section 200 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	program_activity_name	RefProgramActivity	program_activity_name	N/A	N/A	N/A
Purchase Card as Payment Method	Indicates whether the method of payment is the Purchase Card. Agencies may issue formal contract documents and make payment using	Purchase Card as Payment Method	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	purchase_card_as_payment_method_code	N/A	N/A	N/A	N/A	TransactionFPDS	purchase_card_as_payment_m	Contracts	PurchaseCardAsPaymentMethod	N/A
Purchase Card as Payment Method Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Purchase Card as Payment Method	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	purchase_card_as_payment_method	N/A	N/A	N/A	N/A	TransactionFPDS	purchase_card_as_paym_desc	Contracts	PurchaseCardAsPaymentMethod	N/A
RecordType	Code indicating whether an action is an aggregate record, a non-aggregate record, or a non-aggregate record to an individual recipient (PII-	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	record_type_code	N/A	N/A	N/A	N/A	TransactionFABS	record_type	Assistance	record_type	N/A
RecordTypeDescriptionTag	Description tag (by way of the DATA Act Broker) that explains the meaning of the code provided in the RecordType Field.	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	record_type_description	N/A	N/A	N/A	N/A	TransactionFABS	record_type_description	N/A	N/A	N/A
Recovered Materials/Sustainability	Designates whether Recovered Material Certification and/or Estimate of Percentage of Recovered Material Content for EPA-Designated	Recovered Materials/Sustainability	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	recovered_materials_sustainability_code	N/A	N/A	N/A	N/A	TransactionFPDS	recovered_materials_sustai	Contracts	RecoveredMaterialClauses	N/A
Recovered Materials/Sustainability Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Recovered Materials/Sustainability	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	recovered_materials_sustainability	N/A	N/A	N/A	N/A	TransactionFPDS	recovered_materials_s_desc	Contracts	RecoveredMaterialClauses	N/A
Referenced IDV Agency Identifier	Identifier used to link agency in FPDS-NG to referenced IDV information.	Referenced IDV Agency Identifier	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	parent_award_agency_id	N/A	N/A	N/A	N/A	TransactionFPDS	referenced_idv_agency_iden	Contracts	idvagencyid	N/A
Referenced IDV Agency Name	Name of the agency associated with the code in the Referenced IDV Agency Identifier.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	parent_award_agency_name	N/A	N/A	N/A	N/A	TransactionFPDS	referenced_idv_agency_desc	N/A	N/A	N/A

Referenced IDV Modification Number	When reporting orders under Indefinite Delivery Vehicles (IDV) such as a GWAC, IDC, FSS, BOA, or BPA, report the Modification Number	Referenced IDV Modification Number	Award Attribute	all_contracts_prime_transactions_1.csv	parent_award_modification_number	N/A	N/A	N/A	N/A	TransactionFPDS	referenced_idv_modificatio	Contracts	idvmodificationnumber	N/A
Referenced IDV Multiple or Single	Indicates whether the contract of the referenced IDV is one of many that resulted from a single solicitation, all of the contracts are for the same or	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	parent_award_single_or_multiple_code	N/A	N/A	N/A	N/A	TransactionFPDS	referenced_mult_or_single	Contracts	multipleorsingleawardidc	N/A
Referenced IDV Multiple or Single Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Referenced IDV Multiple or Single	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	parent_award_single_or_multiple	N/A	N/A	N/A	N/A	TransactionFPDS	referenced_mult_or_si_desc	Contracts	multipleorsingleawardidc	N/A
Referenced IDV Type	The type of Indefinite Delivery Vehicle (IDV) being loaded by the IDV referenced in this transaction. Referenced IDV Types include	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	parent_award_type_code	N/A	N/A	N/A	N/A	TransactionFPDS	referenced_idv_type	N/A	N/A	N/A
Referenced IDV Type Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Referenced_IDV_Type Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	parent_award_type	N/A	N/A	N/A	N/A	TransactionFPDS	referenced_idv_type_desc	N/A	N/A	N/A
ReportingAgencyName	Represents the name associated with the Reporting Agency Code that is responsible for the account. This information is based on the Agency	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	agency_name, reporting_agency_name	TreasuryAppropriationAccount	reporting_agency_name	N/A	N/A	N/A
ReportingPeriodEndDate	The end date of the reporting period covered by data contained in the submission file or package. This date represents the declared default report	N/A	Submission Attribute	N/A	N/A	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	submission_period	AppropriationAccountBalances, FinancialAccountsByAwards,	reporting_period_end	N/A	N/A	N/A
Research	The designator for type of research determined for the contract action.	Research	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	research_code	N/A	N/A	N/A	N/A	TransactionFPDS	research	Contracts	research	N/A
Research Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Research Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	research	N/A	N/A	N/A	N/A	TransactionFPDS	research_description	Contracts	research	N/A
SAI_Number	A number assigned by state (as opposed to federal) review agencies to the award during the grant application process.	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	sai_number	N/A	N/A	N/A	N/A	TransactionFABS	sai_number	Assistance	sai_number	N/A
SAM Exception	The reason a vendor/contractor not registered in the mandated SAM system may be used in a purchase.	SAM Exception	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	sam_exception	N/A	N/A	N/A	N/A	LegalEntity	sam_exception	Contracts	ccrexception	N/A
SAM Exception Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the SAM Exception Field.	N/A	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	sam_exception_description	N/A	N/A	N/A	N/A	TransactionFPDS	sam_exception_description	N/A	N/A	N/A
SBA Certified 8 a Joint Venture	https://www.sam.gov	SBA Certified 8(a) Joint Venture	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	sba_certified_8a_joint_venture	N/A	N/A	N/A	N/A	LegalEntity	sba_certified_8a_joint_venture	N/A	N/A	N/A
School District Local Government	https://www.sam.gov	School District Local Government	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	school_district_local_government	N/A	N/A	N/A	N/A	LegalEntity	school_district_local_government	Contracts	isschooldistrictlocalgovernment	N/A
School of Forestry	https://www.sam.gov	School of Forestry	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	school_of_forestry	N/A	N/A	N/A	N/A	LegalEntity	school_of_forestry	Contracts	isschoolofforestry	N/A
Sea Transportation	A code designating whether the contractor anticipates some of the supplies may be transported by sea.	Sea Transportation	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	sea_transportation_code	N/A	N/A	N/A	N/A	TransactionFPDS	sea_transportation	Contracts	seatransportation	N/A
Sea Transportation Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Sea Transportation Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	sea_transportation	N/A	N/A	N/A	N/A	TransactionFPDS	sea_transportation_desc	Contracts	seatransportation	N/A

Self-Certified Small Disadvantaged Business	https://www.sam.gov	Self-Certified Small Disadvantaged Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	self_certified_small_disadvantaged_business	N/A	N/A	N/A	N/A	LegalEntity	self_certified_small_disadvantaged_business	Contracts	sdbflag	N/A
Service Disabled Veteran Owned Business	List characteristic of the contractor such as whether the selected contractor is a Service-Related Disabled Veteran Owned Business or	Service Disabled Veteran Owned Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	service_disabled_veteran_owned_business	N/A	N/A	N/A	N/A	LegalEntity	service_disabled_veteran_owned_business	Contracts	srdvobflag	N/A
Simplified Procedures for Certain Commercial Items	This field designates whether the acquisition utilized FAR 13.5 Test Program for Certain Commercial Items. The FAR 13.5 Test Program	Simplified Procedures for Certain Commercial Items	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	simplified_procedures_for_certain_commercial_items_code	N/A	N/A	N/A	N/A	TransactionFPDS	commercial_item_test_progr	Contracts	commercialitemtestprogram	N/A
Small Agricultural Cooperative	https://www.sam.gov	Small Agricultural Cooperative	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	small_agricultural_cooperative	N/A	N/A	N/A	N/A	LegalEntity	small_agricultural_cooperative	Contracts	issmallagriculturalcooperative	N/A
Small Business Competitiveness Demonstration Program	Indicates whether the contract was awarded to a U.S. business concern as a result of a solicitation issued on or after Jan 1, 1989 for the four	Small Business Competitiveness Demonstration Program	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	small_business_competitiveness_demonstration_program	N/A	N/A	N/A	N/A	TransactionFPDS	small_business_competitive	Contracts	smallbusinesscompetitivenessdemonstrationprogram	N/A
Small Disadvantaged Business	List characteristic of the contractor such as whether the selected contractor is a Small Disadvantaged Business Organization or not. It can	Small Disadvantaged Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	small_disadvantaged_business	N/A	N/A	N/A	N/A	LegalEntity	small_disadvantaged_business	Contracts	issbacertifiedsmalldisadvantagedbusiness	N/A
Sole Proprietorship	https://www.sam.gov	Sole Proprietorship	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	sole_proprietorship	N/A	N/A	N/A	N/A	LegalEntity	sole_proprietorship	Contracts	issoleproprietorship	N/A
Solicitation Identifier	Identifier used to link transactions in FPDS-NG to solicitation information.	Solicitation Identifier	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	solicitation_identifier	N/A	N/A	N/A	N/A	TransactionFPDS	solicitation_identifier	Contracts	solicitationid	N/A
Solicitation Procedures	The designator for competitive solicitation procedures available.	Solicitation Procedures	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	solicitation_procedures_code	N/A	N/A	N/A	N/A	TransactionFPDS	solicitation_procedures	Contracts	solicitationprocedures	N/A
Solicitation Procedures Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Solicitation Procedures Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	solicitation_procedures	N/A	N/A	N/A	N/A	TransactionFPDS	solicitation_procedur_desc	Contracts	solicitationprocedures	N/A
SolicitationDate	The date on which the solicitation was issued.	Solicitation Date	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	solicitation_date	N/A	N/A	N/A	N/A	TransactionFPDS	solicitation_date	N/A	N/A	N/A
SpendingAuthorityFromOffsettingCollectionsAmountTotal_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Resources	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	spending_authority_from_offsetting_collections_amount	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	spending_authority_from_offsetting_collections_amount_cpe	N/A	N/A	N/A
State Controlled Institution of Higher Learning	https://www.sam.gov	State Controlled Institution of Higher Learning	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	state_controlled_institution_of_higher_learning	N/A	N/A	N/A	N/A	LegalEntity	state_controlled_institution_of_higher_learning	Contracts	isstatecontrolledinstitutionofhigherlearning	N/A
StatusOfBudgetaryResourcesTotal_CPE	This element addresses the status of budgetary resources and includes the total of obligated and unobligated balances, at the reported date. The	N/A	Account Status	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	status_of_budgetary_resources_total	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	status_of_budgetary_resources_total_cpe	N/A	N/A	N/A
SubAccountCode	This is a component of the TAS. Identifies a Treasury-defined subdivision of the main account. This field cannot be blank. Subaccount	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_treasury_ac	sub_account_code	TreasuryAppropriationAccount	sub_account_code	N/A	N/A	N/A
SubAwardActionDate	The date the action being reported was issued / signed by the Government or a binding agreement was reached.	N/A	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_action_date	N/A	N/A	BrokerSubaward	sub_action_date	N/A	N/A	subaward_date
SubAwardAmount	The total amount being awarded to the sub award recipient.	N/A	Sub-Award Spending	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_amount	N/A	N/A	BrokerSubaward	subaward_amount	N/A	N/A	subaward_amount

SubAwardDescription	A brief description of the purpose of the award.	Description of Requirement	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_description	N/A	N/A	BrokerSubaward	subaward_description	N/A	N/A	subaward_project_description
SubAwardFiscalYear	The fiscal year of the sub award ActionDate. Note that the Federal fiscal year begins on October 1 and ends on September 30, thus October	N/A	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_action_date_fiscal_year	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SubAwardNumber	An identifying number assigned by the prime awardee organization to facilitate the tracking of its sub-awards. Note: the SubAwardNumber	N/A	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_number	N/A	N/A	BrokerSubaward	subaward_number	N/A	N/A	subaward_number
SubAwardPlaceOfPerformanceAddressLine1	Address Line 1.	N/A	Sub-Award Attribute	N/A		all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_primary_place_of_performance_address_line_1	N/A	N/A	BrokerSubaward	place_of_perform_street	N/A	N/A	N/A
SubAwardPlaceOfPerformanceCityName	The name of the city where the predominant performance of the sub-award will be accomplished.	Principal Place of Performance Name	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_primary_place_of_performance_city_name	N/A	N/A	BrokerSubaward	sub_place_of_perform_city_name	N/A	N/A	subaward_principal_place_city
SubAwardPlaceOfPerformanceCongressionalDistrict	U.S. Congressional district where the predominant performance of the sub-award will be accomplished.	Congressional District - Place of Performance	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_primary_place_of_performance_congressional_district	N/A	N/A	BrokerSubaward	sub_place_of_perform_congressio	N/A	N/A	subaward_principal_place_district
SubAwardPlaceOfPerformanceCountryCode	Country code where the predominant performance of the sub-award will be accomplished.	Principal Place of Performance	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_primary_place_of_performance_country_code	N/A	N/A	BrokerSubaward	sub_place_of_perform_country_co	N/A	N/A	subaward_principal_place_country
SubAwardPlaceOfPerformanceCountryName	Name of the country represented by the country code where the predominant performance of the sub-award will be accomplished.	N/A	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_primary_place_of_performance_country_name	N/A	N/A	BrokerSubaward	sub_place_of_perform_country_na	N/A	N/A	N/A
SubAwardPlaceOfPerformanceStateCode	United States Postal Service (USPS) two-letter abbreviation for the state or territory indicating where the predominant performance of the sub-	Principal Place of Performance	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_primary_place_of_performance_state_code	N/A	N/A	BrokerSubaward	sub_place_of_perform_state_code	N/A	N/A	subaward_principal_place_state
SubAwardPlaceOfPerformanceStateName	The name of the state or territory where the predominant performance of the sub-award will be accomplished.	N/A	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_primary_place_of_performance_state_name	N/A	N/A	BrokerSubaward	sub_place_of_perform_state_name	N/A	N/A	N/A
SubAwardPlaceOfPerformanceZIP 4	United States ZIP code (five digits) concatenated with the additional 4 digits, identifying where the predominant performance of the sub-	Zip Code - Place of Performance	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_primary_place_of_performance_address_zip_code	N/A	N/A	BrokerSubaward	sub_place_of_performance_zip	N/A	N/A	subaward_principal_place_zip
SubAwardReportID	Unique 32-character identifier for a report in FFATA Subaward Reporting System (FSRS) that can be used to easily navigate to the report within	N/A	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_fsrs_report_id	N/A	N/A	BrokerSubaward	internal_id	N/A	N/A	N/A
SubAwardReportLastModifiedDate	The last modified date captures the change date.	N/A	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_fsrs_report_last_modified_date	N/A	N/A	BrokerSubaward	date_submitted	N/A	N/A	N/A
SubAwardReportMonth	The month in which a given report in the FFATA Subaward Reporting System (FSRS) was published by the prime awardee.	N/A	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_fsrs_report_month	N/A	N/A	BrokerSubaward	subaward_report_month	N/A	N/A	subaward_report_month
SubAwardReportYear	The year in which a given report in the FFATA Subaward Reporting System (FSRS) was published by the prime awardee.	N/A	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_fsrs_report_year	N/A	N/A	BrokerSubaward	subaward_report_year	N/A	N/A	subaward_report_year
SubAwardType	The type of sub-award (either sub-contract or sub-grant).	N/A	Sub-Award Attribute	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subaward_type	N/A	N/A	BrokerSubaward	subaward_type	N/A	N/A	type_of_spending
SubAwardeeBusinessTypes	Comma separated list representing sub-contractor business types pulled from Federal Procurement Data System - Next Generation (FPDS-	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_business_types	N/A	N/A	BrokerSubaward	sub_business_types	N/A	N/A	subawardee_business_types

SubAwardeeDoingBusinessAsName	The doing as business name of the contractor address.	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_dba_name	N/A	N/A	BrokerSubaward	sub_dba_name	N/A	N/A	subawardee_dba_name
SubAwardeeHighCompOfficer1Amount	The cash and noncash dollar value earned by the one of the five most highly compensated “Executives” during the sub-awardee's preceding	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_highly_compensated_officer_1_amount	N/A	N/A	BrokerSubaward	sub_high_comp_officer1_amount	N/A	N/A	subawardee_executive1_compensation
SubAwardeeHighCompOfficer1FullName	The name of an individual identified as one of the five most highly compensated "Executives." "Executive" means officers, managing	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_highly_compensated_officer_1_name	N/A	N/A	BrokerSubaward	sub_high_comp_officer1_full_na	N/A	N/A	subawardee_executive1
SubAwardeeHighCompOfficer2Amount	The cash and noncash dollar value earned by the one of the five most highly compensated “Executives” during the sub-awardee's preceding	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_highly_compensated_officer_2_amount	N/A	N/A	BrokerSubaward	sub_high_comp_officer2_amount	N/A	N/A	subawardee_executive2_compensation
SubAwardeeHighCompOfficer2FullName	The name of an individual identified as one of the five most highly compensated "Executives." "Executive" means officers, managing	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_highly_compensated_officer_2_name	N/A	N/A	BrokerSubaward	sub_high_comp_officer2_full_na	N/A	N/A	subawardee_executive2
SubAwardeeHighCompOfficer3Amount	The cash and noncash dollar value earned by the one of the five most highly compensated “Executives” during the sub-awardee's preceding	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_highly_compensated_officer_3_amount	N/A	N/A	BrokerSubaward	sub_high_comp_officer3_amount	N/A	N/A	subawardee_executive3_compensation
SubAwardeeHighCompOfficer3FullName	The name of an individual identified as one of the five most highly compensated "Executives." "Executive" means officers, managing	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_highly_compensated_officer_3_name	N/A	N/A	BrokerSubaward	sub_high_comp_officer3_full_na	N/A	N/A	subawardee_executive3
SubAwardeeHighCompOfficer4Amount	The cash and noncash dollar value earned by the one of the five most highly compensated “Executives” during the sub-awardee's preceding	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_highly_compensated_officer_4_amount	N/A	N/A	BrokerSubaward	sub_high_comp_officer4_amount	N/A	N/A	subawardee_executive4_compensation
SubAwardeeHighCompOfficer4FullName	The name of an individual identified as one of the five most highly compensated "Executives." "Executive" means officers, managing	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_highly_compensated_officer_4_name	N/A	N/A	BrokerSubaward	sub_high_comp_officer4_full_na	N/A	N/A	subawardee_executive4
SubAwardeeHighCompOfficer5Amount	The cash and noncash dollar value earned by the one of the five most highly compensated “Executives” during the sub-awardee's preceding	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_highly_compensated_officer_5_amount	N/A	N/A	BrokerSubaward	sub_high_comp_officer5_amount	N/A	N/A	subawardee_executive5_compensation
SubAwardeeHighCompOfficer5FullName	The name of an individual identified as one of the five most highly compensated "Executives." "Executive" means officers, managing	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_highly_compensated_officer_5_name	N/A	N/A	BrokerSubaward	sub_high_comp_officer5_full_na	N/A	N/A	subawardee_executive5
SubAwardeeLegalEntityAddressLine1	First line of the awardee or recipient’s legal business address where the office represented by the Unique Entity Identifier (as registered in the	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_address_line_1	N/A	N/A	BrokerSubaward	sub_legal_entity_address_line1	N/A	N/A	subawardee_street
SubAwardeeLegalEntityCityName	Name of the city in which the awardee or recipient’s legal business address is located.	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_city_name	N/A	N/A	BrokerSubaward	sub_legal_entity_city_name	N/A	N/A	subawardee_city
SubAwardeeLegalEntityCongressionalDistrict	The congressional district in which the awardee or recipient is located. This is not a required data element for non-U.S. addresses.	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_congressional_district	N/A	N/A	BrokerSubaward	sub_legal_entity_congressional	N/A	N/A	subawardee_congressionaldistrict
SubAwardeeLegalEntityCountryCode	Code for the country in which the awardee or recipient is located, using the International Standard for country codes (ISO) 3166-1 Alpha-3 GENC	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_country_code	N/A	N/A	BrokerSubaward	sub_legal_entity_country_code	N/A	N/A	subawardee_countrycode
SubAwardeeLegalEntityCountryName	The name corresponding to the country code.	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_country_name	N/A	N/A	BrokerSubaward	sub_legal_entity_country_name	N/A	N/A	N/A
SubAwardeeLegalEntityForeignPostalCode	For foreign recipients only: foreign postal code in which the awardee or recipient's legal business address is located.	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_foreign_postal_code	N/A	N/A	BrokerSubaward	sub_legal_entity_foreign_posta	N/A	N/A	N/A

SubAwardeeLegalEntityStateCode	United States Postal Service (USPS) two-letter abbreviation for the state or territory in which the awardee or recipient's legal business address is	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_state_code	N/A	N/A	BrokerSubaward	sub_legal_entity_state_code	N/A	N/A	subawardee_state
SubAwardeeLegalEntityStateName	State where the awardee or recipient is located.	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_state_name	N/A	N/A	BrokerSubaward	sub_legal_entity_state_name	N/A	N/A	N/A
SubAwardeeLegalEntityZIP 4	USPS zoning code associated with the awardee or recipient's legal business address. This is not a required data element for non-US	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_zip_code	N/A	N/A	BrokerSubaward	sub_legal_entity_zip	N/A	N/A	subawardee_zipcode
SubAwardeeOrRecipientLegalEntityName	The name of the subaward recipient that relates to the subaward recipient unique identifier. For U.S. based companies, this name is what the	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_name	N/A	N/A	BrokerSubaward	sub_awardee_or_recipient_legal	N/A	N/A	subawardee_name
SubAwardeeOrRecipientUniqueIdentifier	The unique entity identifier for the subaward recipient, currently defined as the 9-digit number assigned by Dun & Bradstreet (D&B), referred to	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_duns	N/A	N/A	BrokerSubaward	sub_awardee_or_recipient_uniqu	N/A	N/A	subawardee_dunsnumber
SubAwardeeUltimateParentLegalEntityName	The name of the ultimate parent entity of the subaward recipient. Currently the name is from the 9-digit number from the global parent	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_parent_name	N/A	N/A	BrokerSubaward	sub_ultimate_parent_legal_enti	N/A	N/A	subawardee_parent_contractor_name
SubAwardeeUltimateParentUniqueIdentifier	The unique identification number for the ultimate parent entity of a subaward recipient. Currently the identifier is the 9-digit number	N/A	Sub-Award Recipient	N/A	N/A	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	subawardee_parent_duns	N/A	N/A	BrokerSubaward	sub_ultimate_parent_unique_ide	N/A	N/A	subawardee_parent_duns
Subchapter S Corporation	https://www.sam.gov	Subchapter S Corporation	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	subchapter_scorporation	N/A	N/A	N/A	N/A	LegalEntity	subchapter_scorporation	Contracts	issubchapterscorporation	N/A
Subcontinent Asian Asian - Indian American Owned Business	List characteristic of the contractor such as whether the selected contractor is a Subcontinent Asian (Asian- Indian) American Owned	Subcontinent Asian (Asian - Indian) American Owned Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	subcontinent_asian_asian_indian_american_owned_business	N/A	N/A	N/A	N/A	LegalEntity	subcontinent_asian_asian_indian_american_owned_business	Contracts	saaobflag	N/A
Subcontracting Plan	Subcontracting plan requirement. (See FAR Part 19.702).	Subcontracting Plan	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	subcontracting_plan_code	N/A	N/A	N/A	N/A	TransactionFPDS	subcontracting_plan	Contracts	SubcontractPlan	N/A
Subcontracting Plan Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Subcontracting Plan Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	subcontracting_plan	N/A	N/A	N/A	N/A	TransactionFPDS	subcontracting_plan_desc	Contracts	SubcontractPlan	N/A
The AbilityOne Program	List characteristic of the contractor such as whether the selected contractor is a Sheltered Workshop (JWOD Provider) Organization or not.	The AbilityOne Program	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	the_ability_one_program	N/A	N/A	N/A	N/A	LegalEntity	the_ability_one_program	Contracts	shelteredworkshopflag	N/A
TotalBudgetaryResources_CPE	Budgetary resources mean amounts available to incur obligations in a given year. Budgetary resources consist of new budget authority and	N/A	Account Resources	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	total_budgetary_resources	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	total_budgetary_resources_amount_cpe	N/A	N/A	N/A
TotalDollarsObligated	This is a system generated element providing the sum of all the amounts entered in the "Action Obligation" field for a particular PIID and Agency.	Total Dollars Obligated	Award Spending	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	total_dollars_obligated, total_obligated_amount	N/A	N/A	N/A	N/A	Award, TransactionFPDS	total_obligation, total_obligated_amount	N/A	N/A	N/A
TotalFundingAmount	The sum of the FederalActionObligation and the Non-Federal Funding Amount.	N/A	Award Spending	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	total_funding_amount	N/A	N/A	N/A	N/A	Award, TransactionFABS	total_funding_amount	Assistance	total_funding_amount	N/A
TotalLoanValue	The sum of all face values in all transactions with the same FAIN.	N/A	Award Spending	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	total_face_value_of_loan	N/A	N/A	N/A	N/A	Award	total_loan_value	N/A	N/A	N/A
TotalNonFederalFundingAmount	The amount of the total award funded by non-Federal source(s), in dollars.	N/A	N/A	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	total_non_federal_funding_amount	N/A	N/A	N/A	N/A	TransactionFABS	non_federal_funding_amount	N/A	N/A	N/A

TotalSubsidyCost	The sum of all original subsidy costs from all transactions with the same FAIN.	N/A	Award Spending	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	total_loan_subsidy_cost	N/A	N/A	N/A	N/A	Award	total_subsidy_cost	N/A	N/A	N/A
Township Local Government	https://www.sam.gov	Township Local Government	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	township_local_government	N/A	N/A	N/A	N/A	LegalEntity	township_local_government	Contracts	istownshiplocalgovernment	N/A
Transaction Number	Tie Breaker for legal, unique transactions that would otherwise have the same key.	Transaction Number	Award Attribute	all_contracts_prime_transactions_1.csv	transaction_number	N/A	N/A	N/A	N/A	TransactionFPDS	transaction_number	Contracts	transactionnumber	N/A
TransactionObligatedAmount	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Breakdown	all_assistance_prime_awards_1.csv, all_contracts_prime_awards_1.csv	obligated_amount	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	transaction_obligated_amount	FinancialAccountsByAwards	transaction_obligated_amount	N/A	N/A	N/A
Transit Authority	https://www.sam.gov	Transit Authority	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	transit_authority	N/A	N/A	N/A	N/A	LegalEntity	transit_authority	Contracts	istransitauthority	N/A
TreasuryAccountName	A descriptive name of the Treasury Account Symbol (TAS).	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	treasury_account_name	FederalAccount, TreasuryAppropriationAccount	account_title	N/A	N/A	N/A
TreasuryAccountSymbol	The Treasury Account Symbol (TAS) is an identification code, to an individual appropriation, receipt, or other fund account. The TAS is	N/A	Treasury Account	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_treasury_ac	treasury_account_symbol	TreasuryAppropriationAccount	tas_rendering_label	N/A	N/A	N/A
TreasuryAccountsFundingThisAward	A single field with associated treasury accounts in order of funding dollars.	N/A	Treasury Account	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	treasury_accounts_funding_this_award	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_award_treasury_accounts_funding_this_award	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tribal College	https://www.sam.gov	Tribal College	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	tribal_college	N/A	N/A	N/A	N/A	LegalEntity	tribal_college	Contracts	istribalcollege	N/A
Tribally Owned Firm	https://www.sam.gov	Tribally Owned Firm	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	tribally_owned_firm	N/A	N/A	N/A	N/A	LegalEntity	tribally_owned_business	Contracts	istriballyownedfirm	N/A
Type Set Aside	The designator for type of set aside determined for the contract action.	Type Set Aside	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	type_of_set_aside_code	N/A	N/A	N/A	N/A	TransactionFPDS	type_set_aside	Contracts	TypeOfSetAside	N/A
Type Set Aside Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Type Set Aside Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	type_of_set_aside	N/A	N/A	N/A	N/A	TransactionFPDS	type_set_aside_description	Contracts	TypeOfSetAside	N/A
Type of IDC	Identifies whether the IDC or Multi-Agency Contract is Indefinite Delivery/Requirements, Indefinite Delivery/Indefinite Quantity, or	Type of IDC	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	type_of_idc_code	N/A	N/A	N/A	N/A	TransactionFPDS	type_of_idc	Contracts	typeofidc	N/A
Type of IDC Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Type of IDC Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	type_of_idc	N/A	N/A	N/A	N/A	TransactionFPDS	type_of_idc_description	Contracts	typeofidc	N/A
TypeOfContractPricing	The type of contract as defined in FAR Part 16 that applies to this procurement.	Type Of Contract	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	type_of_contract_pricing_code	N/A	N/A	N/A	N/A	TransactionFPDS	type_of_contract_pricing	Contracts	typeofcontractpricing	N/A
TypeOfContractPricingDescriptionTag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the TypeOfContractPricing Field.	N/A	Award Attribute	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	type_of_contract_pricing	N/A	N/A	N/A	N/A	TransactionFPDS	type_of_contract_pric_desc	Contracts	typeofcontractpricing	N/A
U.S. Federal Government	List characteristic of the contractor such as whether the selected contractor is a Federal Government Organization or not. It can be derived	U.S. Federal Government	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	us_federal_government	N/A	N/A	N/A	N/A	LegalEntity	us_federal_government	Contracts	federalgovernmentflag	N/A

U.S. Government Entity	https://www.sam.gov	U.S. Government Entity	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	us_government_entity	N/A	N/A	N/A	N/A	LegalEntity	us_government_entity	N/A	N/A	N/A
U.S. Local Government	List characteristic of the contractor such as whether the selected contractor is a Local Government Organization or not. It can be derived	U.S. Local Government	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	us_local_government	N/A	N/A	N/A	N/A	LegalEntity	us_local_government	Contracts	localgovernmentflag	N/A
U.S. State Government	List characteristic of the contractor such as whether the selected contractor is a State Government Organization or not. It can be derived	U.S. State Government	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	us_state_government	N/A	N/A	N/A	N/A	LegalEntity	us_state_government	Contracts	stategovernmentflag	N/A
U.S. Tribal Government	List characteristic of the contractor such as whether the selected contractor is a Tribal Government Organization or not. It can be derived	U.S. Tribal Government	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	us_tribal_government	N/A	N/A	N/A	N/A	LegalEntity	us_tribal_government	Contracts	tribalgovernmentflag	N/A
URI	Unique Record Identifier. An agency defined identifier that (when provided) is unique for every financial assistance action reported by that	N/A	Award Attribute	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv	award_id_uri	N/A	N/A	###_federal_account_account_breakdown_by_award_1.csv,	award_id_uri	Award, FinancialAccountsByAwards, TransactionFABS	uri	Assistance	uri	N/A
USSGL480100_UndeliveredOrdersObligationsUnpaid_CPE	The amount of goods and/or services ordered, which have not been actually or constructively received and for which amounts have not been	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl480100_undelivered_orders_obligations_unpaid_cpe	N/A	N/A	N/A
USSGL480100_UndeliveredOrdersObligationsUnpaid_FYB	The amount of goods and/or services ordered, which have not been actually or constructively received and for which amounts have not been	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl480100_undelivered_orders_obligations_unpaid_fyb	N/A	N/A	N/A
USSGL480200_UndeliveredOrdersObligationsPrepaidAdvanced_CPE	The amount of goods and/or services ordered, which have not been actually or constructively received but have been prepaid or advanced. This	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl480200_undelivered_orders_oblig_prepaid_advanced_cpe	N/A	N/A	N/A
USSGL480200_UndeliveredOrdersObligationsPrepaidAdvanced_FYB	The amount of goods and/or services ordered, which have not been actually or constructively received but have been prepaid or advanced. This	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl480200_undelivered_orders_oblig_prepaid_advanced_fyb	N/A	N/A	N/A
USSGL483100_UndeliveredOrdersObligationsTransferredUnpaid_CPE	The amount of goods and/or services ordered and obligated in one Treasury Appropriation Fund Symbol (TAFS) and transferred to or from	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl483100_undelivered_orders_obligations_transferred_unpaid_cpe	N/A	N/A	N/A
USSGL483200_UndeliveredOrdersObligationsTransferredPrepaidAdvanced_CPE	The amount of goods and/or services ordered and obligated in one Treasury Appropriation Fund Symbol (TAFS) and transferred to or from	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl483200_undelivered_orders_oblig_transferred_prepaid_adv_cpe	N/A	N/A	N/A
USSGL487100_DownwardAdjustmentsOfPriorYearUnpaidUndeliveredOrdersObligationsRecoveries_CPE	The amount of recoveries during the current fiscal year resulting from downward adjustments to obligations originally recorded in a prior fiscal	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl487100_down_adj_pri_unpaid_undel_orders_oblig_recov_cpe	N/A	N/A	N/A
USSGL487200_DownwardAdjustmentsOfPriorYearPrepaidAdvancedUndeliveredOrdersObligationsRefund	The amount of cash refunds during the current fiscal year resulting from downward adjustments to obligations that were originally recorded in a prior	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl487200_down_adj_pri_ppaid_undel_orders_oblig_refund_cpe	N/A	N/A	N/A
USSGL488100_UpwardAdjustmentsOfPriorYearUndeliveredOrdersObligationsUnpaid_CPE	The amount of upward adjustments during the current fiscal year to obligations that were originally recorded in a prior fiscal year in	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl488100_upward_adjust_pri_undeliv_order_oblig_unpaid_cpe	N/A	N/A	N/A
USSGL488200_UpwardAdjustmentsOfPriorYearUndeliveredOrdersObligationsPrepaidAdvanced_CPE	The amount of upward adjustments during the current fiscal year to obligations that were originally recorded in a prior fiscal year in	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl488200_up_adjust_pri_undeliv_order_oblig_ppaid_adv_cpe	N/A	N/A	N/A
USSGL490100_DeliveredOrdersObligationsUnpaid_CPE	The amount accrued or due for: (1) services performed by employees, contractors, vendors, carriers, grantees, lessors, and other	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl490100_delivered_orders_obligations_unpaid_cpe	N/A	N/A	N/A
USSGL490100_DeliveredOrdersObligationsUnpaid_FYB	The amount accrued or due for: (1) services performed by employees, contractors, vendors, carriers, grantees, lessors, and other	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl490100_delivered_orders_obligations_unpaid_fyb	N/A	N/A	N/A

USSGL490200_DeliveredOrdersObligationsPaid_CPE	The amount paid/outlayed for: (1) services performed by employees, contractors, vendors, carriers, grantees, lessors, and other	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl490200_delivered_orders_obligations_paid_cpe	N/A	N/A	N/A
USSGL490800_AuthorityOutlayedNotYetDisbursed_CPE	The amount of authority outlayed but not yet disbursed. Use only in specific circumstances, such as for interest on certain Bureau of the Fiscal	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl490800_authority_outlayed_not_yet_disbursed_cpe	N/A	N/A	N/A
USSGL490800_AuthorityOutlayedNotYetDisbursed_FYB	The amount of authority outlayed but not yet disbursed. Use only in specific circumstances, such as for interest on certain Bureau of the Fiscal	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl490800_authority_outlayed_not_yet_disbursed_fyb	N/A	N/A	N/A
USSGL493100_DeliveredOrdersObligationsTransferredUnpaid_CPE	The amount in USSGL account 490100, "Delivered Orders - Obligations, Unpaid," transferred during the fiscal year to or from	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl493100_delivered_orders_oblig_transferred_unpaid_cpe	N/A	N/A	N/A
USSGL497100_DownwardAdjustmentsOfPriorYearUnpaidDeliveredOrdersObligationsRecoveries_CPE	The amount of recoveries that were originally recorded in a prior fiscal year during the fiscal year resulting from downward adjustments to	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl497100_down_adj_pri_unpaid_deliv_orders_oblig_recov_cpe	N/A	N/A	N/A
USSGL497200_DownwardAdjustmentsOfPriorYearPaidDeliveredOrdersObligationsRefundsCollected_CPE	The amount of cash refunds during the fiscal year resulting from downward adjustments to USSGL account 490200, "Delivered Orders -	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl497200_down_adj_pri_paid_deliv_orders_oblig_refund_cpe	N/A	N/A	N/A
USSGL498100_UpwardAdjustmentsOfPriorYearDeliveredOrdersObligationsUnpaid_CPE	The amount of upward adjustments during the fiscal year to USSGL account 490100, "Delivered Orders - Obligations, Unpaid," or USSGL	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl498100_upward_adjust_pri_deliv_orders_oblig_unpaid_cpe	N/A	N/A	N/A
USSGL498200_UpwardAdjustmentsOfPriorYearDeliveredOrdersObligationsPaid_CPE	The amount of upward adjustments that were originally recorded in a prior fiscal year paid/outlayed during the fiscal year to USSGL account	N/A	Account Breakdown	N/A	N/A	N/A	N/A	N/A	N/A	FinancialAccountsByAwards, FinancialAccountsByProgramActivityObje	ussgl498200_upward_adjust_pri_deliv_orders_oblig_paid_cpe	N/A	N/A	N/A
UltimateParentLegalEntityName	The name of the ultimate parent of the awardee or recipient. Currently the name is from the global parent DUNS® number.	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_parent_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_parent_name	###_federal_account_account_breakdown_by_award_1.csv,	recipient_parent_name	BrokerSubaward, TransactionFPDS	ultimate_parent_legal_enti	Contracts	mod_parent	prime_awardee_parent_contractor_name
UltimateParentUniqueIdentifier	The unique identification number for the ultimate parent of an awardee or recipient. Currently the identifier is the 9-digit number maintained by Dun	N/A	Award Recipient	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	recipient_parent_duns	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_parent_duns	###_federal_account_account_breakdown_by_award_1.csv,	recipient_parent_duns	BrokerSubaward, TransactionFABS, TransactionFPDS	ultimate_parent_unique_ide	Contracts	parentdunsnumber	prime_awardee_parent_duns
Undefinitized Action	Designates whether the contact action is an Undefinitized Action.	Undefinitized Action	Award Attribute	all_contracts_prime_transactions_1.csv	undefinitized_action_code	N/A	N/A	N/A	N/A	LegalEntity	undefinitized_action	Contracts	Lettercontract	N/A
Undefinitized Action Description Tag	Description tag (by way of the FPDS Atom Feed) that explains the meaning of the code provided in the Undefinitized Action Field.	N/A	Award Attribute	all_contracts_prime_transactions_1.csv	undefinitized_action	N/A	N/A	N/A	N/A	TransactionFPDS	undefinitized_action_desc	Contracts	Lettercontract	N/A
UnobligatedBalance_CPE	The definition for this element appears in Section 20 of OMB Circular A-11 issued June 2015; a brief summary from A-11 appears	N/A	Account Status	N/A	N/A	N/A	N/A	###_treasury_account_account_balances_1.csv, ###_federal_acc	unobligated_balance	AppropriationAccountBalances, AppropriationAccountBalancesQuarterly	unobligated_balance_cpe	N/A	N/A	N/A
UsaspendingPermalink	This is Usaspending Permalink	N/A	N/A	all_assistance_prime_awards_1.csv, all_assistance_prime_transactions_1.csv,	usaspending_permalink	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	usaspending_permalink	###_treasury_account_account_breakdown_by_award_1.csv,	usaspending_permalink	N/A	N/A	N/A	N/A	N/A
Vendor Doing As Business Name	The doing as business name of the contractor address.	Vendor Doing As Business Name	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	recipient_doing_business_as_name	all_assistance_subawards_1.csv, all_contracts_subawards_1.csv	prime_awardee_dba_name	N/A	N/A	BrokerSubaward, TransactionFPDS, LegalEntity	dba_name, vendor_doing_as_business_n, vendor_doing_as_bu	Contracts	VendorDoingAsBusinessName	N/A
Vendor Fax Number	The fax number of the contractor.	Vendor Fax Number	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	recipient_fax_number	N/A	N/A	N/A	N/A	LegalEntity	vendor_fax_number	Contracts	faxno	N/A
Vendor Phone Number	The phone number of the contractor.	Vendor Phone Number	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	recipient_phone_number	N/A	N/A	N/A	N/A	LegalEntity	vendor_phone_number	Contracts	phoneno	N/A

Veteran Owned Business	List characteristic of the contractor such as whether the selected contractor is a Veteran Owned Business or not. It can be derived	Veteran Owned Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	veteran_owned_business	N/A	N/A	N/A	N/A	LegalEntity	veteran_owned_business	Contracts	veteranownedflag	N/A
Veterinary College	https://www.sam.gov	Veterinary College	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	veterinary_college	N/A	N/A	N/A	N/A	LegalEntity	veterinary_college	Contracts	isveterinarycollege	N/A
Veterinary Hospital	https://www.sam.gov	Veterinary Hospital	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	veterinary_hospital	N/A	N/A	N/A	N/A	LegalEntity	veterinary_hospital	Contracts	isveterinaryhospital	N/A
Woman Owned Business	List characteristic of the contractor such as whether the selected contractor is a Woman Owned Business or not. It can be derived	Woman Owned Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	woman_owned_business	N/A	N/A	N/A	N/A	LegalEntity	woman_owned_business	Contracts	womenownedflag	N/A
Women Owned Small Business	https://www.sam.gov OR List characteristic of the contractor such as whether the selected contractor is a Woman Owned Small Business or	Women Owned Small Business	Award Recipient	all_contracts_prime_awards_1.csv, all_contracts_prime_transactions_1.csv	women_owned_small_business	N/A	N/A	N/A	N/A	LegalEntity	women_owned_small_business	Contracts	iswomenownedsmallbusiness	N/A

========ABOUT THESE FILES========

This ZIP file was generated from a specific Assistance Award Summary Page on USAspending.gov, located at https://www.usaspending.gov/award/49714040

Data Element Definitions: A searchable Data Dictionary that defines every data element in the included files can be found here: https://www.usaspending.gov/download_center/data_dictionary. We have also included a copy in this download for convenience. Note that the dictionary is updated periodically.

Empty Files: When no data is available for a given file, its contents will only contain column headers (no records will be included).

Split Files: The # in all filenames defaults to 1; if the number of rows in a given file is large enough to warrant breaking it into multiple files, then additional files will be present and appended with 2, 3, etc. instead.

Award ID Characters: In edge cases where the Award ID (FAIN or URI) contain characters that are file system unfriendly (e.g., '?' or '='), they are converted to '_' characters for purposes of file names (no underlying data within the files is altered).

File: Assistance_[Award ID]_FederalAccountFunding_#.csv

This file contains Account Breakdown By Award data, which is reported on a quarterly basis from audited agency financial systems as required by the DATA Act of 2014. It is a breakdown of funding for this award by Treasury Account, Budget Function, Object Class, and sometimes Program Activity--effectively linking the appropriation, budget, financial, and award spheres. Financial data is provided at the TAS level for increased granularity, but may easily be rolled up by Federal Account using the federal_account_symbol column. This data is also available from the Custom Account Download section of the site.

Note that the DATA Act of 2014 went into effect FY17Q2; as such, Account Breakdown by Award data is only available from January 2017 onward, and will not be present for award transactions that occurred prior to that point. Note also that a subset of agency-submitted Account Breakdown by Award data is not definitively linkable to a single Federal Award; unlinked data is available via Custom Account Download only.

File: Assistance_[Award ID]_Sub-Awards_#.csv

This file contains all Sub-Grant data associated with this prime award. Sub-Grant data is also available from the Advanced Search or Custom Award Download sections of the site.

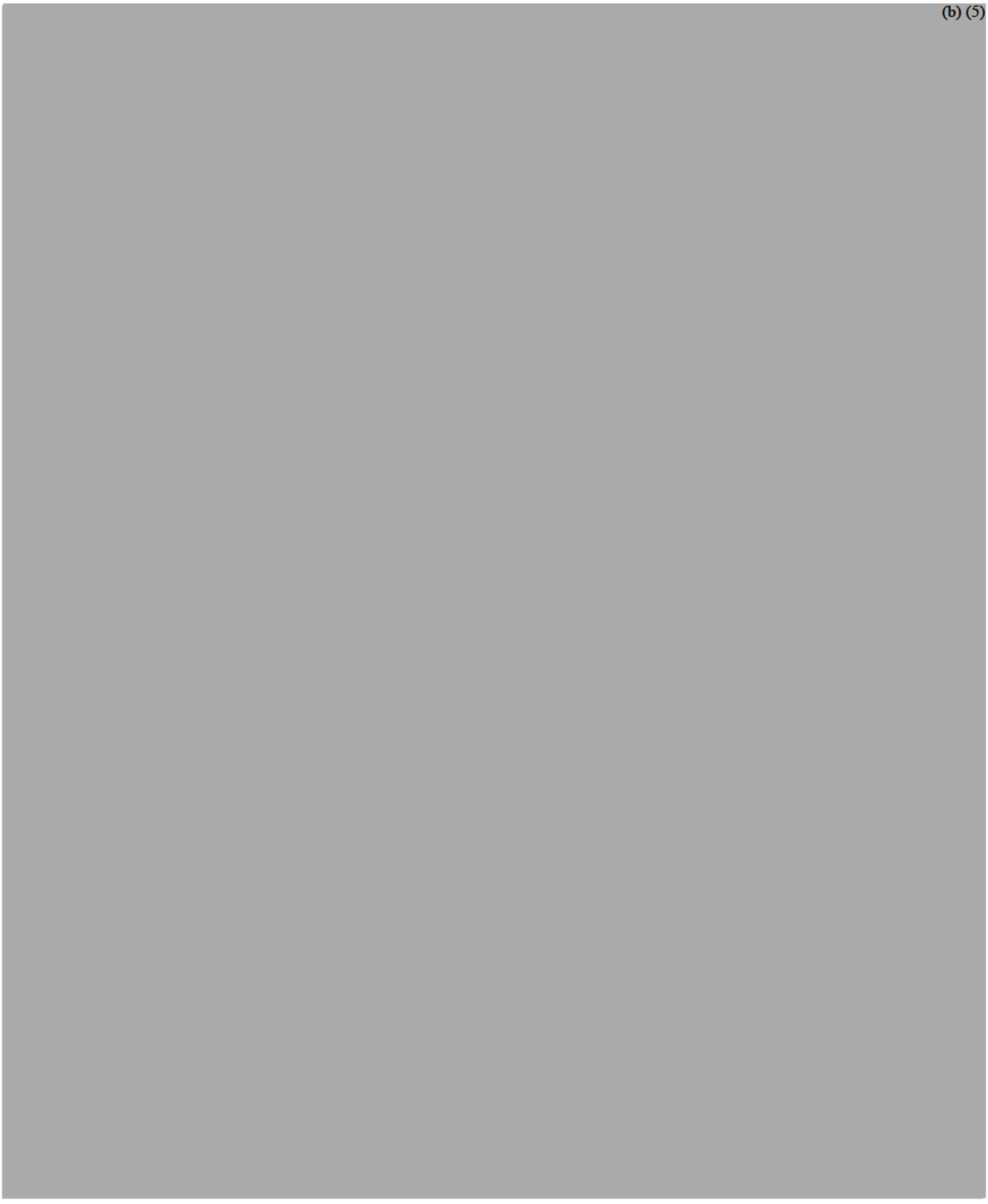
File: Assistance_[Award ID]_TransactionHistory_#.csv

This file contains transaction-level data for all of the modifications made to this assistance award, including the base award. This data is also available from the Advanced Search, Award Data Archive, and Custom Award Download sections of the site.

File: Data_Dictionary_Crosswalk.xlsx

This file contains the data dictionary covering all elements available for download from USAspending.gov. You can find an online and up-to-date version of the data dictionary here: https://www.usaspending.gov/download_center/data_dictionary

EcoHealth Alliance grant R01AI110964 timeline
Mike Lauer (OER)
May 28, 2021



From: Jacobs, Anna (NIH/OD) [E]
To: Lauer, Michael (NIH/OD) [E]
Cc: Lankford, David (NIH/OD) [E]; Lauer, Michael (NIH/OD) [E]
Subject: Re: PRIVILEGED AND CONFIDENTIAL--applications and NOAs for EcoH?
Date: Monday, August 24, 2020 9:17:58 AM

Thanks, Mike.
Best,

Anna L. Jacobs, J.D., M.S.
Senior Attorney
HHS Office of the General Counsel
Public Health Division, NIH Branch
31 Center Drive, Bldg. 31, Rm.2B-50
Bethesda, MD 20892
(b) (6) (main)
301-402-1034 (fax)
(b) (6)

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From: Lauer, Michael (NIH/OD) [E] (b) (6)
Sent: Monday, August 24, 2020 6:09:39 AM
To: Jacobs, Anna (NIH/OD) [E] (b) (6)
Cc: Lankford, David (NIH/OD) [E] (b) (6); Lauer, Michael (NIH/OD) [E] (b) (6)
Subject: Re: PRIVILEGED AND CONFIDENTIAL--applications and NOAs for EcoH?

Thanks Anna – see attached.

Mike

From: "Jacobs, Anna (NIH/OD) [E]" (b) (6)
Date: Friday, August 21, 2020 at 2:22 PM
To: "Lauer, Michael (NIH/OD) [E]" (b) (6)
Cc: "Lankford, David (NIH/OD) [E]" (b) (6)
Subject: PRIVILEGED AND CONFIDENTIAL--applications and NOAs for EcoH?

PRIVILEGED AND CONFIDENTIAL—ATTORNEY-CLIENT PRIVILEGE

(b) (5)

(b) (5)

Anna L. Jacobs, J.D., M.S.
Senior Attorney
HHS Office of the General Counsel
Public Health Division, NIH Branch
31 Center Drive, Bldg. 31, Rm.2B-50
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From: Lauer, Michael (NIH/OD) [E]
To: Jacobs, Anna (NIH/OD) [E]
Cc: Lankford, David (NIH/OD) [E]; Lauer, Michael (NIH/OD) [E]
Subject: Re: PRIVILEGED AND CONFIDENTIAL--applications and NOAs for EcoH?
Date: Monday, August 24, 2020 6:11:08 AM
Attachments: shr_downloadprojdoc.cfm-30.pdf
shr_downloadprojdoc.cfm-29.pdf
shr_downloadprojdoc.cfm-28.pdf

Attachment cfm-30 and Attachment cfm-29 were released in the February 2022 production. Cfm-30 is pages 399-543 and cfm29 is pages 159-304 from the February production.

Thanks Anna – see attached.

Mike

From: "Jacobs, Anna (NIH/OD) [E]" (b) (6)
Date: Friday, August 21, 2020 at 2:22 PM
To: "Lauer, Michael (NIH/OD) [E]" (b) (6)
Cc: "Lankford, David (NIH/OD) [E]" (b) (6)
Subject: PRIVILEGED AND CONFIDENTIAL--applications and NOAs for EcoH?

PRIVILEGED AND CONFIDENTIAL—ATTORNEY-CLIENT PRIVILEGE

(b) (5)

Anna L. Jacobs, J.D., M.S.
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PI: **DASZAK, PETER**	Title: Risk of Viral Emergence from Bats	
Received: 10/09/2007	FOA: PA07-246	Council: 05/2008
Competition ID:	FOA Title: NON-BIODEFENSE EMERGING INFECTIOUS DISEASES RESEARCH OPPORTUNITIES (R01)	
1 R01 AI079231-01	Dual:	Accession Number: 3030604
IPF: 4415701	Organization: ECOHEALTH ALLIANCE, INC.	
Former Number:	Department: CCM	
IRG/SRG: IRAP	AIDS: N	Expedited: N
Subtotal Direct Costs (excludes consortium F&A) Year 1: 399,304 Year 2: 395,764 Year 3: 381,276 Year 4: 391,092 Year 5: 407,481	Animals: Y Humans: N Clinical Trial: N Current HS Code: (b) (5) HESC: N	New Investigator: Early Stage Investigator:
Senior/Key Personnel:	*Organization:*	*Role Category:*
Peter Daszak	Wildlife Trust Inc	PD/PI
W. Lipkin	The Trustees of Columbia University in the City of New York	Co-PD/PI
Bruce Mungall	Commonwealth Science and Industry Organization	Co-PD/PI
Kate Jones	Zoological Society of London	Co-PD/PI
Jonathan Epstein	Wildlife Trust	Co-PD/PI
Thomas Briese	The Trustees of Columbia University in the City of New York	Co-PD/PI
Gustavo Palacios	The Trustees of Columbia University in the City of New York	Co-PD/PI

APPLICATION FOR FEDERAL ASSISTANCE

SF 424 (R&R)

1. * TYPE OF SUBMISSION	**2. DATE SUBMITTED** 10/05/2007	**Applicant Identifier**
	3. DATE RECEIVED BY STATE	**State Application Identifier**
❍ Pre-application ❍ Application ● Changed/Corrected Application	**4. Federal Identifier** GRANT00349359	

5. APPLICANT INFORMATION *** Organizational DUNS:**077090066

* Legal Name: Wildlife Trust Inc

Department: CCM | Division:

* Street1: 460 W34th Street | Street2: 17th Floor

* City: New York | County: New York | * State: NY: New York

Province: | * Country: USA: UNITED STATES | * ZIP / Postal Code: 10001

Person to be contacted on matters involving this application

Prefix:	* First Name:	Middle Name:	* Last Name:	Suffix:
Dr.	Peter		Daszak	

* Phone Number: (b) (6) | Fax Number: 2123804475 | Email: (b) (6)

6. * EMPLOYER IDENTIFICATION NUMBER *(EIN) or (TIN)*:
311726494

7. * TYPE OF APPLICANT
M: Nonprofit with 501C3 IRS Status (Other than Institution of Higher Education)

8. * TYPE OF APPLICATION: ● New
❍ Resubmission ❍ Renewal ❍ Continuation ❍ Revision

Other (Specify):

Small Business Organization Type
❍ Women Owned ❍ Socially and Economically Disadvantaged

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:
National Institutes of Health

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER:
TITLE:

11. * DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:
Risk of Viral Emergence from Bats

12. * AREAS AFFECTED BY PROJECT *(cities, counties, states, etc.)*
N/A

13. PROPOSED PROJECT:

* Start Date	* Ending Date
07/01/2008	06/30/2013

14. CONGRESSIONAL DISTRICTS OF:

a. * Applicant	b. * Project
08	00-000

15. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION

Prefix:	* First Name:	Middle Name:	* Last Name:	Suffix:
Dr.	Peter		Daszak	

Position/Title: Executive Director | * Organization Name: Wildlife Trust Inc

Department: CCM | Division:

* Street1: 460 W34th Street | Street2: 17th Floor

* City: New York | County: New York | * State: NY: New York

Province: | * Country: USA: UNITED STATES | * ZIP / Postal Code: 10001

* Phone Number: (b) (6) | Fax Number: 2123804475 | * Email: (b) (6)

16. ESTIMATED PROJECT FUNDING	
a. * Total Estimated Project Funding	$3,051,586.31
b. * Total Federal & Non-Federal Funds	$3,051,586.31
c. * Estimated Program Income	$0.00

17. * 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

18. 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.*

19. Authorized Representative

Prefix:	* First Name:	Middle Name:	* Last Name:	Suffix:
	Aleksei	Avery	Chmura	

* Position/Title: Program Assistant
* Organization Name: Wildlife Trust Inc
Department: CCM
Division:
* Street1: 460 West 34th Street
Street2: 17th Floor
* City: New York
County: New York
* State: NY: New York
Province:
* Country: USA: UNITED STATES
* ZIP / Postal Code: 10001
* Phone Number: (b) (6)
Fax Number: 1.212.380.4475
* Email: (b) (6)

*** Signature of Authorized Representative**

Aleksei Chmura

*** Date Signed**

10/09/2007

20. Pre-application File Name: Mime Type:

21. Attach an additional list of Project Congressional Districts if needed.

File Name: Mime Type:

424 R&R and PHS-398 Specific
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RESEARCH & RELATED Project/Performance Site Location(s)

Project/Performance Site Primary Location

Organization Name: Wildlife Trust

* Street1: 460 West 34th Street		Street2: 17th Floor
* City: New York	County:	* State: NY: New York
Province:	* Country: USA: UNITED STATES	* Zip / Postal Code: 10001

Project/Performance Site Location 1

Organization Name: The Trustees of Columbia University

* Street1: 630 West 168th Street		Street2: Box 49
* City: New York	County:	* State: NY: New York
Province:	* Country: USA: UNITED STATES	* Zip / Postal Code: 10032

Project/Performance Site Location 2

Organization Name: The Institute of Zoology

* Street1: Regent's Park		Street2:
* City: London	County:	* State:
Province:	* Country: GBR: UNITED KINGDOM	* Zip / Postal Code: NW14RY

Project/Performance Site Location 3

Organization Name: Australian Animal Health Laboratory (AAHL)

* Street1: 5 Portarlington Road		Street2:
* City: East Geelong	County:	* State:
Province: Victoria	* Country: AUS: AUS-TRALIA	* Zip / Postal Code: VIC 3219

	File Name	Mime Type
Additional Location(s)	7886-Other_performance_sites.pdf	application/pdf

Other Performance Sites

The research plan involves collection of serum and other samples from wildlife (bats) in regions around the world that are hotspots for emerging diseases. Our preliminary analyses (**See preliminary data, Section 4.1**) suggest that these countries will be largely in tropical regions, with high wildlife biodiversity, but where there are significant human population pressure. In the initial period of the project (years 1 and 2) these will include Bangladesh, China, Brazil, Mexico and Cameroon. It is possible that later on, as we refine our predictive modeling, we will also target other regions.

RESEARCH & RELATED Other Project Information

1. * Are Human Subjects Involved?	❍ Yes	● No
1.a. If YES to Human Subjects		
Is the IRB review Pending?	❍ Yes	❍ No
IRB Approval Date:		
Exemption Number:	_ 1 _ 2 _ 3 _ 4 _ 5 _ 6	
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	None	
3. * Is proprietary/privileged information included in the application?	❍ Yes	● No
4.a. * Does this project have an actual or potential impact 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.a. * Does this project involve activities outside the U.S. or partnership with International Collaborators?	● Yes	❍ No
5.b. If yes, identify countries:	Australia	
5.c. Optional Explanation:	Please see attachment (item 11, below)	

6. * Project Summary/Abstract	6134-NIAID_abstract_Final.pdf	Mime Type: application/pdf
7. * Project Narrative	661-Project_Narrative.pdf	Mime Type: application/pdf
8. Bibliography & References Cited	5093-B bliography.pdf	Mime Type: application/pdf
9. Facilities & Other Resources	3165-Resources_COMBINED.pdf	Mime Type: application/pdf
10. Equipment		
11. Other Attachments	1719-Justification_of_Work_at_Foreign_Site.pdf	Mime Type: application/pdf

Abstract (character limit)

Emerging zoonoses are a significant threat to global public health and our economies. The majority are caused by pathogens that emerge with increasing frequency from wildlife hosts (e.g. HIV-1 from chimpanzees, SARS CoV from bats and civets, Nipah virus from fruit bats). This group of diseases alone causes tens of thousands of deaths each year, and some outbreaks (e.g. SARS) have cost the global economy tens of billions of dollars. However, despite the huge social, demographic and economic impact of EIDs, there has been little advance in our understanding of the underlying process of how these wildlife zoonoses emerge, and in developing predictive approaches to prevent future emergence.

Developing predictive and proactive approaches to zoonotic emergence is a key challenge to medical science. New zoonoses emerge regularly from wildlife in a seemingly random way, from disparate regions of the globe, and from a wide diversity of wildlife species. Our ability to understand what drives this process is hampered by a lack of rigorous analyses of the processes that cause emergence; our lack of knowledge of the diversity of microbes in wildlife (the 'zoonotic pool') from which new zoonoses regularly emerge; and our poor understanding of pathogenic factors that explain why some viruses are able to cross the species barrier while others are not. In this proposal, we bring together a multidisciplinary team of emerging disease ecologists and modelers, viral bioinformaticists, and molecular virologists who are leaders in their fields, and who have already collaborated together to study zoonotic disease emergence. Building on preliminary data that demonstrates bats are a key wildlife reservoir, and that emergence is due to a range of anthropogenic drivers, this team will **1)** develop predictive models of global 'hotspots' for the future emergence of bat viruses; **2)** use a large repository of bat biological samples to conduct targeted surveillance in these 'hotspots' for known and undiscovered bat pathogens, elucidating the unknown diversity of the bat 'virome' and; **3)** using a range of *in vitro* techniques (including infection in bat cell culture), examine the pathogenesis of these new viruses, and a pool of available bat viruses which have not yet emerged in humans. **This multidisciplinary approach represents the first, concerted effort to understand the depth and breadth of the process of emergence within a key group of wildlife hosts associated with the recent emergence of SARS, Nipah, Hendra, Ebola and Marburg viruses.**

Emerging zoonoses (e.g. HIV/AIDS, Influenza) are a major threat to health globally, causing tens of thousands of deaths each year in the USA and abroad and a number of these have emerged from bats recently (SARS, Ebola, Nipah). This research provides a way to predict the regions where the next new emerging zoonosis from bats is most likely to emerge, and proposes targeted surveillance of these animals using state-of-the-art molecular techniques in those regions. It will characterize new viruses, and study the pathogenesis of these, and a bank of known bat viruses that have not yet emerged in the human population: It is therefore a predictive, proactive approach to combating the most high profile group of emerging pathogens.

Principal Investigator/Program Director (Last, First, Middle): Daszak, Peter

Consortium for Conservation Medicine (CCM) RESOURCES

FACILITIES: Specify the facilities to be used for the conduct of the proposed research. Indicate the performance sites and describe capacities, pertinent capabilities, relative proximity, and extent of availability to the project. If research involving Select Agent(s) will occur at any performance site(s), the biocontainment resources available at each site should be described. Under "Other," identify support services such as machine shop, electronics shop, and specify the extent to which they will be available to the project. Use continuation pages if necessary.

Laboratory: The Consortium for Conservation Medicine (CCM) has a fully equipped wet lab a their headquarters in Wildlife Trust, New York, designed for receiving, storing and aliquoting samples under BSL-2 conditions. All testing will be conducted at our collaborators, the Greene Lab and Australian Animal Health Lab (below)

Clinical: N/A

Animal: N/A

Computer:
The CCM is equipped with 20 PCs. Drs. Daszak, Epstein, and Jones have access to standard PC stations, 24-7 server and server support, and all required software including ArcGIS, MatLab, Microsoft Office, and Adobe CS

Office:
The CCM is based at Wildlife Trust in New York City with (b) (4) of office space including a meeting room and laboratory. The CCM is supported by administrative staff and two assistants who are available for work on this project and are part-funded through core foundation support.

Other:
N/A

MAJOR EQUIPMENT: List the most important equipment items already available for this project, noting the location and pertinent capabilities of each.

Principal Investigator/Program Director (Last, First, Middle): Daszak, Peter

Center for Infection and Immunity RESOURCES

FACILITIES: Specify the facilities to be used for the conduct of the proposed research. Indicate the performance sites and describe capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Under "Other," identify support services such as machine shop, electronics shop, and specify the extent to which they will be available to the project. Use continuation pages if necessary.

Laboratory:

The Center for Infection and Immunity occupies approximately 7,500 square feet on two floors in the Mailman School of Public Health of Columbia University. The center proper contains isolated areas for work with cultured mammalian cells, radioactivity, recombinant DNA and Biohazard Level (BL)-2 and BL-3 infectious agents, as well as a separate laboratory for molecular epidemiology using real time PCR. To minimize potential for spurious results, access to the latter laboratory is restricted; the room is positive pressure and equipped with overhead UV lamps; individual glove boxes are used for nucleic acid extraction and addition of reagents for PCR analyses.

The Center for Infection and Immunity is registered for 'Possession, Use, and Transfer of Select Biological Agents and Toxins'.

Clinical:

Not applicable

Animal:

Not applicable

Computer:

Computer equipment in the Center for Infection and Immunity includes personal computers and printers, and software for word processing, graphics, statistics, nucleic acid and protein sequence analysis. Computers are linked to larger systems on the Columbia campus that allow reference searches, computer mail and access to national and international protein and nucleic acid databases.

Office:

The Center for Infection and Immunity includes approximately 1,500 square feet of office and computer space.

Other:

MAJOR EQUIPMENT: List the most important equipment items already available for this project, noting the location and pertinent capabilities of each.

The Center for Infection and Immunity contains an ultracentrifuge and high speed preparative centrifuge, phosphorimager, on-line thermal cycler (ABI 7700), HPLC, flow cytometer for bead based immunologic and molecular assays (Luminex), automated sequencer (ABI 310), Agilent LC/MS 1D system, microfuges, MultiDrop plate dispenser station, CO_2 incubators for noninfected and infected cell lines, autoclave, scintillation counter, liquid nitrogen, dry ice, and darkroom with film developer incubators for bacterial plates, shaking incubator for plasmid preparation, freezers and refrigerators, thermal cyclers, cryostat, motorized sliding cryomicrotome suitable for cutting thick sections (Microm HM440E), brightfield and fluorescent microscope, inverted fluorescent microscope, water purification system, gel boxes and power supplies for nucleic acid and protein electrophoresis, gel dryer, water baths, pH meter, balances, tissue homogenizers, vacuum pumps, speedvac, vacuum oven, spectrophotometer, gel documentation system, UV transilluminator and gel documentation system, glassware, plasticware and pipetting aids. In close proximity are a confocal microscope, luminometer, FACS, amino acid analyzer, and DNA and protein sequencers.

Principal Investigator/Program Director (Last, First, Middle): Daszak, Peter

Australian Animal Health Laboratory RESOURCES

FACILITIES: Specify the facilities to be used for the conduct of the proposed research. Indicate the performance sites and describe capacities, pertinent capabilities, relative proximity, and extent of availability to the project. If research involving Select Agent(s) will occur at any performance site(s), the biocontainment resources available at each site should be described. Under "Other," identify support services such as machine shop, electronics shop, and specify the extent to which they will be available to the project. Use continuation pages if necessary.

Laboratory:

The PI's non-BSL4 laboratories are inside the secure area of AAHL which has approximately 30,000 square feet of BSL-3 lab space. There are 2 labs of approximately 400 square feet each, equipped with 2 CO_2 incubators for tissue culture, inverted, bright field microscopes, several high speed and ultracentrifuges, three biological safety cabinets, 2 PCR machines, an ELISA plate reader, luminometer, gel electrophoresis and western blot equipment and -20^{0}C and -80^{0}C storage facilities. A number of shared resources are also available including liquid handling robotics, fluorescence microscopes and image analysis software. Each laboratory is linked via LAN to a main frame and computers in offices outside the secure area.

The AAHL BSL-4 laboratory facility is approximately 400 square feet and is equipped with the necessary air supply systems, a CO2 incubator and large roller machine encased in an incubator, a low speed bench and high speed ultracentrifuge, -80^{0}C freezer, inverted microscope, dunk tank, class 1 And class II biohazard cabinets and computer linkage to the LAN. The laboratory has all the necessary ancillary facilities such as BSL-4 suits and Microchem Plus shower capacity required for BSL-4 facilities. Individuals working at BSL-4 wear head phones which permit instant communication with others outside the laboratory. An extensive training and safety program is in place to ensure operator safety. An engineering staff of about 30 ensure continuous and safe operation of the secure (BSL3 and BSL4) facilities at AAHL.

Clinical:

Animal:

AAHL's large animal facility has 28 large animal rooms, two of which (1000 and 400 square feet) have the capacity to operate at BSL-4. The animal rooms contain specially designed cages which have wire crushing mechanisms capable of pushing the animal to one side of the cage to permit easy and safe anaesthetization. Animal experiments done at BSL-4 are thoroughly planned by all scientific staff involved in the experiment with input form animal technicians, engineering, and microbiological security staff involved in the operation of the BSL-4 labs. Animals held at BSL-4 are under constant video surveillance and temperature is continuously monitored via radio telemetry.

Computer:

Pentium computers are present in both non-BSL-4 laboratories and the BSL-4 laboratory in the secure area and linked to the AAHL server by a LAN.

Office:

The PI has offices within and outside the secure area of AAHL and has access to full time library, records and IT personnel in addition to state of the art copying and printing facilities.

Other:

MAJOR EQUIPMENT: List the most important equipment items already available for this project, noting the location and pertinent capabilities of each.

Common support facilities in the secure area of AAHL include cold rooms, dark rooms, fluorescent microscopes, ELISA facilities and image analysis facilities.

Principal Investigator/Program Director (Last, First, Middle): Daszak, Peter

Institute of Zoology (IOZ) - RESOURCES

FACILITIES: Specify the facilities to be used for the conduct of the proposed research. Indicate the performance sites and describe capacities, pertinent capabilities, relative proximity, and extent of availability to the project. If research involving Select Agent(s) will occur at any performance site(s), the biocontainment resources available at each site should be described. Under "Other," identify support services such as machine shop, electronics shop, and specify the extent to which they will be available to the project. Use continuation pages if necessary.

Laboratory:

N/A

Clinical: N/A

Animal: N/A

Computer:

Kate Jones' computer laboratory is based at IoZ and consists of 5 PCs and 1 Apple computer (desktops and laptops), running all the relevant software required for the project. There is also access to a number of different webservers in Cambridge for database development and hosting. There is also a separate agreement with the Data Management Center in Newcastle University who are contracted for additional technical database assistance and webserver hosting with one of their programmers is employed within the lab on a part-time basis.

Office:

The Institute of Zoology (IoZ) is scientific research department of The Zoological Society of London (ZSL) based in London, and is part of Cambridge University. IoZ has IT and administrative support both through ZSL and Cambridge University and access to webservers, technical assistance and the library through Cambridge University. The IT departments support a range of statistical software packages (e.g., R, SPSS, MatLab), geospatial programs (e.g. ArcView, ArcInfo, ArcGIS) as well as the standard applications.

Other:

MAJOR EQUIPMENT: List the most important equipment items already available for this project, noting the location and pertinent capabilities of each.

Justification of Work at Foreign Site (AAHL)

The Australian Animal Health Laboratory (AAHL), a component of the CSIRO, conducts world leading research on a number of new and emerging zoonotic agents and has been a key sub-contractor of several recent and on-going NIH funded programs, including a previous R01 on bat viruses (Daszak, PI). In addition to providing fundamental expertise in bat virology and immunology, AAHL is one of the largest and most sophisticated biocontainment facilities in the world and houses a large repository of characterized and as-yet uncharacterized emerging viruses. Of relevance to the current proposal, a significant proportion of the bat samples collected by CCM are stored at AAHL (for biocontainment reasons) such that access to a world class biocontainment facility will be essential for the successful completion of this project. Additionally, a number of parallel projects supported by CSIRO investment in the area of Transformational Biology will significantly value add to the current proposal. We are the only group in the world with immortalized bat cell lines of relevance to this project, essential for enabling ongoing *in vitro* research activities (Eric French Fellowship 2007), and we are continuing to develop new cell lines that will be used by this project. We are also rapidly expanding our bat immunology and genetics programs with CSIRO Office of the Chief Executive funding and participation in the AB-CRC funded project to sequence the transcriptome of *Pteropus* and *Rhinolophus* spp. bats.

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Project Director/Principal Investigator

Prefix	* First Name	Middle Name	* Last Name	Suffix
Dr.	Peter		Daszak	

Position/Title: Executive Director
Department: CCM

Organization Name: Wildlife Trust Inc
Division:

* Street1: 460 W34th Street
Street2: 17th Floor

* City: New York
County: New York
* State: NY: New York Province:

* Country: USA: UNITED STATES
* Zip / Postal Code: 10001

*Phone Number	Fax Number	* E-Mail
(b) (6)	2123804475	(b) (6)

Credential, e.g., agency login: (b) (6)

*** Project Role:** PD/PI
Other Project Role Category:

	File Name	Mime Type
***Attach Biographical Sketch**	8982-Bio_Daszak.pdf	application/pdf
Attach Current & Pending Support		

PROFILE - Senior/Key Person

Prefix	* First Name	Middle Name	* Last Name	Suffix
Dr.	W.	Ian	Lipkin	

Position/Title: Professor
Department: Epidemiology

Organization Name: The Trustees of Columbia University in the City of New York
Division:

* Street1: 630 West 168 Street, Box 49
Street2:

* City: New York
County:
* State: NY: New York Province:

* Country: USA: UNITED STATES
* Zip / Postal Code: 10032

*Phone Number	Fax Number	* E-Mail
(b) (6)		(b) (6)

Credential, e.g., agency login: (b) (6)

*** Project Role:** Co-PD/PI
Other Project Role Category:

	File Name	Mime Type
***Attach Biographical Sketch**	5696-Bio_Lipkin.pdf	application/pdf
Attach Current & Pending Support		

PROFILE - Senior/Key Person

Prefix	* First Name	Middle Name	* Last Name	Suffix
Dr.	Bruce	Andrew	Mungall	

Position/Title: Research Scientist
Department: Australian Animal Health Lab

Organization Name: Commonwealth Science and Industry Organization
Division:

* Street1: Private Bag 24
Street2:

* City: Geelong
County:
* State:
Province: Victoria

* Country: AUS: AUSTRALIA * Zip / Postal Code: VIC3220

*Phone Number	Fax Number	* E-Mail
(b) (6)		(b) (6)

Credential, e.g., agency login (b) (6)

*** Project Role:** Co-PD/PI **Other Project Role Category:**

	File Name	Mime Type
***Attach Biographical Sketch**	859-Bio_Mungall.pdf	application/pdf
Attach Current & Pending Support		

PROFILE - Senior/Key Person

Prefix	* First Name	Middle Name	* Last Name	Suffix
Dr.	Kate	Elizabeth	Jones	

Position/Title: Research Fellow Department: Institute of Zoology

Organization Name: Zoological Society of London Division:

* Street1: Regents Park Street2:

* City: London County: * State: Province:

* Country: GBR: UNITED KINGDOM * Zip / Postal Code: NW14RY

*Phone Number	Fax Number	* E-Mail
(b) (6)		(b) (6)

Credential, e.g., agency login: (b) (6)

*** Project Role:** Co-PD/PI **Other Project Role Category:**

	File Name	Mime Type
***Attach Biographical Sketch**	2366-Bio_Jones.pdf	application/pdf
Attach Current & Pending Support		

PROFILE - Senior/Key Person

Prefix	* First Name	Middle Name	* Last Name	Suffix
Dr.	Jonathan	H.	Epstein	

Position/Title: Senior Research Scientist Department: CCM

Organization Name: Wildlife Trust Division:

* Street1: 460 West 34th Street Street2: 17th Floor

* City: New York County: * State: NY: New York Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 10001

*Phone Number	Fax Number	* E-Mail
(b) (6)		(b) (6)

Credential, e.g., agency login (b) (6)

*** Project Role:** Co-PD/PI **Other Project Role Category:**

	File Name	Mime Type
***Attach Biographical Sketch**	8568-Bio_Epstein.pdf	application/pdf
Attach Current & Pending Support		

PROFILE - Senior/Key Person

Prefix	* First Name	Middle Name	* Last Name	Suffix
Dr.	Thomas		Briese	

Position/Title: Associate Professor
Department: Epidemiology

Organization Name: The Trustees of Columbia University in the City of New York
Division:

* Street1: 630 West 168 Street, Box 49
Street2:

* City: New York
County:
* State: NY: New York Province:

* Country: USA: UNITED STATES
* Zip / Postal Code: 10032

*Phone Number	Fax Number	* E-Mail
(b) (6)		(b) (6)

Credential, e.g., agency login: (b) (6)

*** Project Role:** Co-PD/PI
Other Project Role Category:

	File Name	Mime Type
***Attach Biographical Sketch**	0031-Bio_Briese.pdf	application/pdf
Attach Current & Pending Support		

PROFILE - Senior/Key Person

Prefix	* First Name	Middle Name	* Last Name	Suffix
Dr.	Gustavo	F.	Palacios	

Position/Title: Assistant Professor
Department: Epidemiology

Organization Name: The Trustees of Columbia University in the City of New York
Division:

* Street1: 630 West 168 Street, Box 49
Street2:

* City: New York
County:
* State: NY: New York Province:

* Country: USA: UNITED STATES
* Zip / Postal Code: 10032

*Phone Number	Fax Number	* E-Mail
(b) (6)		(b) (6)

Credential, e.g., agency login: (b) (6)

*** Project Role:** Co-PD/PI
Other Project Role Category:

	File Name	Mime Type
***Attach Biographical Sketch**	5740-Bio_Palacios.pdf	application/pdf
Attach Current & Pending Support		

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

Additional Senior/Key Person Form Attachments

When submitting senior/key persons in excess of 8 individuals, please attach additional senior/key person forms here. Each additional form attached here, will provide you with the ability to identify another 8 individuals, up to a maximum of 4 attachments (32 people).

The means to obtain a supplementary form is provided here on this form, by the button below. In order to extract, fill, and attach each additional form, simply follow these steps:

- Select the "Select to Extract the R&R Additional Senior/Key Person Form" button, which appears below.
- Save the file using a descriptive name, that will help you remember the content of the supplemental form that you are creating. When assigning a name to the file, please remember to give it the extension ".xfd" (for example, "My_Senior_Key.xfd"). If you do not name your file with the ".xfd" extension you will be unable to open it later, using your PureEdge viewer software.
- Using the "Open Form" tool on your PureEdge viewer, open the new form that you have just saved.
- Enter your additional Senior/Key Person information in this supplemental form. It is essentially the same as the Senior/Key person form that you see in the main body of your application.
- When you have completed entering information in the supplemental form, save it and close it.
- Return to this "Additional Senior/Key Person Form Attachments" page.
- Attach the saved supplemental form, that you just filled in, to one of the blocks provided on this "attachments" form.

Important: Please attach additional Senior/Key Person forms, using the blocks below. Please remember that the files you attach must be Senior/Key Person Pure Edge forms, which were previously extracted using the process outlined above. Attaching any other type of file may result in the inability to submit your application to Grants.gov.

1) Please attach Attachment 1	
2) Please attach Attachment 2	
3) Please attach Attachment 3	
4) Please attach Attachment 4	

ADDITIONAL SENIOR/KEY PERSON PROFILE(S)	**Filename** **MimeType**
Additional Biographical Sketch(es) (Senior/Key Person)	**Filename** **MimeType**
Additional Current and Pending Support(s)	**Filename** **MimeType**

Principal Investigator/Program Director (Last, First, Middle): Luby, Stephen Patrick

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Peter Daszak	Executive Director, Consortium for Conservation Medicine, Wildlife Trust
eRA COMMONS USER NAME (b) (6)	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Bangor University (UK)	BSc. (hons)	1986	Zoology
University of East London (UK)	Ph.D	1994	Infectious Diseases

A. Positions and Honors

Positions and Employment

1989-1992 Research Assistant, University of East London
1993-1998 Senior Faculty Research Scientist, Kingston University
1999 Guest Researcher, Centers for Disease Control and Prevention (CDC)
1999-2001 Faculty Research Scientist, University of Georgia
2001- Adjunct Faculty, Tufts Univ. Sch. Veterinary Med.; Univ. Georgia; Columbia Univ.
2001- Executive Director, Consortium for Conservation Medicine
2007- Co-Director, Joint Institute for Wildlife & Zoonoses, ECNU, Shanghai, China

Other Experience and Professional Membership

2000 Keynote speaker Merieux Foundation Conference on Emerging paramyxoviruses, France
2002 National Academy of Sciences: gave evidence to panel on infectious disease & climate change
2002-2006 United Nations Millenium Ecosystem Assessment: Lead Author, human infectious diseases
2003- NIH: ad hoc member, ZRG1 IDM-G 90 study section: Virology, Biodefense & Emerg. Diseases
2005- NIH: ad hoc member, ZRG1 IRAP-Q study section (infectious diseases, epidemiology)
2004- Editorial Board, Conservation Biology (Blackwell); Founding Co-Editor *EcoHealth* (Springer)
2004-2005 National Research Council: Member, Committee on Future Needs in Veterinary Research
2004- Member of Scientific Committee (Treasurer 2007-), DIVERSITAS (UNESCO-ICSU).
2005- International Standing Advisory Committee, Australian Biosecurity Cooperative Research Center
2005 NIAID: Steering Committee, workshop on virus-host shifts & emergence of new pathogens
2006- Founding board of directors, Treasurer, International Association of Ecology and Health
2006 Keynote address, Pasteur Institute Shanghai annual conference on infectious diseases

Honors

1999 Meritorious service award, Centers for Disease Control and Prevention (CDC)
2000 Winner of the CSIRO silver medal for international collaborative research
2002 Daszak *et al.* (2000) *Science* paper cited by ISI as a “fast-breaking paper”
2003 Work on Nipah virus featured on CBS 60 Minutes
2003 6th Annual Lecturer in Medicine and Humanities, Texas A&M, 2003
2006 West Nile virus *PLOS Biology* paper cited as “editor’s choice”, *Science* 311: 1675
2007 Finalist, Director’s Pioneer Award

B. Peer-reviewed publications (selected from 115)

*** = Corresponding author**

1. Ekbom A, **Daszak P**, Kraaz W & Wakefield AJ. Crohn's disease after *in utero* measles virus exposure. *Lancet* 1996; 348: 515-517.
2. Berger L, Speare R, **Daszak P**, et al. Chytridiomycosis causes amphibian population declines in the rain forests of Australia and Central America. *Proc. Natl Acad. Sci, USA* 1998; 95: 9031-9036.
3. **Daszak P**, Berger L, Cunningham AA, Hyatt AD, Green DE & Speare R Emerging infectious diseases & amphibian population declines. *Emerging Infectious Diseases* 1999; 5: 735-748.
4. **Daszak P**, Cunningham AA & Hyatt AD Emerging infectious diseases of wildlife - threats to biodiversity and human health. *Science* 2000; 287: 443-449
5. **Daszak P**, Cunningham AA & Hyatt AD Anthropogenic environmental change and the emergence of infectious diseases in wildlife. *Acta Tropica* 2001; 78:103-116.
6. Mazzoni R, Cunningham AA, **Daszak P** et al. Emerging pathogen in frogs (*Rana catesbeiana*) farmed for international trade. *Emerging Infectious Diseases* 2003; 9: 995-998
7. Goldsmith CS, Whistler T, Rollin PE, Ksiazek TG, Rota PA, Bellini WJ, **Daszak P**, Wong KT, Shieh W-J & Zaki SR Elucidation of Nipah virus morphogenesis and replication using ultrastructural and molecular approaches. *Virus Research* 2003; 92: 89-98
8. Hyatt AD, **Daszak P**, Cunningham AA, Field H & Gould AR Henipaviruses: Gaps in the knowledge of emergence. *Ecohealth* 2004; 1: 25-38.
9. Field HE, Mackenzie J & **Daszak P** Novel viral encephalitides associated with bats (Chiroptera) – host management strategies. *Archives of Virology* 2004; S18: 113-121.
10. Anderson PK, Cunningham AA, Patel NG, Morales FJ, Epstein PR & **Daszak P**. Emerging infectious diseases of plants. *Trends in Ecology and Evolution* 2004; 19: 535-544.
11. 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 L-F Bats are natural reservoirs of SARS-like coronaviruses. *Science* 2005; 310: 676-679.
12. Olival KJ & **Daszak P** The ecology of emerging neurotropic viruses *J. Neurovirology* 2005; 11: 441-446
13. Kilpatrick AM, Kramer LD, Campbell S, Alleyne EO, Dobson AP & **Daszak P** West Nile virus risk and the bridge vector paradigm. *Emerging Infectious Diseases* 2005; 11: 425-429.
14. Wolfe ND, **Daszak P**, Kilpatrick AM & Burke DS. Bushmeat hunting, deforestation and prediction of zoonotic disease emergence. *Emerging Infectious Diseases* 2005; 11: 1822-1827.
15. Pulliam J, Field H, Olival KJ & the Henipavirus Ecology Research Group (**Daszak P.**). An alternative explanation of Nipah virus strain variation. *Emerging Infectious Diseases* 2005; 11: 1978-1979
16. Epstein JH, Rahman SA, Halpin K, Meehan G, Jamaluddin AA, Hassan SS, Field HE, Hyatt AD, **Daszak P** Feral cats (*Felis catus*) and risk for Nipah virus. *Emerging Infectious Diseases* 2006;12: 1178-1179.
17. Kilpatrick AM, **Daszak P**, Jones MJ, Marra PP & Kramer LD Host heterogeneity dominates West Nile virus transmission. *Proceedings of the Royal Society: Biological Sciences* 2006; 273: 2327-2333.
18. Epstein JH, Field HE, Luby S, Pulliam JRC & **Daszak P.** Nipah Virus: Impact, Origins and Causes of Emergence. *Current Infectious Disease Reports* 2006; 8: 59-65
19. **Daszak P**, Plowright R, Epstein JH, Pulliam J, Abdul Rahman S, Field HE, Smith CS, Olival KJ, Luby S et al. The emergence of Nipah and Hendra virus: pathogen dynamics across a wildlife-livestock-human continuum. In: Collinge S & Ray S, Eds. *Disease Ecology*. Oxford Univ. Press 2006; 186-201
20. Kilpatrick AM, Kramer LD, Jones MJ, Marra PP & **Daszak P** West Nile virus epidemics in North America are driven by shifts in mosquito feeding behavior. *PLoS Biology* 2006; 4: 606-610.
21. Mendelson JR, Lips KR, Gagliardo RW, Rabb GB, Collins JP, Diffendorfer JE, **Daszak P** *et al.* Policy Forum: Confronting amphibian declines and extinctions. *Science* 2006; 313: 48.
22. Wang L-F, Shi Z, Zhang S, Field H, **Daszak P** & Eaton BT. A review of bats and SARS: virus origin and genetic diversity. *Emerging Infectious Diseases* 2006; 12: 1834-1840.
23. Kilpatrick AM, Chmura AA, Gibbons DW, Fleischer RC, Marra PP & **Daszak P**. Predicting the global spread of H5N1 avian influenza. *Proc. Natl. Acad. Sci., USA* 2006;103: 19368-19373.
24. Halpin K, Hyatt AD, Plowright RK, Epstein JH, **Daszak P**, Field HE, Wang L, Daniels PW and HERG. Emerging viruses: Coming in on a wrinkled wing and a prayer. *Current Infectious Disease Reports* 2007; 44: 711-717

25. Rodríguez JP, Taber AB, **Daszak P**. et al. Policy Forum: The globalization of conservation: A view from the South. *Science*; 317: 755-756.
26. Field HE, Mackenzie J & **Daszak P** Henipaviruses: Emerging paramyxoviruses associated with fruit bats. *Current Topics Microbiol. Immunol.* 2007; 315: 133-159.
27. **Daszak P**, Epstein JH, Kilpatrick AM, Aguirre AA, Karesh WB & Cunningham AA (2007). Collaborative research approaches to the role of wildlife in zoonotic disease emergence. *Current Topics Microbiol. Immunol.* 2007; 315: 463-475.
28. McLaughlin AB, Epstein JH, Prakash V, Smith CS, Field HE, **Daszak P** & Cunningham AA. Plasma biochemistry and hematological values for wild-caught flying foxes (*Pteropus giganteus*) in India. *J. Zoo. Wildl. Med.* 2007; 38: 446-452.
29. Cui J, Han N, Streicker D, Li G, Tang X, Shi Z, Hu Z, Zhao G, Fontanet A, Yi G, Wang L, Jones G, .Field HE, **Daszak P* (Corresponding Author)** & Zhang, S. Evolutionary relationships between bat coronaviruses and their hosts. *Emerging Infectious Diseases* 2007;13: 1526-1533
30. (b) (4)
31.
32.
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C. Research Support

ONGOING RESEARCH SUPPORT

N01 AI-25490 Kramer (PI) 10/01/02 - 10/01/09
NIH/NIAID
West Nile & pox viruses: ecology, pathogenesis & immunity
This subcontract provides partial salary for a postdoc to conduct field studies, mathematical modeling and analysis of the ecology of West Nile virus in the USA.
Role: PI on a subcontract, oversee research on WNV ecology.

NSF EF-062239 Kilpatrick (PI) 09/01/06 - 08/30/11
National Science Foundation/National Institutes of Health: Ecology of Infectious Diseases program
Predicting spatial variation in West Nile virus transmission
This project is to assess the interaction between vector populations, reservoir host populations and West Nile virus across an urban-to-rural human density gradient in the northeastern USA.
Role: Co-PI, planning and executing research on WNV ecology

NSF RCN Charles Perrings (PI) 02/01/07 – 01/31/10
NSF Research Coordination Network
Biodiversity and Ecosystem Services Training Network (BESTNet)
This project is to provide interdisciplinary research and training among diverse disciplines including ecologists and health scientists.
Role: Co-PI, responsible for program on biodiversity and infectious diseases

COMPLETED RESEARCH SUPPORT (during last 3 years)

R01 TW05869 Daszak 08/01/02 - 05/31/07
NIH/Fogarty International Center
Anthropogenic change & emerging zoonotic paramyxoviruses

This project investigated anthropogenic factors that drove the emergence of Nipah and Hendra viruses in Malaysia and Australia.
Role: PI, directed all research on Nipah and Hendra virus ecology, virology and pathology

DEB 02133851 Collins (PI) 10/01/03 - 09/30/06
National Science Foundation
Emerging diseases of wildlife: Threats to amphibian conservation
This project was to assess the role of environmental factors and emerging diseases on the global decline of amphibian populations.
Role: PI on subcontract, directed research on disease ecology and pathogenesis

HSD 0525216 Daszak (PI) 10/15/05-10/14/06
National Science Foundation: Human and Social Dynamics
Collaborative Research: Socio-Economic and Environmental Drivers of Emerging Diseases
National Science Foundation
This project was to analyze patterns of disease emergence globally and produce a broad risk assessment.
Role: PI, directed research on global patterns of disease emergence.

Principal Investigator/Program Director (Last, First, Middle): Lipkin, W. Ian

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
W. Ian Lipkin	Professor
eRA COMMONS USER NAME (b) (6)	

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Sarah Lawrence College, Bronxville, NY	B.A.	1974	Liberal Arts
Rush Medical College, Chicago, IL	M.D.	1978	Medicine

A. Positions and Honors.

Positions and Employment

1977-78 Clinical Clerk, Institute of Neurology, Queen Square, London, UK
1978-79 Intern in Medicine, Presbyterian Hospital, University of Pittsburgh, Pittsburgh, PA
1979-81 Resident in Medicine, University of Washington, Seattle, WA
1981-84 Resident in Neurology, University of California, San Francisco, CA
1984-90 Postdoctoral Fellow (Michael Oldstone & Floyd Bloom), Scripps Research Institute, La Jolla, CA
1990-02 Asst. Professor (1990-93), Assoc. Professor (1993-96), Professor (1996-02), Neurology; Anatomy & Neurobiology; Microbiology & Molecular Genetics, University of California Irvine, Irvine, CA
1996-97 Sabbatical Professor, Institut für Virologie und Immunbiologie, Universität Würzburg, Germany
1996-02 Adjunct Professor, Neuropharmacology, The Scripps Research Institute, La Jolla, CA
2000-02 Louise Turner Arnold Professor of Neuroscience, University of California Irvine, Irvine, CA
2002-07 Jerome L. and Dawn Greene Professor of Epidemiology; Director, Jerome L and Dawn Greene Infectious Disease Laboratory, Mailman School of Public Health; Professor of Neurology and Pathology, College of Physicians & Surgeons; Columbia University, New York, NY
2003- Principal Investigator and Scientific Director, Northeast Biodefense Center, Region II NIAID Regional Center of Excellence for Biodefense and Emerging Infectious Diseases
2003- Dalldorf Research Physician, Wadsworth Center, New York State Dept of Health
2007- Professor of Epidemiology, Neurology and Pathology; Director, Center for Infection and Immunity; Mailman School of Public Health and College of Physicians & Surgeons; Columbia University, New York, NY

Other Experience and Professional Memberships

Amer Bd of Internal Medicine, 1981; Amer Bd of Psychiatry and Neurology, 1986; National MS Soc Advisory Com on Fellowships, 1991-94; PI, UCI-Markey Program in Human Neurobiology, 1994-99; Founding Chair, Scientific Advisory Bd, Cure Autism Now Fdn, 1998-2000; Advisory Bd, 1st Intl Conf on Emerging Zoonoses, 1996; Organizer, Keystone Symp on Infections of the Nervous System, 1998; NCI/NIAID Blue Ribbon Panel on New Approaches to Identifying Infectious Etiologies of Chronic Disease, 1999; Bio-Centric Operations, US Joint Warfighting Center (bioterrorism), 1999; Organizer, NIAID Blue Ribbon Panel on Neurovirology, 2000; Organizer, Banbury Conf on Microbiology, Immunology and Toxicology of Autism and Other Neurodevelopmental Disorders, 2000; Organizer, Infectious Etiologies of Neuropsychiatric Disorders, World Congress Biol Psychiatry, Berlin, 2001; Organizer, FASEB Conf Microbial Pathogenesis, 2002; NCI Blue Ribbon Panel, Microbial Infection and Human Cancer, 2002; Scientific Advis Bd, 454 Life Sciences Corp, 2003; WHO SARS Lab Network, 2003; External Reviewer, Bd of Scientific Counselors, NIMH, 2003; Founding Chair, Emerging Infectious Diseases Discussion Group, NY Acad of Sciences, 2003; WHO Lab Network, 2004.

Honors

National MS Soc Postdoc Fellow, 1984; Silver Medal for Claret (Amateur) Sonoma County Fair, 1985; NINDS Clinical Investigator Development Award, 1987; National Alliance for Research in Schizophrenia and Depression Young Investigator, 1991; Pew Scholar Biomedical Sciences, 1991; State-of-the-Art Lecturer, American Soc Virology, 1997; Lecturer, XXIst Collegium Internationale Neuropsychopharmacologicum, 1997; Lecturer, 50th Anniversary NIAID/NIH, 1998; Visiting Professor, Japanese Health Sci Fdn, 1999; Visiting Bruenn Professor, Columbia Univ 2000; Millenium Commencement Speaker, Sarah Lawrence College, 2000; American Soc for Microbiol/Waksman Fdn Lecturer, 2001; Ellison Medical Fdn Senior Scholar in Global Infectious Diseases, 2002; Distinguished Lecturer, Institute of Genomics and Bioinformatics, UC Irvine, 2003; Special Advisor for Ministry of Science & Technology, People's Republic of China, 2003; Advisory Board, Guangzhou Ctr Biomedicine and Health, 2003; Dalldorf Res Physician NYS Dept of Health, 2003; Advisory Board, Institut Pasteur de Shanghai; Fellow, NY Academy of Sciences, 2003; CDC Distinguished Lecturer,

2005; Honorary Director, Beijing Infectious Disease Ctr, 2005; Visiting Professor Beijing University; Fellow, American Soc for Microbiol, 2006; Alumnae Citation for Achievement and Service, Sarah Lawrence College, 2006.

B. Selected peer-reviewed publications (in chronological order).

1. **Lipkin WI**, Parry G, Kiprov D, Abrams D (1985) Inflammatory neuropathy in homosexual men with lymphadenopathy. Neurology 35, 1479
2. Panitch HS, Francis GS, Hooper CJ, Messing RO, **Lipkin WI** (1985) Immunologic studies in patients with acquired immune deficiency syndrome. Ann NY Acad Sci 437, 413
3. **Lipkin WI**, Battenberg ELF, Bloom FE, Oldstone MBA (1988) Viral infection of neurons can depress neurotransmitter mRNA levels without histologic injury. Brain Res 451, 333
4. **Lipkin WI**, Carbone KM, Duchala CS, Narayan O, Oldstone MBA (1988) Neurotransmitter abnormalities in Borna disease. Brain Res 475, 366
5. **Lipkin WI**, Travis GH, Carbone KM, Wilson MC (1990) Isolation and characterization of Borna disease agent cDNA clones. Proc Natl Acad Sci USA 87, 4184
6. Briese T, de la Torre JC, Lewis A, Ludwig H, **Lipkin WI** (1992) Borna disease virus, a negative-strand RNA virus, transcribes in the nucleus of infected cells. Proc Natl Acad Sci USA 89, 11486
7. Briese T, Schneemann A, Lewis AJ, Park Y, Kim S, Ludwig H, **Lipkin WI** (1994) Genomic organization of Borna disease virus. Proc Natl Acad Sci USA 91, 4362
8. Schneider PA, Schneemann A, **Lipkin WI** (1994) RNA splicing in Borna disease virus, a non-segmented, negative-strand RNA virus. J Virol 68, 5007
9. Schwemmle M, De B, Shi L, Banerjee A, **Lipkin WI** (1997) Borna disease virus P-protein is phosphorylated by protein kinase Cε and casein kinase II. J Biol Chem 272, 21818
10. Schwemmle M, Salvatore M, Shi L, Lee C, **Lipkin WI** (1998) Interactions of the Borna disease virus P, N, and X proteins and their functional implications. J Biol Chem 273, 9007
11. Hatalski CG, Hickey WF, **Lipkin WI** (1998) Evolution of the immune response in the central nervous system during experimental Borna disease. J Neuroimmunol 90, 137
12. Hornig M, Weissenböck H, Horscroft N, **Lipkin WI** (1999) An infection-based model of neurodevelopmental damage. Proc Natl Acad Sci USA 96, 12102
13. Briese T, Jia X-J, Huang C, Grady LJ, **Lipkin WI** (1999) Identification of a Kunjin/West Nile-like flavivirus in brains of New York encephalitis patients. Lancet 354, 1261
14. Jia X-J, Briese T, Jordan I, Rambaut A, Chi HC, Mackenzie JS, Hall RA, Scherret J, **Lipkin WI** (1999) Genetic analysis of the West Nile New York 1999 encephalitis virus. Lancet 354, 1971
15. Walker MP, Schlaberg R, Hays AP, Bowser R, **Lipkin WI** (2001) Absence of echovirus sequences in brain and spinal cord of ALS patients. Ann Neurol 49, 249
16. Briese T, Rambaut A, Pathmajeyan M, Bishara J, Weinberger M, Pitlik S, **Lipkin WI** (2002) Phylogenetic analysis of a human isolate from the 2000 Israel West Nile virus epidemic. Emerg Infect Dis 8, 528
17. Zhai J, Briese T, Dai E, Wang X, Pang X, Du Z, Liu H, Wang J, Wang H, Guo Z, Chen Z, Jiang L, Zhou D, Han Y, Jabado O, Palacios G, **Lipkin WI**, Tang R (2004) Real-time polymerase chain reaction for detecting SARS coronavirus, Beijing, 2003. Emerg Infect Dis 10, 300
18. Hoffman KL, Hornig M, Yaddanapudi K, Jabado O, **Lipkin WI** (2004) A murine model for neuropsychiatric disorders associated with group A β-hemolytic streptococcal infection. J Neurosci 24,1780
19. Qiao M, Mundrigi A, Bernard KA, Palacios G, Zhou ZH, **Lipkin WI**, Jake Liang TJ (2004) Induction of sterilizing immunity against West Nile virus by immunization with West Nile virus-like particles produced in insect cells. J. Infectious Dis 190, 2104-2108
20. Briese T, Palacios G, Kokoris M, Jabado O, Liu Z, Renwick N, Kapoor V, Casas I, Pozo F, Limberger R, Perez-Brena P, Ju J, **Lipkin WI** (2005). Diagnostic system for rapid and sensitive differential detection of pathogens. Emerg Infect Dis 11, 310-313
21. Palacios G, Jabado O, Cisterna D, de Ory F, Renwick N, Castellanos A, Mosquera M, Freire MC, Campos RH, **Lipkin WI** (2005) Molecular typing of mumps genotypes from clinical samples: standardized method of analysis. J Clin Microbiol 43, 1869-1878
22. Macdonald J, Tonry J, Hall RA, Williams B, Palacios G, Ashok M, Jabado O, Clark D, Tesh RB, Briese T, **Lipkin WI** (2005) NS1 protein secretion during the acute phase of West Nile virus infection. J Virol 79, 13924-13933
23. Domingo C, Palacios G, Jabado O, Reyes N, Niedrig M, Gascon J, Cabrerizo M, **Lipkin WI**, Tenorio A (2006) Use of a short fragment of the C-terminal E gene for detection and characterization of two new lineages of dengue virus 1 in India. J Clin Microbiol 44, 1519
24. Palacios G, Briese T, Kapoor V, Jabado O, Liu Z, Venter M, Zhai J, Renwick N, Grolla A, Geisbert T, Drosten C, Towner J, Ju J, Paweska J, Nichol ST, Swanepoel R, Feldmann H, Jahrling PB, **Lipkin WI** (2006) MassTag polymerase chain reaction for differential diagnosis of viral hemorrhagic fevers. Emerg Infect Dis 12, 692-695

25. Briese T, Bird B, Kapoor V, Nichol ST, **Lipkin WI** (2006) Batai and Ngai virus: M- segment reassortment and association with severe disease in East Africa. J Virol 80, 5627-5630
26. Lamson D, Renwick N, Kapoor V, Liu Z, Palacios G, Ju J, Dean A, St. George K, Briese T, **Lipkin WI** (2006) MassTag polymerase-chain-reaction detection of respiratory pathogens, including a new rhinovirus genotype, causing influenza-like illness in New York State, 2004-2005/ J Infect Dis, Nov 15; 194 (10): 1398-402
27. Yaddanapudi K, Palacios G, Towner JS, Nichol ST, Sariol C, **Lipkin WI** (2006) Implication of a retrovirus-like glycoprotein peptide in the immunopathogenesis of Ebola and Marburg viruses. FASEB, 20, 2519
28. Jabado OJ, Palacios G, Kapoor V, Hui J, Renwick N, Zhai J, Briese T, **Lipkin WI** (2006) Greene SCPrimer: a rapid comprehensive tool for designing degenerate primers from multiple sequence alignments. *Nucleic Acids Res*, 34, 6605
29. Zhai J, Palacios G, Towner JS, Jabado O, Kapoor V, Venter M, Grolla, A, Briese T, Paweska J, Swanepoel R, Feldman H, Nichol ST, **Lipkin WI** (2006) A rapid molecular strategy for filovirus detection and characterization. J Clin Microbiol, 45, 224
30. Palacios G, Quan P-L, Jabado OJ, Conlan S, Hirschberg DL, Liu Y, Zhai J, Renwick N, Hui J, Hegyi H, Grolla A, Strong JE, Towner JS, Geisbert TW, Jahrling PB, Büchen-Osmond C, Ellerbrok H, Sanchez-Seco MP, Lussier Y, Formenty P, Nichol ST, Feldmann H, Briese T, **Lipkin WI** (2007) Panmicrobial oligonucleotide array for diagnosis of infectious diseases. *Emerg Infect Dis*, 13, 73, http://www.cdc.gov/ncidod/EID/13/1/73.htm
31. Quan P-L, Palacios G, Jabado OJ, Conlan S, Hirschberg DL, Richt J, Pozo F, Casas I, Perez-Breña P, Drysdale A, Hui J, Cisterna D, Baumeister E, Savy V, Garcia-Sastre A, Briese T, **Lipkin WI** (2007) Detection of respiratory viruses and subtype identification of influenza viruses by GreeneChipResp oligonucleotide microarray. *J Clin Microbiol*, 45, 2359.
32. (b) (4)
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C. Research Support.

Ongoing Research Support

(b) (4) Lipkin (PI) 10/01/01 to 09/30/07

Establish and implement new high throughput molecular methods for microbial surveillance.

U54 AI1057158 Lipkin (PI) 09/04/03 to 02/29/08
Northeast Biodefense Center
Establish a Regional Center of Excellence for Biodefense and Emerging Infectious Disease Research.

U01 NS047537 Lipkin (PI) 09/30/03 to 05/31/08
Gene:Environment Interactions in an Autism Birth Cohort
Establish a 100,000 child prospective birth cohort in Norway, collect clinical data and samples, map the natural trajectory of neurodevelopmental disorders, and establish a foundation for determining the role of gene-environment interactions in pathogenesis of neurodevelopmental disorders.

UC1 AI062705 Lipkin (PI) 09/30/04 to 08/31/08
MassTag PCR Detection of Respiratory Pathogens
Establish a multiplex PCR platform for differential diagnosis of acute respiratory disease.

HL083850 Lipkin (PI) 05/08/06 to 04/30/10
Pathogen Discovery in Chronic Lung Disease by Mass Tag PCR and Microarrays
Employ high throughput molecular diagnostic tools to survey for pathogen discovery in idiopathic pulmonary fibrosis, pulmonary arterial hypertension and bronchiolitis obliterans syndrome.

1U01AI070411 Lipkin (PI) 09/01/06 to 08/31/11
Viral Arrays for Biodefense
Establish and validate a viral sequence database and its complementary oligonucleotide array technology for detection and differentiation of influenza viruses and hemorrhagic fever viruses.

1 R24 EY017404 Hageman (PI, Univ of Iowa) 08/01/06-07/31/11
Subcontract to Columbia (Lipkin) from the Univeristy of Alabama
Development of Complement Modulating Therapeutics for AMD
The sub-contract will survey clinical samples (eyes and blood) for evidence of infection using two novel molecular diagnostic platforms, Mass Tag PCR and GreeneChips.

HHSN266200400036C Lefkowitz (PI, Univ Alabama) 06/30/06 to 06/28/09
Subcontract to Columbia (Lipkin) from the Viral Bioinformatics Resource Center
ICTVdB: A Virus Database for Biodefense and Emerging Infectious Disease Research
Curate and improve the user interface of the electronic database of the International Committee for Taxonomy of Viruses.

Completed Research Support

R01 AI51292 Lipkin (PI) 07/01/02 to 06/30/07
A Staged Strategy for Virus Identification and Discovery
Establish an integrated program in bioinformatics and molecular diagnostics focused on investigating the role of infection in neurologic diseases and cancer.

CDC/American Academy of Pediatrics Lipkin (PI) 09/30/02 to 09/29/06
MV Sequences in Children with Autistic Disorders
Determine whether autism is associated with the presence of measles virus sequences in gastrointestinal tract through blinded analysis in three laboratories (Columbia, CDC, Coombe Women's Hospital).

HD37546 Lipkin (PI) 05/01/00 to 04/30/06
A Developmental Model for Autism Based on CNS Infection

AI55466 Rewers (PI, Univ Colorado) 10/01/02 to 09/30/04
Subcontract to Columbia (Lipkin)
Viral Triggers of Type I Diabetes

NS29425 Lipkin (PI) 07/01/98 to 06/30/03
Molecular Analysis of a Neurotropic Agent, Borna Virus

MH57467 Lipkin (PI) 07/01/99 to 06/30/03
Borna Disease Virus and Neuropsychiatric Disease

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Bruce Andrew Mungall	Research Scientist
eRA COMMONS USER NAME (b) (6)	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Queensland	B.Sc.	1991	Biological Science
University of Queensland	B.Sc. (Hons)	1992	Physiology & Pharmacology
University of Queensland	Ph.D.	2000	Veterinary Science

A. Positions

1996-2000 Doctoral Candidate, Department of Companion Animal Medical Science, School of Veterinary Science, University of Queensland, St. Lucia, Queensland, Australia

2000-2001 Post Doctoral Fellow, Department of Pediatrics, Division of Infectious Diseases, Epidemiology and Immunology, Emory University School of Medicine, Atlanta, Georgia.

2001-2002 Post Doctoral Fellow, Strain Surveillance Section, Influenza Branch, Division of Viral and Rickettsial Diseases, Centres for Disease Control and Prevention, Atlanta, Georgia.

2003 Post Doctoral Fellow, Metabolic Research Unit, School of Science, Deakin University, Waurn Ponds, Victoria, Australia

2004 Post Doctoral Fellow, Pituitary Research Group, Murdoch Children's Research Institute, Parkville, Victoria, Australia

2004-2006 Research Scientist, Australian Animal Health Laboratory, Commonwealth Science and Industry Organisation, Geelong, Victoria, Australia

2007-present Project Leader, Henipavirus Therapeutics, Australian Animal Health Laboratory, Commonwealth Science and Industry Organisation, Geelong, Victoria, Australia

Honours

2006 Smart Geelong Network Researcher of the Year (Bruce Mungall, Mark Rechenberg, Rob Hensel and Dayna Johnson) in the category of Animal Health for the development of radio telemetry monitoring systems for temperature monitoring of animals at BSL4.

2007 Recipient of the Eric French Fellowship (awarded by CSIRO Livestock Industries) to enable the acquisition and establishment of primary cell line transformation technology from US collaborators.

2007 Smart Geelong Network Researcher of the Year (Nick Schopman, Terry Wise, Tim Doran and Bruce Mungall) in the category of Biotechnology for the application of RNAi toward a therapeutic intervention for Nipah and Hendra virus.

B. Selected Publications.

1. **Mungall, B.A.**, Shinkel, T.A., Sernia, C. (1995) Immunocytochemical localization of angiotensinogen in the fetal and neonatal rat brain. Neuroscience. 67(2):505-24.

2. Wright, J.W., Clemens, J.A., Panetta, J.A., Smalstig, E.B., Weatherly, L.A., Kramar, E.A., Pederson, E.S., **Mungall, B.A.**, Harding, J.W. (1996) Effects of LY231617 and angiotensin IV on ischemia-induced deficits in circular water maze and passive avoidance performance in rats. Brain Res. 717(1-2):1-11.

3. **Mungall, B.A.**, Pollitt, C.C., Collins, R. (1998) Localisation of gelatinase activity in epidermal hoof lamellae by in situ zymography. Histochem Cell Biol.110(5):535-40.

4. **Mungall, B.A.**, Pollitt, C.C. (1999) Zymographic analysis of equine laminitis. Histochem Cell Biol. 112(6):467-72.

5. **Mungall, B.A.**, Kyaw-Tanner, M., Pollitt, C.C. (2001) In vitro evidence for a bacterial pathogenesis of equine laminitis. Vet Microbiol. 79(3):209-23.

6. **Mungall, B.A.**, Pollitt, C.C. (2001) In situ zymography: topographical considerations. J Biochem Biophys Methods. 47(3):169-76.

7. **Mungall, B.A.**, Pollitt, C.C. (2002) Thermolysin activates equine lamellar hoof matrix metalloproteinases. J Comp Pathol. 126(1):9-16.

8. Xu, X., Smith, C.B., **Mungall, B.A.**, Lindstrom, S.E., Hall, H.E., Subbarao, K., Cox, N.J., Klimov, A. (2002) Intercontinental circulation of human influenza A(H1N2) reassortant viruses during the 2001-2002 influenza season. J Infect Dis. 186(10):1490-3.

9. Loukopoulos, P., **Mungall, B.A.**, Straw, R.C., Thornton, J.R., Robinson, W.F. (2003) Matrix metalloproteinase-2 and -9 involvement in canine tumors. Vet Pathol. 40(4):382-94.

10. **Mungall, B.A.**, Xu, X., Klimov, A. (2003) Assaying susceptibility of avian and other influenza A viruses to zanamivir: comparison of fluorescent and chemiluminescent neuraminidase assays. Avian Dis. 47(3 Suppl):1141-4.

11. Xu, X., Lindstrom, S.E., Shaw, M.W., Smith, C.B., Hall, H.E., **Mungall, B.A.**, Subbarao, K., Cox, N.J., Klimov, A. (2004) Reassortment and evolution of current human influenza A and B viruses. Virus Res. 103(1-2):55-60.

12. **Mungall, B.A.**, Xu, X., Klimov, A. (2004) Surveillance of influenza isolates for susceptibility to neuraminidase inhibitors during the 2000-2002 influenza seasons. Virus Res. 103(1-2):195-7.

13. Loukopoulos, P., O'Brien, T., Ghoddusi, M., **Mungall, B.A.**, Robinson, W.F. (2004) Characterisation of three novel canine osteosarcoma cell lines producing high levels of matrix metalloproteinases. Res Vet Sci.77(2):131-41.

14. Bossart, K.N., Crameri, G., Dimitrov, A.S., **Mungall, B.A.**, Feng, Y.R., Patch, J.R., Choudhary, A., Wang, L.F., Eaton, B.T., Broder, C.C. (2005) 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.

15. Bonaparte, M.I., Dimitrov, A.S., Bossart, K.N., Crameri, G., **Mungall, B.A.**, Bishop, K.A., Choudhry, V., Dimitrov, D.S., Wang, L.F., Eaton, B.T., Broder, C.C. (2005) Ephrin-B2 ligand is a functional receptor for Hendra virus and Nipah virus. Proc. Natl. Acad. Sci. U.S.A. 26;102(30):10652-7.

16. Bossart, K.N., **Mungall, B.A.**, Crameri, G., Wang, L.F., Eaton, B.T., Broder, C.C. (2005) Inhibition of Henipavirus fusion and infection by heptad-derived peptides of the Nipah virus fusion glycoprotein. Virol J. 18;2:57.

17. Zhu. Z., Dimitrov, A.S., Bossart, K.N., Crameri, G., Bishop, K.A., Choudhry, V., **Mungall, B.A.**, Feng, Y.R., Choudhary, A., Zhang, M.Y., Feng, Y., Wang, L.F., Xiao, X., Eaton, B.T., Broder, C.C., Dimitrov, D.S. (2006) Potent neutralization of hendra and nipah viruses by human monoclonal antibodies. J Virol.80(2):891-9.

18. **Mungall, B.A.**, Middleton, D., Crameri, G., Bingham, J., Halpin, K., Russell, G., Green, D., McEachern, J., Pritchard, L.I., Eaton, B.T., Wang, L.F., Bossart, K.N., Broder, C.C. (2006) Feline model of acute nipah

virus infection and protection with a soluble glycoprotein-based subunit vaccine. J. Virol. 80(24): 12293-302.

19. **Mungall, B.A.**, Middleton, D., Crameri, G., Halpin, K., Bingham, J., Eaton, B.T. and Broder, C.C. (2007) Vertical transmission and fetal replication of Nipah virus in an experimentally infected cat. J.I.D. 196(6): 812-6.

20. Porotto, M., Carta, P., Deng, Y., Kellogg, G.E., Whitt, M., Lu, M., **Mungall, B.A.**, Moscona, A. (2007) Molecular determinants of antiviral potency of paramyxovirus entry inhibitors. *J Virol.* Jul 25 (Epub).

21. Halpin, K. and **Mungall, B.A.** (2007) Recent progress in henipavirus research. Comparative Immunology, Microbiology & Infectious Diseases Jul 13 (Epub).

C. Research Support
Previous None

Current None

Completed (last 3 years)
"Nipah Virus and Hendra Virus Peptide Therapeutics"
Principal Investigator: Christopher C. Broder, Ph.D.
Agency: NIH/NIAID, Type 1 U01 AI056423-01 Period: September 15, 2003 to February 28, 2007
Major goals: 1. Establish virus infection, lethal dose, and detection parameters of Nipah virus in the cat model. 2. Design and synthesize second-generation, capped, heptad peptides and develop assay procedures for peptide detection in cat blood/plasma. 3. Evaluate the pharmacokinetics and determine the serum half-life of the peptide in the cat. 4. Determine the efficacy of heptad peptide in Nipah virus infected cats. Bruce Mungall PhD. Research Scientist responsible for performing and achieving all activities listed. (No overlap).

Principal Investigator/Program Director (Last, First, Middle):

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Kate Elizabeth Jones	Research Fellow, Institute of Zoology, Zoological Society of London
eRA COMMONS USER NAME (b) (6)	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Leeds (UK)	B.Sc.	1993	Zoology (with honors)
Roehampton University (UK)	Ph.D.	1998	Zoology
Imperial College (UK)	Post Doc	1999-2000	Biodiversity
University of Virginia (US)	Post Doc	2000-2003	Biodiversity

A. Positions and Honors

Positions and Employment

1999 London Conservation Officer, Bat Conservation Trust (UK)
1999-2000 Postdoctoral Research Assistant, Imperial College (UK)
2000-2003 Postdoctoral Research Associate, University of Virginia (USA)
2003-2005 Research Fellow, Earth Institute, Columbia University (US)
2005- Research Fellow, Institute of Zoology, Zoological Society of London (UK)
2005- Honorary Research Fellow, University College London (UK)
2005- Adjunct Faculty, University of Cambridge (UK)
2006- Associate, Consortium for Conservation Medicine (US)

Other Experience and Professional Membership

2006- Journal Editor - Global Ecology and Biogeography
2006- Member of IUCN Species Specialist Conservation Group, Chiroptera
2006- Chair of IUCN Advisory Group on Historical Extinctions
2006- Trustee of The Bat Conservation Trust (UK)

Workshop participant for the following:

- *Research Coordination Network: TraitNet.* Columbia University, New York, US (2007-2010)
- *Research Coordination Network: Integrating Macroecological Pattern and Processes across Scales*. University of New Mexico, US (2007-2010).
- *Global Biodiversity Indicators Development*. Zoological Society of London & Imperial College, UK (2006-2009).
- *Infectious Disease and Host Behavior*. National Center for Ecological Analysis and Synthesis, University of California, US (2001-2003).
- *Role of Pathogens in the Conservation of Biological Diversity*. Conservation International, US, (2002-2006).

Honors

- Nominated in 2006 for the Philip Leverhulme Prize for recognition of original and significant contributions to knowledge in zoology.
- My research has been widely reported in the local, national and international press (including BBC, CNN, The Daily Telegraph UK, Discover Magazine, BBC Wildlife, The Economist, Radio 4 UK, Radio Scotland UK, National Public Radio USA, New Scientist UK, New York Times USA; The Sun UK, Washington Post USA).

B. Peer-reviewed publications (selected from 55)

1. Publications: Peer Reviewed Journals

1. 1997. ***Jones K.E.** and A. Purvis. An optimum body size for mammals? Comparative evidence from bats. *Functional Ecology* 11:751-756.
2. 2000. Purvis A., **K.E. Jones**, and G. Mace. Extinction. *Bioessays* 22:1123-1133.
3. 2001. Gittleman J.L., M.E. Gompper and **K.E. Jones**. Extinction: complexity of assessing risk. *Science* 292:217-218.
4. 2001. Hosken D., **K.E. Jones**, K. Chipperfield and A. Dixson. Is the bat os penis sexually selected? *Behavioural Ecology and Sociobiology* 50:450-460.
5. 2001. ***Jones K.E.** and A. MacLarnon. Bat life-histories: testing models of mammalian life history evolution. *Evolutionary Ecology Research* 3:465-476.
6. 2001. ***Jones K.E.**, K.E. Barlow, N. Vaughan, A. Rodriguez-Duran and M. Gannon. Short-term impacts of extreme environmental disturbance on the bats (Chiroptera) of Puerto Rico. *Animal Conservation* 4:56-66.
7. 2002. Hewitt G., A. MacLarnon and **K.E. Jones**. The functions of laryngeal air sacs in primates: a new hypothesis. *Folia Primatologica* 73:70-94.
8. 2002. ***Jones K.E.**, A. Purvis, A. MacLarnon, O.R.P. Bininda-Emonds and N.B. Simmons. A phylogenetic supertree of the bats (Mammalia: Chiroptera). *Biological Reviews* 77:223-259.
9. 2003. Altizer S., C.L. Nunn, P.H. Thrall, J.L. Gittleman, J. Antonovics, A.A. Cunningham, A.P. Dobson, V. Ezenwa, **K.E. Jones**, A.B. Pedersen, M. Poss and J.R.C. Pulliam. Social organization and parasite risk in mammals: integrating theory and empirical studies. *Annual Review of Ecology, Evolution and Systematics* 34:517-547.
10. 2003. Bininda-Emonds O.R.P., **K.E. Jones**, S.A. Price, R. Grenyer, M. Cardillo, M. Habib, A. Purvis and J.L. Gittleman. Supertrees are a necessary not-so-evil: A comment on Gatesy *et al*. *Systematic Biology* 52:724-729.
11. 2003. ***Jones K.E.**, A. Purvis and J.L. Gittleman. Biological correlates of extinction risk in bats. *American Naturalist* 161:601-614.
12. 2003. Nunn C.L., S. Altizer, **K.E. Jones** and W. Sechrest. Comparative tests of parasite species richness in primates. *American Naturalist* 162:597-614.
13. 2003. Purvis A., A. Webster, P-M. Agapow, **K.E. Jones** and N.J.B. Isaac. Primate life histories and phylogeny. In: *Primate Life Histories and Socioecology* (eds. P.M . Kappeler and M. Pereira), pp 25-40. Chicago: University of Chicago Press.
14. 2003. Smith F.A., S.K. Lyons, S.K.M. Ernest, **K.E. Jones**, D.M. Kaufman, T. Dayan, P.A. Marquet, J.H. Brown, and J.P. Haskell. Body mass of late Quaternary mammals. *Ecology* 84: 3403.
15. 2004. Bininda-Emonds O.R.P., **K.E. Jones**, S.A. Price, M. Cardillo, R. Grenyer, and A. Purvis. Garbage in, garbage out: Data issues in supertree construction. In: *Phylogenetic supertrees: Combining information to reveal the Tree of Life* (ed. O.R.P. Bininda-Emonds). Computational Biology Series, Vol 4, pp 267-280. Kluwer Academic Publishers, Dordrecht, The Netherlands.
16. 2004. Blackburn T.M., **K.E. Jones**, P. Cassey and N. Losin. The influence of spatial resolution on macroecological patterns of range size variation: a case study using parrots (Psittaciformes) of the world. *Journal of Biogeography* 31:285-293.
17. 2004. Cassey P., T.M. Blackburn, G.J. Russell, **K.E. Jones** and J.L. Lockwood. Influences in the transport and establishment of traded bird species: a comparative analysis of the parrots (Psittacidae) of the world. *Global Change Biology* 10:417-426.

18. 2004. Cassey P., T.M. Blackburn, **K.E. Jones** and J.L. Lockwood. Mistakes in the analysis of exotic species establishment: source pool designation and correlates of introduction success among parrots (Psittaciformes) of the world. *Journal of Biogeography* 31:277-284
19. 2004. Gittleman J.L., **K.E. Jones** and S.A. Price. Supertrees: using complete phylogenies in comparative biology. In: *Phylogenetic supertrees: combining information to reveal the Tree of Life* (ed. O.R.P. Bininda-Emonds). Computational Biology Series, Vol 4, pp 439-460. Kluwer Academic Publishers, Dordrecht, The Netherlands.
20. 2004. ***Jones K.E.** and A.M. MacLarnon. Affording larger brains: testing hypotheses of mammalian brain evolution on bats. *American Naturalist* 164:20-31.
21. 2004. Maurer B.A., J.H. Brown, T. Dayan, B.J. Enquist, S.K.M. Ernest, E.A. Hadly, J.P. Haskell, D. Jablonski, **K.E. Jones**, D.M. Kaufman, S.K. Lyons, K.J. Niklas, W.P. Porter, K. Roy, F.A. Smith, B. Tiffney and W.R. Willig. Similarities in body size distributions of small-bodied flying vertebrates. *Evolutionary Ecology Research* 6:783-797.
22. 2004. Nunn C.L., S. Altizer, W. Sechrest, **K.E. Jones**, R.A. Barton and J.L. Gittleman. Parasites and the evolutionary diversification of primate clades. *American Naturalist* 164: 90-103.
23. 2004. Smith F.A., J.H. Brown, J.P. Haskell, S.K. Lyons, J. Alroy, E.L. Charnov, T. Dayan, B.J. Enquist, S.K.M. Ernest, E.A. Hadly, **K.E. Jones**, D.M. Kaufman, P.A. Marquet, B.A. Maurer, K.J. Niklas, W.P. Porter, B. Tiffney and M.R. Willig. Similarity of mammalian body size across the taxonomic hierarchy and across space and time. *American Naturalist* 163:672-691.
24. 2005. Cardillo M., G.M. Mace, **K.E. Jones**, J. Bielby, O.R.P. Bininda-Emonds, W. Sechrest, C.D.L. Orme and A. Purvis. Multiple causes of high extinction risk in large mammal species. *Science* 309:1239-1241.
25. 2005. Isaac N.J.B., **K.E. Jones**, J.L Gittleman and A. Purvis. Correlates of species richness in mammals: Body size, life-history and ecology. *American Naturalist* 165:600-607.
26. 2005. ***Jones K.E.**, O.R.P. Bininda-Emonds and J.L. Gittleman. Bats, clocks and rocks: diversification patterns in Chiroptera. *Evolution* 59:2243-2255.
27. 2005. ***Jones K.E.**, W. Sechrest and J.L. Gittleman. Age and area revisited: identifying global patterns and implications for conservation. In: *Phylogeny and Conservation* (eds. A. Purvis, J.L. Gittleman and T. Brooks), pp 141-165. Cambridge: Cambridge University Press.
28. 2006. Cruz-Neto A.P. and **K.E. Jones**. Exploring the evolution of the basal metabolic rates of bats. In: *Functional and Evolutionary Ecology of Bats* (eds. A. Zubaid, G.F. McCracken and T.H. Kunz), pp 56-89. New York: Oxford University Press.
29. 2006. Grenyer, R., C. D.L. Orme, S.F. Jackson, G.H. Thomas, R.G. Davies, T.J. Davies, **K.E. Jones**, V.A. Olson, R.S. Ridgely, P.C. Rasmussen, T-S Ding, P.M. Bennett, T.M. Blackburn, K.J. Gaston, J.L. Gittleman and I.P.F. Owens. The global distribution and conservation of rare and threatened vertebrates. *Nature* 444:93-96.
30. 2006. Pitnick S., **K.E. Jones** and G.S. Wilkinson. Mating system and brain size in bats. *Proceedings of the Royal Society of London, Series B*. 273:719-724.
31. 2007. Bielby J.N., G.M. Mace, O.R.P. Bininda-Emonds, M. Cardillo, J.L. Gittleman, **K.E. Jones**, D. Orme and A. Purvis,. The fast-slow continuum in mammalian life history: an empirical re-evaluation. *American Naturalist* 169:748-757.
32. 2007. Bininda-Emonds, O.R.P., M. Cardillo, **K.E. Jones**, R.D.E. MacPhee, R.M.D. Beck, R. Grenyer, S.A. Price, R. Vos, J.L. Gittleman & A. Purvis. The delayed rise of present-day mammals. *Nature* 446:507-512.
33. 2007. Davies, R.G., C. D.L. Orme, A.J. Webster, **K.E. Jones**, T.M. Blackburn and K.J. Gaston. Environmental predictors of global parrot (Aves: Psittaciformes) species richness and phylogenetic diversity. *Global Ecology and Biogeography* 16:220-233.
34. 2007. Lindenfors, P, J.L. Gittleman and **K.E. Jones**. Sexual size dimorphism in mammals. In: *Sex, Size and Gender Roles: Evolutionary Studies of Sexual Size Dimorphism* (eds. Fairbairn, D.J., W.U. Blanckenhorn, and T. Szekely), pp 16- 26. Oxford: Oxford University Press.
35. 2007. Lindenfors, P., C.L. Nunn, **K.E. Jones**, A.A. Cunningham, W. Sechrest and J.L. Gittleman. Parasite species richness in carnivores: Effects of host body mass, latitude, geographic range and population density. *Global Ecology and Biogeography*16:496-509.
36. 2007. Pedersen, A.B., **K.E. Jones**, C.L. Nunn and S. Altizer. Infectious diseases and extinction risk in wild mammals. *Conservation Biology* 21:1269-1279.

37. (b) (4)

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*** = Corresponding author**

C. Research Support

ONGOING RESEARCH SUPPORT

Jones & Chatterjee (Co-PIs) Oct 2007-Oct 2010
(b) (4)
Evolution of echolocation in bats – PhD studentship.
Role: Co-supervisor

Jones (PI) June 2007- June 2008
(b) (4)
Bats of the Steppe: monitoring bat biodiversity in Mongolia.
This is a scoping award to set up a bat monitoring program in Mongolia.
Role: PI

Jones (PI) May 2006- May 2009
(b) (4)
Monitoring bat biodiversity: indicators of sustainable development in Eastern Europe.
This is 3 year project to set up bat monitoring programs in Romania, Hungary, Bulgaria and Moldova.
Role: PI

COMPLETED RESEARCH SUPPORT (during last 3 years)

HSD 0525216 Daszak (PI) Jones (Co-PI) Oct 2005 – Oct 2006
National Science Foundation: Human and Social Dynamics
Collaborative Research: Socio-Economic and Drivers of Emerging Diseases
This project was to analyse patterns of disease emergence globally and produce a broad risk assessment.
Role: Co-PI, analyzed data and co-wrote resulting papers.

Jones (PI) June 2003- June 2005
Earth Institute, Columbia University
Predicting Extinction: Models of Global Priority Setting for Conservation.
This was a 2 year fellowship to use spatial and biological and ecological trait data to model extinction risk in mammals and predict future extinction under different scenarios of global change.
Role: PI

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME Jonathan H. Epstein	POSITION TITLE Senior Research Scientist Veterinary Epidemiology, Emerging Zoonoses
eRA COMMONS USER NAME (b) (6)	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Brandeis University, MA	BA	1996	Biology
Tufts University, Sch. Vet. Med., Grafton, MA	DVM	2002	Wildlife Med., Intl. Med.
Tufts University, School of Medicine, Boston, MA	MPH	2002	Epidemiology
Tufts University, Sch. Vet. Med., Grafton, MA	Cert Intl Med	2002	Zoonotic Diseases

Please refer to the application instructions in order to complete sections A, B, and C of the Biographical Sketch.

A. Positions and Honors

Positions and Employment

2002 Public Health Externship, Division of Viral and Rickettsial Diseases, Centers for Disease Control and Prevention (CDC), Atlanta, GA
2002-2003 Veterinary Internship, Small animal emergency and critical care, Ocean State Vet. Spec., RI
2003- Senior Research Scientist, Consortium for Conservation Medicine, Columbia University, NY
2003- Adjunct Faculty, Ecology, Columbia Univ., NY & Tufts University Cummings School of Veterinary Medicine, MA.
2006- Adjunct Faculty, Mailman School of Public Health, Columbia Univ, NY
2007- Adjunct Asst. Clinical Professor, Public Health & Family Med, Tufts Univ School of Medicine, MA

Other Experience and Professional Memberships

1998- Member: American Veterinary Medicinal Association, American Association of Zoo Vets, Wildlife Disease Association, New York Academy of Sciences,
2003- Appointed Member, IUCN Veterinary Specialist Group
2004 Invited speaker, WHO, Emerging Zoonotic Diseases Working Group meeting
2004 Invited speaker, Merieux Foundation Conference on Emerging Viral Respiratory Pathogens
2004 Invited speaker, Swiss Re Executive Roundtable on Emerging Diseases
2004 Invited speaker, Royal Swedish Academy of Forestry and Agriculture: Ecology of Henipaviruses
2004 Invited speaker, Swedish University of Agricultural Sciences: Disease Emergence
2006- Member, IUCN Chiroptera Species Specialist Group; Advisory committee, Suffolk Country Board of Public Health; Delta Omega Public Health Honors Society, International Assoc. Ecology and Health

Honors

2002 First recipient, Certificate of International Veterinary Medicine, Tufts University Sch. Vet. Med.
2002 Hills award for excellence in veterinary clinical nutrition
2002 Sylvia Mainzer award for outstanding achievement in the field of public health
2006 Inducted into Delta Omega Honor Society for Public Health (Alpha Rho Chapter – 1st alumni inductee; 1st Inaugural Keynote Speaker)

B. Peer-reviewed publications (in chronological order)

1. McCall, B.J., **Epstein, J.H**. & Annette, N., Potential human exposure to Australian bat Lyssavirus, Queensland, 1996-1999. *Emerging Infectious Diseases* 2000; 6: 259-264

2. Kaufman, G.E., Else, J., Bowen, K., Anderson, M. & **Epstein, J.H**. Conservation medicine in the veterinary curriculum. *EcoHealth* 2004; 1: S43-S49.

3. Daszak, P., Tabor, G.M., Kilpatrick, A.M., **Epstein, J**. & Plowright, R. Conservation Medicine and a new agenda for emerging diseases. *Annals of the New York Academy of Sciences* 2004; 1026: 1-11

4. Patz, J.A., Daszak, P., Tabor, G.M., Aguirre, A.A., Pearl, M., **Epstein, J**., Wolfe, N.D., Kilpatrick, A.M., Foufopoulos, J., Molyneux, D., Bradley, D.J. & Members of the Working Group Land Use Change and Disease Emergence. Unhealthy Landscapes: Policy Recommendations on Land Use Change and Disease Emergence. *Environmental Health Perspectives* 112: 1092-1098

5. Newman SH, **Epstein JH**, Schloegel LM. The nature of emerging zoonotic diseases: ecology, prediction, and prevention. *Medical Laboratory Observer* 2005 37:10-19.

6. 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 L-F Bats are natural reservoirs of SARS-like coronaviruses. *Science* 2005; 310: 676-679.

7. Pulliam J, Field H, Olival KJ & the Henipavirus Ecology Research Group (**Epstein**). An alternative explanation of Nipah virus strain variation. *Emerging Infectious Diseases*. 2005; 11: 1978-1979

8. Daszak, P., Plowright, R., **Epstein, J.H**., Pulliam, J., Abdul Rahman, S., Field, H.E., Smith, C.S., Olival, K.J., Luby, S., Halpin, K., Hyatt, A.D. & the Henipavirus Ecology Research Group (HERG). The emergence of Nipah and Hendra virus: pathogen dynamics across a wildlife-livestock-human continuum. In: Collinge, S.K. & Ray, C. (Eds.), Disease Ecology: Community Structure and Pathogen Dynamics Oxford University Press 2006; pp 186-201.

9. **Epstein, J.H**., Field, H.E., Luby, S., Pulliam, J., and Daszak, P. Nipah Virus: Impact, Origins, and Causes of Emergence. *Current Infectious Disease Reports* 2006; 8: 59-65.

10. **Epstein, J.H**., Rahman, S.A., Zambriski, J.A., Halpin, K., Meehan, G., Jamaluddin, A.A., Hassan, S.S., Field, H.E., Hyatt, A.D., Daszak, P. & HERG. Feral cats (*Felis catus*) as possible vectors for Nipah virus. *Emerging Infectious Diseases*. 2006; 12: 1178-1179.

11. Breed, A.C., Field, H.E., **Epstein, J.H**., Daszak, P. Emerging henipaviruses and flying foxes - conservation and management perspectives. *Biological Conservation* 2006;131: 211-220.

12. **Epstein, J.H.,** McKee, J., Shaw, P., Hicks, V., Micalizzi, G., Daszak, P., Kilpatrick, A.M. & Kaufman, G.The Australian white ibis (*Threskiornis molucca*) as a reservoir of zoonotic and livestock pathogens.*EcoHealth*. 2006; 3: 290-298.

13. Halpin, K., Hyatt, A.D., Plowright, R.K., **Epstein, J.H**., Daszak, P., Field, H.E., Wang, L., Daniels, P., and the Henipavirus Ecology Research Group. 2007 Emerging viruses – coming in on a wrinkled wing and a prayer. *Clinical Infectious Diseases* 2007; 44: 711-17.

14. (b) (4)

15. (b) (4)

C. Research Support
Ongoing Research Support

1K08AI067549 - 01A2 Epstein (PI) 07/01/2007 – 6/30/2011
NIH/NIAID
Understanding the ecology of Nipah virus in Bangladesh. The study will conduct cross-sectional and longitudinal Nipah virus surveillance in *Pteropus giganteus* across Bangladesh and analyze data alongside human outbreak data to model the drivers of emergence.
Role: PI

(b) (4) Epstein (PI) 01/01/2007 – 12/31/2007
The study is designed to train Bangladeshi health care professionals including veterinarians and physicians in Nipah virus surveillance and to develop intervention techniques that prevent infection.
Role PI

Principal Investigator/Program Director (Last, First, Middle):

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Thomas Briese	Associate Professor
eRA COMMONS USER NAME (b) (6)	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Freie Universität Berlin, Germany	M.S.	1983	Biology
Freie Universität Berlin, Germany	Ph.D.	1987	BIOLOGY

A. Positions and Honors.

Positions and Employment

1987-1988 Postdoctoral Fellow, Dept. T. A. Trautner, Max-Planck-Institut für molekulare Genetik, Berlin, Germany
1989-1990 Postdoctoral Fellow, Institute of Virology, Freie Universität Berlin, Germany
1991-1992 Assistant Researcher, Institute of Virology, Freie Universität Berlin, Germany
1992-1994 Visiting Assistant Researcher, Dept. of Neurology, University of California, Irvine, CA
1994-1995 Assistant Researcher, Institute of Virology, Freie Universität Berlin, Germany
1995-1996 Researcher, Institute of Microbiology, BFA für Viruskrankheiten der Tiere, Tübingen, Germany
1997-2002 Assistant Adjunct Professor, Dept. of Neurology, University of California, Irvine, CA
2002- Associate Professor, Dept. of Epidemiology, Columbia University, NY

Honors

1987 Postdoctoral grant of the Max-Planck Society
1993 NARSAD Young Investigator Award

B. Selected peer-reviewed publications (in chronological order).

1. **Briese T** and Hakenbeck R (1985) Interaction of the pneumococcal amidase with lipoteichoic acid and choline. Eur J Biochem 146, 417-427
2. Hakenbeck R, Ellerbrok H, **Briese T**, Handwerger S and Tomasz A (1986) Penicillin-binding proteins of penicillin-susceptible and penicillin-resistant pneumococci: immunological relatedness of altered proteins and changes in peptides carring the beta-lactam binding site. Antimicrob Agents Chemother 30, 553-558
3. Hakenbeck R, **Briese T** and Ellerbrok H (1986) Antibodies against the benzyl-penicilloyl moiety as a probe for pencillin-binding proteins. Eur J Biochem 157, 101-106
4. Hakenbeck R, **Briese T**, Chalkley L, Ellerbrok H, Kalliokoski R, Latorre C, Leinonen M and Martin C (1991) Variability of penicillin-binding proteins from penicillin-sensitive *Streptococcus pneumoniae.* J Inf Dis 164, 307-312
5. Hakenbeck R, **Briese T**, Chalkley L, Ellerbrok H, Kalliokoski R, Latorre C, Leinonen M and Martin C (1991) Antigenic variation of penicillin-binding proteins from penicillin-resistant clinical strains of *Streptococcus pneumoniae.* J Inf Dis 164, 313-319
6. Hakenbeck R, **Briese T**, Laible G, Martin C and Schuster C (1991) Penicillin-binding proteins in *Streptococcus pneumoniae*: Alterations during development of intrinsic penicillin resistance. J Chemother 3, 86-90
7. Martin C, **Briese T** and Hakenbeck R (1992) Nucleotide sequences of genes encoding penicillin-binding proteins from *Streptococcus pneumoniae* and *Streptococcus oralis* with high homology to *Escherichia coli* penicillin-binding proteins 1A and 1B. J Bacteriol 174, 4517-4523
8. **Briese T**, de la Torre JC, Lewis A, Ludwig H and Lipkin WI (1992) Borna disease virus, a negative-strand RNA virus, transcribes in the nucleus of infected cells. Proc Natl Acad Sci U.S.A. 89, 11486-11489
9. Schneider PA., **Briese T**, Zimmermann W, Ludwig H and Lipkin WI (1994) Sequence conservation in field and experimental isolates of Borna disease virus. J Virol 68, 63-68
10. **Briese T**, Schneemann A, Lewis AJ, Park Y, Kim S, Ludwig H and Lipkin WI (1994) Genomic organization of Borna disease virus. Proc Natl Acad Sci U.S.A. 91, 4362-4366
11. Stoyloff R, **Briese T**, Borchers K, Zimmermann W and Ludwig H (1994) N-glycosylated protein(s) are important for the

infectivity of Borna disease virus (BDV). Arch Virol 137, 405-409
12. Kliche S, **Briese T**, Henschen AH, Stitz L and Lipkin WI (1994) Characterization of a Borna disease virus glycoprotein, gp18. J Virol 68, 6918-6923
13. **Briese T**, Hatalski CG, Kliche S, Park Y and Lipkin WI (1995) Enzyme-linked immunosorbent assay for detecting antibodies to Borna disease virus-specific proteins. J Clin Microbiol 33, 348-351
14. Kliche S, Stitz L, Mangalam H, Shi L, Binz T, Niemann H, **Briese T** and Lipkin WI (1996) Characterization of the Borna disease virus phosphoprotein, p23. J Virol 70, 8133-8137
15. Jordan I, **Briese T**, Averett D.R. and Lipkin WI (1999) Inhibition of Borna disease virus replication by ribavirin. J Virol 73, 7903-7306
16 **Briese T**, Jia XY, Huang C, Grady LJ and Lipkin WI (1999) Identification of a Kunjin/West Nile-like flavivirus in brains of patients with New York encephalitis. Lancet 354, 1261-1262
17. Evengård B, **Briese T**, Lindh G, Lee S and Lipkin WI (1999) Absence of evidence of Borna disease virus infection in Swedish patients with chronic fatigue syndrome. J NeuroVirol 5, 495-499
18. Jia XY, **Briese T**, Jordan I, Rambaut A, Chi HC, Mackenzie JS, Hall RA, Scherret J and Lipkin WI (1999) Genetic analysis of West Nile New York 1999 encephalitis virus. Lancet 354, 1971-1972
19. Portlance Walker M, Jordan I, **Briese T**, Fischer N and Lipkin WI (2000) Expression and Characterization of the Borna disease virus polymerase. J Virol 74, 4425-4428
20. **Briese T**, Glass WG and Lipkin WI (2000) Detection of West Nile virus sequences in cerebrospinal fluid. Lancet 355, 1614-1615
21. Jordan I, **Briese T**, Fischer N, Lau JY-N and Lipkin WI (2000) Ribavirin inhibits West Nile virus replication and cytopathic effect in neural cells. J Inf Dis 182, 1214-1217
22. Solbrig M V, Koob GF, Parsons LH, Kadota T, Horscroft N, **Briese T** and Lipkin WI (2000) Neurotrophic factor expression after CNS viral injury produces enhanced sensitivity to psychostimulants: Potential mechanism for addiction vulnerability. J Neurosci 20, RC104, U1- U6
23. Scherret JH, Poidinger M, Mackenzie JS, Broom AK, Deubel V, Lipkin WI, **Briese T**, Gould EA and Hall RA (2001) The relationships between West Nile and Kunjin viruses. Emerging Inf Dis 7, 697-705
24. **Briese T**, Rambaut A, Pathmajeyan M, Bishara J, Weinberger M, Pitlik S and Lipkin WI (2002) Phylogenetic analysis of a human isolate from the 2000 Israel West Nile virus epidemic. Emerging Inf Dis 8, 528-531
25. Solbrig MV, Schlaberg R, **Briese T**, Horscroft N and Lipkin WI (2002) Neuroprotection and reduced microglial proliferation in Ribavirin treated Bornavirus infected rats. Antimicrob. Agents Chemother 46, 2287-2291
26. Zhai J, **Briese T**, Dai E, Wang X, Pang X, Du Z, Liu H, Wang J, Wang H, Guo Z, Chen Z, Jiang L, Zhou D, Han Y, Jabado O, Palacios G, Lipkin WI, and Tang R (2004) Real-time polymerase chain reaction for detecting SARS coronavirus, Beijing, 2003. Emerg Infect Dis 10, 300-303
27. **Briese T**, Rambaut A, and Lipkin WI (2004) Analysis of the medium (M) segment sequence of *Guaroa virus* and its comparison to other orthobunyaviruses. J Gen Virol 85, 3071-3077
28. **Briese T**, Palacios G, Kokoris M, Jabado O, Liu Z, Renwick N, Kapoor V, Casas I, Pozo F, Limberger R, Perez-Brena P, Ju J, and Lipkin WI (2005) Diagnostic system for rapid and sensitive differential detection of pathogens. Emerg Infect Dis 11, 310-313
29. Palacios G, Jabado O, Renwick N, **Briese T**, and Lipkin WI (2005) Severe acute respiratory syndrome coronavirus persistence in Vero cells. Chin Med J (Engl) 118, 451-459
30. Hirsch AJ, Medigeshi GR, Meyers HL, DeFilippis V, Fruh K, **Briese T**, Lipkin WI, and Nelson JA (2005) The Src family kinase c-Yes is required for maturation of West Nile virus particles. J Virol 79, 11943-11951
31. Macdonald J, Tonry J, Hall RA, Williams B, Palacios G, Ashok MS, Jabado O, Clark D, Tesh RB, **Briese T**, and Lipkin WI (2005) NS1 protein secretion during the acute phase of West Nile virus infection. J Virol 79, 13924-13933
32. Palacios G, **Briese T**, Kapoor V, Jabado O, Liu Z, Venter M, Zhai J, Renwick N, Grolla A, Geisbert TW, Drosten C, Towner J, Ju J, Paweska J, Nichol ST, Swanepoel R, Feldmann H, Jahrling PB, Lipkin WI (2006) MassTag polymerase chain reaction for differential diagnosis of viral hemorrhagic fevers. Emerg Infect Dis 12, 692-695
33. **Briese T**, Bird B, Kapoor V, Nichol ST, and Lipkin WI (2006) Batai and Ngari viruses: M-segment reassortment and association with severe febrile disease outbreaks in East Africa. J Virol 80, 5627-5630
34. Lamson D, Renwick N, Kapoor V, Liu Z, Palacios G, Ju J, Dean A, St George K, **Briese T**, Lipkin WI (2006) MassTag polymerase-chain-reaction detection of respiratory pathogens, including a new rhinovirus genotype, causing influenza-like illness in New York State, 2004-2005. J Infect Dis, Nov 15; 194 (10): 1398-402
35. Zhai J, Palacios G, Towner JS, Jabado O, Kapoor V, Venter M, Grolla A, **Briese T**, Paweska J, Swanepoel R, Feldmann H, Nichol ST, Lipkin WI (2006) A rapid molecular strategy for filovirus detection and characterization. J Clin Microbiol, 2006 Nov 1
36. Palacios G, Quan P-L, Jabado OJ, Conlan S, Hirschberg DL, Liu Y, Zhai J, Renwick N, Hui J, Hegyi H, Grolla A, Strong JE, Towner JS, Geisbert TW, Jahrling PB, Büchen-Osmond CV, Ellerbrok H, Sanchez-Seco MP, Lussier Y, Formenty P, Nichol ST, Feldmann H, **Briese T**, Lipkin WI (2007) Panmicrobial oligonucleotide array for diagnosis of infectious diseases. Emerg Infect Dis, 13, 73 http://www.cdc.gov/ncidod/EID/13/1/73.htm

37. Jabado OJ, Palacios G, Kapoor V, Hui J, Renwick N, Zhai J, **Briese T**, Lipkin WI (2006) Greene SCPrimer: a rapid comprehensive tool for designing degenerate primers from multiple sequence alignments. Nucleic Acids Res, 34, 6605

38. Quan P-L, Palacios G, Jabado OJ, Conlan S, Hirschberg DL, Richt J, Pose F, Casas I, Perez-Breña P, Drysdale A, Hui J, Cisterna D, Baumeister E, Savy V, García-Sastre A, **Briese T**, and Lipkin WI (2007) Detection of respiratory viruses and subtype identification of influenza viruses by GreeneChipResp oligonucleotide microarray. J. Clin Microbiol. 45, 2359.

39. Medigeshi GR, Lancaster AM, Hirsch AJ, **Briese T**, Lipkin WI, DeFilippis V, Früh K, Mason PW, Nikolich-Zugich J, and Nelson JA (2007) West Nile virus infection activates the unfolded protein response leading to CHOP 1 induction and apoptosis. J Virol. published online ahead of print on 8 August 2007.

40. (b) (4)

41.

42.

C. Research Support

Ongoing Research Support

(b) (4) Lipkin (PI) 10/01/01 to 09/30/07

Establish and implement new high throughput molecular methods for microbial surveillance.

U54 AI05715801 Lipkin (PI) 09/04/03 to 02/29/08
NIH/NIAID
Northeast Biodefense Center
Establish a Regional Center of Excellence for Biodefense and Emerging Infectious Disease Research.

U01 NS047537 Lipkin (PI) 12/01/03 to 11/30/08
NIH/NINDS
Gene:Environment Interactions in an Autism Birth Cohort
Establish a 100,000 child prospective birth cohort in Norway, collect clinical data and samples, map the natural trajectory of neurodevelopmental disorders, and establish a foundation for determining the role of gene-environment interactions in pathogenesis of neurodevelopmental disorders.

R01 HL083850 Lipkin (PI) 05/08/06-04/30/10
NIH
Pathogen Discovery in Chronic Lung Disease by Mass Tag PCR and Microarrays
Employ high throughput molecular diagnostic tools to survey for pathogen discovery in idiopathic pulmonary fibrosis, pulmonary arterial hypertension and bronchiolitis obliterans syndrome.

1 U01 AI070411-01 Lipkin (PI) 09/01/06 to 08/31/11
NIH
Viral Arrays for Biodefense
Establish and validate a viral sequence database and its complementary oligonucleotide array technology for detection and differentiation of influenza viruses and hemorrhagic fever viruses.

1 R24 EY017404 Hageman (PI, Univ of Iowa) 08/01/06-07/31/11
NIH/NEI
Development of Complement Modulating Therapeutics for AMD

Sub-Contract
The sub-contract will survey clinical samples (eyes and blood) for evidence of infection using two novel molecular diagnostic platforms, Mass Tag PCR and GreeneChips.

HHSN266200400036C Lefkowitz (PI, Univ Alabama) 06/30/06 to 06/28/09
Subcontract to Columbia (Lipkin) from the Viral Bioinformatics Resource Center
ICTVdB: A Virus Database for Biodefense and Emerging Infectious Disease Research
Curate and improve the user interface of the electronic database of the International Committee for Taxonomy of Viruses.

Completed Research Support

R01 AI51292 Lipkin (PI) 07/01/02 to 06/30/07
NIH/NIAID
A Staged Strategy for Virus Identification and Discovery
Establish an integrated program in bioinformatics and molecular diagnostics focused on investigating the role of infection in neurologic diseases and cancer.

CDC/American Academy of Pediatrics Lipkin (PI) 09/30/02 to 09/29/06
MV Sequences in Children with Autistic Disorders
Determine whether autism is associated with the presence of measles virus sequences in gastrointestinal tract through blinded analysis in three laboratories (Columbia, CDC, Coombe Women's Hospital).

HD37546 Lipkin (PI) 05/01/00 to 04/30/06
A Developmental Model for Autism Based on CNS Infection

AI55466 Rewers (PI, Univ Colorado) 10/01/02 to 09/30/04
Subcontract to Columbia (Lipkin)
Viral Triggers of Type I Diabetes

NS29425 Lipkin (PI) 07/01/98 to 06/30/03
Molecular Analysis of a Neurotropic Agent, Borna Virus
MH57467 Lipkin (PI) 07/01/99 to 06/30/03
Borna Disease Virus and Neuropsychiatric Disease

Principal Investigator/Program Director (Last, First, Middle):

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Gustavo Palacios	Assistant Professor
eRA COMMONS USER NAME (b) (6)	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Buenos Aires University, Buenos Aires, Argentina	B.S.	1990	Microbiology
Buenos Aires University, Buenos Aires, Argentina	M.S.	1992	Medical Virology
Buenos Aires University, Buenos Aires, Argentina	Ph.D.	2002	Virology

A. Positions and Honors

Positions and Employment

1996-2001 Graduate Research Assistant of the Neurovirosis Division in the Department of Virology, of the National Institute of Infectious Diseases, Buenos Aires, Argentina
1995-2001 Assistant Professor of the Chair of Applied Chemistry I and II of the Forensic Sciences Department of the Instituto Universitario de la Policia Federal Argentina
1994-2002 Research Assistant at the Virology Department, School of Pharmacy and Biochemistry, University of Buenos Aires
2002-2004 Postdoctoral Research Scientist, Epidemiology Department, MSPH, Columbia University
2004-2006 Associate Research Scientist, Epidemiology Department, MSPH, Columbia University
2007-present Assistant Professor, Epidemiology Department, MSPH, Columbia University

B. Selected peer-reviewed publications (in chronological order)

1. Lopez JL, Telenta P, **Palacios Poggio G,** Alonso A, Gonzalez J, Lemberg A, y Campos R. Detección caracterización de mutantes pre-core del virus de la hepatitis B (HBV) en pacientes crónicamente infectados (Detection and characterization of HBV pre-core mutants in chronically infected Patients) (1995). *Act Gastr Latinoam*; 25:85-90.
2. Telenta P, **Palacios Poggio G**, López JL, González J, Lemberg A, Campos R. Increased prevalence of genotipo F Hepatitis B virus isolates in Buenos Aires, Argentina (1997). *J Clin Microbio*l; 35(7);1873-5.
3. Beltramino JC, Freire MC, Cisterna D, Almitrani H, Karakachoff M, Battagliotti C, Meneghetti F, Ara P, **Palacios Poggio G**, Rodriguez C. Manifestaciones neurológicas del virus de la parotiditis en niños sin paperas. Neurological manifestations of Mumps virus in children without parotitis inflammation (1998). *Arch Arg Pediatr*; 96:376-80.
4. Mbayed VA, Lopez JL, Telenta P, **Palacios G**, Badia I, Ferro A, Galoppo C, Campos R. Distribution of Hepatitis B virus genotypes in two different pediatric populations from Argentina (1998). *J Clin Microbiol*; 36(11): 3362-65.
5. **Poggio GP**, Rodriguez C, Cisterna D, Freire MC, Cello J. Nested PCR for rapid detection of mumps virus in cerebrospinal fluid from patients with neurological diseases (2000). *J Clin Microbiol*; 38(1): 274-8.
6. **Palacios G**, Cisterna D, Freire MC, Cello J. RT-Nested PCR for the detection of enterovirus in biological samples from patients with suspected enteroviral infections (2000). *Rev Argent Microbiol*; 32(4): 165-72.
7. Casas I, **Palacios G**, Cisterna D, Trallero G, Freire MC, Tenorio, A. Molecular characterization of human enteroviruses in clinical samples by three different RT nested-PCR assays and direct sequencing of amplified products (2001). *J Med Virol*; 65:138-48.
8. Bok K, **Palacios G,** Sijvarger K, Matson D, Gomez J. Emergence of G9 P[6] human rotaviruses in Argentina: phylogenetic relationships among G9 strains (2001). *J Clin Microbiol*; 39(11): 4020-25.
9. **Palacios G**, Casas I, Cisterna D, Trallero G, Tenorio, Freire C. Molecular epidemiology of Echovirus 30: temporal circulation and prevalence of single lineages (2002). *J Virol*; 76(10): 4940-9.

10. **Palacios G**, Casas, Tenorio A, Freire C. Molecular identification of enterovirus analysing a partial VP1 genomic region with different methods (2002). *J Clin Microbiol*; 40(1): 182-92.
11. Avellon A, Casas I, Trallero G, Perez C, Tenorio A, **Palacios G**. Echovirus 13 isolates associated with aseptic meningitis, Spain (2003). *Emerg Infect Dis*; 9(8): 934-41.
12. Freire MC, Cisterna DM, Rivero K, **Palacios G**, Casas I, Tenorio A, Gomez JA. Analisis de un brote de meningitis viral en la provincia de Tucuman Argentina [Analysis of an outbreak of viral meningitis in the province of Tucuman Argentina] (2003). *Rev Panam Salud Publica*; 13(4): 246-51.
13. Zhai J, Briese, T, Dai E, Wang X, Pang X, Du Z, Liu H, Wang J, Wang H, Guo Z, Chen Z, Jiang L, Zhou D, Han Y, Jabado O, **Palacios G**, Lipkin, WI, Tang R. Real-time polymerase chain reaction for detecting SARS coronavirus, Beijing (2003). *Emerg Infect Dis*; 10(2): 300-3.
14. Qiao M, Mundrigi A, Bernard KA, **Palacios G**, Hong Zhou Z, Lipkin WI, Liang JT. Induction of sterilizing immunity against West Nile virus by immunization with West Nile virus-like particles produced in insect cells (2004). *J Infect Dis*; 15; 190(12):2104-8.
15. Briese T, **Palacios G**, Kokoris M, Jabado O, Liu Z, Renwick N, Kapoor V, Casas I, Pozo F, Limberger R, Perez-Breña P, Lipkin WI. Diagnostic system for rapid and sensitive differential detection of pathogens (2005). *Emerg Infect Dis 1, 310-313*; available at http://www.cdc.gov/ncidod/EID/vol11no02/04-0492.htm **(first two authors contributed equally).**
16. Domingo C, **Palacios G**, Niedrig M, Cabrerizo M, Jabado O, Reyes N, Lipkin WI, Tenorio A. A new tool for the diagnosis and molecular surveillance of dengue infections in clinical samples (2004). *Dengue WHO Bulletin*; 28:87-95.
17. **Palacios G**, Jabado O, Cisterna D, de Ory F, Renwick N, Echevarria JE, Castellanos A, Mosquera M, Freire MC, Campos RH, Lipkin WI. Molecular typing of mumps genotypes from clinical samples: standarized method of analysis (2005). *J Clin Microbiol*; 43(4): 1869-78.
18. **Palacios G**, Jabado O, Renwick N, Briese T, Lipkin WI. Severe acute respiratory syndrome coronavirus persistence in Vero cells (2005). *Chinese Med J*; 118(6): 451-59.
19. **Palacios G**, Oberste MS. Enteroviruses as agents of emerging infectious diseases (2005). *J Neurovirol*; Oct; 11(5):424-33. Review.
20. Casas I, Avellon A, Mosquera M, Jabado O, Echevarria JE, Campos RH, Rewers M, Perez-Breña P, Lipkin WI, **Palacios G.** Molecular identification of adenoviruses in clinical samples by analyzing a partial hexon genomic region (2005). *J Clin Microbiol;* Dec; 43(12):6176-82.
21. Macdonald J, Tony J, Hall R, Williams B, **Palacios G**, Ashok M, Jabado O, Clark D, Tesh R, Briese T, Lipkin WI. NS1 protein secretion during the acute phase of West Nile virus infection (2005). *J Virol;* Nov; 79(22):13924-33.
22. Lee D, Cohen J, Twaddell W, **Palacios G**, Gill M, Levit E, Halperin A, Mones A, Busam K, Silvers D, Celebi J. Are all melanomas the same? Spitzoid melanoma is a distinct subtype of melanoma (2006). *Cancer;* January 18.
23. **Palacios G**, Briese T, Kapoor V, Jabado O, Liu Z, Venter M, Zhai J, Renwick N, Grolla A, Geisbert T, Drosten C, Towner J, Ju J, Paweska J, Nichol S, Swanepoel R, Feldmann H, Jahrling P, Lipkin WI. MassTag polymerase chain reaction for differential diagnosis of viral hemorrhagic fevers. (2006). *Emerg Infect Dis 12, 692-695* [serial on the Internet]; Apr [date cited]. Available from http://www.cdc.gov/ncidod/EID/vol12no04/05-1515.htm.
24. Domingo C, **Palacios G**, Jabado O, Reyes N, Niedrig M, Gascón J, Cabrerizo M, Lipkin WI, Tenorio A. Detection of two new lineages of dengue virus 1 in India using a short fragment of the c-terminal E gene for virus detection and characterization (2006). *J Clin Microbiol;* Apr;44(4):1519-29. **(first two authors contributed equally).**
25. Sanz JC, Mosquera MM, Echevarría JE, Fernández M, Herranz N, **Palacios G,** Ory F. Sensitivity and specificity of immunoglobulin g titer for the diagnosis of mumps virus in infected patients depending on vaccination status (2006). *Acta Pathol Microbiol Immunol Scand*; Nov;114(11):788-94.
26. Avellón A, Rubio G, **Palacios G**, Casas I, Rabella N, Reina G, Pérez C, Lipkin WI, Trallero G. Emergence of EV75 as a cause of aseptic meningitis in Spain, 2006 (2006). *Emerg Infect Dis* [serial on the Internet]; Oct [cited July 21, 2006]. Available from http://www.cdc.gov/ncidod/EID/vol12no10/06-0353.htm.
27. Witsø E, **Palacios G**, Rønningen KS, Cinek O, Janowitz D, Rewers M, Grinde B, Lipkin WI. Asymptomatic circulation of HEV71 in Norway (2006). *Virus Res;* Sep 8; [Epub ahead of print] **(first two authors contributed equally, corresponding author).**

28. Witsø E, **Palacios G**, Cinek O, Stene LC, Grinde B, Janowicz D, Lipkin WI, Rønningen KS. Natural circulation of human enteroviruses: high prevalence of human enterovirus A Infections (2006). *J Clin Microbiol;* Aug 30; [Epub ahead of print].
29. Lamson D, Renwick N, Kapoor V, Liu Z, **Palacios G**, Ju J, Dean A, St. George K, Briese T, Lipkin WI. MassTag polymerase-chain-reaction detection of respiratory pathogens, including a new rhinovirus genotype, causing influenza-like illness in New York state, 2004-2005/ *J Infect Dis*; Nov 15; 194(10):1398-402.
30. Yaddanapudi K, **Palacios G**, Towner JS, Chen I, Nichol ST, Sariol CA, Lipkin WI. Implication of a retrovirus-like glycoprotein peptide in the immunopathogenesis of Ebola and Marburg viruses (2006). *FASEBJ*; 2006 Oct 5; [Epub ahead of print] **(first two authors contributed equally).**
31. Zhai J, **Palacios G**, Towner JS, Jabado O, Kapoor V, Venter M, Grolla A, Briese T, Paweska J, Swanepoel R, Feldmann H, Nichol ST and W. Ian Lipkin. Rapid molecular strategy for filovirus detection and characterization (2006). *J Clin Microbiol*, Jan;45(1):224-6. **(first two authors contributed equally)**.
32. Jabado O, **Palacios G**, Kapoor V, Hui J, Renwick N, Zhai J, Briese T, and W. Ian Lipkin. Greene SCPrimer: a rapid comprehensive tool for designing degenerate primers from multiple sequence alignments. *Nucl Acids Res*;34(22):6605-11. Epub 2006 Nov 28.
33. **Palacios G**, Quan P-L, Jabado OJ, Conlan S, Hirschberg DL, Liu Y, Renwick N, Hui J, Hegyi H, Grolla A, Strong JE, Towner JE, Geisbert TW, Jahrling P, Büchen-Osmond C, Ellerbrok H, Sanchez-Seco MP, Lussier Y, Formenty P, Nichol ST, Feldmann H, Briese T, Lipkin WI. Panmicrobial oligonucleotide array for diagnosis of infectious diseases. Emerg Infect Dis [serial on the Internet]. 2007 Jan [date cited]. Available from http://www.cdc.gov/ncidod/EID/13/1/73.htm 1 **(first two authors contributed equally)**.
34. Cisterna DM, **Palacios G**, Rivero K, Girard D, Lema C, Freire MC. Epidemiology of enterovirus associated with neurologic diseases. *Medicina (B Aires).* 2007;67(2):113-9. Spanish.
35. Quan PL, **Palacios G,** Jabado OJ, Conlan S, Hirschberg DL, Richt J, Pozo F, Casas I, Perez-Brena P, Drysdale A, Hui J, Cisterna D, Baumeister E, Savy V, Garcia-Sastre A, Briese T, Lipkin WI. Detection of respiratory viruses and subtype identification of influenza viruses by GreeneChipResp oligonucleotide microarray. *J Clin Microbiol*, 45, 2359 [Epub ahead of print] **(first two authors contributed equally).**
36. Cox-Foster DL, Conlan S, Holmes EC, **Palacios G**, Evans JD, Moran NA, Quan PL, Briese T, Hornig M, Geiser DM, Martinson V, Vanengelsdorp D, Kalkstein AL, Drysdale A, Hui J, Zhai J, Cui L, Hutchison SK, Simons JF, Egholm M, Pettis JS, Lipkin WI. A metagenomic survey of microbes in honey bee colony collapse disorder. *Science*. 2007 Sep 6; [Epub ahead of print]

C. Research Support

Ongoing Research Support

(b) (4) 09/01/2007-07/31/2010

Environmental Triggers of Type 1 Diabetes Mellitus
Role: Principal Investigator

R24 EY017404 (Hageman, PI) 08/01/2006-07/31/2011
National Institute of Health
Development of Complement Modulating Therapeutics for AMD
The sub-contract will survey clinical samples (eyes and blood) for evidence of infection using two novel molecular diagnostic platforms, Mass Tag PCR and GreeneChips.
Role: Co-Investigator

R01 HL 083850 (Lipkin, PI) 05/08/2006-04/30/2010
National Institute of Health
Pathogen Discovery in Chronic Lung Disease by Mass Tag PCR and Microarrays
The project will investigate the contributions of viruses to the pathogenesis of chronic lung diseases.
Role: Co-Investigator

U01 AI070411 (Lipkin, PI) 09/01/2006-08/31/2011
National Institute of Health

Viral Arrays for Biodefense
The objective of this program is to establish stable and sensitive viral microarray assays to enable differential diagnosis of infection by select NIAID priority agents.
Role: Co-Investigator

Completed Research Support

U54 AI057158 (Palacios, PI) 03/01/2006-2/28/2007
Northeast Biodefense Center
Identification of interferon-antagonists encoded by new world arenavirus
The major goal of this project is to characterize the activity of a domain found in the Z arenavirus protein that presents structural and positional similarity to the protein inhibitor of stat1 activation (PIAS1).
Role: Principal Investigator

U54 AI07158 (Palacios, PI) 03/01/2005-8/30/2006
Northeast Biodefense Center
Immunosuppression in filovirus infections
The major goal of this project is to characterize the activity of a domain found in the Ebola virus glycoprotein that presents structural and positional similarity to an immunosuppressive domain found in the retroviral envelope.
Role: Principal Investigator

R01 AI51292 (Lipkin, PI) 07/01/04 to 06/30/06
National Institute for Allergies and Infectious Disease
Underrepresented Minority Supplement to AI51292
The major goal of this project is to establish an integrated program in bioinformatics and molecular diagnostics focused on investigating the role of infection in neurologic diseases and cancer.
Role: Co-Investigator

(b) (4) (Palacios, PI) 09/01/2000-09/01/2001
Fundación Alberto J. Roemmers, Buenos Aires, Argentina.
Molecular Epidemiology of the Mumps Virus In Argentina
The major goal of this project was to design a method to genotype mumps virus and to characterize the strains of mumps virus circulating in Argentina
Role: Principal Investigator

(b) (4) Freire (PI) 09/01/1997-09/01/1998
Fundación Alberto J. Roemmers, Buenos Aires, Argentina.
Viral Infections of the central nervous system
The major goal of this project was to design, develop and validate diagnostic and characterization systems for virus causing neurological disease.
Role: Co-Investigator

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 1

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ❍ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2008 *** End Date:** 06-30-2009 **Budget Period: 1**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Peter		Daszak		PD/PI							(b) (4), (b) (6)
2.	Dr.	Jonathan	H.	Epstein		co-PD/PI							

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
1	Post Doctoral Associates						(b) (4), (b) (6)
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	**Total Number Other Personnel**					**Total Other Personnel**	(b) (4), (b) (6)
						Total Salary, Wages and Fringe Benefits (A+B)	**79,933.84**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

Tracking Number

OMB Number 4040-0001
Expiration Date 04/30/2008

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ○ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2008 *** End Date:** 06-30-2009 **Budget Period: 1**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	* Funds Requested ($)

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 1

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ○ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2008 *** End Date:** 06-30-2009 **Budget Period: 1**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	25,542.17
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	2,000.00
5. Subawards/Consortium/Contractual Costs	371,871.00
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
Total Other Direct Costs	**399,413.17**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**499,347.01**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. Total Direct Costs	22.16	499,347.00	110,665.30
		Total Indirect Costs	**110,665.30**

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)	**610,012.31**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 8155-Justification_CCM.pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 2

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ○ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2009 *** End Date:** 06-30-2010 **Budget Period: 2**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Peter		Daszak		PD/PI							(b) (4), (b) (6)
2.	Dr.	Jonathan	H.	Epstein		co-PD/PI							

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
1	Post Doctoral Associates						(b) (4), (b) (6)
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	**Total Number Other Personnel**					**Total Other Personnel**	(b) (4), (b) (6)
						Total Salary, Wages and Fringe Benefits (A+B)	**82,331.85**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

Tracking Number

OMB Number 4040-0001
Expiration Date 04/30/2008

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 2

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ○ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2009 *** End Date:** 06-30-2010 **Budget Period: 2**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	* Funds Requested ($)
Total funds requested for all equipment listed in the attached file	
Total Equipment	

Additional Equipment: File Name: Mime Type:

D. Travel	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	9,000.00
Total Travel Cost	**9,000.00**

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 2

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ❍ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2009 *** End Date:** 06-30-2010 **Budget Period: 2**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	7,367.15
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	2,000.00
5. Subawards/Consortium/Contractual Costs	398,302.00
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
Total Other Direct Costs	**407,669.15**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**499,001.00**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. Total Direct Costs	22.16	499,001.00	110,578.62
		Total Indirect Costs	**110,578.62**

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)	**609,579.62**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 8155-Justification_CCM.pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 3

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ❍ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2010 *** End Date:** 06-30-2011 **Budget Period: 3**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Peter		Daszak		PD/PI							(b) (4), (b) (6)
2.	Dr.	Jonathan	H.	Epstein		co-PD/PI							

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
1	Post Doctoral Associates						(b) (4), (b) (6)
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	**Total Number Other Personnel**					**Total Other Personnel**	(b) (4), (b) (6)
						Total Salary, Wages and Fringe Benefits (A+B)	**84,801.30**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 3

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ○ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2010 *** End Date:** 06-30-2011 **Budget Period: 3**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	* Funds Requested ($)
Total funds requested for all equipment listed in the attached file	
Total Equipment	

Additional Equipment: File Name: Mime Type:

D. Travel	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	5,000.00
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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 3

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ❍ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2010 *** End Date:** 06-30-2011 **Budget Period: 3**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	5,077.35
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	2,000.00
5. Subawards/Consortium/Contractual Costs	403,087.00
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
Total Other Direct Costs	**410,164.35**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**499,965.65**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. Total Direct Costs	22.16	499,966.16	110,792.50
		Total Indirect Costs	**110,792.50**

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)	**610,758.15**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 8155-Justification_CCM.pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 4

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ❍ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2011 *** End Date:** 06-30-2012 **Budget Period: 4**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Peter		Daszak		PD/PI							(b) (4), (b) (6)
2.	Dr.	Jonathan	H.	Epstein		co-PD/PI							

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
1	Post Doctoral Associates						(b) (4), (b) (6)
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	**Total Number Other Personnel**					**Total Other Personnel**	(b) (4), (b) (6)
						Total Salary, Wages and Fringe Benefits (A+B)	**87,345.86**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

Tracking Number

OMB Number 4040-0001
Expiration Date 04/30/2008

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 4

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ○ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2011 *** End Date:** 06-30-2012 **Budget Period: 4**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	* Funds Requested ($)

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

D. Travel	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	12,000.00
Total Travel Cost	**12,000.00**

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 4

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ❍ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2011 *** End Date:** 06-30-2012 **Budget Period: 4**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	25,388.14
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	2,000.00
5. Subawards/Consortium/Contractual Costs	372,979.00
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
Total Other Direct Costs	**400,367.14**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**499,713.00**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. Total Direct Costs	22.16	499,713.00	110,736.40
		Total Indirect Costs	**110,736.40**

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)	**610,449.40**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 8155-Justification_CCM.pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 5

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ○ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2012 *** End Date:** 06-30-2013 **Budget Period: 5**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Peter		Daszak		PD/PI							(b) (4), (b) (6)
2.	Dr.	Jonathan	H.	Epstein		co-PD/PI							

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
1	Post Doctoral Associates						(b) (4), (b) (6)
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	**Total Number Other Personnel**					**Total Other Personnel**	(b) (4), (b) (6)
						Total Salary, Wages and Fringe Benefits (A+B)	**89,966.24**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 5

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ○ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2012 *** End Date:** 06-30-2013 **Budget Period: 5**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	* Funds Requested ($)

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

D. Travel	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	12,000.00
Total Travel Cost	**12,000.00**

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 5

* ORGANIZATIONAL DUNS: 0770900660000

*** Budget Type:** ● Project ○ Subaward/Consortium

Enter name of Organization: Wildlife Trust Inc

*** Start Date:** 07-01-2012 *** End Date:** 06-30-2013 **Budget Period: 5**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	22,491.77
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	2,000.00
5. Subawards/Consortium/Contractual Costs	373,539.00
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
Total Other Direct Costs	**398,030.77**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**499,997.01**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. Total Direct Costs	22.16	499,997.00	110,799.34
		Total Indirect Costs	**110,799.34**

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)	**610,796.35**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 8155-Justification_CCM.pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification – NIH R01

RESEARCH & RELATED BUDGET - Cumulative Budget

	Totals ($)	
Section A, Senior/Key Person		**113,795.14**
Section B, Other Personnel		**310,583.95**
Total Number Other Personnel	5	
Total Salary, Wages and Fringe Benefits (A+B)		**424,379.09**
Section C, Equipment		
Section D, Travel		**58,000.00**
1. Domestic	0.00	
2. Foreign	58,000.00	
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		**2,015,644.58**
1. Materials and Supplies	85,866.58	
2. Publication Costs		
3. Consultant Services	0.00	
4. ADP/Computer Services	10,000.00	
5. Subawards/Consortium/Contractual Costs	1,919,778.00	
6. Equipment or Facility Rental/User Fees	0.00	
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		**2,498,023.67**
Section H, Indirect Costs		**553,572.16**
Section I, Total Direct and Indirect Costs (G + H)		**3,051,595.83**
Section J, Fee		

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2008 *** End Date:** 06-30-2009 **Budget Period: 1**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Walter	Ian	Lipkin		co-PD/PI							(b) (4), (b) (6)
2.	Dr.	Thomas		Briese		co-PD/PI							
3.	Dr.	Gustavo		Palacios		co-PD/PI							

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Sean Conlan, Rsch. Scientist						(b) (4), (b) (6)
1	**Total Number Other Personnel**				**Total Other Personnel**		(b) (4), (b) (6)
					Total Salary, Wages and Fringe Benefits (A+B)		**53,728.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

Tracking Number

OMB Number 4040-0001
Expiration Date 04/30/2008

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2008 *** End Date:** 06-30-2009 **Budget Period: 1**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	*** Funds Requested ($)**

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2008 *** End Date:** 06-30-2009 **Budget Period: 1**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	67,000.00
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. sequencing, courier, maintemnance contracts, dishwasing	27,000.00
Total Other Direct Costs	**94,000.00**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**147,728.00**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. federal	61	147,729.00	90,115.00
		Total Indirect Costs	**90,115.00**

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)	**237,843.00**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 6878-Justification_CU.pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2009 *** End Date:** 06-30-2010 **Budget Period: 2**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Walter	Ian	Lipkin		co-PD/PI							(b) (4), (b) (6)
2.	Dr.	Thomas		Briese		co-PD/PI							
3.	Dr.	Gustavo		Palacios		co-PD/PI							

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
0	Sean Conlan	1.20					(b) (4), (b) (6)
0	**Total Number Other Personnel**				**Total Other Personnel**		(b) (4), (b) (6)
					Total Salary, Wages and Fringe Benefits (A+B)		**54,985.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2009 *** End Date:** 06-30-2010 **Budget Period: 2**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	* Funds Requested ($)

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2009 *** End Date:** 06-30-2010 **Budget Period: 2**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	70,170.00
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. sequencing, courier, maintenance contracts, dishwashing	27,810.00
Total Other Direct Costs	**97,980.00**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**152,965.00**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. federal	61	152,965.00	93,309.00
		Total Indirect Costs	**93,309.00**

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)	**246,274.00**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 6878-Justification_CU.pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 3

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2010 *** End Date:** 06-30-2011 **Budget Period: 3**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Walter	Ian	Lipkin		co-PD/PI							(b) (4), (b) (6)
2.	Dr.	Thomas		Briese		co-PD/PI							
3.	Dr.	Gustavo		Palacios		co-PD/PI							

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
0	Sean Conlan Rsch. Scientist						(b) (4), (b) (6)
0	**Total Number Other Personnel**				**Total Other Personnel**		(b) (4), (b) (6)
					Total Salary, Wages and Fringe Benefits (A+B)		**56,278.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

Tracking Number

OMB Number 4040-0001
Expiration Date 04/30/2008

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 3

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2010 *** End Date:** 06-30-2011 **Budget Period: 3**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	* Funds Requested ($)

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 3

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2010 *** End Date:** 06-30-2011 **Budget Period: 3**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	61,375.00
2. Publication Costs	2,000.00
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. sequencing, courier, maintenance contracts, dishwashing	58,644.00
Total Other Direct Costs	**122,019.00**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**178,297.00**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. federal	61	178,297.00	108,762.00
		Total Indirect Costs	**108,762.00**

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)	**287,059.00**

J. Fee	**Funds Requested ($)**

K. * Budget Justification	File Name: 6878-Justification_CU.pdf	Mime Type: application/pdf
	(Only attach one file.)	

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 4

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2011 *** End Date:** 06-30-2012 **Budget Period: 4**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Walter	Ian	Lipkin		co-PD/PI							(b) (4), (b) (6)
2.	Dr	Thomas		Briese		co-PD/PI							
3.	Dr.	Gustavo		Palacios		co-PD/PI							

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
0	Sean Conlan Rsch. Scientist						(b) (4), (b) (6)
0	**Total Number Other Personnel**				**Total Other Personnel**		(b) (4), (b) (6)
					Total Salary, Wages and Fringe Benefits (A+B)		**57,612.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 4

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2011 *** End Date:** 06-30-2012 **Budget Period: 4**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	* Funds Requested ($)

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 4

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2011 *** End Date:** 06-30-2012 **Budget Period: 4**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	42,616.00
2. Publication Costs	2,060.00
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. sequencing, courier, maintenance contracts, dishwashing	59,504.00
Total Other Direct Costs	**104,180.00**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**161,792.00**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. federal	61	161,792.00	98,693.00
		Total Indirect Costs	**98,693.00**

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)	**260,485.00**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 6878-Justification_CU.pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 5

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2012 *** End Date:** 06-30-2013 **Budget Period: 5**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Walter	Ian	Lipkin		co-PD/PI							(b) (4), (b) (6)
2.	Dr.	Thomas		Briese		co-PD/PI							
3.	Dr.	Gustavo		Palacios		co-PD/PI							

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
0	Sean Conlan Rsch. Scientist						(b) (4), (b) (6)
0	**Total Number Other Personnel**				**Total Other Personnel**		(b) (4), (b) (6)
					Total Salary, Wages and Fringe Benefits (A+B)		**58,983.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 5

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2012 *** End Date:** 06-30-2013 **Budget Period: 5**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	*** Funds Requested ($)**

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 5

*** ORGANIZATIONAL DUNS:** 6218898150000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: The Trustees of Columbia University in the City of New York

*** Start Date:** 07-01-2012 *** End Date:** 06-30-2013 **Budget Period: 5**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	43,895.00
2. Publication Costs	2,122.00
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. sequencing, courier, maintenance contracts, dishwashing	30,389.00
Total Other Direct Costs	**76,406.00**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**135,389.00**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. federal	61	135,389.00	82,588.00
		Total Indirect Costs	**82,588.00**

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)	**217,977.00**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 6878-Justification_CU.pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - Cumulative Budget

	Totals ($)	
Section A, Senior/Key Person		**236,408.00**
Section B, Other Personnel		**45,178.00**
Total Number Other Personnel	1	
Total Salary, Wages and Fringe Benefits (A+B)		**281,586.00**
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		**494,585.00**
1. Materials and Supplies	285,056.00	
2. Publication Costs	6,182.00	
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	203,347.00	
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		**776,171.00**
Section H, Indirect Costs		**473,467.00**
Section I, Total Direct and Indirect Costs (G + H)		**1,249,638.00**
Section J, Fee		

Personnel

W. Ian Lipkin, MD, Principal Investigator and Director, Center for Infection and Immunity (b) (4), (b) (6) Lipkin is a physician scientist with expertise in molecular microbiology and high throughput methods for pathogen surveillance and discovery. He is principal investigator and scientific director of the Northeast Biodefense Center, and a member of the WHO laboratory network. Lipkin will be responsible for coordination of the research to be conducted at Columbia, for experimental design, analysis and reporting of results and fiscal oversight.

Thomas Briese, Associate Director, Center for Infection and Immunity (b) (4), (b) (6) Briese is a molecular microbiologist with experience in high throughput methods for pathogen surveillance and discovery including bioinformatics, phylogenetic analysis, real time PCR, differential display and MassTag PCR. He will direct fellows and technicians responsible for extracting nucleic acids, and performing MassTag and real time PCR assays.

Gustavo Palacios, Assistant Professor (b) (4), (b) (6) Palacios is a molecular microbiologist with experience in PCR, DNA microarrays, phylogenetic analyses, and tissue culture. Palacios will direct fellows and technicians in GreeneChip and tissue culture experiments.

Sean Conlan, Research Scientist (b) (4), (b) (6) Conlan is an expert in bioinformatics. Under Lipkin's direction Conlan will be responsible for database creation and management, and design of software for MassTag and GreeneLAMP analyses.

Note: Fringe benefits are calculated at 27.1% in years 1 thru 5. Salary increases at a rate of 3% per year.

Supplies

Photocleavable mass tags coupled to primers: $25,000 (year 01 only)

Microarrays:
The current unit cost for each slide (either single-plex or 24-plex array format) is $400. In year 02 we will need 75 arrays ($30,000), in year 03- 50 arrays ($20,000).

Reagents for molecular biology and biochemistry: $20,000
Sequencing kits and columns, oligonucleotide primers (including fluorescence labeled probes for real time PCR), modification and restriction enzymes, Tri-Reagent (RNA extraction), vectors, competent cells, columns for the purification of nucleic acids, size markers (DNA, RNA), dry ice, liquid nitrogen, columns for chromatography, salts, acids, bases, buffers, alcohols, phenol, chloroform, acetone, agarose, agar, yeast extract, tryptone, acrylamide, formamide, sepharose, membranes.

Plastics/Glassware: $7,000
Plates and tubes for real time PCR, flasks, beakers, glass plates for protein and nucleic acid electrophoresis, centrifuge tubes, syringes, microfuge tubes, pipettes, tips, columns for chromatography, gloves, biohazard waste bags.

Chemicals: $10,000

Salts, acids, bases, buffers, alcohols, phenol, chloroform, acetone, B-gal, scintillation fluid, acrylamide, formamide, sepharose (includes costs for hazardous waste disposal).

Pipetting equipment: $3,000 (year 01 only)
Gilson pipetmen-two sets (1000 mcl, 200 mcl, 20 mcl, 10 mcl) dedicated for RNA work, and two Pipet-Aid-pipettors.

Software and Licenses: $2,000
Microarray, statistical, and data management programs; shared cost for access.

Other Expenses
Conventional (DNA) sequencing of PCR products and plasmid clones: $15,000
Sequencing of isolates, standards and hybridized nucleic acid eluted from arrays.

Metagenomic high throughput sequencing (HTS)/ 454:
Year 03- $30,000, year 04- $30,000.

Courier/Import Fees: $3,000
Includes cost of hazardous goods/biohazard shipping containers, dry ice, handling, import fees.

Publications:
We anticipate publications in the years 03-05 of the project:
Year 03- $2,000, year 04- $2,060, year 05- $2,122.

Equipment maintenance/Maintenance contracts: $4,000
This project will require 20% usage allocation of core equipment, and BSL-2 and BSL-3 maintenance, mass spectrometer, autoclave, laminar flow hoods, cell culture incubators, stationary and shaking bacterial incubators, DNA sequencer, microscopes, liquid nitrogen, freezers, centrifuges, spectrophotometer, thermal cyclers, gel documentation system.

Dishwashing/Autoclave: $5,000

Note: Supplies and other expenses increase at a rate of 3% per year.

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2008 *** End Date:** 06-30-2009 **Budget Period: 1**

A. Senior/Key Person

Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1. Dr.	Bruce		Mungall		co-PD/PI							(b) (4), (b) (6)

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Research Technician (Molecular Genetics)						(b) (4), (b) (6)
1	Research Technician (Cell Culture)						
2	**Total Number Other Personnel**				**Total Other Personnel**		(b) (4), (b) (6)
					Total Salary, Wages and Fringe Benefits (A+B)		**75,000.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

Tracking Number

OMB Number 4040-0001
Expiration Date 04/30/2008

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2008 *** End Date:** 06-30-2009 **Budget Period: 1**

C. Equipment Description		
List items and dollar amount for each item exceeding $5,000		
	Equipment Item	*** Funds Requested ($)**
Total funds requested for all equipment listed in the attached file		
	Total Equipment	
Additional Equipment:	File Name:	Mime Type:

D. Travel	**Funds Requested ($)**
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	3,000.00
Total Travel Cost	**3,000.00**

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 1

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2008 *** End Date:** 06-30-2009 **Budget Period: 1**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	46,100.00
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	
Total Other Direct Costs	**46,100.00**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**124,100.00**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. Facilities and Administration	8	124,100.00	9,928.00
		Total Indirect Costs	**9,928.00**

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)	**134,028.00**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 6351-NIAID_Bat_viruses_Budget_Justification_(AAHL).pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 2

* **ORGANIZATIONAL DUNS:** 7543079570000

* **Budget Type:** ○ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

* **Start Date:** 07-01-2009 * **End Date:** 06-30-2010 **Budget Period: 2**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Bruce		Mungall		co-PD/PI							(b) (4), (b) (6)

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Research Technician (Molecular Genetics)						(b) (4), (b) (6)
1	Research Technician (Cell Culture)						
2	**Total Number Other Personnel**				**Total Other Personnel**		(b) (4), (b) (6)
					Total Salary, Wages and Fringe Benefits (A+B)		**75,000.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2009 *** End Date:** 06-30-2010 **Budget Period: 2**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	* Funds Requested ($)

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

D. Travel	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	3,000.00
Total Travel Cost	**3,000.00**

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 2

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2009 *** End Date:** 06-30-2010 **Budget Period: 2**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	46,100.00
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	
Total Other Direct Costs	**46,100.00**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**124,100.00**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. Facilities and Administration	8	124,100.00	9,928.00
		Total Indirect Costs	**9,928.00**

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)	**134,028.00**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 6351-NIAID_Bat_viruses_Budget_Justification_(AAHL).pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 3

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2010 *** End Date:** 06-30-2011 **Budget Period: 3**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Bruce		Mungall		co-PD/PI							(b) (4), (b) (6)

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Research Assistant (Molecular Genetics)						(b) (4), (b) (6)
1	Research Assistant (Cell Culture)						
2	**Total Number Other Personnel**				**Total Other Personnel**		(b) (4), (b) (6)
					Total Salary, Wages and Fringe Benefits (A+B)		**75,000.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

Tracking Number

OMB Number 4040-0001
Expiration Date 04/30/2008

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 3

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2010 *** End Date:** 06-30-2011 **Budget Period: 3**

C. Equipment Description		
List items and dollar amount for each item exceeding $5,000		
	Equipment Item	*** Funds Requested ($)**
Total funds requested for all equipment listed in the attached file		
	Total Equipment	
Additional Equipment:	File Name:	Mime Type:

D. Travel	**Funds Requested ($)**
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	3,000.00
Total Travel Cost	**3,000.00**

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 3

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2010 *** End Date:** 06-30-2011 **Budget Period: 3**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	46,100.00
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	
Total Other Direct Costs	**46,100.00**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**124,100.00**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. Facilities and Admininstration	8	124,100.00	9,928.00
		Total Indirect Costs	**9,928.00**

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)	**134,028.00**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 6351-NIAID_Bat_viruses_Budget_Justification_(AAHL).pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 4

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2011 *** End Date:** 06-30-2012 **Budget Period: 4**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Bruce		Mungall		co-PD/PI							(b) (4), (b) (6)

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Research Assistant (Molecular Genetics)						(b) (4), (b) (6)
1	Research Assistant (Cell Culture)						
2	**Total Number Other Personnel**				**Total Other Personnel**		(b) (4), (b) (6)
					Total Salary, Wages and Fringe Benefits (A+B)		**75,000.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 4

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2011 *** End Date:** 06-30-2012 **Budget Period: 4**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	*** Funds Requested ($)**
Total funds requested for all equipment listed in the attached file	
Total Equipment	

Additional Equipment: File Name: Mime Type:

D. Travel	**Funds Requested ($)**
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	3,000.00
Total Travel Cost	**3,000.00**

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 4

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2011 *** End Date:** 06-30-2012 **Budget Period: 4**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	46,100.00
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	
Total Other Direct Costs	**46,100.00**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**124,100.00**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. Facilities and Administration	8	124,100.00	9,928.00
		Total Indirect Costs	**9,928.00**

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)	**134,028.00**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 6351-NIAID_Bat_viruses_Budget_Justification_(AAHL).pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 5

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2012 *** End Date:** 06-30-2013 **Budget Period: 5**

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary ($)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
1.	Dr.	Bruce		Mungall		co-PD/PI							(b) (4), (b) (6)

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: Mime Type: **Total Senior/Key Person** (b) (4), (b) (6)

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary ($)	* Fringe Benefits	* Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Research Assistant (Molecular Genetics)						(b) (4), (b) (6)
1	Research Assistant (Cell Culture)						
2	**Total Number Other Personnel**				**Total Other Personnel**		(b) (4), (b) (6)
					Total Salary, Wages and Fringe Benefits (A+B)		**75,000.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

Tracking Number

OMB Number 4040-0001
Expiration Date 04/30/2008

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 5

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2012 *** End Date:** 06-30-2013 **Budget Period: 5**

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment Item	* Funds Requested ($)

Total funds requested for all equipment listed in the attached file

Total Equipment

Additional Equipment: File Name: Mime Type:

D. Travel	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	3,000.00
Total Travel Cost	**3,000.00**

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**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, BUDGET PERIOD 5

*** ORGANIZATIONAL DUNS:** 7543079570000

*** Budget Type:** ❍ Project ● Subaward/Consortium

Enter name of Organization: CSIRO

*** Start Date:** 07-01-2012 *** End Date:** 06-30-2013 **Budget Period: 5**

F. Other Direct Costs	**Funds Requested ($)**
1. Materials and Supplies	46,100.00
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	
Total Other Direct Costs	**46,100.00**

G. Direct Costs	**Funds Requested ($)**
Total Direct Costs (A thru F)	**124,100.00**

H. Indirect Costs

Indirect Cost Type	**Indirect Cost Rate (%)**	**Indirect Cost Base ($)**	*** Funds Requested ($)**
1. Facilities and Administration	8	124,100.00	9,928.00
		Total Indirect Costs	**9,928.00**

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)	**134,028.00**

J. Fee	**Funds Requested ($)**

K. * Budget Justification File Name: 6351-NIAID_Bat_viruses_Budget_Justification_(AAHL).pdf Mime Type: application/pdf

(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - Cumulative Budget

	Totals ($)	
Section A, Senior/Key Person		**0.00**
Section B, Other Personnel		**375,000.00**
Total Number Other Personnel	10	
Total Salary, Wages and Fringe Benefits (A+B)		**375,000.00**
Section C, Equipment		
Section D, Travel		**15,000.00**
1. Domestic	0.00	
2. Foreign	15,000.00	
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		**230,500.00**
1. Materials and Supplies	230,500.00	
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)		**620,500.00**
Section H, Indirect Costs		**49,640.00**
Section I, Total Direct and Indirect Costs (G + H)		**670,140.00**
Section J, Fee		

Bruce Mungall, Ph.D. Consortium (b) (4), (b) (6) is a Project Leader at the Australian Animal Health Laboratory in the field of Henipavirus Therapeutics. He will coordinate and oversee the efforts of all personnel in addition to performing much of the *in vitro* viral characterization experimental work. Dr. Mungall has expertise in most of the technical areas directly related to this project and has developed the current proposal with Dr. Daszak (PD/PI) and Dr. Lipkin (PI). Dr. Mungall has established key assays relating to viral quantitation *in vitro*.

To Be Appointed, B.Sc. Research Technician (b) (4), (b) (6) will be an infectious disease technician with considerable experience in molecular virology. Under the supervision of Dr. Mungall, the technician will assist during reverse genetics studies and all *in vitro* experiments and will assist with the laboratory characterization of experimental samples.

To Be Appointed, B.Sc. Research Technician (b) (4), (b) (6) will be an infectious disease technician with experience in the routine culture of viruses. Under the supervision of the Dr. Mungall, the technician will perform much of the *in vitro* assessment of viral samples.

Supplies:

Supplies budgeted are in keeping with the types of experiments and number of persons engaged in the research to be conducted in Dr. Mungall's laboratories. A significant portion of the initial work involves *in vitro* characterization of viral infection, such that considerable funds are requested to support tissue culture activities.

(Itemized by category)

Tissue Culture (sera, media etc.)	$16,100
Disposable Plasticware, gloves, gowns	$10,000
Taqman PCR reagents	$20,000
	$46,100

Travel:

Funds are requested for Dr. Mungall to travel to the US to meet with Dr's Daszak and Lipkin once each year ($3,000).

PHS 398 Cover Page Supplement

OMB Number: 0925-0001
Expiration Date: 9/30/2007

1. Project Director / Principal Investigator (PD/PI)

Prefix: Dr.
* First Name: Peter
Middle Name:
* Last Name: Daszak
Suffix:

* New Investigator? ● No ○ Yes

Degrees: Ph.D. | BSC (HON) |

2. Human Subjects

Clinical Trial? ● No ○ Yes

* Agency-Defined Phase III Clinical Trial? ○ No ○ Yes

3. Applicant Organization Contact

Person to be contacted on matters involving this application

Prefix: Dr.
* First Name: Peter
Middle Name:
* Last Name: Daszak
Suffix:

* Phone Number: (b) (6)
Fax Number: 2123804475
Email: (b) (6)

* Title: Executive Director, CCM

* Street1: 460 West 34th Street
Street2: 17th Floor
* City: New York
County:
* State: NY: New York
Province:
* Country: USA:
* Zip / Postal Code: 10001

PHS 398 Cover Page Supplement

OMB Number: 0925-0001
Expiration Date: 9/30/2007

4. Human Embryonic Stem Cells

* Does the proposed project involve human embryonic stem cells? ●No ○Yes

If the proposed project involves human embryonic stem cells, list below the registration number of the specific cell line(s) from the following list: http://stemcells.nih.gov/registry/index.asp . Or, if a specific stem cell line cannot be referenced at this time, please check the box indicating that one from the registry will be used:

Cell Line(s): ❑ Specific stem cell line cannot be referenced at this time. One from the registry will be used.

OMB Number: 0925-0001
Expiration Date: 9/30/2007

PHS 398 Research Plan

1. Application Type:

From SF 424 (R&R) Cover Page and PHS398 Checklist. The responses provided on these pages, regarding the type of application being submitted, are repeated for your reference, as you attach the appropriate sections of the research plan.

*Type of Application:

● New ○ Resubmission ○ Renewal ○ Continuation ○ Revision

2. Research Plan Attachments:

Please attach applicable sections of the research plan, below.

1. Introduction to Application (for RESUBMISSION or REVISION only)	
2. Specific Aims	4103-SPECIFIC_AIMS.pdf
3. Background and Significance	1143-BACKGROUND.PDF
4. Preliminary Studies / Progress Report	7901-PRELIMSTUDIES.PDF
5. Research Design and Methods	8817-RESEARCHDESIGNMETHODS.pdf
6. Inclusion Enrollment Report	
7. Progress Report Publication List	

Human Subjects Sections

Attachments 8-11 apply only when you have answered "yes" to the question "are human subjects involved" on the R&R Other Project Information Form. In this case, attachments 8-11 may be required, and you are encouraged to consult the Application guide instructions and/or the specific Funding Opportunity Announcement to determine which sections must be submitted with this application.

8. Protection of Human Subjects	
9. Inclusion of Women and Minorities	
10. Targeted/Planned Enrollment Table	
11. Inclusion of Children	

Other Research Plan Sections

12. Vertebrate Animals	4896-vertebrate_animals.pdf
13. Select Agent Research	
14. Multiple PI Leadership	
15. Consortium/Contractual Arrangements	3161-Consortium_Contractual_Arrangements.pdf
16. Letters of Support	6720-Support.pdf
17. Resource Sharing Plan(s)	

18. Appendix

Attachments

IntroductionToApplication_attDataGroup0

File Name	Mime Type

SpecificAims_attDataGroup0

File Name	Mime Type
4103-SPECIFIC_AIMS.pdf	application/pdf

BackgroundSignificance_attDataGroup0

File Name	Mime Type
1143-BACKGROUND.PDF	application/octet-stream

ProgressReport_attDataGroup0

File Name	Mime Type
7901-PRELIMSTUDIES.PDF	application/octet-stream

ResearchDesignMethods_attDataGroup0

File Name	Mime Type
8817-RESEARCHDESIGNMETHODS.pdf	application/pdf

InclusionEnrollmentReport_attDataGroup0

File Name	Mime Type

ProgressReportPublicationList_attDataGroup0

File Name	Mime Type

ProtectionOfHumanSubjects_attDataGroup0

File Name	Mime Type

InclusionOfWomenAndMinorities_attDataGroup0

File Name	Mime Type

TargetedPlannedEnrollmentTable_attDataGroup0

File Name	Mime Type

InclusionOfChildren_attDataGroup0

File Name	Mime Type

VertebrateAnimals_attDataGroup0

File Name	Mime Type
4896-vertebrate_animals.pdf	application/pdf

SelectAgentResearch_attDataGroup0

File Name	Mime Type

MultiplePILeadershipPlan_attDataGroup0

File Name	Mime Type

ConsortiumContractualArrangements_attDataGroup0

File Name	Mime Type
3161-Consortium_Contractual_Arrangements.pdf	application/pdf

LettersOfSupport_attDataGroup0

File Name	Mime Type
6720-Support.pdf	application/pdf

ResourceSharingPlans_attDataGroup0

File Name **Mime Type**

Appendix

File Name **Mime Type**

2. Specific Aims.

A key challenge to understanding emerging zoonosesis their unpredictability. They emerge in a seemingly random way, from disparate regions on the globe, from a wide diversity of wildlife and domestic animals. Our ability to understand this process is hampered by three major issues: **1)** the lack of rigorous analyses of the processes that cause emergence; **2)** the large diversity of microbes in wildlife (the 'zoonotic pool') from which new zoonoses regularly emerge; and **3)** our poor understanding of why some viruses are able to cross the species barrier and others not. Despite this, a number of key studies have begun to analyze the rules that govern zoonotic disease emergence. There are also a growing number of molecular tools for discovering potential zoonoses, and assessing their capacity to infect humans. In this proposal, we will use a novel, multidisciplinary approach to examine the basic rules of emergence for zoonoses from a key wildlife group - bats. Bat-borne viruses are a significant, and expanding group of emerging pathogens that include viruses with high mortality rates in people (e.g. Rabies virus, Nipah virus, Ebola virus, Hendra virus), and which have caused pandemic outbreaks (e.g. bat SARS-like coronaviruses). There are also a variety of bat viruses with unknown potential to become zoonotic. We will address these significant challenges to global health in three aims:

Aim 1. Predictive modeling of bat viral diversity and risk of future emergence. We have just published an important new tool for the prediction of pathogen emergence. (PI Daszak, Co-PI Jones)

1.1. Prediction of global hotspots for bat viral biodiversity, and for the emergence of new zoonoses from bats. We will use our database of bat pathogens and GAP analysis to predict the global biodiversity of bat viruses (the bat 'virome'). We will test the hypothesis that bats are reservoirs of a disproportionate number of zoonotic and potentially zoonotic pathogens. We will then use spatial multivariate logistic regression models to examine the correlation between bat-borne zoonotic EIDs (from our Human EID database) and a range of socio-economic, demographic and ecological factors. This will provide spatial prediction of EID emergence from bats ('hotspot' maps).

1.2. Targeted surveillance in EID 'hotspots' to expand our current knowledgebase of bat viruses. We will target collection of bat biological samples at the sites predicted to be high bat viral diversity and at high risk of an EID emergence in *Aim 1.1*,.

1.3. Risk assessment of future viral emergence from bats. In years 04 and 05, we will expand our hotspot modeling to incorporate global, gridded datasets on projected future changes in EID drivers, and on international travel and trade. This will provide a refined, more accurate risk assessment for future viral emergence from bats.

Aim 2. Bat viral pathogen identification using a staged strategy. We will implement an efficient, staged strategy for microbial surveillance and discovery. In year -01 MassTag PCR panels will be used to rapidly screen bat samples for the presence of known and closely related paramyxoviruses, lyssaviruses, and coronaviruses. In years -02 and -03 GreeneChips will be used to survey all vertebrate virus taxa. In years -03 and -04 a selected subset of samples from the CCM collection will be subjected to HTS analysis to identify microbes not captured by MassTag PCR or GreeneChip and to profile microflora. (Co-PIs Lipkin & Briese)

2.1. MassTag PCR assays for detection of paramyxoviruses, lyssaviruses and coronaviruses. We will establish bat housekeeping gene controls for MassTag PCR assays and optimize MassTag PCR assays for bat feces, saliva, urine and serum. We will then Implement MassTag PCR assays for paramyxoviruses, lyssaviruses and coronaviruses, confirm identity of viruses identified by MassTag PCR analysis and establish and implement specific real time PCR assays for quantitation of pathogen burden and surveillance

2.2. GreeneChip Microarray assays for detection of vertebrate viruses We will optimize and implement GreeneChip assays to screen bat feces, saliva, urine and serum for any known vertebrate viruses, confirm the identity of those viruses identified by GreeneChip analysis, and establish and implement specific real time PCR assays for the quantitation of pathogen burden and surveillance.

2.3. Metagenomic sequence analysis of bat feces, saliva, urine and serum. We will design and implement software for subtraction of bat sequences, implement HTS assays of bat

feces, saliva, urine and serum, confirm identity of microbes identified in metagenomic assays, and establish and implement specific real time PCR assays for quantitation of pathogen burden and surveillance

2.3. Metagenomic sequence analysis of bat feces, saliva, urine and serum. We will design and implement software for subtraction of bat sequences, implement HTS assays of bat feces, saliva, urine and serum, confirm identity of microbes identified in metagenomic assays, and establish and implement specific real time PCR assays for quantitation of pathogen burden and surveillance

Aim 3. Bat viral pathogenesis. We will use a multi-platform *in vitro* approach to investigate the likelihood of known, non-select agent bat viruses, and of new viruses discovered and sequenced in Aim 2 emerging in people.

3.1. In vitro evaluation of bat derived paramyxoviruses, coronaviruses and lyssaviruses in Vero and bat cell lines to determine correlates of infection. Routine cell culture systems (Vero cells or BHK cells) or primary and/or continuous bat cell lines (developed in a previous CSIRO project) will be utilized to evaluate a number of recently emerged, non-biodefence related paramyxoviruses (MenV, TPMV, SalV, Tioman, Mapuera and PoRV Virus), coronaviruses (bat SARS CoV, bat CoV, and a number of bat coronavirus isolates from Hong Kong) in addition to several lyssaviruses (and related rhabdoviruses) for determining molecular correlates of infection via whole genome, rapid pyrosequencing.

3.2. Evaluation of paramyxovirus correlates of infection using reverse genetics. Once infection correlates have been determined *in vitro*, we will reverse engineer specific molecular correlates into, or out of, wild type paramyxoviruses and assess their phenotypes in suitable *in vitro* systems.

3.3. Identification of viral or host correlates of infection. Using a range of cell lines and the NHBE cell as a surrogate model for human respiratory infection, we will evaluate the cellular pathogenicity of novel viruses discovered through Aims 1 and 2. Incorporating rapid, whole virus genome sequencing technologies, we will rapidly evaluate quasispecies changes relevant to host adaptation. By comparison of data for these newly discovered viruses to well characterised, but closely related viruses, we expect to determine potential viral or host correlates of infectivity and pathogenicity, or both.

3. Background and Significance.

3.1. Emerging zoonoses from wildlife and their drivers.

Emerging infectious diseases (EIDs) are a key threat to global health [1, 2]. They are caused by pathogens that emerge on a pandemic scale (e.g. HIV/AIDS) or through smaller outbreaks that have high case fatality rates or lack effective therapies or vaccines (e.g. Ebola virus, multi-drug resistant TB). Recent work using large databases of human pathogens have shown that around three-fourths of the pathogens that have emerged in people originate in wildlife [3, 4]. These 'wildlife EIDs' include the most significant and highly threatening EIDs to have emerged so far (e.g. HIV/AIDS, SARS Coronavirus, Ebola virus, Nipah virus). This group of EIDs alone causes tens of thousands of deaths each year, and some outbreaks (e.g. SARS) have cost the global economy tens of billions of dollars. However, despite the huge social, demographic and economic impact of EIDs, there has been little advance in our understanding of the underlying process of how these wildlife zoonoses emerge, and in developing predictive approaches to prevent future emergence[5-8].

This unpredictability is a key challenge to medical science. New zoonoses emerge from wildlife regularly, and in a seemingly random way, from disparate regions on the globe, and from a wide diversity of wildlife and domestic animals. Our ability to understand what drives this process is hampered by three major issues: **1)** a lack of rigorous analyses of the processes that cause emergence; **2)** our lack of knowledge of the diversity of microbes in wildlife (the 'zoonotic pool'[9, 10]) from which new zoonoses regularly emerge; and **3)** our poor understanding of pathogenetic factors that explain why some viruses are able to make the species jump, and others are not. Despite these problems, a number of recent studies have begun to analyze the rules that govern zoonotic disease emergence[3, 4, 11-15] (**Fig. 1**), to develop molecular techniques to assess the dimensions of the 'zoonotic pool' [16, 17], and to work with animal models and in vitro approaches to examine viral pathogenesis and host-jumping [18, 19].

Previous research on how anthropogenic drivers cause disease emergence has either reviewed broad trends without detailed analyses[1, 8, 9, 20], or concentrated on specific diseases and the role of single anthropogenic driver (e.g. deforestation, climate and malaria [21-25]). Other work has studied how specific changes in travel and trade may facilitate the spread of specific diseases (e.g. SARS[7, 26-28] and H5N1 avian influenza[29]). The critical need for research in this field has led to the National Research Council listing 'Infectious Disease and the Environment' as their 5th of 6 "Grand Challenges in Environmental Sciences"[30]. In this proposal, we will refine our recently-published approach to predicting EID 'hotspots'[13], and test the predictive ability of the hotspots map through targeted, enhanced surveillance of a key group of wildlife reservoirs (bats) within high-risk geographic locations.

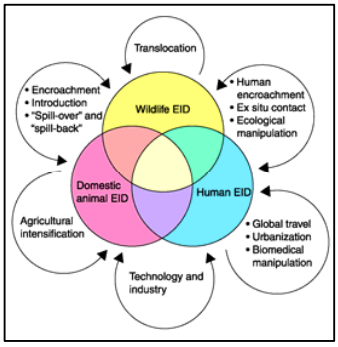


Figure 1. Factors that promote disease emergence[31, 32]. This figure from[15] illustrates that anthropogenic factors (socio-economic, demographic or environmental changes) drive pathogen emergence [8, 33]. For example, agricultural intensification led to the emergence of Nipah virus in 1998[34, 35]. These factors alter the contact among humans, wildlife and livestock to promote pathogen 'spill-over' and emergence. There is a critical underlying relationship: **Zoonotic emergence is a product of the high diversity of pathogens in non-human animals, and a series of anthropogenic changes that bring our populations into contact.** This is a central theme to the current proposal.

3.2. Bats and Emerging Zoonoses.

While there are a considerable number of recently emerged zoonotic pathogens[36], of particular interest are those which appear to have emerged from mammalian reservoir hosts, particularly rodents, ungulates, primates, carnivores and, more recently, bats[3, 37]. More than 30 viruses have been isolated from bats including a number of zoonotic viruses [38] (**Table 3, Research design *5.2.1***). Bats have been implicated as the natural host of some of these zoonoses, and may be simply aberrant carriers of others. We believe that through targeted sampling of various bat populations in predicted EID hotspots, additional viruses with zoonotic potential will be discovered. Analyzing the diversity of pathogens in this group will inform our predictive models

and allow us to develop more generalizable strategies for combating future zoonotic EIDs. Statistically, RNA viruses are more likely to emerge, comprising 37% of all emerging and reemerging pathogens [36]. RNA viruses are also prominent among the subset of emerging pathogens that have apparently entered the human population only in the past few decades, such as HIV, SARS-CoV or Nipah virus. Among these, both paramyxoviruses and coronaviruses appear to infect the broadest range of host species, particularly mammalian species[39], and include a number of agents with bats as reservoir hosts. They also include a number of viruses related to emerging viruses in humans, but which have not been associated with human infections. Elucidating the likely pathogenesis of these viruses in human cells may have significance in understanding the future risk of them emerging into the human population.

3.2.1. Paramyxoviruses. Paramyxoviruses include common human pathogens which entered the human population (mumps, measles, parainfluenza 1-4) and a number of important emerging pathogens (Hendra and Nipah viruses). Currently, we have unique access to a set of related bat-derived paramxyoviruses that display either mild clinical signs during infection of swine, asymptomatic infections, or are as yet uncharacterised with respect to their pathogenicity in terrestrial mammals. Six new members of the paramyxovirus family have been described in the last decade:

1) *Hendra virus* (HeV), the cause of an outbreak of fatal respiratory disease resulting in the death of 14 horses and one human, was isolated in September 1994 [40, 41]. The virus is carried by fruit bats (genus *Pteropus*)[42, 43]. Recently the cellular receptor which HeV (and NiV) us to gain entry to vertebrate cells was discovered [44, 45] with an additional co-receptor discovered subsequently [46]; 2) *Menangle virus* (MenV) was isolated in 1997 from stillborn piglets at a commercial piggery in New South Wales, Australia[47]. The presence of neutralizing antibodies against MenV in several species of fruit bats (genus *Pteropus*) and their absence in a range of domestic and other wild animals within the vicinity of the piggery suggested that flying foxes are the probable natural host of this virus [47]; 3) *Nipah virus* (NiV), was the cause of an outbreak of viral encephalitis in Malaysia and Singapore which resulted in 105 human fatalities and the slaughter of over a million pigs once it became evident that swine were the source of human infection [48-53]. Malaysian fruit bats (*P. vampyrus* and *P. hypomelanus*) are the natural reservoirs of NiV [54, 55], and its emergence is thought linked to the intensification of pig production in the region[34]. NiV has now also emerged repeatedly in Bangladesh[56], where it has undergone chains of human-to-human transmission[57]. NiV is closely related to HeV (and uses the same cell receptor) and it has been proposed that these two viruses represent members of a new genus within the subfamily *Paramyxovirinae* [51, 58, 59]; The remaining three new viruses, in contrast, have an unknown propensity to cause disease: 4) *Tupaia paramyxovirus* (TPMV) was isolated from an apparently healthy Southeast Asian tree shrew [60]; 5) *Salem virus* (SalV), although identified while investigating the cause of an unknown equine illness, was not considered to be the etiological agent of the disease in question [61]. Although neither of these viruses has been classified taxonomically, initial phylogenetic comparisons suggested that the closest evolutionary relationships existed between TPMV, SalV, HeV, and members of the genus *Morbillivirus*, with TPMV more closely related to HeV, and SalV more closely related to the morbilliviruses; 6)*Tioman virus* (TiV), was isolated in Malaysia from urine samples collected from fruit bats in an attempt to identify the natural host of NiV [62] and cross-reacts with MenV-specific antisera which it appears to be closely related to genetically [62].

The first finding of a paramyxovirus in bats was described in 1966. A parainfluenza virus type 2 was isolated from the frugivorus bat *Rousettus leschenaulti* in India[63]. *Mapuera virus* was the second paramyxovirus isolated from the yellow-shouldered bat (*Sturnira lilium*) in Brazil in 1979 [64] and recent studies suggest Mapuera may be related to a porcine rubulavirus (PoRV, a.k.a. blue eye disease virus) [65] isolated from pigs with nervous disorders, pneumonia, corneal opacity and infertility [66]. Neither bat virus has been found to cause human infections. Two additional porcine paramyxoviruses have been identified including the Isolation of a cytopathogenic virus from a case of porcine reproductive and respiratory syndrome (PRRS) and its characterization as parainfluenza virus type 2 [67]. Janke and co-workers [68] reported a neurological and respiratory disease in a swine herd in the northern USA associated with Porcine

Paramyxovirus (PPMV). The clinical respiratory and neurological disease was similar to that observed with Nipah virus infection except the disease was milder.

Other paramyxoviruses with unknown human, bat or porcine involvement include phocine, dolphin, and porpoise morbilliviruses[69-72]; *Mossman virus* (MoV) isolated from wild rats trapped in Queensland, Australia, during the early 1970s [73]; *Nariva virus* (NaV) was isolated on four separate occasions from the forest rodent species *Zygodontomys brevicauda brevicauda,* trapped in Eastern Trinidad during 1962 and 1963 [74 75]; Jvirus (J-V) from moribund *Mus musculus* trapped in 1972 during a study of the pathology of feral rodents in North Queensland, Australia [76, 77]; Beilong virus (BeiPV), discovered as two putative novel cDNAs, termed Angrem 104 and Angrem 52 using BLASTx searches on the NCBI server [78], from human mesangial cells with significant homology to JPV genes [79 80, 81]. BeiPV was then isolated from the human mesangial cell line from which the cDNA sequences Angrem 104 and Angrem 52 were originally obtained [82]. Later, it was discovered that a rat mesangial cell line, from the same laboratory in which the human mesangial cells were cultured, carried BeiPV, which is believed to be the original source of the virus [82]. Whilst the ability of many of these new viruses to cause disease is unknown their isolation and characterization further illustrates the wide host range, distribution, and genetic diversity of recently emerged members of the subfamily *Paramyxovirinae*.

3.2.2. Coronaviruses. Coronaviruses are found in a wide range of animal species. In humans, coronaviruses are mainly respiratory pathogens, although they have been occasionally shown to be the cause of diarrhea. Before the SARS epidemic, only two human coronaviruses (HCoVs) had been characterized (HCoV- 229E and HCoV-OC43). Both of these usually cause a mild upper respiratory tract infection. In 2004, two novel human coronaviruses were identified in individuals with respiratory infections[83, 84]. HCoV-NL63 has since been detected in individuals with typical features of acute respiratory infection in Europe, Japan, China, Australia, and North America, and HCoV-HKU1 was isolated from individuals with pneumonia (Reviewed in [85]). HCoVs, including the previously known HCoV-229E and HCoV-OC43, may account for up to 30% of respiratory infections in the general population [83, 86]. Animal and human coronaviruses have been classified into three different serologically distinct groups based on their antigenicity [87, 88]: Group 1 contains HCoV- 229E and porcine [TGEV (transmissible gastroenteritis virus) and PDEV, (porcine diarrhea epidemic virus)], feline [FIPV (feline infectious peritonitis virus)] and canine coronaviruses; Group 2 contains HCoV-OC43 along with MHV (mouse hepatitis virus), bovine coronavirus and haemagglutinating encephalomyelitis virus; and Group 3 contains avian coronaviruses, including IBV (infectious bronchitis virus) of chickens and turkey coronavirus. SARS-CoV lies in a group of its own, based on gene sequencing studies [87, 88].

Coronaviruses have been shown experimentally and in nature, to undergo genetic recombination by a genomic template-switching mechanism and to generate genetic point mutations at a rate similar to that of other RNA viruses including influenza A viruses. This may explain the high degree of host switching and zoonotic transmission within the group [89, 90]. The origin of SARS-CoV host-switch to humans appears to be wildlife. Civets and related small carnivores were implicated in the emergence of SARS-CoV[91] and recent work by our group shows that Chinese horseshoe bats harbor SARS-like CoV that are the likely wildlife source of the SARS-CoV lineage[92, 93]. Since then, a new group 1 coronavirus (includes the human pathogens human coronaviruses 229E and NL63) was detected in three species of *Miniopterus* bats in Southeast Asia [94]. In Hong Kong, Coronaviruses were detected by RT-PCR of rectal swabs in 37 of 309 bats (12%) with the bat-SARS-CoV being detected in 21 of 118 (17.8%) *R. sinicus*[95]. Six other coronaviruses were also discovered in different bat species during a survey of Chinese bats[96]. Even more recently, antibodies bat-SARS-CoV have been detected in African bats[97], and a diverse assemblage of group 1 coronaviruses has been reported from North American bats[98].

3.2.3. Lyssaviruses. The Lyssavirus species include rabies virus, (genotype 1), Lagos bat virus (genotype 2), Mokola virus (genotype 3), Duvenhage virus (genotype 4), European bat lyssaviruses 1 and 2 (genotypes 5 and 6, respectively), Australian bat lyssavirus (genotype 7), and four newly described genotypes found in Eurasia, Aravan (isolated in 1991), Khujand (isolated in 2001), Irkut (isolated in 2002), and West Caucasian bat viruses (isolated in 2002) [71,

[99, 100]. These four Eurasian genotypes and the Lagos bat virus have not been shown to cause human infections to date [101]. There had only been one reported case of human infection caused by the Duvenhage virus to date which occurred in South Africa in 1970 [102, 103]. *Miniopterus schreibersii* was considered to be the host associated with the infection and the virus was isolated once from a *Nycteris thebaica* bat [103]. All the above lyssaviruses have been isolated from bats except Mokola virus which is mainly isolated from cats and occasionally from rodents and shrews [96]. For the bat-associated lyssaviruses, only rabies virus is also associated with other terrestrial animals (especially carnivores); all the others have bats as the sole natural reservoir.

Rabies virus has a worldwide distribution while the other lyssaviruses are relatively restricted geographically. A large number of animals are susceptible to infection by the classical rabies virus. However, only mammals of the orders Chiroptera and Carnivora transmit the virus efficiently in nature. In countries which are free from canine rabies, bats are the most important source for human rabies. Cross-species transmission of rabies virus still occurs today but all these incidents are the result of bat-to-terrestrial animals spillover not the reverse [104]. Phylogenetic division of bat rabies viruses was clearly shown to be associated with clustering of specific bat species in two studies, suggesting that some rabies viruses co-segregate with their bat hosts [105, 106]. In Canada, for example colonial and non-migratory *Myotis* bats are associated with rabies virus clades that are distinct from those associated with solitary, tree-dwelling and migratory red bats *(Lasiurus* spp.) [106]. From 1958 to 2000, bat rabies accounted for 32 of the 35 indigenous cases of rabies in the USA [107]. In 26 of the patients, there was no history of bat bites. Nineteen of these 26 'cryptic' rabies were associated with two species, *Lasionycteris noctivagans* and *Pipistrellus subflavus*. Similarly in Latin America, bat rabies is as important as canine rabies in causing disease in humans and livestocks. In Brazil, analysis showed that canine- and bat-related rabies viruses reside in distinct groups, reinforcing the hypothesis that different rabies virus strains are preferentially related to different mammalian hosts [108, 109]. Bat rabies viruses are associated with a large number of bat species, both frugivorous, insectivorous, and sanguivorous. Pteropus bats have been found to be infected with rabies virus in India [110], and with other lyssaviruses in Thailand, Bangladesh, and Australia[111, 112]. Australian bat lyssavirus was first recovered from *Pteropus alecto* in New South Wales, Australia, and later also found in other bat species [113]. Two fatal human infections in Australia have been reported, both had sustained bat-related injuries prior to onset of disease [114]. Post-exposure prophylaxis with rabies vaccine and immunoglobulin were given in subsequent potential exposures to Australian bat lyssavirus and no further human cases have ever been described [115, 116]. In contrast to other bat-associated pathogens, Australian bat lyssavirus can cause encephalitis in infected bats [115, 116].

3.3. Viral Discovery

In this proposed work, we will develop a three-phase viral discovery strategy to examine the viral diversity with bats. The first step is ***MassTag PCR***, an inexpensive high-throughput system which uses digital mass tags rather than fluorescent dyes to serve as reporters, and which was first implemented to distinguish 22 different viral and bacterial respiratory pathogens [117, 118]. Our next step is the use of ***DNA Microarrays (our GreeneChip)*** which have potential to provide a still broader platform for highly multiplexed microbial surveillance. The number of potential features far exceeds that with any other known technology. Furthermore, probes of up to 70 nt are not uncommon. Thus, unlike PCR where short primer sequences demand complementarity between probe and target, DNA arrays are less likely to be confounded by minor sequence mismatches. Despite these advantages, DNA arrays have not been widely employed because of limited sensitivity. This limitation has been addressed with GreeneChip technology through improvements in sample preparation, random amplification and labelling protocols. Thus, specimens found negative by MassTag PCR will be analysed using GreeneChips that comprise probes for all known vertebrate viruses. Finally, we will use ***High-throughput sequencing (HTS) to enable*** pathogen discovery. Unlike multiplex PCR or array methods where investigators are limited by known sequence information and must make choices regarding the range of pathogens to consider in a given experiment, HTS is unbiased and allows an opportunity to consider the entire tree of life: bacteria, viruses, fungi and parasites.

3.4. Viral Pathogenesis.

Both closely and distantly related animal hosts are potential sources of emerging human disease[3, 11]. However, the scope of the virus to solve novel molecular problems encountered in different hosts is likely a key factor in preventing emergence. If fewer natural evolutionary molecular barriers need to be overcome, whether in cell surface receptors, engagement of entry or fusion machinery, evasion of host interferon responses, or interaction with cell replication mechanisms, then emergence will be favoured assuming the novel host and agent are suitably juxtaposed. Thus, understanding viral pathogenesis is likely critical to understanding emergence.

3.4.1. Cell viability and apoptotic events. The ultrastructural characteristics of paramyxovirus-infected cells share common features including the generation of large syncytia and presence of viral nucleocapsids in cytoplasmic inclusion bodies and underlying electron dense areas of the serum membrane [119]. Under normal circumstances, once infected, cells then attempt pre-programmed cell death, apoptosis, in order to aid in virus elimination from the host. Some viruses, among them certain paramyxoviruses, actually suppress apoptosis in order to prolong viral replication cycles and enhance virus spread [120, 121]. Apoptosis and necrosis represent two extremes of a continuum of cell death. This continuum includes many variations. "Apoptosis-like programmed cell death" refers to a cell death process that has some of the hallmarks of apoptosis such as chromatin condensation and the appearance of PS on the outer leaflet of the cell membrane but does not necessarily require caspase activity [122]. "Necrosis-like programmed cell death" describes programmed cell death that does not include chromatin condensation and has varying degrees of other apoptotic features. Caspase-1 and caspase-8 have been implicated in some cases of this type of programmed cell death [123].

Apoptosis occurs via a complex signaling cascade that is tightly regulated at multiple points, providing many opportunities to evaluate the activity of the proteins involved. The initiator and effector caspases are particularly good targets for detecting apoptosis in cells. These ubiquitous enzymes exist as inactive zymogens in cells and are cleaved before forming active heterotetramers that drive apoptotic events. Luminescent and fluorescent substrates for specific caspases have allowed the development of homogeneous assays to detect their activity. The caspase family of cysteine proteases are the central mediators of the proteolytic cascade leading to cell death and elimination of compromised cells. As such, the caspases are tightly regulated both transcriptionally and by endogenous anti-apoptotic polypeptides, which block productive activation [124]. Furthermore, the enzymes involved in this process dictate distinct pathways and demonstrate specialized functions consistent with their primary biological roles [125]. Assays that directly measure caspase activity can provide valuable information about the mechanism of death in infected or dying cells.

3.4.2. Interferon function/blockade. The IFN system is one of the first lines of innate immune defense against infection in mammals, and is designed to limit the spread of microorganisms from the source of infection [126-129]. There are two types of IFN: i) Type I IFNs are produced in response to virus and bacterial infection and comprise a family of related IFNα proteins and IFNβ. The type II IFN, IFNγ, is synthesized only by certain cells of the immune system. The transcriptional activation of type I IFNα/β genes is a complex, bi-phasic process (Reviewed in [130]). The first phase, IFN induction, occurs in cells soon after infection and leads to the synthesis of IFNβ and a subset of IFNα proteins [129, 131]. The IFN induction pathway can be activated by double-stranded (ds)RNA [132] or by virus infection, in which viral components other than dsRNA might be responsible [133]. In the second phase, IFN signaling, the IFNs that are induced as a result of virus infection bind to type-I-IFN receptors on the surface of both infected and uninfected cells, and activate hundreds of IFN-inducible genes, some of which have antiviral activity [127-129].

Almost all viruses have evolved ways to evade the IFN-induced antiviral responses of their hosts [126, 131]. These mechanisms include the inhibition of host-cell transcription and translation and the consequent failure to synthesize IFN, inhibition of dsRNA-signalling and IFN-signalling pathways, and antagonizing the IFN-induced antiviral effecter proteins. The anti-IFN activities of many paramyxoviruses are encoded by the viral P gene. Products of the P gene inhibit both dsRNA signaling [134-137] and IFN signaling [138-140], but often by slightly different approaches.

3.5. Significance.

Understanding the natural wildlife reservoir, amplifying host, the routes of transmission, the type of susceptible human hosts, and the epicentres for zoonotic and human transmissions is crucial in the control of zoonotic infections. As an illustration, there have been multiple recent paramyxovirus emergence events, many of these involving bats. Some of these newly emerged viruses are highly pathogenic (henipaviruses), some are moderately pathogenic (Menangle, PoRV, PPMV) while many are of unknown pathogenicity (Tioman, Mapuera, SalV, TPMV). Significantly, members of these viruses are present on at least five continents (Australia, Asia, Africa, North and South America), suggesting a high global importance associated with paramyxovirus infections. Two of these newly emerged viruses, HeV and NiV, are not only novel discoveries, they are also BSL4 agents that possess several biological features that make them highly adaptable for use as bioterror agents. Firstly, unlike most notable viral agents of biodefense concern such as smallpox or ebola, NiV can be isolated from natural sources [141, 142], it can be readily grown in cell culture to high titers near $1x10^8$ $TCID_{50}$/ml [143], it is highly infectious and transmitted via the respiratory tract [144, 145], it can be amplified and spread in livestock serving as a source for transmission to humans, and recently it has been shown to be transmitted directly from person to person [57]. Clearly, there is a high level of public health importance attributed to Henipaviruses, and by inference, a considerable risk associated with new emergence events by other unknown or uncharacterised bat viruses.

Similarly, there have been multiple recent human coronaviruses identified. Some are mildly pathogenic (HCoV-229E and HCoV-OC43) causing mild upper respiratory tract infections that result in self-resolving common colds in otherwise healthy individuals or severe pneumonia in immunocompromised people [146, 147]. Others are moderately pathogenic (HCoV-NL63) causing conjunctivitis, croup, and, sometimes, serious respiratory infections in children [83, 148], while SARS-CoV infected patients presented with an influenza-like illness that began with headache, myalgia, and fever, often followed by acute atypical pneumonia, respiratory failure, and death [88]. While there are many lyssaviruses that have been isolated from bats (Reviewed in [96]), only rabies virus is commonly associated with other terrestrial animals (especially carnivores). All the others appear to have bats as the sole natural reservoir hosts. However, the recent fatal lyssavirus infections in humans resulting directly from bats, suggest the potential for sporadic lyssavirus infections is poorly understood [114].

EID hot spot modeling integrated with a proven strategy for microbial surveillance and discovery affords an unprecedented opportunity to identify new pathogens before they emerge to threaten human health. Viruses identified using a range of cutting edge PCR and microarray technologies will then be comparatively analyzed with closely related viruses via whole genome sequencing, combined with assessment of their relative pathogenicity and the nature of the induced host immune responses using a range of cell lines. Additionally, these studies will enhance our understanding of bat microbial ecology, an important reservoir of a significant and increasing number of emerging pathogens. We will also make use of our excellent experimental collections of paramyxoviruses, coronaviruses and lyssaviruses enabling comparative pathogenesis studies to be undertaken *in vitro*, and potentially *in vivo*. If novel paramyxoviruses are discovered, in addition to comparative pathogenomics, we will also employ manipulation of viral genomes using established reverse genetics technologies to evaluate potential molecular correlates of infection. Combining this knowledge with the epidemiology of emergent zoonoses and predictive modeling techniques, we will not only be able to more accurately predict future transmission events, but we will be able to rapidly identify the relative threat posed by newly emerged related viruses. Further, through the identification of conserved therapeutic targets, we will enhance our ability to respond quickly and effectively to mitigate these threats.

4. Preliminary Studies

4.1. Analyzing the process of zoonotic disease emergence. At the Consortium for Conservation Medicine (CCM) (PI Daszak, Co-PI Kate Jones), we specialize in research to understand and predict the process of disease emergence. Our recent work on the ecology of West Nile virus[149-152], Nipah virus[34, 35, 153-156] and SARS [157-160] has provided evidence that the process of disease emergence via 'host-jumping' can be mathematically modeled, and predicted. Disease emergence has been characterized as a three-part process: a) initial pathogen establishment, b) persistence, and c) spread to other host communities[161], or initial spill-over to a new host, limited host-to-host transmission, and larger-scale geographic spread [162]. Each of the steps in the emergence process (**Fig. 2**) has been analyzed and modeled for some individual pathogen systems[7, 27, 163-165], and we can use this to develop a predictive approach to zoonotic disease emergence.

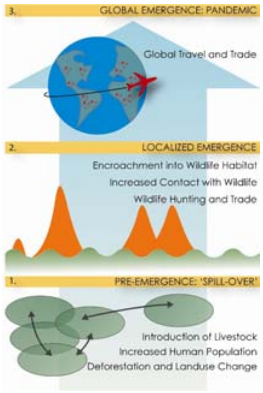


Figure 2. Widespread zoonotic disease emergence involves three critical phases: 1) cross species transmission (black arrows) where environmental changes cause animal populations to interact and share pathogens; 2) Spill-over and local establishment in humans. This relies on a high diversity of pathogens in wildlife hosts, the traits of these pathogens, phylogenetic similarity between hosts, and environmental conditions; 3) pandemic emergence depends on large-scale geographic contact networks established through trade and travel, leading to movement of hosts, pathogens and vectors.

To analyze disease emergence, we have spent the past 3 years studying the impact of human change on global disease emergence. To do this we developed our **Human Emerging Infectious Disease Event Database**, which includes data on all 338 diseases that have emerged in people from 1940 to 2004, referenced to the primary literature. We identified 375 EID 'events', defined as the first emergence of a new disease, or the first cluster of cases or outbreaks that represented a pathogen being listed as emerging, following definitions in the literature. We based our data collection on a previously-published list of emerging infectious diseases [4] updated to 2004. We added information on time, location, pathogen type, transmission mode, other hosts, and pathogen life history traits. We also listed the most commonly cited causes of emergence for each pathogen following published definitions [1, 2, 8, 15, 33]. The location of each EID event was digitized into ArcGIS [166] (**Figure 3**).

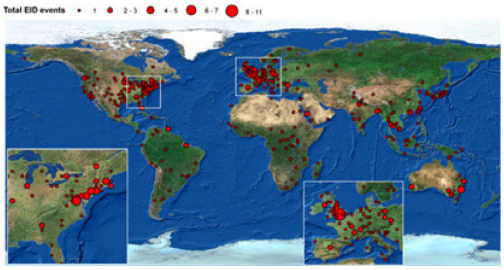


Figure 3. Human EID 'hotspots' 1940-2004. Global richness map of the origin of each emerging pathogen reported in humans 1940-2004. Points represent 1º grid cell centroids where # of EID events in the grid is proportional to the area of the point. The major EID hotspots are NE USA, W. Europe, Japan and SE Australia, albeit that these also likely represent regions where infectious disease surveillance and research is also high[13].

To develop a predictive approach to disease emergence, we first corrected for reporting biases in the dataset. We calculated the annual number of articles published in the leading infectious disease journal (*Journal of Infectious Diseases*) from 1945 to 2004, and the country of origin of each author (senior and co-authors, n=17,979). We were able to answer some significant questions regarding disease emergence. First, we showed that the number of EIDs has risen significantly with time after correcting for reporting bias (Generalised Linear Model with Poisson errors, offset by log(JID articles) ($GLM_{P,JID}$), $F_{1,57} = 86.4$, $p < 0.001$). We found that zoonotic diseases originating in wildlife (e.g. SARS, Ebola, Hantavirus) represent a large and increasing fraction of all emerging diseases, having increased significantly with time, controlling for reporting effort ($GLM_{P,JID}$ $F_{1,57} = 53.4$, $p < 0.001$), and constituted the majority (53.1%) of EID events in the most recent decade (1990-2000). This supports the suggestion that zoonotic EIDs are increasing and represent the most significant current EID threat to global health[1, 2, 167-169].

We then built a multivariate logistic regression model which included our correction for reporting bias. We found a significant correlation between zoonotic EID events originating in

wildlife and mammalian biodiversity (species richness)[13], supporting the hypothesis that regions with higher diversity of wildlife are more likely to foster new zoonotic EIDs. Zoonotic EIDs from wildlife are also significantly correlated with human population density. This factor acts as a 'proxy' for anthropogenic and socio-economic changes (e.g. alterations to agriculture, intensification of livestock production, deforestation). Thus, the key group of EIDs – those caused by zoonoses from wildlife – emerge in regions with high human population density and high wildlife biodiversity. In the current proposal, we will develop this approach further and test the correlations between other drivers (agriculture, deforestation, hunting etc), projected trends in these drivers, and the emergence of bat viruses.

Pathogen Type # EID event grid cells	All 356-366		Zoonotic: Wildlife 198-204	
	b	B	b	B
log(JID articles)	0.31-0.34***	1.36-1.40	0.29-0.31***	1.34-1.36
log(Human Pop. Density)	0.51-0.57***	1.67-1.77	0.42-0.48***	1.52-1.61
Human Pop. Growth	0.14-0.47	1.15-1.60	-0.12-0.24	0.89-1.27
Latitude (decimal degrees)	0.02-0.03**	1.02-1.03	0.01-0.02#	1.01-1.02
Rainfall (mm)	$0.27x10^{-3}$-$0.51x10^{-3}$***	1.00-1.00	$0.05x10^{-3}$-$0.29x10^{-3}$	1.01-1.01
Wildlife Host Richness	$0.16x10^{-2}$-$0.42x10^{-2}$	1.00-1.00	$0.67x10^{-2}$-$0.92x10^{-2}$**	1.00-1.00
Constant	-13.69--12.66***		-12.96--11.96***	
Pathogen Type **# EID event grid cells**	**Drug-Resistant** **64-68**		**Vector-Borne** **118-121**	
log(JID articles)	0.47-0.53***	1.60-1.69	0.16-0.22***	1.17-1.24
log(Human Pop. Density)	0.99-1.24***	2.69-3.45	0.35-0.50***	1.41-1.66
Human Pop. Growth	1.02-1.53***	2.76-4.62	-0.44-0.06	0.65-1.06
Latitude (decimal degrees)	0.05-0.06**	1.05-1.06	-0.01-0.00	0.99-1.00
Rainfall (mm)	$0.37x10^{-3}$-$0.62x10^{-3}$*	1.00-1.00	$0.02x10^{-3}$-$0.35x10^{-3}$	1.00-1.00
Sub-national GDP	0.25-0.49***	1.29-1.55	0.18-0.34**	1.19-1.40
Constant	-27.03--23.33***		-12.20--10.11***	

Table 1: Multivariable logistic regressions for EID events (origins of EIDs) according to pathogen type. Numbers represent the range of values obtained from 10 random draws of the possible grid squares where b represent the regression coefficients and B represents the odds ratio for the independent variables in the model. Higher odds ratios indicate that variable value increases have a higher likelihood of being associated with an EID event and probability value equals the median probability from 10 random draws of the possible grid squares where *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$ and # $p < 0.1$. (Results from each random draw are given in[13].

Finally, we used the results from these spatial logistic regressions to visualize the true, current risk of EIDs globally (EID 'hotspots'). For zoonotic EIDs from wildlife, these regions are areas with high wildlife biodiversity and high human population pressure (e.g. parts of Latin America, Africa and Asia), as well as regions with exceptionally high anthropogenic change and lower diversity (e.g. North America, Europe, South Asia) – (**Figure 4**).

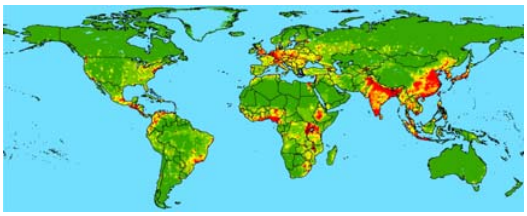


Figure 4. Global Predicted Risk of EID Outbreak (Risk scores calculated without using reporting bias control variable). Risk scores are categorized by deciles, and mapped on a scale from dark green (lowest decile) to dark red (highest decile).

This predictive map shows the risk of a future EID emerging from any wildlife species, due to a few simple anthropogenic changes. It provides proof-of-concept, and can be refined to focus on specific groups of wildlife that are likely to produce significant new EIDs (e.g. bats) and can be expanded using datasets on other anthropogenic changes (e.g. agricultural production, deforestation, road-building), and with data on future projected changes to these factors. This will likely greatly refine the predictive power of the model. Our paper on this preliminary research is now in press with the journal *Nature* [13].

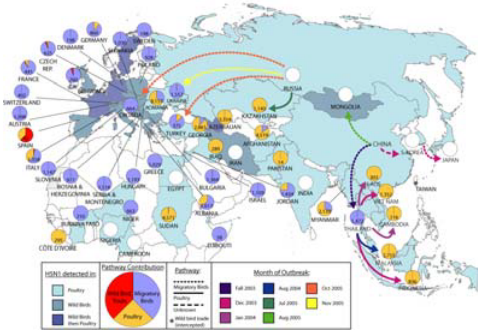


Fig. 5. Spread of H5N1 avian influenza in Asia, Europe, and Africa[29]. Each circle (pie chart) represents a separate spreading event for prior H5N1 spread. Pie charts illustrate the total number of infectious bird-days (# infected birds * days shedding virus) and fraction from each pathway for birds moving between previous H5N1 outbreak countries and the focal country. The orange color denotes poultry trade as the most likely cause of that spreading event, the blue color denotes wild bird migration as the likely cause.

The preliminary data described above provides a strategy to identify regions with the conditions necessary for the initial origins of an EID event. We also developed a strategy to examine what factors cause some EIDs to become pandemic in a case study of H5N1 avian influenza spread. We considered the trade in poultry and pet birds and the movement of migratory birds [29] and found that 44 of 52 country introductions were consistent with trade or migratory bird movement (**Fig. 5, above**).

The success of this approach in explaining H5N1 spread (and demonstrating close congruence with pathogen sequence phylogeny) suggests that this approach can be used for predicting the movement of pathogens linked to trade. We have also modeled the spread of West Nile virus to Galapagos, Hawaii, and Barbados [170-172]. Other workers have published similar analyses predicting the spread of SARS [7], the tiger mosquito (*Aedes albopictus*), an important vector of 22 arboviruses [27], and the future spread of H5N1 should it be viably transmitted among humans [28]. We have demonstrated proof-of-concept that data on trade, combined with virological information and host ecology can be used to predict the pathway and direction of spread of a pathogen globally (**Fig. 6.**). We used data on the global trade of poultry and wild birds, as well as the movements of migratory birds to predict the future spread of H5N1 avian influenza. We found that the risk of spread to the Americas was far greater through poultry trade than by migratory birds.

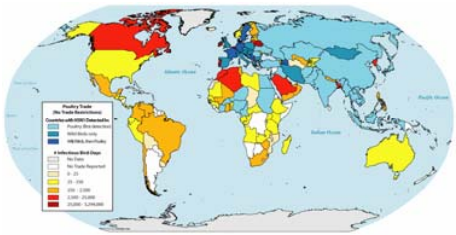
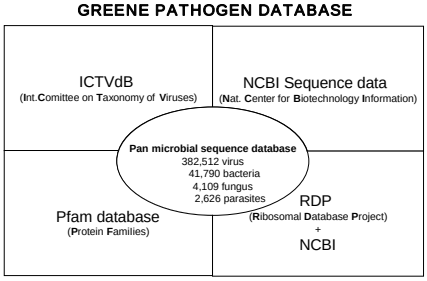


Fig. 6. The predicted risk of H5N1 avian influenza introduction via poultry trade from countries that have previously reported the pathogen (blue) to countries that have not[29]. The risk measures are given in # of infectious bird-days (red = highest, brown = moderate, yellow/white = lowest). This work demonstrates that poultry trade is a far more likely pathway for introduction of H5N1 into the Americas than wild bird migration.

Using this approach, we will build a spatial and temporal database of bat pathogens and human disease emergence events involving bat pathogens, analyse the factors that cause them to emerge, and develop predictive models of 1) the unknown diversity of the bat 'virome'; 2) the future 'hotspots' for emergence of new bat viruses; and 3) the regions within this hotspot map which have the highest connectivity, and which are therefore the most likely to lead to the next emerging pandemic from bats. **Our goal is to expand our sample repository from these hotspot sites, and then use novel virus discovery and pathogenesis techniques to identify new viruses, and understand the likelihood of their future emergence.**

4.2. Microbial surveillance and discovery.
Molecular methods for direct detection of microbes in clinical specimens are rapid, sensitive and may succeed where fastidious requirements for agent replication or the need for high level biocontainment confound cultivation. This program will employ three proven complementary molecular platforms to enable comprehensive surveillance and discovery: MassTag PCR, GreenChip arrays and High Throughput Sequencing (HTS).

4.2.1. Bioinformatics: Establishment of the Greene Microbial Database. A critical early step in the development of the MassTag PCR and microarray tools was the establishment of a viral sequence database. We first implemented a panel that distinguishes 22 different viral and bacterial respiratory pathogens[173]. We later expanded the repertoire to include causative agents of hemorrhagic fever, diarrheal diseases and to subtype influenza viruses. During the period of 10-12/2004, an increased incidence of Influenza-Like Illness (ILI) was recorded by the New York State Department of Health that tested negative for influenza virus by molecular testing, and negative for other respiratory viruses by culture. Concern that a novel agent might be implicated led us to investigate clinical materials [174]. MassTag PCR resolved 26 of 79 previously negative samples, revealing the presence of rhinoviruses in a large proportion of samples, about half of



which belonged to a previously uncharacterized genetic clade. Follow-up studies in Europe, Asia, Africa, and Australia indicated a global distribution of these novel viruses and revealed that they are represent a substantial proportion of unexplained pediatric bronchiolitis and pneumonia. The 2004 New York ILI study confirmed the utility of MassTag PCR for surveillance, outbreak detection and epidemiology by demonstrating its potential to rapidly query with high sensitivity samples for the presence of a wide range of candidate viral and bacterial pathogens that may act alone or in concert.

The development of our viral sequence database was facilitated in 2002 by the move of the ICTVdB (International Committee on Taxonomy of Viruses Database; http://phene.cpmc.columbia.edu), from Biosphere 2 (Earth Institute) in Oracle, Arizona to Columbia; and the establishment of a Northeast Biodefense Center Biomedical Informatics Core (PI Lipkin). To ensure comprehensive coverage, we included every vertebrate virus listed in the ICTVdB, a taxonomic database that describes viruses at the levels of order, family, genus, and species. Construction began by using the Protein Families database of alignments (Pfam, http://pfam.wustl.edu) and Hidden Markov Models (HMM). Sequences for the design of oligonucleotide probes and MassTag PCR primers were selected based on biological parameters, including the degree of conservation of proteins or domains, their expression level during infection, and the amount of data available for the respective region. The majority of viral protein coding sequences in the NCBI database (84%) were represented in the Pfam database; the remainder were mapped using pair-wise BLAST alignments [175]. A pan-microbial database (GreenePmdB) was established by supplementing the GreeneVrdB with ribosomal RNA (rRNA) sequences of fungi, bacteria and parasites obtained from the Ribosomal Database Project (RDP, http://rdp.cme.msu.edu) or the NCBI database. At the time of this writing the GreenePmdB comprises the 382,512 viral sequences of the GreeneVrdB, representing both complete and partial viral genomes; 41,790 bacterial 16S rRNAs; 4,109 fungal 18S rRNAs; and 2,626 18S parasitic rRNAs. **These sequences represent all 2,011 recognized vertebrate virus species** and 135 bacterial, 73 fungal and 63 parasite genera.

4.2.2. GreeneChip Fabrication and Hybridization. DNA arrays have not been widely employed because of limited sensitivity. Using improved methods for sample preparation, amplification, labeling and printing, we have now addressed the challenge of applying this technology to clinical specimens. Together with Agilent Technologies we created a DNA microarray platform suited to analysis of clinical materials without amplification in culture. Investigation by MassTag PCR and viral DNA microarray of blood collected during the 2005 Angola Marburg virus outbreak from an individual who died of hemorrhagic fever failed to yield a pathogen; however, implementation of a *panmicrobial* DNA array, GreeneChipPm, implicated *P. falciparum* infection [176]. Array fabrication studies were initiated by spotting 50, 60, and 70 nt oligonucleotides representing a wide range of viruses with and without amino modifications at the 5' end, onto glass slides. We observed no difference between unmodified 60 or 70 nt oligonucleotide targets. However, hybridization signal improved with the increase in target length from 50 to 60 nt, and amino modification. The enhanced signal with amino modification reflects controlled binding of the oligonucleotide to the slide at one end of the molecule, such that the entire probe is available for hybridization to its intended microbial target. Our intent in implementing the GreeneChip was to identify both known and related agents for which precise sequence information is not available. To assess to what extent a given probe sequence can hybridize to a non-matching but related sequence, we analyzed synthetic mismatch-controls. Whereas up to 15 terminal mismatches had little effect, strings of 5 or more mismatches distributed throughout a sequence, particularly mismatched G/C pairs, resulted in reduced signal; more than 12 mismatches distributed throughout a sequence resulted in no signal. We recently moved from home to commercial printing on the Agilent mask-less printing platform. Advantages include: (1) *Probe orientation*: oligonucleotides are synthesized *in situ* at right angle with respect to the planar surface to allow optimal exposure for hybridization. (2) *Design flexibility*: arrays can be produced in batches of 9 to facilitate modification to include new sequences. (3) *Consistent probe density and morphology*: unlike spotted arrays, Agilent arrays are not confounded by variations in humidity and oligonucleotide concentration. (4) *Higher printing density/higher throughput*: unlike spotted arrays where we have only been able to use 15,000 probes per slide, Agilent slides can accept up to 500,000 probes

per slide, printed in several formats e.g., a 2–well array comprising 220,000 probes/well, a 4-well array comprising 50,000 probes per well, and an 8-well array comprising 15,000 probes per well; gaskets and hybridization chambers have been developed for each of these formats. (5) *Scanning strategy*: implementation of an Agilent scanner allows automatic adjustment of the focal plane for improved resolution; software for extraction of meaningful hybridization data is rapid and user friendly.

Sensitivity is critical to implementation of arrays directly with human, bat or other specimens. Efficiency of individual steps of the protocol was optimized using spiked human samples and real time PCR. First-strand reverse transcription is initiated with a random octamer linked to a specific primer sequence (5'-TCG CGT TAC ATA GTT CGA GNN NNN NN). After RNAse H digestion, cDNA is amplified using a 1:9 mixture of the above primer and a primer targeting the specific primer sequence (5'-CGC TCG CGT TAC ATA GTT CGA). Initial PCR amplification cycles are performed at a low annealing temperature (35^{o}C); subsequent cycles use a stringent annealing temperature (55^{o}C) to favor priming through the specific sequence. Products of this first PCR are then amplified in a second 'labeling' PCR using the specific primer sequence linked to a capture sequence for 3DNA dendrimers containing more than 300 fluorescent reporter molecules (Genisphere Inc.). The PCR product is denatured in hybridization buffer and added to GreeneChips for hybridization. Following washes, a second hybridization step is performed to add Cy3-labeled dendrimers. GreeneChips are incubated with the dendrimers, washed, dried, imaged using an Agilent DNA microarray scanner, and analyzed using Agilent Feature Extractor software. The use of dendrimers provides a 100x gain in sensitivity over microarray labeling methods where reporter molecules are directly incorporated into amplification products.

4.2.3. *GreeneChip analysis.* GreeneLAMP (Log-transformed Analysis of Microarrays using P-values) version 1.0 software was created to assess results of GreeneChip hybridizations. Common analysis software focuses on the differential two-color analysis used in gene expression arrays, which is not applicable to the GreeneChip. GreeneLAMP has a robust and generalized framework for microarray data analysis including: flexible data loading, filtering and control experiment subtraction. Probe intensities are background corrected, $\log_2$-transformed and converted to Z-scores (and their corresponding p-values). Where available, control matched experiments from uninfected samples are used and spots >2 standard deviations (SD) from the mean are subtracted. In instances where matched control samples are not available, the background distribution of signal fluorescence is calculated using fluorescence associated with 1,000 random 60-mers (Null probes). In both scenarios, positive events are selected by applying a false positive rate of 0.01 (the rate at which Null probes are scored as significant) and a minimum p-value per probe of 0.1 (in cases with a matching control) and 0.023 (2 SD) (in cases without a matching control). A map, built from a BLASTN alignment of probes to the GreenePmdB, is used to connect probe sequences to the respective entries in the GreenePmdB. Each of those sequences corresponds to an NCBI Taxonomy ID (TaxID). The individual TaxIDs are mapped to nodes in a taxonomic tree built based on ICTV virus taxonomy or the NCBI taxonomic classification for other organisms. The program output is a ranked list of candidate TaxIDs. Candidate TaxIDs are ranked by combining the p-values for the positive probes for that TaxID using the QFAST method of Bailey and Gribskov [177].

4.2.4. Assessment of GreeneChip Performance. Although our primary goal in developing the GreeneChip platform is to have a tool for clinical applications, there are instances where it may also be useful for characterization of cultured materials. High density GreeneChips allow virus speciation. Additionally, hybridized microbial sequences recovered from GreeneChips, can be cloned and sequenced, eliminating the need for trial and error consensus PCR. However, the most compelling reason to use cultured materials is pragmatic: we have access to large banks of well characterized cultured viruses. Through collaborative relationships with our partners in WHO network laboratories we obtained extracts of cultured cells infected with adeno-, alpha-, arena-, corona-, entero-, filo-, flavi-, herpes-, orthomyxo-, paramyxo-, pox-, reo-, and rhabdoviruses (total of 49 viruses). All were accurately identified. To assess sensitivity, viral RNA extracted from infected cell supernatants was quantitated by real time PCR, serially diluted and subjected to

analysis using template concentrations ranging from 1,000,000 to 10 copies/assay. The threshold detection of adenovirus was 10,000 RNA copies; the threshold for detection of the other viruses tested was 1,000 RNA copies. Array performance was tested using samples obtained from patients with diarrhea, respiratory disease, hemorrhagic fever, tuberculosis and urinary tract infections. In all cases array analysis detected an agent consistent with the diagnosis obtained by culture or PCR. GreeneLAMP analysis revealed the presence of human rotavirus A, human adenovirus F, caliciviruses, astrovirus, human enterovirus A (EV-A), human respiratory syncytial virus A (RSV-A), influenza A virus, Lake Victoria marburg virus (MARV), severe acute respiratory syndrome coronavirus (SARS-CoV), lactobacillus, mycobacteria and gammaproteobacteria. Specific real time PCR analyses indicated viral loads in the clinical specimens of $6.3x10^5$ copies/assay for SARS-CoV [178], $1.1x10^3$ copies/assay for RSV-A [179], and $5.46x10^5$ copies/assay for EV-A [180].

4.2.5. Recovery of Hybridized Sequences from GreeneChips. In pilot experiments using WNV, SARS, and Sindbis isolates, we recovered cDNAs ranging from 200 to 1,000 nt. GreeneChips display 3 or more probes representing different genomic regions for each virus. Sequence recovery, characterization and phylogenetic analysis are straightforward and readily implemented in clinical or field laboratories. A silicon gasket is applied to the slide to define a well over the array. Water is placed in the well at 65°C for 10 min. The water containing the eluted cDNA is used as template for PCR amplification with the specific amplification primer used to generate the hybridized product. Products are cloned, screened by direct colony PCR and sequenced.

4.3. Viral pathogenesis in vitro.

4.3.1. Fusion kinetics. As part of an existing collaboration funded by NIAID (U01 AI056423-01) (Mungall, Co-PI) we have developed methods to quantitate NiV infection in Vero cell culture for the implementation of antiviral assays. To date, we have developed functional and quantitative assays for measuring NiV cell-fusion and virus entry [181-183]. Using recombinant vaccinia viruses expressing henipavirus F and G proteins we can accurately quantitate the kinetics of viral fusion (**Fig. 7**). By producing analogous constructs for each paramyxovirus under investigation, we will evaluate the fusion kinetics of each virus in equivalent cell lines.

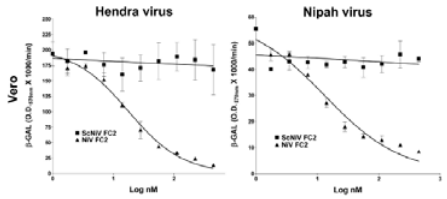


Figure 7. Quantitation of Hendra virus and Nipah virus-mediated cell-cell fusion. HeLa cells were infected with vaccinia recombinants encoding HeV F and HeV G or NiV F and NiV G glycoproteins, along with a vaccinia recombinant encoding T7 RNA polymerase (effector cells). Each designated target cell type was infected with the *E. coli* LacZ-encoding reporter vaccinia virus vCB21R. The cell fusion assay was performed for 2.5 hr at 37°C, followed by lysis in Nonidet P-40 (1%) and β-Gal activity was quantified.

In addition to these kinetic assays, we have also developed assays incorporating fluorescent immunolabelling of viral protein in cell cultures 24hrs after infection providing a reproducible measure of syncytium formation (**Fig. 8**).

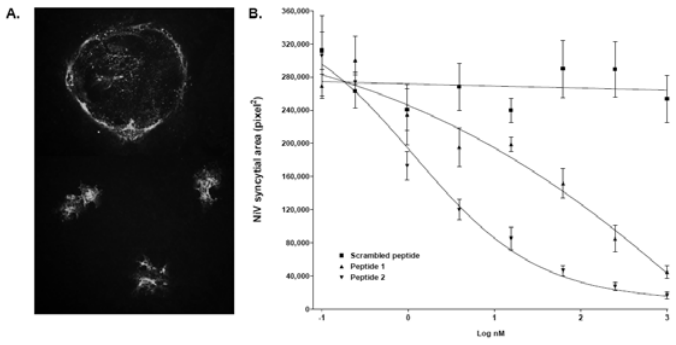


Figure 8. Quantitation of NiV infection of Vero cells. A. Vero cells are infected with NiV in the presence or absence of test antiviral. Cells are incubated for 24 hours, fixed in methanol and immunofluorescently labeled for phosphoprotein prior to digital microscopy. The top image is an untreated control well, the image on the bottom shows a well treated with a test antiviral peptide, resulting in decreased syncytium size. **B.** Image analysis was performed to determine the relative area of each syncytium. Figure shows the relative

syncytial area versus peptide concentration for scrambled peptide control (squares) and two test peptides (triangles).

4.3.2. Viral replication kinetics. In addition to direct virus quantitation assays, we have developed reliable systems for isolation and quantification of NiV from samples and tissues of infected animals [18]. We have established real time PCR assays for NiV, HeV and MenV (Bowden, unpublished data) used to quantify virus in infected tissue culture supernatant and clinical samples (**Fig. 9**). We will establish Taqman PCR assays for detection of each virus under investigation enabling the rapid and accurate quantitation of viral genome *in vitro*.

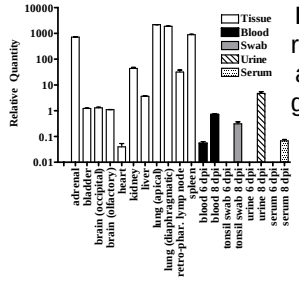


Figure 9. NiV genome in cats detected by Taqman PCR. Normalized, relative NiV genome levels in samples collected during NiV infection in cats and at necropsy. Taqman PCR Ct values were determined in triplicate for NiV genome and normalized by dividing by the 18S rRNA Ct values for each sample. Relative NiV genome was determined by linear regression of NiV cDNA standard curves for each assay. Values are expressed as the average of all replicates and are from a single representative animal.

4.4. Paramyxovirus reverse genetics

As described previously [184] a cDNA representing the full length of the Malaysian NiV genome [51] has been constructed. This was inserted in the plasmid pMDB1 with unique restriction sites included at the end of each gene (pNiV6+ **Fig. 10.**). An additional construct expressing the EGFP gene, inserted downstream of the N gene has also been prepared. Infectious virus was rescued from the full-length clones by infecting CV-1 cells with MVAGKT7, a highly host-restricted strain of vaccinia virus MVA that expresses the T7 polymerase [185]. A mixture of the genome plasmid and N, P, and L supporting plasmids were transfected to the infected CV-1 cells.

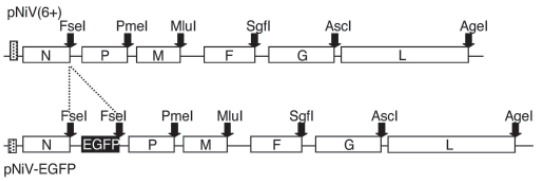


Figure 10. Schematic representation of the pNiV full-length clones constructed. The unique restriction sites used in the cloning procedure are shown. pNiV(6+) has six unique restriction enzyme sites (indicated) and the EGFP construct contains this additional gene inserted between the N and P genes.

The ratio of the plasmids used was that determined previously[186] using a minigenome system for NiV. The transfected CV-1 cells were cultured for 7 days with the addition of new cells. Syncytia were successfully visible 2 days after transfection. Virus was then passaged in Vero cells in which it induced a large number of syncytia within 24 h, characteristic of NiV infection. The rescued NiVs (rNiVs) were further passaged in Vero cells to produce a stock. The recombinant virus expressing EGFP (rNiV-EGFP) was also recovered by using the same procedure. The expression of EGFP in the rNiV-EGFP-infected cells was verified by using fluorescence microscopy (**Fig. 11.**).

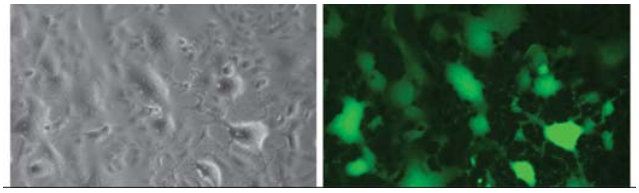


Figure 11. Vero cells were infected with rNiV-EGFP at a multiplicity of infection of 0.01 pfu per cell. The cells were observed after 24 h in a light microscope (left panel) or by fluorescence (right panel). The fluorescence was stably detected after the rNiV-EGFP was grown for three passages in cell culture. The extent of the cytopathic effect (CPE) induced by rNiV or rNiV-EGFP was similar to that of their parental NiV.

While this EGFP expressing virus could theoretically be detected using a fluorimeter we intend to replace the EGFP gene with firefly luciferase, greatly enhancing the sensitivity of virus detection and making use of the luminometer available in our laboratory. Using a commercially available assay system for quantitation of firefly luciferase (Promega), we anticipate being able to rapidly and sensitively quantitate viral load following infection.

4.5. Bat cell lines

Bats including those belonging to the genus *Pteropus*, display an almost uniform asymptomatic response when infected with doses of virus which kill other non-volant mammalian species. A detailed understanding of the immune response of bats at the cellular and molecular level may lead to previously unrecognised mechanisms of disease control. CSIRO-AAHL has initiated a project (Eric French Fellowship to Dr Mungall) to develop tools for viral pathogenesis in bats. At the heart of this program is a concerted effort to develop both primary and immortalized bat cell lines. There are currently no *Pteropus* cell lines commercially available and primary bat cell lines are inherently difficult to establish and maintain. This development program is already in progress and a number of cell lines from a range of Pteropus organs will be available early 2008, prior to the commencement of this NIH proposal. For the collection of bat organs for cell culture AAHL has several veterinarians on staff who are experienced and competent in dealing with bats and AAHL has an approved animal welfare assurance status (**OLAW: A5399-01**). As the bat cell line generation is funded separately, and only immortalized cell cultures will be used for this project, we believe that we should not include a vertebrate animal research section.

4.6. Whole virus genome HTS.

HTS in this aim will be pursued at the Columbia site where there is already considerable expertise in 454 technology. Data will be conveyed to the CSIRO site for detailed bioinformatic and functional analyses.

5. Research Design and Methods

Our Team. This is a unique, multidisciplinary proposal to address the complexity of viral emergence in humans from a key wildlife reservoir group. We have assembled a powerful interdisciplinary team that includes: The director and key staff at the Consortium for Conservation Medicine (CCM) – an institution dedicated to understanding the ecology of emerging diseases from wildlife reservoirs (Daszak, Epstein); a world authority on analysing large databases of reservoir hosts and their pathogens (Jones); the leader and key personnel of the Center for Infection and Immunity (CII) – the premier viral discovery laboratory globally (Lipkin, Briese, Palacios), and a senior staff member at one of few labs dedicated globally to emerging zoonotic pathogens, the Australian Animal Health Lab (Mungall). Each team member has proven expertise in their field, and all have collaborated together under the umbrella of the CCM over the past five years. Indeed, the collaborative approach is central to the way the CCM functions, building multidisciplinary teams to address key issues in disease emergence (www.conservationmedicine.org). Each of the leads at Columbia University (Lipkin), IOZ (Jones), and CSIRO AAHL (Mungall) are long-term adjuncts at CCM, and the CCM faculty are long-term adjuncts at CU and IOZ. This produces a seamless inter-institutional collaboration.

This collaboration has taken place under three projects: **1)** An NIH (Fogarty Intl. Center)-funded project to understand the emergence of Hendra and Nipah virus (R01-TW05869, Daszak PI) which involved Daszak, Epstein and Mungall; **2)** An NSF-funded project to develop a predictive approach to disease emergence (HSD collaborative award #0525216, Daszak PI) which involved Daszak and Jones; **3)** A NIAID-funded training project to understand the emergence of Nipah virus in Bangladesh (K08-AI067549, Epstein PI) which involves Daszak and Lipkin as co-mentors. These collaborative projects have provided some of the preliminary data for this proposal, and demonstrate the cohesion of this group of PIs and their ability to collaborate in this type of multidisciplinary work (see also **"Management Plan"** below).

5.1.Aim 1. Predictive modeling of bat viral diversity and risk of future emergence.

5.1.1. Prediction of global hotspots for bat viral biodiversity, and for the emergence of new zoonoses from bats.

Our approach will follow that used previously for the predictive modeling of EIDs of different types (zoonotic, drug-resistant, vector-borne)[13] and our (Jones) previous development of pathogen databases from carnivores, ungulates and primates [187, 188]. Digital spatial distributions of parasites will be generated from the combined ranges of their hosts using information on the host-parasite combinations from the Bat Disease database and range maps from the Mammal Digital Distribution database[189]. Preliminary data collection has already started on the Bat Disease Database with collaborator Dr. Maarten Vonhof (Western Michigan University) which currently holds data on 5,000 host parasite interactions for over 500 bat species from over 1,000 references. Richness grids (counting the number of parasite taxa per equal area spatial global grid) generated using ArcGIS[166]for all parasites reported from wild bats will be adjusted for measures of sampling effort for each host. GAP analysis will identify areas that have been under-sampled for infectious diseases relative to bat diversity[190]. We will finalize the database, then use GAP analysis to predict the global biodiversity of bat viruses, following the techniques developed by our earlier collaborators for primate pathogens[191]. Using this database, we will also test the hypothesis that bats are reservoirs of a disproportionate number of zoonotic and potentially zoonotic pathogens, which is widely proposed in the recent literature[37, 159, 192], but not supported by previous database analysis[3].

To predict global hotspots of zoonotic disease emergence from bats, we will repeat the analyses in [13] using the database of emerging zoonoses from bats to assess the spatial risk of future zoonotic disease emergence from bats. Specifically, we will regress our gridded datasets of richness of EIDs from bat pathogens onto gridded data sets of bat species richness, rainfall, temperature, human population density and growth and our measure of literature bias (corrected for a more bat-specific measure – e.g. using the authors of articles in the *Journal of Wildlife Diseases* and *Journal of Infectious Diseases*). The richness grid of all mammalian hosts serves as a null model for patterns of parasite richness and including it allows us to determine the influence of the other factors independently of the distribution of mammalian hosts. We will use generalized least squares models (SAS) and likelihood ratio tests for nested models[193, 194] to

quantify the relationship between pathogen species richness in livestock and wildlife (the two response variables) and the core explanatory variables. We will test for spatial autocorrelation of the residuals using Moran's I tests as we have done previously [195, 196], and use autoregressive models to account for spatial autocorrelation between adjacent localities[197, 198]. We will repeat these analyses using the spatial predictions of the unknown diversity of the bat 'virome' to gain a fuller understanding of the predictive risk.

We will then use global, gridded datasets on environmental variables that are shown to more directly impact bat populations and increase contact with people. These will include datasets subnational livestock distribution for sheep, goat, small ruminant, pig, poultry, and bovines from the Food and Agricultural Organization (http://www.fao.org/ag/aga/glipha/index.jsp) and livestock data from other sources. These include data on rearing density, production method, and area of cultivation.

5.1.2. Targeted surveillance in EID 'hotspots' to expand our current knowledgebase of bat viruses.

The CCM is one of the key institutions working on bat viruses globally. The Executive Director, Daszak, heads the Henipavirus Ecology Research Group (HERG) formed five years ago around an NIH-funded program (R01-TW05869) which has investigated the origins of Nipah virus in Malaysia[34, 35], Hendra virus in Australia[199], and SARS CoV in China[158, 160, 200, 201]. This work (Daszak, Epstein) has involved collection and storage of 3,785 biological samples from bats of a range of species from Australia, Indonesia, Malaysia and Bangladesh (**Table 2**).

Table 2. List of bat biological samples collected by the Consortium for Conservation Medicine and available for the current project

Bat Species	Sample Type	Number	Country of Origin
Pteropus giganteus	Serum	500	Bangladesh
	saliva	500	Bangladesh
	urine	500	Bangladesh
	colony urine	1250	Bangladesh
P. vampyrus	serum	256	Malaysia
	saliva	256	Malaysia
	urine	256	Malaysia
	dried blood spot	63	Malaysia
	serum	4	Indonesia
P.hypomelanus	serum	789	Malaysia
	saliva	789	Malaysia
	urine	789	Malaysia
	serum	20	Indonesia
Eonycterus spelea	salivary gland	30	Malaysia
	liver	30	Malaysia
	kidney	30	Malaysia
Cynopterus brachyotis	salivary gland	102	Malaysia
	liver	102	Malaysia
	kidney	102	Malaysia

Samples from these countries are stored at the Center for Infection and Immunity (CII, Lipkin) and the Australian Animal Health Laboratory (Mungall), and are available for our current research. We will expand this collection by targeting bat species within the regions uncovered by our hotspot predictions. Because we don't yet know the location of these hotspots, we cannot yet assess with total accuracy where sampling will need to take place. However, we can refer to our predictive map of the future origins of zoonotic EIDs from all wild mammal species (**Fig. 3**). Bats make up almost a quarter of all mammals[202], and it is likely that the final hotspots will be within the broad regions predicted by the mammalian 'hotspot' map. We therefore anticipate collection of samples in Mexico, Brazil, Cameroon and China in addition to those already collected. To facilitate this, the CCM will use its network of collaborators in the Wildlife Trust Alliance, with which it is formally a partner (www.wildlifetrust.org), and with which CCM scientists collaborate actively (e.g. see[203]). We anticipate no problems in obtaining samples from China, due to our unique formal collaboration with East China Normal University (Dr Shuyi Zhang), which is built around a signed MOU (see www.conservationmedicine.org). Previous

collaboration with Dr Zhang in China involved samples from over 1,500 bats being sent to the Australian Animal Health Lab (Mungall) and the discovery of bats as the likely source of the progenitors of SARS CoV[160, 201].

Potential pitfalls/alternative strategies: It is possible that the predictive modeling will highlight regions which are not covered by the Wildlife Trust Alliance, or other collaborators with CCM. We believe this is unlikely, because the risk map is essentially likely to be a product of regions of high anthropogenic pressure and high bat biodiversity. Regions of bat biodiversity closely correlate with mammalian biodiversity [202, 204], and therefore these areas are likely to be correlated with the hotspot map in Figure 3. Furthermore, if the regions are different, we believe that collaborative arrangements could easily be set up to collect samples. Our groups are very well connected in the conservation and ecology community, and we have been able to conduct such sampling without much difficulty, even in politically sensitive countries (e.g. China and India) in the past.

5.1.3. Risk assessment of future viral emergence from bats. In years 04 and 05, we will expand our hotspot modeling to incorporate global, gridded datasets on projected future changes in EID drivers, and on international travel and trade. This will provide a refined, more accurate risk assessment for future viral emergence from bats. We will use the regression models from **5.1.1** with only significant terms to generate likelihood for disease emergence for each global grid square. Next, we will produce an integrated, spatial database of drivers projected through the year 2050. Third, we will apply the parameters derived from the Aim 1 statistical findings to generate first-order estimates of future disease emergence risks, for four different scenarios of the future. Finally, we will compare the results across scenarios and conduct sensitivity analyses determine the degree to which the results are influenced by different drivers and projected patterns of change.

Central to this activity is the spatial database of projected drivers. To help achieve a high degree of internal consistency, we will seek to utilize model outputs from an integrated collection of linked models utilized widely within the global change research community, the IMAGE model[205, 206]. The IMAGE model, and its linked modules, provide the following useful parameters on a 0.5 degree grid, to the year 2100: Human population; Urbanization; GDP; Land cover; Livestock density; Temperature; and Precipitation. A benefit of utilizing these data sets and models is that it facilitates consideration of our results by the broader global change modeling community. We will supplement this collection of spatial drivers with select additional data, including projections of international air travel obtained from Boeing [207, 208].

We will utilize the same alternative scenarios used in the IPCC[209] to calculate different ranges of future drivers and impacts. The scenarios contain alternative packages of assumptions regarding a number of factors that influence global change, most important of which for our purposes are population and per-capita income growth rates. We will apply the results from the statistical analyses to the projected values of the socioeconomic and environmental drivers to estimate possible disease emergence risk surfaces, for each of the disease categories. We will then forecast and map changes in the probability of the panzootic spread of bat-origin EIDs using projections of climate change, human population growth, livestock production increases (**Figure 12**), relative GDP growth, and global trade and travel (**Figure 13**).

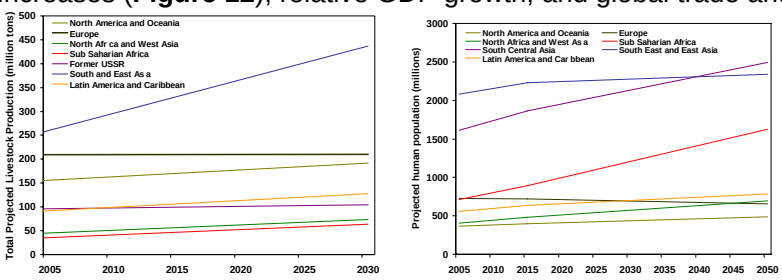


Figure 12 (above). Projected changes in livestock production (left, in 10^6 tons) and human population, by region (right, in thousands)[148, 205].

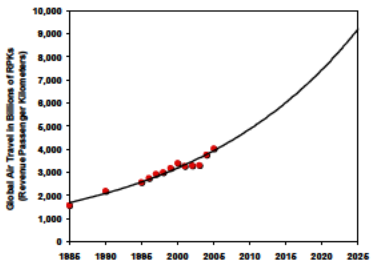


Figure 13 (left). Past and projected change in global air traffic volume[210]. RPK is the number of kilometers traveled annually multiplied by the number of people traveling. In our dataset, air traffic volume data are available on an airport-by-airport basis.

For both analyses, we will test alternative functional forms (allowing for non-linearities, variable interactions, multilevel models), to explore the degree to which such projections are sensitive to such variation. We will compare the results of the alternative scenarios to see which differences are most significant in terms of EID risk. This analysis will enable us to set priorities for future research, by illuminating areas of current uncertainty that have the highest potential to resolve uncertainties about the future.

5.2.Aim 2. Bat viral pathogen identification using a staged strategy.

5.2.1. MassTag PCR analysis.

We will implement an efficient, staged strategy for microbial surveillance and discovery. In year -01 MassTag PCR panels will be used to rapidly screen bat samples for the presence of known and closely related paramyxoviruses, lyssaviruses, and coronaviruses. In years -02 and -03 GreeneChips will be used to survey all vertebrate virus taxa. In years -03 and -04 a selected subset of samples from the CCM collection will be subjected to HTS analysis to identify microbes not captured by MassTag PCR or GreeneChip and to profile microflora. (Co-PIs Lipkin & Briese).

Our first strategy will be to <u>establish bat housekeeping gene controls</u>. Housekeeping gene controls are critical for assay calibration and monitoring RNA integrity (MassTag PCR, GreeneChips, HTS). CSIRO-AAHL is in the process of sequencing an Australian *Rhinolophus* and an Australian *Pteropus* transcriptome (funded by the Australian Biosecurity CRC). Sequence will be available late 2007. Employing these as a guide, the coding sequences for commonly used expression control genes like beta-actin and GAPDH, will be cloned from bat mRNA by cPCR with primers designed using GreeneSCPrimer.

<u>MassTag PCR assays for detection of paramyxoviruses, lyssaviruses and coronaviruses.</u> We will inventory viruses known and closely related to taxa already identified in bats using an inexpensive, high throughput screen. Assay development will be completed within 6 months with implementation immediately thereafter. We will rapidly identify candidate viruses for further characterization through analysis of sequence, phylogenetic, and prevalence data. These analyses will focus investment in culture and pathogenesis in years 1-2. We will establish bat housekeeping gene controls for MassTag PCR assays and optimize MassTag PCR assays for bat feces, saliva, urine and serum. We will then implement MassTag PCR assays for paramyxoviruses, lyssaviruses and coronaviruses, confirm identity of viruses identified by MassTag PCR analysis and establish and implement specific real time PCR assays for quantitation of pathogen burden and surveillance. Utilyzing a large panel of uncharacterized virus isolates obtained from bats and stored at the Australian Animal Health Laboratory (AAHL – Consortium), extracted RNA will be provided to the Columbia University lab for MassTag PCR analysis.

<u>Optimize MassTag PCR assays for bat feces, saliva, urine and serum.</u> The effects of sample type on assay specificity and sensitivity will be tested using bat feces, saliva, urine and serum spiked with known concentrations of paramyxovirus, lyssavirus and coronavirus. Routine sample preparation will use Tri-Reagent. In the event that PCR inhibition is detected with housekeeping gene controls, alternative extraction procedures will be evaluated; including Qiagen silica columns (Qiagen); NucliSens soluble silica extraction (Biomerieux) or a combined Ultraspec II extraction system (Biotecx).

<u>Implement MassTag PCR assays for paramyxoviruses, lyssaviruses and coronaviruses.</u> Primer sets will be selected in conserved regions of the viral genomes to screen for the presence of coronaviruses, rhabdo-/lyssaviruses, paramyxoviruses. For coronaviruses the available SARS and bat coronavirus sequences will be used and primers will be selected in the same conserved polymerase regions that were used to initially identify this virus. For other viruses multiple

sequence alignments based on sequences listed in **Table 3** will be used to select appropriate primer sets using SCPrimer software. MassTag PCR panels will be built as 20-plex reactions; in the event that more than 20 primer sets are needed to cover the targeted sequences 2 MassTag panels will be assembled. We will include in addition screening primers targeting flavi-, bunya-, filo- and reoviruses that have been described or are suspected to occur in bats (Table 3).

Table 3. Significant viruses isolated from, or identified in, bats.

Lyssaviruses	**Paramyxoviruses**	**Flaviviruses**	**Bunyaviruses**
rabies	Hendra	Bukalasa bat	Kaeng Khoi
Duvenhage	Nipah	Carey Island	Nepuyo
Lagos bat	Mapuera	Dakar bat	Hantaan
Australian bat	Menangle	Entebbe bat	Rift Valley fever
European bat 1 and 2	Tioman	Japanese encephalitis	Toscana
West Caucasian bat	Beilong	Jugra	
Aravan		Kyasanur Forest disease	**Togaviruses**
Khujand	**Filoviruses**	Montana myotis	Chikungunya
Irkut	Ebola Reston	Phom-Penh bat	
		Rio Bravo	
Other Rhabdoviruses	**Reoviruses**	St. Louis	
Kern Canyon	Melaka	Saboya	
Mount Elgon bat	Nelson bay	Sokuluk	
Oita 296	Pulau	Tamana bat	
		Uganda S	
		Yokose	

Confirm identity of viruses identified by MassTag PCR analysis. Either conserved genetic regions amplified in MassTag assays (typically 100-200nt) will be cloned and sequenced or, where possible, adjacent genome regions with greater phylogenetic information will be amplified using published primer sets, or sets selected from multiple sequence alignments by SCPrimer. We will then establish and implement specific real time PCR assays for quantitation of pathogen burden and surveillance. Control templates will be cloned and sequenced; primers will be tested for sensitivity and specificity and modified as required to achieve threshold of 50 RNA copies. We have extensive experience in the development of Taqman PCR assays such that we don't envisage technical difficulties in this aim.

Anticipated results: Given our recent success in establishing and utilyzing MassTag PCR assays [118, 211], we do not anticipate major impediments to the swift completion of this aim. After establishing suitable bat internal controls, we will rapidly accumulate sequence data and characterize bat paramyxoviruses, coronaviruses and lyssaviruses, forming a substantial base with which to compare and contrast novel viruses discovered through the targeted sampling and surveillance of bats in EID hotspots identified in Aim 1.

Potential pitfalls/alternative strategies: Given the largely unknown nature of bat sequence information, it is possible that sequence variability between bat species may confound cloning of housekeeping gene controls. Bat mitochondrial genes are well represented in GenBank and are typically employed for phylogenetic studies. We have established primer sets that detect NADH dehydrogenase subunit 2. This primer set will be used in the unlikely event we fail to identify suitable pol II transcript controls. NADH dehydrogenase subunit 2 primers address a wide range of bat species including: *Pteropus giganteus*,*P. rodricensis*, *Pteropus hypomelanus, Pteropus scapulatus, Pteropus pumilus, Pteropus vampyrus, Cynopterus brachyotis, Paranyctimene raptor, Boneia bidens, Macroglossus minimus, Nyctimene albiventer, Nyctimene aello, Cynopterus sphinx, Thoopterus nigrescens, Syconycteris australis, Rousettus aegyptiacus* and *Eidolon helvum.* We acknowledge that the limit of detection of MassTag PCR assays may prevent the identification of viral targets that are either present in samples at a concentrations <100 RNA copies or are sufficiently different in nt sequence to abrogate primer binding. We cannot address the issue of sensitivity; however, detection of viruses that elude detection due to sequence variation may be captured by GreeneChip or HTS.

5.2.2. GreeneChip assays for detection of vertebrate viruses.

Samples negative in MassTag, and a random sample of 10% of positive samples (detection of co-infections) will be analysed by GreeneChip. Samples positive in GreeneChip assays will be further characterized by release and sequence analysis of hybridized nucleic acid as described section 4.2.5 of Preliminary Studies. Specific real time PCR assays will be established and implemented for quantitation of pathogen burden and surveillance
This aim requires optimization GreeneChip assays for bat feces, saliva, urine and serum. We will then implement GreeneChip assays for bat feces, saliva, urine and serum using the same strategy employed in Aim 5.2.1.

Potential pitfalls/alternative strategies: Our consistent success in implementing GreeneChips for pathogen identification in cultured as well as clinical specimens indicate that we will not have difficulties establishing assays [16, 17, 212, 213]. Viral targets may escape detection that are either present in samples at concentrations below the sensitivity threshold (<5,000 RNA copies) or differ in nt sequence by more than 10% from any printed viral probe. Novel viruses missed in this aim may be identified through HTS.

5.2.3. Metagenomic sequence analysis of bat feces, saliva, urine and serum

Samples negative in GreeneChip, and a random sample of 10% of positive samples (detection of co-infections) will be analysed by HTS. We will design and implement software for subtraction of bat sequences. The method will be analogous to the one that we developed for the subtraction of human host sequences to identify a novel arenavirus in human transplant tissues (manuscript in press, NEJM) or to subtract bee sequences in our study of Colony Collapse Disorder of the honey bee [157]. Bat sequences for this purpose will be obtained through a bat transcriptome project that is currently conducted at CSIRO-AAHL This project is funded by the Australian Biosecurity CRC (Daszak and Lipkin are members of the International Standing Advisory Committee), and is expected to be completed in late 2007. Co-PI Mungall is a member of the bat transcriptome project, which is based at AAHL. We will then implement metagenomic assays of bat feces, saliva, urine and serum subjected to HTS. Sample preparation for metagenomic assays of bat feces, saliva, urine and serum will be optimized by spiking bat feces, saliva, urine and serum with a known target nucleic acid. Extraction efficiency and amplification performance will be traced using the established housekeeping gene controls as well as real time PCR quantitation of the introduced target nucleic acid.

To confirm identity of microbes identified in metagenomic assays, we will use data obtained through HTS to design specific and cPCR primers for amplification of products that can be used for phylogenetic analyses. Finally, we will establish and implement specific real time PCR assays for quantitation of pathogen burden and surveillance. Data obtained through HTS will be used to design real time primers and probes and to clone control templates. This will proceed as previously described in sections **5.2.1 and 5.2.2.** HTS is rapidly establishing itself as a viable strategy for the mass sequencing of viral (and other) genomes.

Potential pitfalls/alternative strategies: Microbial targets may escape detection that represent either <1% of total sequence present after subtraction of chromosomal DNA and host rRNA or have less than <30% aa similarity to microbial sequences in the database. As for the previous assays, sensitivity will always be a limiting factor in any pathogen discovery strategy but we believe the staged assay implementation strategy we have chosen has a high chance of identifying novel pathogens, if present in samples. If we suspect that nt sequence variation is responsible for assay failure, novel sequences will be used to design primers for cloning larger fragments by 3' and 5' RACE, and to establish and implement specific real time PCR assays for quantitation of pathogen burden and surveillance.

It is possible that we will not be able to identify new viruses in the wildlife samples we have collected, and will collect. We believe this is unlikely. A simple analysis (Daszak, unpublished data) shows that for the known 50,000 vertebrate species present, if we estimate that each species harbours 20 endemic viruses (likely a significant underestimate, given that there are 217 known viruses found in humans [4]), it follows that there are around 1,000,000 vertebrate viruses, yet we have only discovered 2,000 viruses in total, an underestimate of pathogen diversity by 99.8%. If this degree of underestimation is equivalent across the vertebrate classes, then bats are likely to have over 20,000 viruses as yet undiscovered, given

an estimated total for bat host species diversity of 1116 species[214]. It is likely that prevalence of most viruses (which tend to be acute) will be low. However, we will pool samples to maximize the likelihood of viral discovery. Finally, even if no new viruses are discovered, we are likely to find significant new information on the incidence of known emerging viruses, which has great relevance to the study of bat virus ecology and biology, as well as public health.

5.3. Aim 3. Bat Viral Pathogenesis

3.1. In vitro evaluation of bat derived paramyxoviruses, coronaviruses and lyssaviruses in Vero and bat cell lines to determine correlates of infection.

We will initially characterise the infection of a number of prototype viruses from each of the three main bat virus families in cell lines that will not only readily propagate virus (Vero and BHK cells), but in primary or continuous bat cell lines (developed during a parallel CSIRO funded project) to evaluate potential tissue tropisms and cellular responses to infection in the bat. In addition to comparing the cellular (host) responses, we will also evaluate the viral quasispecies changes (using whole genome sequencing) apparent following single or multiple passages to examine adaptation during the establishment phase of viral infections.

Host response to infection. Routine cell culture systems (Vero cells or BHK cells) or primary and/or continuous bat cell lines (unrelated CSIRO funded project) will be utilyzed to evaluate host responses to a number of recently emerged, non-biodefence related paramyxoviruses (MenV, TPMV, SalV, Tioman, Mapuera and PoRV Virus), coronaviruses (bat SARS CoV, bat CoV, and a number of bat coronavirus isolates from Hong Kong) in addition to several lyssaviruses (and related rhabdoviruses). Further, we will harness the power of whole genome, rapid pyrosequencing for the determination of molecular correlates of infection and pathogenesis. A suite of routine assays for evaluating the state of cellular physiology and function will be incorporated to compare uninfected versus infected cells. These include markers for apoptosis and necrosis, fusion kinetics, viral replication kinetics and local immune function (including interferon inhibition utilized by each virus).

Assessment of apoptosis and necrosis. There are a number of simple add, mix and measure assays available for rapid quantitation of cell viability and apoptotic events, enabling the rapid characterisation of viral infection in vitro. The MultiTox-Fluor (MT-F) Multiplex Cytotoxicity Assay is a single-reagent-addition fluorescent assay that simultaneously measures the relative number of live and dead cells in cell populations. The MT-F Assay gives ratiometric, inversely correlated measures of cell viability and cytotoxicity. In addition to information about relative cell viability, assays that directly measure caspase activity can provide valuable information about the mechanism of death in infected or dying cells. The Caspase-Glo® Assays use the luminogenic caspase-8 tetrapeptide substrate (Z-LETD-aminoluciferin), the caspase-9 tetrapeptide substrate (Z-LEHD-aminoluciferin) or the caspase-3/7 substrate (Z-DEVD-aminoluciferin) and a stable luciferase in proprietary buffers. The buffers are optimized for the specific caspase activity, cell lysis and luciferase activity. In the absence of active caspase, the caspase substrates do not act as substrates for luciferase and thus produce no light. Upon cleavage of the substrates by the respective caspase, aminoluciferin is liberated and can contribute to the generation of light in a luminescence reaction. The resulting luminescent signal is directly proportional to the amount of caspase activity present in the sample.

Fusion kinetics. As part of an existing collaboration funded by NIAID (U01 AI056423-01) (Mungall, Co-PI), we have developed methods to quantitate NiV infection in Vero cell culture for the implementation of antiviral assays. To date, we have developed functional and quantitative assays for measuring NiV cell-fusion and virus entry [181-183]. Using recombinant vaccinia viruses expressing henipavirus F and G proteins we can accurately quantitate the kinetics of viral fusion (see preliminary data). By producing analogous constructs for each paramyxovirus under investigation, we will evaluate the fusion kinetics of each virus in equivalent cell lines.

Viral replication kinetics. In addition to direct virus quantitation assays, we have developed reliable systems for isolation and quantification of NiV from samples and tissues of infected animals [18]. We have established real time PCR assays for NiV, HeV and MenV (Bowden, unpublished data) used to quantify virus in infected tissue culture supernatant and clinical samples (see preliminary data). We will establish Taqman PCR assays for detection of each virus under investigation enabling rapid and accurate quantitation of viral genome *in vitro*.

Immune function. We will comprehensively evaluate a panel of cytokines likely to be released during the initial phases of viral infection. Using an established real-time PCR assay, modified for each cell type (species), which allows the precise quantification of changes in the expression level of six relevant porcine cytokines, and three housekeeping genes [215] we can simultaneously detect nine sequences by measuring 3x3 targets in a triplex-format. The mRNA of the lymphokines IL-2, IL-4, IL-10, and IFN-γ, of the proinflammatory cytokines IL-1α and IL-6, and of the housekeeping genes are quantified using TaqMan-probes by means of standard dilution series on the ABI 7500. The standard consists of equal aliquots of the experimental cDNAs under investigation. Simultaneously the most suitable combination of 3 out of the four housekeeping genes h-actin, HPRT, GAPDH, and cyclophilin can be selected, and their averaged expression values constitute a normalisation factor. The raw data of all targets of interest is then calculated relative to this normalisation factor, making eventual changes of the relative expression level of the single housekeeping genes controllable and quantifiable.

These cytokine assays will additionally enable us to evaluate the mechanisms employed by each virus for the inhibition of host-cell transcription and translation and the consequent failure to synthesize IFN, inhibition of dsRNA-signalling and IFN-signalling pathways, and antagonizing the IFN-induced antiviral effecter proteins. For example, the anti-IFN activities of many paramyxoviruses are encoded by the viral P gene. Products of the P gene inhibit both dsRNA signaling [134-137] and IFN signaling [138-140], but often by slightly different approaches. We are still teasing out the intricacies of henipavirus P/V/W/C interactions with STAT molecules and the recent addition of a NiV reverse genetics system to our arsenal, combined with monospecific antisera for NiV P, V, W and C proteins (supplied by Dr Rota, CDC, Atlanta) should rapidly enable evaluation of the relative role of each of these proteins during experimental infection. We anticipate generating an equivalent set of reagents for each paramyxovirus under investigation.

Viral adaptation using rapid whole genome virus sequencing. Using established techniques for multiple passaging of viruses *in vitro*, we will perform whole genome sequencing before during and after variable numbers of replication cycles. By comparison with established rates of mutation for paramyxoviruses and other RNA viruses [39] we may be able to assess the relative roles of genetic drift versus specific adaptation within relevant cell types. Further, comparison of multiple passaged viruses in a range of cell types may provide clues to selective adaptation pressures present in different tissues.

Anticipated results. These analyses will provide a quantitative assessment of the relative infectivity and pathogenicity of a subset of bat-derived viruses from three important viral families. We anticipate that this will enable the identification of molecular patterns among isolates which can then be correlated directly with pathogenicity. For the first time, we will develop a quantitative understanding of the differences in host animal/cell events in response to viral infection by closely (and distantly) related viruses. Additionally, harnessing the power of HTS technology, we will perform quasispecies analysis of viral evolution and host adaptation, as it happens.

Quasispecies analysis of experimental viral populations before (inoculum), during and after (shedding) infection in animals/cells will provide a measure of the population of potential emergent viruses and may indicate the relative role of genetic drift (random fluctuations in allele frequencies) versus the natural selection of advantageous mutations for host adaptation. Longitudinal samples collected during serial passaging in cell lines are ideal for this type of comparison. Quite simply, changes in the dominant viral species at specific time points may provide identifiable indicators of the relative viral fitness and how this adapts over time within the host. Repeated passaging of virus in cell lines may also provide an insight into whether successful host infection results in adaptation of the virus or rather, successful infection only occurs if the virus already possesses the necessary mutations. For the latter, pre-adaptation of the virus in a secondary cell line may be required to establish infection.

Potential pitfalls/alternative strategies: As already mentioned, we already have unique access to this set of related bat-derived paramxyoviruses that display either mild clinical signs during infection, asymptomatic infections, or are as yet uncharacterised with respect to their pathogenicity in terrestrial mammals. We have incorporated a range of established, routine assays for evaluating virus infection and pathogenicity so we do not anticipate technical limitations to this approach. While access to pyrosequencing technology can be expensive,

CSIRO has made an AUD$800,000 commitment to ensuring access to this technology as part of studies unrelated to this proposal.

Aim 3.2. Evaluation of correlates of paramyxovirus infection using reverse genetics.
Rationale

Once wild type virus pathogenicity has been established (**Aim 3.1**), the entire virus genome has been sequenced and we have identified possible molecular determinants of infection/pathogenicity, we will clone out the gene of interest and reverse engineer specific genetic mutations (associated with specific correlates of infection identified through comparative whole virus sequencing) and evaluate these effects on virulence independently using viral chimera's (NiV parent systems with pseudotyped viral proteins incorporated. If cell lines are largely refractory to a particular virus we will reverse engineer genetic correlates expected to confer pathogenicity and evaluate their effect *in vitro*.

Using a NiV reverse genetics system similar to that described in the preliminary data section above (provided by Dr. Paul Rota, CDC – see attached letter of support), we can manipulate specific genes (or portions of genes) to make viral chimera's facilitating the evaluation of specific genetic correlates of infectivity. We have unique access to a set of related bat-derived paramxyoviruses that display either mild clinical signs during infection, asymptomatic infections, or are as yet uncharacterised with respect to their pathogenicity in terrestrial mammals. In this project we will conduct comparative analysis of these related viruses via whole genome sequencing, manipulation of viral genomes using established reverse genetics technologies, combined with assessment of their relative pathogenicity and the nature of induced host immune responses using a range of cell lines, either as a surrogate for humans (normal human bronchial epithelial - NHBE cells) or using bat cells to evaluate the characteristics of infection in the natural or reservoir host.

Anticipated results: Detailed analysis of the physiological and molecular markers of viral infection, using controlled systems only possible via reverse genetics, we expect to identify specific genetic correlates that make particular viruses more (or less) infectious to specific cells types. By teasing apart these molecular correlates of pathogenicity, we can then begin to understand what adaptation steps may be required to make a non-infectious, or non-pathogenic virus infectious and pathogenic to human cell lines. This information will then enable a more targeted approach to mitigation of these possibilities, through the identification of targeted antiviral strategies.

Potential pitfalls/alternative strategies: Previous studies with minigenome systems have indicated that the support proteins of HeV and NiV are interchangeable [186] but that Measles Virus proteins are not, suggesting that although the replication strategies are similar, there are also genus specific differences between related paramyxoviruses. While this may indicate that viral chimera's may not be functionally transcribed, the approach suggested here is likely to be successful as only the gene coding regions will be altered, leaving the highly conserved intergenic sequences [58, 59, 216-219] and genomic termini unaltered [220]. Unfortunately, we do not have reverse genetics systems for coronaviruses or lyssaviruses so our evaluations will need to be confined only to paramyxovirus pathogenicity.

3.3. Identification of viral or host correlates of infection.

Using a range of mammalian (including bat derived) cell lines and the NHBE cell as a surrogate model for human respiratory infection, we will evaluate the cellular pathogenicity of novel viruses discovered through Aims 1 and 2 using the same suite of assays for *in vitro* characterisation of paramyxoviruses, coronaviruses and lyssaviruses (Aim 3.1.). Incorporating rapid, whole virus genome sequencing technologies, we will rapidly evaluate quasispecies changes relevant to host adapatation. By comparison of data for these newly discovered viruses to well characterised, but closely related viruses, we expect to determine potential viral or host correlates of infectivity and pathogenicity, or both.

Comprehensive sequence analysis of viruses at various times before and after the host transfer event are required to tease out the evolutionary changes of biological significance in host switching. For the most rewarding interpretation of this data, dissection of the molecular controls of host range and of the host barriers restricting infection are also required. In parallel with an

unrelated project (funded by CSIRO), we will be in a position to characterize the cellular physiology and immunology of cell lines derived from the natural host for these viruses, namely the bat. There are currently no continuous bat cell lines available, significantly hampering efforts to understand these important reservoir hosts. This CSIRO funded project will not only establish bat primary cell cultures, we have recently developed the expertise to transform primary bat cells, into continuous cell lines amenable for multi-passage research

Anticipated results: As for the previous studies in paramyxoviruses using reverse genetics, detailed analysis of the physiological and molecular markers of viral infection is likely to identify specific genetic correlates that make particular viruses more (or less) infectious to specific cells types. The knowledge gained using control reverse genetics systems for paramyxoviruses (Aim 3.2.) should provide essentially a road map, with which to evaluate and characterise novel virus pathogenicity.

Potential pitfalls/alternative strategies: As with any pathogen discovery program, there is an inherent risk that no novel viruses will be identified. We have elected to perform controlled characterization studies on a range of paramyxoviruses, coronaviruses and lyssaviruses in parallel with the pathogen discovery aims such that irrespective of the results of the targeted sampling and screening process, we will still be able to identify specific virus and/or host correlates of infection in vitro. We have access to a large number of uncharacterised pathogens, so a number of these could also be incorporated into the analyses as the results of the screening process become clear.

Management Plan

This brings together different disciplines to unravel the complexity of the process of zoonotic disease emergence. All members of this team have worked together for the past 5 years, and are able to seamlessly collaborate on this program. The potential risks in this proposal have been outlined above, and here we lay out our management strategy which builds cohesiveness, and increases the likelihood that this proposal will yield significant advances in this critical field. This is a collaborative proposal among four institutions: The CCM at Wildlife Trust, New York (Daszak, Epstein); The Greene Lab, Columbia Univ., New York (Lipkin, Briese, Palacios); The Institute of Zoology at Cambridge University, UK (Jones); and the Australian Animal Health Lab (Mungall). All PIs are connected via adjunct status in other's labs (Daszak, Epstein at Columbia;

Year	CCM/IOZ	Greene Lab	AAHL
	Build bat database, conduct modeling, train field teams (Wildlife Trust Alliance) in sample collection.	Establish housekeeping gene controls, optimize and implement Mass Tag PCR	*In vitro* evaluation of paramyxo-, corona- and lyssaviruses.
2	Expand sample collection following hotspot modeling	Mass Tag PCR; Optimize and implement GreeneChip analyses	Continue *in vitro* evaluations. Quasispecies analysis.
3	Continue sample collection. Begin refining datasets	Metagenomic high throughput sequencing (HTS)/ 454; Analyses, publication	Paramyxovirus reverse genetics studies. Begin novel virus characterization.
4	Sample collection in newly targeted hotspots. Begin refined modeling	Metagenomic high throughput sequencing (HTS)/ 454; Analyses, publication	Continue paramyxovirus reverse genetics studies. Continue novel virus characterization.
5	Final sample collections. Finalize risk assessment.	Analyses of sequence data and publications	Finalize molecular correlates of infection and/or pathogenicity.

Daszak at Inst. Zool., Jones, Mungall, Lipkin at CCM).

Research will be co-ordinated via monthly conference calls involving all PIs and led by Daszak. Mungall will visit the USA each year as part of this research (funded by AAHL) and PIs Lipkin and Daszak will visit Australia each year to meet with Mungall and other team members as part of (and funded by) their membership of the AB-CRC (see bios Lipkin, Daszak). The CCM postdoctoral assistant will conduct all sample collection and inventory, and all modeling tasks

under the supervision of Daszak, Jones and Epstein. Postdocs at CU and at AAHL will conduct work on aims 2 and 3 under the direction of Lipkin and Mungall respectively.

12. Vertebrate Animals

Vertebrate animal use is confined to collection of blood from wild animals (bats) in foreign countries that are listed as "other performance sites". The primary institution for this project (Wildlife Trust) has it's own IACUC Committee, which follows the structure of those set up under OLAW guidelines, and this project is pending approval by that committee. However, Wildlife Trust does not have an Animal Welfare Assurance Number and is unable to acquire one, because (as stated by the AAALAC) the organization works only on wildlife and does not have a laboratory animal facility.
If this application is funded, the correct procedure is for us to apply to NIH's OLAW for approval on a project basis. We have done this previously for work on wildlife, and will be able to progress rapidly should the project be approved for funding, because we will have our own organization's IACUC committee's approval at that time. Below are the answers to the 5 questions on vertebrate animal use:

1. Detailed description of animal use.
All work with vertebrate animals will be conducted in the field, in the countries listed as 'other performance sites'.
Bat capture. Capture and bleeding techniques are in accordance with those used by other workers[1, 2] and by ourselves in previous published studies[3-5] and have previously been approved by our IACUC committee. Bats will be captured using a mist net manned continuously by two people during the entire capture period, and bats are removed from the net as soon as they become entangled to minimize stress and prevent injury. In my experience, a maximum of 15-20 pteropodid fruit bats or 30 insectivorous or small fruit bats can be safely held and processed by a team of three people per trapping period using gas anesthesia. Duration of trapping will depend on the capture rate. Bats are placed individually into small bags and hung from a branch or post until samples are collected. Bats are held for a maximum of six hours.

Chemical restraint. Chemical restraint will be used only for large pteropodid bats. Bleeding and swabbing of small bats (insectivorous bats or small fruit bats) can be safely undertaken without anesthesia. We will use isoflurane and a portable vaporizer to restrain bats, as described in the literature[6] and used by us previously. Isoflurane has been shown to be safe and effective for short-term chemical restraint of bats. The CCM has two portable isoflurane vaporizers (Harvard Apparatus, MA, USA). Bats will be under anesthesia for 10-12 minutes, and recovery is determined by presence of palpebral and withdrawl reflexes, as well as biting reflex. Bats are kept in a quiet, cool place while waiting to be processed and while recovering from anesthesia. Bats are given mango juice orally by syringe prior to release. Bats are released at their site of capture and are allowed to climb into a tree where they can either rest or fly.

Sample Collection. Bats will be anesthetized prior to sampling. Two sets of three swabs will be taken from each bat: throat, urogenital tract, and rectal. Blood (3.0 ml) will be collected from the radial artery or vein using a 23 gauge needle and 3cc syringe.

Animal Identification Bats will be banded on the first phalanx of digit I, using stainless steel thumb bands (Gey Band & Tag Co, PA, USA) stamped with a unique serial number (Kunz, pers. com). A veterinary microchip (AVID Identification Systems, LA) carrying a unique ID number will be implanted subcutaneously between the scapulae according to manufacturer's instruction. These ID numbers can be retrieved using a microchip reader (AVID). This allows for two means of animal identification: the thumb bands can be

viewed from a distance, allowing for crude censusing of marked bats using binoculars; and the microchip insures animal ID for collecting accurate recapture data in the event that the thumb band is lost.

Species and number used in study:
Fruit bats (*Pteropus spp.*, *Eidelon*) 1,000 each
Small fruit bats (*Cyanopterus* spp., *Eonycterus* spp., *Rousettus* spp.) 1,000 each
Insectivorous bats (*Rhinolophus* spp., *Pippistrellus* spp., other members of the family Verspetillionidae): 1,000 each

2. Justify use of animals, choice of species, numbers to be used.
These bats are reservoirs of a number of emerging zoonoses. The sample size (1,000 bats per species) was chosen to provide enough samples given approximately 5 sampling sites globally (=200 samples per bat species per site) and the 5 year grant period (=40 samples per bat species per site per year). This should provide an opportunity to detect viruses that are often found at low viral prevalence of 1%-3% (e.g. the SARS-like Coronaviruses[5].

3. Provide information on veterinary care. Animals will receive emergency veterinary care if necessary. There is no specific veterinary care that is appropriate for this project, nor are clinical veterinary facilities included as a performance site, as animals will be released within hours of capture.

4. Procedures for ensuring animal comfort, lack of distress, pain, or injury.
Bats will not be held longer than 6 hours. In my experience, bats tolerate this period well and there have been no clinical adverse effects seen in any of the bats captured and sampled in Malaysia and Bangladesh. Mist nets will be attended during capture periods, and bats will be extracted from the net as soon as they become entangled. This will minimize stress and prevent injury from entanglement. Bats will be placed in pillowcases and hung from tree branches while awaiting processing and during recovery. The pillowcases are sufficiently porous as to allow for ventilation. The enclosed environment seems to calm the bats, as they do not struggle once inside, but they hang quietly. Bats are protected from extreme heat or cold while under anesthesia, and lubrication is used on their eyes to protect them from injury. Bats are monitored by a veterinarian during all stages of capture, processing, and release. Bats are kept in a cool place while in the pillowcases. Prior to release, bats will be syringe-fed fruit juice to accommodate any hypoglycemia from capture.
We have placed collars on captive Australian flying foxes and observed them for two months. These bats were free to forage at night and tolerated the collars well (C. Smith, pers. comm..). In Malaysia we have had a flying fox carrying a transmitter for seven months. Tidemann and Nelson report Grey-headed flying foxes carrying transmitters for up to a year [7].

5. Euthanasia: To date, there has been no mortality of fruit bats in CCM's or collaborator's work related to Nipah virus. More than 1,000 bats representing seven species of *Pteropus* have been captured for projects in Malaysia, India, and Australia. In the event of injury to an animal that results in pain and suffering, and reasonable veterinary care is unavailable, the animal will be euthanized by Dr Epstein or a trained veterinary officer using ketamine injected intramuscularly 37.5mg/kg (81) and sodium pentobarbital injected intravenously at a dose of 1.0ml per 5kg injected intravenously. This protocol is in accordance with the AVMA euthanasia report (2001).

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Consortium/Contractual Arrangements

This project is a multi-institutional collaboration led by the Consortium for Conservation Medicine at Wildlife Trust, New York (Daszak, PI), which will subcontract funds to two institutions: Columbia University (Lipkin) and the Australian Animal Health Laboratory (AAHL – Mungall), which is a foreign institution (see attachment to Research and Related, other project information Form for justification of work at foreign site). Dr Daszak has over 10 years previous experience managing collaborative projects, including an R01 on Nipah virus that involved 5 separate foreign institutions (including AAHL where Co-PI Mungall is based) and a 5-year NSF/NIH Ecology of Infectious Disease award on West Nile virus which involves 3 domestic subcontractees.

The applicant organization (Wildlife Trust) is justified in taking the lead on this project because this group (specifically it's Consortium for Conservation Medicine), led by Dr Daszak, specializes in understanding the ecological, and virological processes underlying zoonotic disease emergence. Dr Daszak has conducted significant preliminary work on this issue (see preliminary data), including collection of over 3,000 samples which will be used in the study, and the building of a large database of emerging infectious disease ecological information which will be analyzed in this study. Wildlife Trust also acts as the headquarters of the Wildlife Trust Alliance – an international group of organizations which will supply new samples to the group as this project progresses. The subcontractees will work on specific issues that they have proven expertise in. These areas are: viral discovery (Columbia University, Dr Lipkin) from the samples that Dr Daszak's group collects, and viral pathogenesis (AAHL, Dr Mungall) on the viruses that are discovered in these samples.

Department of Health and Human Services
Public Health Service

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27 September, 2007

Dr. Bruce Mungall
Project Leader
Henipavirus Therapeutics
Australian Animal Health Laboratory
5 Portarlington Rd East Geelong Vic. 3220

Dear Bruce:

I am of course quite eager and extremely pleased to continue to work with you in your initiation of an exciting viral pathogen discovery and characterization proposal. The combined expertise and resources provided by the Consortium for Conservation Medicine, Columbia University and AHHL make this an ideal research plan and one that very few investigators have the opportunity to execute. I am very excited about the possibility that certain novel pathogens could be discovered, but I agree that there is some risk that no new pathogens will be identified. Your back-up plan of characterization of the six most recently emerged paramyxovirus pathogens will proved valuable data towards understanding the viral and host correlates of infection. As you know, we have already developed a full length infectious clone for Nipah virus as testimony toward our existing collaborations. One of my graduate students will be spending three months in your laboratory in order to establish this reverse genetics system and rescue a number of recombinant viruses. These will be important tools for elucidating the molecular correlates of infection and pathogenicity in among important pathogens

As in our past collaborations I and my associates will always be available for help and consultations should the need arise, as well as for joint experiments aimed at characterization of novel viruses that your team may discover. Your laboratory's progress these past few years in both the *in vitro* and *in vivo* Nipah virus infection assays, including the recently published animal model, has been impressive, and the research plan that you have outlined may provide critical new data and important advances toward understanding the host-pathogen interaction for these important emerging viruses.

I look forward to a continued, and now expanded, collaboration on these exciting projects!

Yours Sincerely,

(b) (6)

Paul Rota, Ph.D.
Supervisory Microbiologist

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3rd October 2007

Peter Daszak
Consortium for Conservation Medicine
460 West 34th Street, 17th Floor
New York, NY 10001

Dear Peter,

I am very pleased to be involved on this grant 'Quantifying the risk of viral emergence from bats' and it has my full support.

You and I have been collaborating predicting modelling of emerging diseases for over 3 years and have seen it develop to a stage where further funding is now crucial for it to continue. We have been extremely productive with our previous funding, developing a global dataset of human emerging diseases (Human Emerging Infectious Disease Event Database) and analysing these patterns, with one book chapter and paper in review in Nature.

I have been investigating bat evolution, biodiversity and disease macroecology for over 15 years and bring a significant level of expertise to this research project. My particular involvement in your project is to support the further development of the bat disease database and more detailed analyses of the patterns to develop a predictive model of bat zoonotic disease emergence.

I anticipate that this research will produce results that will have a profound impact on the way we manage the impacts of global change.

Best wishes

Kate Jones

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PHS 398 Checklist

OMB Number: 0925-0001
Expiration Date: 9/30/2007

1. Application Type:

From SF 424 (R&R) Cover Page. The responses provided on the R&R cover page are repeated here for your reference, as you answer the questions that are specific to the PHS398.

* Type of Application:

● New ○ Resubmission ○ Renewal ○ Continuation ○ Revision

Federal Identifier: GRANT00349359

2. Change of Investigator / Change of Institution Questions

☐ Change of principal investigator / program director

Name of former principal investigator / program director:

Prefix:
* First Name:
Middle Name:
* Last Name:
Suffix:

☐ Change of Grantee Institution

* Name of former institution:

3. Inventions and Patents (For renewal applications only)

* Inventions and Patents: Yes ○ No ○

If the answer is "Yes" then please answer the following:

* Previously Reported: Yes ○ No ○

OMB Number. 0925-0001
Expiration Date: 9/30/2007

4. * Program Income

Is program income anticipated during the periods for which the grant support is requested?

○Yes ●No

If you checked "yes" above (indicating that program income is anticipated), then use the format below to reflect the amount and source(s). Otherwise, leave this section blank.

*Budget Period	*Anticipated Amount ($)	*Source(s)

5. Assurances/Certifications (see instructions)

In agreeing to the assurances/certification section 18 on the SF424 (R&R) form, the authorized organizational representative agrees to comply with the policies, assurances and/or certifications listed in the agency's application guide, when applicable. Descriptions of individual assurances/certifications are provided at: http://grants.nih.gov/grants/funding/424

If unable to certify compliance, where applicable, provide an explanation and attach below.

Explanation:

Attachments

CertificationExplanation_attDataGroup0

File Name	Mime Type