

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
BEFORE THE HONORABLE VINCE CHHABRIA

IN RE: ROUNDUP PRODUCTS) No. M-16-2741 VC
LIABILITY LITIGATION,) San Francisco, California
_____) Wednesday
April 4, 2018.

TRANSCRIPT OF PROCEEDINGS

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(APPEARANCES CONTINUED ON FOLLOWING PAGE)

Reported By: Debra L. Pas, CSR 11916, CRR, RMR, RPR
Official Reporter - US District Court
Computerized Transcription By Eclipse

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ALSO PRESENT: The Honorable Ioana Petrou

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PROCEEDINGS

1 Wednesday - April 4, 2018

10:05 a.m.

2 P R O C E E D I N G S

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4 **THE CLERK:** Calling Case No. 16-MD-2741, In Re
5 Roundup Products Liability Litigation.

6 Counsel, please state your appearances for the record.

7 **MS. WAGSTAFF:** Good morning, Your Honors. Nice to
8 see you both again. Aimee Wagstaff for the plaintiffs.

9 And with me I have Robin Greenwald, David Wool, Brent
10 Wisner and Kathryn Forgie.

11 **MS. FORGIE:** Good morning, Your Honor.

12 **MS. GREENWALD:** Good morning.

13 **THE COURT:** Hello.

14 **MR. LASKER:** Yes, your Honor. Eric Lasker for
15 Monsanto. And I have Heather Pigman and Grant Hollingsworth.

16 **THE COURT:** Hello.

17 **MR. HOLLINGSWORTH:** Good morning.

18 **THE COURT:** Okay. So this is the day to continue
19 hearing from Dr. Ritz. As I think I mentioned to you-all when
20 I got you on the phone recently, I wanted to start with my own
21 follow-up questions of Dr. Ritz and any questions of course
22 that Judge Petrou has, but after that, happy to give both sides
23 an opportunity to, you know, follow up with her as well.

24 Who do you-all think should go first -- or go second after
25 me?

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1 **MS. WAGSTAFF:** Your Honor, we were sort of thinking
2 that plaintiffs would go second.

3 **THE COURT:** Okay. That's fine.

4 **MR. LASKER:** I'm not sure I understand. Second after
5 the judge or second after us?

6 **MS. WAGSTAFF:** I assume -- we were thinking that it
7 would go judge, judge; judge, judge, judge; and then
8 plaintiffs.

9 **MR. LASKER:** That's fine.

10 **THE COURT:** Okay. That sounds good. And we'll try
11 not to disappoint you. And we'll take -- we'll take as much as
12 time as we need with Dr. Ritz.

13 I think one of the problems, you know, one of the problems
14 is that Dr. Ritz went first, and I personally did not -- you
15 know, I was -- I was not in as good a position to ask her
16 questions as I would have had she testified on Friday at the
17 end. And I think also everybody was a little rushed because of
18 the time constraints that we had.

19 On reflection I think, you know, we -- we did not schedule
20 enough time during that week to talk to the experts, and so
21 that's why I wanted to have a couple more days.

22 So anyway, with that, why don't we go ahead and have
23 Dr. Ritz take the stand.

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BEATE RITZ,

called as a witness for the Plaintiff, having been duly sworn,
testified as follows:

THE WITNESS: I do.

THE CLERK: Thank you. Please be seated.

THE COURT: Welcome back.

THE CLERK: Judge, can I get --

THE COURT: You're going to go ahead and get her name
and spelling?

THE CLERK: Yes.

THE COURT: Thank you.

THE CLERK: For the record, please state your first
and last name and please spell both.

THE WITNESS: Beate Ritz. B-E-A-T-E, R-I-T-Z.

THE CLERK: Thank you.

THE COURT: Thank you for coming back. I know you
were in Europe until very recently, so I hope you're not too
jet lagged.

THE WITNESS: It's all right. But if I start
speaking German, you'll remind me.

THE COURT: So one of the big concerns I have still
after hearing all the testimony the other week is about the
issue of latency. And it seems to me that all of the numbers
that the plaintiffs are relying on, all of the numbers that the
plaintiffs view as favorable to them come from these, you know,

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1 pools of people in the United States and in Canada. I guess
2 particularly the pool -- I'm concerned about the pools from the
3 United States. Come from pools of people who were diagnosed
4 with NHL in the late '70s, early '80s, maybe spanning til the
5 mid-'80s. And glyphosate was only introduced onto the market
6 in '75 or '76, something like that. I don't remember --

7 **THE WITNESS:** '75 I think.

8 **THE COURT:** '75. And so their initial exposure to
9 glyphosate in many, many of those cases was less than ten years
10 before being diagnosed with NHL. I think in a number of cases
11 less than eight years, less than seven years.

12 And as I said, that appears -- it appears that all of the
13 numbers that the plaintiffs rely on to support their argument
14 that glyphosate is causing NHL come from those pools of people,
15 or primarily from those pools of people. And that strikes me
16 as a significant concern about the reliability of those
17 numbers.

18 And so that's the first issue that I -- I'd love for you
19 to address. And keep in mind -- I mean, give me as long and as
20 detailed an answer as you want with as much background as you
21 want, keeping in mind I'm a layperson. I'm not a scientist.

22 So go ahead.

23 **THE WITNESS:** Yeah. So latency is interesting, as
24 you said. Generally when we do an epidemiologic study, we
25 would like to follow people for cancer for a very long time.

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1 However, when I say that, that's usually a study
2 designed -- we call it cohort study design. We start with
3 people who are exposed and unexposed, and we are actually
4 excluding everyone who has the disease at baseline. We even
5 exclude people who would get the disease one or two years after
6 baseline --

7 **THE COURT:** You're talking about in a cohort.

8 **THE WITNESS:** In a cohort, right.

9 **MS. FORGIE:** Doctor, just to interrupt for a second.
10 Could you speak a little bit slower for the court reporter and
11 a little louder, please? Thank you.

12 **THE WITNESS:** And -- and that is for exactly that
13 reason that we are assessing exposure at baseline. And what we
14 are knowing about it at baseline is probably not reflecting the
15 causative type of exposure in the first year or what already --
16 I mean, the cancers that we are harvesting at baseline or in
17 the first two or three or sometimes five years.

18 So in a case-control study, that's why in a cohort we
19 definitely want to make sure that we have a minimum of five
20 years of follow-up, because we are very concerned about, you
21 know, do we have the timing right and have we waited long
22 enough to actually see an increase in cancer.

23 **THE COURT:** But, I mean, I was -- my primary concern
24 is about --

25 **THE WITNESS:** The case control.

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1 **THE COURT:** -- the case control studies. But since
2 you bring up the cohort studies, let's take a quick detour and
3 let me ask you about the cohort studies.

4 I mean, let's say we start following these people in year
5 one, right, and we follow them for five years.

6 I understand why that would be a problem if we are only
7 looking at what they are being exposed to beginning in year
8 one, but if we start following people in year one and we have
9 information about their exposure the last 10 or 20 years, why
10 is it a problem that we're only following them for five years?

11 **THE WITNESS:** It is a problem if we don't see
12 anything, because it could mean that what they reported at
13 baseline is not really a good reflection of the exposure.
14 Because what we are after is the best exposure contrast we can
15 get.

16 And the further these people have to remember backward --
17 and remember, they have no reason to really, you know, want to
18 remember or make a big effort. They are just being asked:
19 Hey, do you want to be in the study? And, you know: Here is a
20 questionnaire, please fill it out. Then we are quite concerned
21 when that time period goes too long backward that they are not
22 making that effort.

23 So I'm -- I'm probably not comfortable about what they are
24 reporting for the last few years and for a long time period
25 back. So that's one reason.

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1 The other reason is that I really would be concerned about
2 the timing. Sometimes cancers take a little bit of -- longer
3 to be diagnosed, depending on the patient really picking up on
4 symptoms. So you may be picking up some that, you know, in the
5 first few years that really are -- have already a longer
6 history, but you -- it took awhile to come to diagnose. So the
7 temporality is really not all that clear as to when the
8 exposure first started.

9 Of course, if it's 10 years or 20 years ago, that's not a
10 problem. But if it's really in that last five years, then it's
11 a little bit more wishy-washy. So it's more cleaner if we have
12 a follow-up in a cohort study, we generally agree on that.

13 Some cohorts actually make rules of, well, the first five
14 years we really don't count anyone and then after the five
15 years we start because we have a clean slate. So that's the
16 cohort.

17 But in a case-control study we go the other way around.
18 We accumulate the cases and at the time when the case occurs,
19 we then go out and find controls from the population and we ask
20 them about their exposures.

21 So in this case if you have an exposure that only reaches,
22 let's say, five to seven years back -- and that was, I think,
23 the time in one of the studies, was five to seven years, and
24 the other 8 to 11 years maximum, 11 years -- then my worry is
25 that depending on when the exposure actually happened, but also

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1 how long it took for the cancer to develop. I'm only seeing
2 the early birds of the cancers.

3 So those would be the cases where the exposure was either
4 strong enough to have initiated a -- a cancer event or the
5 cases that were the most aggressive.

6 So I'm actually harvesting the most aggressive cases in
7 the very early period and exposures that are maybe more
8 moderate but cumulative over time wouldn't have had a chance
9 yet to show the cases that come later. So I think the concern
10 with the early studies is that assuming that, you know, I did
11 my job right with the exposure assessment, those were probably
12 the most aggressive cases.

13 Does that make sense for these early studies? It could be
14 if we think about how farmers at the time used pesticides and
15 what they were used to. They were used to pesticides that were
16 quite toxic. The pesticides in the 1960s, a lot of them were
17 quite toxic and they were warned, or they had slight symptoms
18 of fever or of any flu-like symptoms when they exposed
19 themselves, these organophosphates. And then glyphosate came
20 along and they were not considered to be really very toxic to
21 human beings.

22 So we could see that, you know, these farmers were
23 possibly not taking the same precautions as they should have.
24 And so what it might mean, these early studies, is that we have
25 a lot more not protected exposure in people who did not -- who

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1 did not really think about glyphosate being very harmful.

2 **JUDGE PETROU:** Dr. Ritz, would it be fair to say then
3 that it's your opinion that NHL could develop within the 5- to
4 11-year time frame in these studies --

5 **THE WITNESS:** Yes.

6 **JUDGE PETROU:** -- based on your assumption,
7 presumption, you tell me what it is, that the workers were
8 using glyphosate in an unprotected manner?

9 **THE WITNESS:** Absolutely. We generally -- I mean
10 for -- for solid cancers, I would pause. But for blood-related
11 cancers, we know that two years might be enough. Five years
12 might be enough. And I did a radiation worker study. For the
13 leukemias and lymphomas we could go back to 2- and 5-year
14 latency. We would not go to 10 years. But for the solid
15 tumors you would pause and say, well, maybe ten years. But,
16 really, for blood-related cancers they are faster.

17 **THE COURT:** Well, so if I could -- if I could ask you
18 a follow-up question on that point, Dr. Ritz.

19 I'm looking at your expert report, your report that you
20 submitted, and I -- I have to say that it seems like you said a
21 number of things in that report that contradict what you're
22 saying now about the issue of latency.

23 I'm looking at -- do you have your report in front of you?

24 **THE WITNESS:** Which one? Yes.

25 **THE COURT:** Your original expert report.

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1 **THE WITNESS:** Yes.

2 **MR. WISNER:** Exhibit 1.

3 It's also in the binders if you want a hard copy, Your
4 Honor.

5 **THE WITNESS:** What page?

6 **THE COURT:** Start on Page 17.

7 **THE WITNESS:** Yes.

8 Oh, I have a deposition here. Exhibit 1, yes. Sorry.

9 **MS. FORGIE:** Do you need help finding it?

10 **THE WITNESS:** No, I've got it.

11 **JUDGE PETROU:** Just a side note, though, because I am
12 looking at the binder. It says Exhibit 1 is the expert report,
13 but then Exhibit 1 does appear to be the deposition transcript,
14 as Dr. Ritz just noted.

15 **MR. WISNER:** In the tab it should say Exhibit 1
16 after --

17 **JUDGE PETROU:** I see how you did it.

18 **THE WITNESS:** I got it.

19 **MR. WISNER:** The deposition transcripts are
20 technically not exhibits.

21 **MS. FORGIE:** Is that clarified enough? Thank you.

22 **THE COURT:** So I'm looking at the middle of Page 17,
23 and in this report of your report you're talking about the
24 Eriksson study; right?

25 **THE WITNESS:** Yes.

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1 **THE COURT:** And you're talking about the part of the
2 Eriksson study that analyzed -- that focused on people who were
3 diagnosed more than ten years after they started using
4 glyphosate; right?

5 **THE WITNESS:** Yes.

6 **THE COURT:** You say:

7 "These results are more convincing due to
8 biological plausibility; in the group in which less
9 than ten years had elapsed since exposure, the effect
10 estimate was much lower, as would be expected since
11 these exposures are less likely to contribute to
12 disease onset."

13 And then if you go to the bottom of Page 18, when you're
14 talking about the Cantor study. And the Cantor study, that's
15 the cases in Iowa and Minnesota; is that right?

16 **THE WITNESS:** Yes.

17 **THE COURT:** You -- you say that:

18 "Less informative for the current evaluation is
19 the Cantor study because, although it was carefully
20 conducted, cases were included that were diagnosed
21 1980 to 1983. Hence, only six to ten years could have
22 elapsed between a potential first glyphosate exposure
23 and NHL diagnosis, which for cancer epidemiologic
24 studies is considered an inadequate latency period and
25 one would want to see at least the median latency

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1 period of ten years."

2 And then you say:

3 "Again, for an individual the latency period may
4 vary (one year to many decades), but on average for a
5 study one would prefer a minimum latency period of on
6 average ten years."

7 So it -- it seems to me at least as a lay person that what
8 you are now saying about latency is different from what you
9 said in your report. If that's true, can you explain why
10 you're changing; and if it's not true, explain to me why it's
11 not, not true?

12 **THE WITNESS:** You asked me to explain why I say this
13 here. Well, I'm generally a conservative human being and this
14 report I consider the conservative way.

15 So the Cantor study wasn't what I base my opinion on, and
16 I wanted to make that very clear. And so I'm -- I'm phrasing
17 here very carefully what usually would be expected in cancer
18 studies. And I apologize if I didn't qualify that for
19 blood-related cancers. I thought I did, but I guess I didn't.

20 But my saying that for any individual it could be one year
21 or 20 years or 50, whatever I said, is actually true. We want
22 the average latency to be covered by the study. If the average
23 latency is really ten years, then what I'm saying is Cantor
24 actually underestimates. It's not the best study to base this
25 on.

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1 However, I wouldn't be too concerned because they are
2 actually seeing something. But if we want to be conservative,
3 we would actually want to do these studies later.

4 **THE COURT:** But, so I -- so a question about that
5 last point. You say they are seeing something.

6 **THE WITNESS:** Right.

7 **THE COURT:** Right? And I guess -- I don't yet
8 understand whether they really are seeing something.

9 In other words, these studies, depending on how you look
10 at the numbers, show a -- potentially show a statistically
11 significant association between NHL and glyphosate use.

12 **THE WITNESS:** Right.

13 **THE COURT:** But the question is that -- we're trying
14 to answer is whether it's merely an association or there is
15 causation.

16 **THE WITNESS:** Correct.

17 **THE COURT:** Right?

18 **THE WITNESS:** Uh-huh.

19 **THE COURT:** And I think the concern with the latency
20 issue, right, is that when somebody has NHL -- or if somebody
21 is diagnosed with NHL and they only began being exposed to
22 glyphosate five years prior, the sort of automatic question we
23 all would ask, I think, given what we've been told by you and
24 others about latency, is that -- is, well, is something else
25 causing the NHL? Is -- is something that these people were

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1 exposed to more than ten years ago causing the NHL?

2 And so my question is: How do we know that it wasn't
3 something else that was causing the NHL that the people in
4 these groups were being exposed to before they started being
5 exposed to glyphosate given particularly that we know that
6 farmers have always had elevated cases of NHL?

7 **THE WITNESS:** Right. I would be completely of your
8 opinion if I would base my opinion on Cantor. I wouldn't know.

9 However, Anneclaire De Roos did something very beautiful.
10 She combined these studies. And by combining these early
11 studies she was then able to do a lot of analyses, including a
12 47 pesticide adjusted analysis that still found a significant
13 and a multiply adjusted significant result.

14 None of the early studies could have done that because of
15 the number of cases exposed to glyphosate. They did not -- it
16 wasn't enough in any one of the studies to actually properly
17 adjust for other pesticides. So that question could not be
18 solved or answered in the early studies.

19 So the -- the De Roos study is really so beautiful because
20 it allows us this pooling of data and then it allows us to do
21 exactly that.

22 So I would be completely with you if it was just Cantor.
23 And that's what I also was trying to say in my expert report.
24 I would dismiss it. But after De Roos, pooling all of this
25 data and then being able to adjust for all of these different

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1 pesticides and still finding an increased risk and multiply
2 adjusted increased risk, I find that convincing.

3 **THE COURT:** Okay. And so I think you may have
4 answered this, but I'll -- let me just make sure.

5 So by adjusting for other pesticide use, that addresses
6 the concern that I am expressing about latency. That is to
7 say, the -- the adjusting for other pesticide use in this
8 context tells us, okay, you don't have to worry about whether
9 this association that we're seeing between glyphosate use and
10 NHL is actually attributable to these farmers' use of MCPA, you
11 know, 15 years prior or whatever; is that right?

12 **THE WITNESS:** That is correct. Because you would
13 assume that if really it was just an indicator, glyphosate was
14 just an indicator of prior MCPA use, then putting that variable
15 into the model would have taken care of it.

16 And that would not have been possible in the Cantor study
17 because of the numbers, but it was possible in De Roos. And,
18 therefore, because you have now a lot more cases and a lot more
19 exposed cases, but you also have a lot more controls. So
20 you're filling up these cells in a way that you're actually now
21 allowing your model to work for adjustment.

22 When you have any one of these studies, you can't do it
23 without generating, pooling or having zero cells or your model
24 collapses. It basically collapses. So you're stuck with not
25 being able to adjust.

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1 Or if you adjust, what can also happen -- and that's
2 actually one thing I was trying to do with my visual
3 recommendation, one of them on Hardell, the early Hardell
4 study. We can see that we generate something called sparse
5 data bias, meaning we have so few cases and we throw so many
6 variables into the model that I know there must be a lot of
7 zero cells, so the model misbehaves.

8 And then you actually have a bias introduced that
9 increases the risk. And it looks like glyphosate has a
10 five-fold risk when the univariant model only shows you 2.3
11 fold. And I would then go with the 2.3 fold because I know
12 this model must have not behaved.

13 That's not the case in De Roos. De Roos was actually able
14 to have enough numbers to do the proper adjustment.

15 **THE COURT:** Another thing I'm curious about, this may
16 be a dumb question, but we have these case-controlled studies
17 and they are on -- all look at people -- McDuffie was later.

18 **THE WITNESS:** Yes, '92.

19 **THE COURT:** McDuffie looked at people who were
20 diagnosed with NHL in the early 90's.

21 **THE WITNESS:** Early 90's, uh-huh.

22 **THE COURT:** But these other North American pools are
23 looking at people who were diagnosed with NHL late '70s, early
24 80's, mid-80's.

25 Sorry. Were you going to...

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1 **THE WITNESS:** They were actually -- there was only
2 one study that started in 1979. The others were '80 through
3 '86.

4 **THE COURT:** Okay. And we're now in 2018; right?

5 And we have had many papers written about these studies of
6 people who were diagnosed with NHL in the 80's and people are
7 crunching the numbers and re-crunching the numbers and
8 re-crunching the numbers.

9 But why have there not been any -- why have there not been
10 any case-controlled studies of people who were diagnosed with
11 NHL in the late 90's or in 2005 or 2010 or whatever?

12 **THE WITNESS:** I can venture some guesses. One was
13 the Hardell study in 1993, and everybody thought that would
14 give us the answer. So it's actually NIH. One, they invest in
15 one study that they believe is the Cadillac. Reviewers are
16 very reluctant to spend more money on something that they
17 consider may be inferior, which is a case-controlled study;
18 right? And I disagree with those reviewers.

19 There was also -- when I started as a young professor in
20 1995, there was almost no money in occupational and
21 environmental epidemiology. And the Hardell study was funded
22 within NIH, but for external funds. There was no money. And I
23 struggled for four years to get money, and I finally got the
24 State of California to give me my first cancer study in 1999.

25 So it was really hard to convince reviewers at NIH that

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1 occupational and environmental exposures were important. And,
2 unfortunately, I have to say it didn't change much. It was the
3 genomic era and it was the nutrition era and everybody wanted
4 to study just that. And when you came with a proposal saying:
5 Oh, I want to study pesticides, you really had an uphill
6 battle. And on top of it, you had the Hardell study that
7 everybody was pointing to saying: They will answer it. Right?
8 We just have to wait.

9 Yeah, I wish that hadn't happened, but that's how research
10 is, unfortunately, funded.

11 **THE COURT:** There are currently no case-controlled
12 studies being done on the link between glyphosate and various
13 cancers?

14 **THE WITNESS:** I would doubt it. For the U.S. I don't
15 know. Of course, the Swedes then started up, so there might be
16 other countries who are now investigating this; right? Yes.
17 And definitely the Scandinavian countries are forerunners of
18 this kind of research. So I hope they will put out more
19 research.

20 **THE COURT:** Speaking of which, that reminds me of
21 some testimony you gave when you were last here on the
22 Ericksson study. And let me see if I can remember the concept
23 you were articulating, but I think maybe you didn't have enough
24 time to fully explain.

25 You have had a criticism of the Ericksson study and the

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1 criticism, if I recall correctly, was that the Ericksson study
2 compared people who were exposed to glyphosate and other
3 pesticides to people who were not exposed to any pesticides at
4 all. And you explained -- it seems rather obvious why that's a
5 real problem, and you explained to us that that's a problem.

6 And then you said during your testimony that you were able
7 to adjust for that and still extract some value from the
8 Ericksson study and -- but that part of your testimony was
9 pretty quick and I don't think you had enough of a chance to
10 explain what you did and why what you did resulted in helpful
11 numbers.

12 **THE WITNESS:** I totally agree. That wasn't clear.
13 So what you can do is when you -- when the authors actually
14 provide you with some raw data, which is the numbers exposed
15 and unexposed, you can actually reconstruct the number of
16 unexposed that you should have who were also exposed to other
17 pesticides from those tables.

18 So I was able to reconstruct that number --

19 **THE COURT:** Let me stop you right there and ask a
20 clarification question.

21 So you're saying that in the pool of people that Ericksson
22 looked at, there were -- there were cases. Those people were
23 exposed to glyphosate and other pesticides. There were
24 controls, and some of the controls were not exposed to any
25 pesticides and other of the controls were exposed to other

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1 pesticides?

2 **THE WITNESS:** Correct.

3 **THE COURT:** So what Ericksson did in the paper was to
4 remove the controls who were not exposed to glyphosate, but
5 exposed to other pesticides?

6 **THE WITNESS:** Yes, exactly. And so they had a group
7 of controls that had no other pesticide exposure. It may sound
8 like a good idea. I think that's why they tried it. But when
9 you -- when you do a formal analysis in --

10 **THE COURT:** I don't understand why that would ever
11 sound like a good idea to anybody.

12 **THE WITNESS:** That's good. I agree. I totally
13 agree.

14 But sometimes clinical colleagues think it's a cleaner
15 control group if they are not exposed to other pesticides. And
16 these arguments, I've seen them being made, that that's a
17 cleaner control group; right? They have no other pesticide
18 exposures.

19 So we're really only comparing the glyphosate exposure in
20 the controls to the glyphosate exposure in the cases, and we'll
21 ignore that the cases have maybe also some other pesticide
22 exposure; right?

23 It's not a good idea, but I was able to reconstruct the
24 control numbers with other types of pesticide exposure. So,
25 and then to calculate what we call a crude odds rate ratio,

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1 which is just a cross product. And that crude odds rate ratio
2 was about ten percent different from the one that they
3 reported. That could be because I couldn't adjust for age
4 because I didn't have the raw data, and I couldn't adjust for
5 sex and province, all the variables they adjusted for.

6 But when I did this -- and we were too fast last time.
7 You remember that visual representation that we call forest
8 plot, but I don't want to call it forest plot? At the bottom
9 there were all these other subtypes of NHL listed. And that --
10 I did that for a purpose, because actually the Ericksson
11 subtypes -- and when you read that paper carefully, it says in
12 those analyses he used all controls. So they don't have that
13 problem, these subgroup analyses. And they are adjusted for.
14 Age and sex and everything else he adjusted for.

15 So when you then kind of scan along and you look at the
16 largest group, which I think was B-cells, and it was 800 out of
17 the 900 about, then you can actually see that that estimate is
18 also about 1.8 something, 1.9. And it is the largest group of
19 NHL. And so that would really then weigh the heaviest in the
20 overall estimate.

21 So I was quite comfortable with my crude estimate being
22 very close to an adjusted estimate when you're including every
23 single control and not just the ones who -- or excluded the
24 ones who had any other pesticide exposure.

25 **THE COURT:** Is there -- do you recall, is there any

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1 explanation of the numbers you came up with or the estimate you
2 came up with in your reports?

3 **THE WITNESS:** An explanation on the Ericksson study?

4 **THE COURT:** Yeah.

5 **THE WITNESS:** An explanation in this way?

6 **THE COURT:** Yeah. An explanation of how you
7 addressed the problem of Ericksson deciding to use only the
8 controls who hadn't been exposed to other pesticides and how I
9 think you said that, you know, the numbers -- your estimate is
10 that they were within ten percent of the numbers. Is there
11 anything sort of laying out --

12 **THE WITNESS:** I'm not sure I was as explicit because
13 it becomes very technical and -- to explain this. And then you
14 could say: Well, you didn't adjust for age, and that's a
15 problem.

16 So I could have hesitated to really do that, but I
17 convinced myself that the numbers that Ericksson reports are
18 not too far off the truth. If they are within ten percent,
19 epidemiologists are generally happy. That's kind of the rule
20 of thumb.

21 So it might be that I haven't really explained how I got
22 to that -- how I convinced myself that that's correct, but I do
23 remember that one reason I put in this visual graph, I put all
24 those numbers was because I then found that they had actually
25 used the full cohort set and not a subgroup. So that bias

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1 could not have been in the subgroup.

2 **THE COURT:** For the subtypes.

3 **THE WITNESS:** Yes.

4 **THE COURT:** Before I ask you a follow-up question
5 about the subtypes, for the overall number where you sort of
6 put the -- put the controls back in, who had been exposed to
7 pesticides and then sort of did your -- did your estimate where
8 you were unable to adjust for age and gender and things like
9 that, were those -- was all that stuff adjusted for other
10 pesticide use or were these the numbers that were not adjusted
11 for other pesticide use?

12 **THE WITNESS:** They don't report -- oh, they report
13 the multi-variant analysis as well. So I couldn't do that;
14 right? I didn't have age. I also didn't have -- and so that's
15 why I hesitated; right? That is a problem.

16 However, you remember that when you're adjusting, what
17 you're actually trying to do is simulate a clinical trial where
18 you are taking care of confounding by randomizing. Meaning,
19 you're assigning the treatment to the two groups in a random
20 way.

21 And the reason why we do this in medicine, randomly
22 assigning treatment, is because then confounding in the long
23 run is actually taken care of because you are distributing all
24 risk factors across the treated and untreated group or the
25 exposed and unexposed group fairly.

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1 So you still have other risk facts that are causing the
2 outcome, but they are kind of distributed randomly so they can
3 not influence the outcome in one group more than in the other.

4 So what we are trying to do with adjusting for confounding
5 is recreate this kind of evenness in all other risk factors
6 except for the exposure. So that's -- that's really what we're
7 after.

8 **THE COURT:** And so on the -- on these numbers up here
9 on the screen, the break it down by subtypes, you say that
10 these -- these numbers are based on all of the controls?

11 **THE WITNESS:** Yes.

12 **THE COURT:** Not just the controls who were unexposed
13 to other pesticides?

14 **THE WITNESS:** Correct.

15 **THE COURT:** But these numbers are also not adjusted
16 for exposure to other pesticides; correct?

17 **THE WITNESS:** They couldn't do that because of the
18 number game. Again, they would have run --

19 **THE COURT:** In other words, the pool -- the pool of
20 people in each subtype is too small --

21 **THE WITNESS:** Yes.

22 **THE COURT:** -- to adjust for other pesticide use.

23 **THE WITNESS:** Right; right.

24 **THE COURT:** Okay.

25 Does this -- I mean, discussion about Ericksson, does that

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1 leave you feeling that, you know, the De Roos 2003 study is
2 much more useful study than Ericksson?

3 **THE WITNESS:** I find De Roos very, very useful.
4 Definitely I would prefer her.

5 However, I think there is a lot to Ericksson. There
6 really is a lot to Ericksson. It's a large study. It's one
7 outside the U.S. And it's otherwise quite well done because
8 they have such wonderful data, cancer data, as well as the way
9 they do their studies is very solid. I wish they had tried to
10 adjust more.

11 However, I think they present their results in that
12 multi-variant model very fairly, fair and square. And I am
13 still okay with the 1.5, a 50 percent increased risk after
14 adjustment. I'm fine with that. Especially since they then
15 later also did the ten days per year analysis and, you know --
16 and that kind of confirmed it for me.

17 **THE COURT:** That reminds me of another question I
18 have about Ericksson. But first Kristen has asked that we take
19 a break because of a technical issue.

20 To give you extra time, why don't we take an extra break
21 and come back in at five minutes to 11:00.

22 (Whereupon there was a recess in the proceedings
23 from 10:44 a.m. until 11:06 a.m.)

24 **THE COURT:** Okay. Let me ask you a couple other
25 questions about latency maybe and then we can -- we can move

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1 on.

2 By the way, was there anything that you wanted -- that
3 we've discussed so far that you wanted to clarify or elaborate
4 on or anything?

5 **THE WITNESS:** Actually, while I was sitting here, I
6 realized that I hadn't made it very clear what latency means in
7 terms of biology.

8 So when we think about latency, it is not only a question
9 of when the exposure happened, but at what age the exposure
10 happened. And we now know that there are actually periods that
11 are much more sensitive.

12 So, for example, it could be very different if I expose a
13 55- or 60-year-old farmer than a 35- or 40-year-old. And in a
14 case-controlled study that is kind of a given.

15 So if I only have five to ten years of latency, it means
16 the exposure actually happened in the five to ten years prior
17 to the onset of the disease, which naturally, because all of
18 these individuals are older, means they were exposed at an
19 older age.

20 In a cohort studies that is not -- and I presume -- I do
21 elderly studies --

22 **THE COURT:** So when you say because all these people
23 are older --

24 **THE WITNESS:** On average.

25 **THE COURT:** -- you mean in the case-controlled

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1 studies, because we are looking at people who have already been
2 diagnosed with NHL --

3 **THE WITNESS:** Yes.

4 **THE COURT:** -- by -- by definition or by logic, they
5 are going to be older --

6 **THE WITNESS:** Yes.

7 **THE COURT:** -- than people we're looking at in a
8 cohort study.

9 **THE WITNESS:** Correct. Because in a cohort study we
10 actually are enrolling everyone; right? So sometimes we set a
11 limit and say they have to be 25 or 35, especially when I want
12 to see cancer. Because we all know, even though the people may
13 be exposed at 35, we have to wait until 60 on average to see
14 the cancer.

15 So the latency actually depends on how -- whether that
16 person reaches 60 or above. So for lung cancer we know that,
17 you know, it's around 62, and for NHL, too, is the peak of the
18 cancer incidents. So even though the exposure may have
19 happened at age 35, your immune system was able to keep it in
20 check.

21 And then with the weakening, we think now, with the
22 weakening of the immune system surveillance with aging, that's
23 what then brings it all on.

24 So I know when I do a study where I enroll 25-year-olds, I
25 probably should wait 30 years before I see something really

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1 happening.

2 In the early years all I see are the very aggressive young
3 age cases that are unusual; right? So in a case-controlled
4 study I don't have that problem because everybody who would
5 become a case already is a case. And so if I only go five or
6 ten years back, then I know that was the exposure prior to that
7 event happening and probably during a lifespan that was more
8 susceptible or sensible.

9 **THE COURT:** And so in the -- in the -- for the people
10 who De Roos looked at, do we know what the average or median
11 age was of the cases and the controls?

12 **THE WITNESS:** Yes. That is actually usually in
13 Table 1. She may not have represented, but I just looked back
14 at one of them and it was about 62.

15 **THE COURT:** Was the average --

16 **THE WITNESS:** The average age.

17 **THE COURT:** -- average or median?

18 **THE WITNESS:** That's the average age. It was
19 reported as the average age.

20 **THE COURT:** For the cases?

21 **THE WITNESS:** Cases. And the controls are usually
22 matched by age, so they are about the same.

23 **THE COURT:** Okay. And then since we -- since we
24 bounced back to De Roos, let me ask you one more question about
25 that. And this is sort of a more general question to make sure

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1 I understand the effect of adjusting for other pesticide
2 exposure, okay?

3 So what that means for De Roos, for example, is when we
4 have these numbers showing an association between NHL and
5 glyphosate exposure, the fact that adjustments were made for
6 MCPA and other pesticides can give us confidence that the
7 exposure to the other pesticides is not responsible for this
8 association that we're seeing in the numbers for -- for NHL and
9 glyphosate.

10 **THE WITNESS:** Correct.

11 **THE COURT:** We still are left to wonder whether
12 something else might have -- might be responsible for this
13 association, such as exposure to diesel fumes or excess
14 exposure to the sun or something like that; right?

15 **THE WITNESS:** Yes. We are left with everything that
16 we haven't adjusted for, assuming that those were similarly
17 distributed among the exposed and non-exposed.

18 So if I can come up with a reason why that's not the case,
19 and really every farmer who used glyphosate took sun baths
20 every day, and the ones who did something and used other
21 pesticides, you know, wore sunscreen or didn't go out in the
22 middle of the day, then that suspicion has a grounding in
23 reality.

24 So that's actually the job of the investigator, to think
25 about all the potential other risk factors that not only are

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1 risk factors for the outcome, but also different among the
2 exposed and the unexposed and would, therefore, explain that
3 pattern that I see for glyphosate.

4 And I didn't read that the investigators thought that any
5 of that would be the problem. What we usually hope is that
6 it -- yeah, there are all these other risk factors, but they
7 are kind of evenly distributed among the exposed and the
8 unexposed, unless I can come up with a true reason that that's
9 not the case. Like, they did not allow smoking on the farms
10 that used glyphosate, or -- that's a bad example, but it's
11 actually true for woodworkers; right?

12 Woodworkers can't go and smoke in the wood shop. So they
13 are likely not smokers and, you know, they have dust exposure,
14 but they have less smoking. So there -- there a kind of
15 reason. Even if I don't have smoking data, I should be worried
16 because the distribution would be different. But if I can come
17 up with a reason why that would be the case, then I'm not so
18 concerned.

19 **JUDGE PETROU:** I just want to go back one moment to a
20 make sure that I understand your testimony regarding age of
21 exposure and latency, since you raised that issue.

22 So is your point or one of your points that the age of
23 exposure is relevant in the sense that people who were using
24 glyphosate would be more susceptible to its potentially
25 deleterious impacts if they were older because of a weakened

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1 immune system over time?

2 **THE WITNESS:** It's actually both. You caught that
3 right.

4 So one thing I -- I suppose could be that we say, yes,
5 with aging we know the immune system ages and the immune system
6 has issues in aging; right? We see all of the herpes zoster
7 outbreaks in the elderly for good reason, because the immune
8 system can't check it anymore.

9 So yes, definitely when I am exposed at an older age, my
10 system may not be capable of coping with it. And we call that
11 a susceptible group in terms of age of exposure.

12 But the other factor is really also the distinction
13 between the case control and the cohort studies, where in the
14 cohort studies I have a mixture of ages and for only the small
15 group that is close enough to the peak age of NHL can I expect
16 within a short period of follow up to see the cancers. For the
17 others, even though they might have that cancer cell already
18 sitting somewhere, I might have to wait 20 years to see it
19 emerge, or 30 years.

20 **JUDGE PETROU:** And the -- the individuals that we
21 commonly think that -- potentially being particularly
22 susceptible, such as in utero, infancy, puberty, periods of
23 time, right, when your body is going through very quick
24 cellular change in growth, those are not groups that we have at
25 issue here, because of the -- because of the item at issue

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1 basically.

2 **THE WITNESS:** Correct. Correct. Because it's
3 occupational exposure.

4 Yeah, I wish somebody had done a study on children who
5 help on farms.

6 **THE COURT:** The one other question I had about the
7 Ericksson study that I was mentioning before the break, can you
8 talk to me in a little bit more detail the significance of
9 Ericksson's conclusion about people who were exposed for
10 greater than ten years or longer than ten years before
11 diagnosis?

12 And then there was also some discussion you had in your
13 previous testimony about people, I believe -- I may be
14 misremembering this, but people who were exposed even longer,
15 like greater than 20 years, and how numbers dropped off for
16 that.

17 **THE WITNESS:** Yes, yes.

18 **THE COURT:** And I didn't -- I think that was, again,
19 another example of something that was gone through pretty
20 quickly in your prior testimony, and so I wanted to hear more
21 about that.

22 **THE WITNESS:** Right. So in Ericksson it seems that a
23 lot of the farmers they actually enrolled in the studies had
24 actually stopped farming. So I don't think they really had the
25 exposures close to the onset of their -- their disease.

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1 So they must have stopped when they were 60 and maybe
2 gotten the disease at 65. So that's at least five years. Some
3 got the disease at 70.

4 So that they saw most of the effect between 10 and 20
5 years, I think, was probably a reflection of them -- it taking
6 them a little longer to get to the disease because they may
7 have stopped farming earlier.

8 And I'm saying that because it looked from the patterns
9 of, you know, when they last farmed, et cetera, it seemed to
10 make sense that a lot of the --

11 **THE COURT:** So they had -- sorry. Let me interrupt
12 real quick.

13 **THE WITNESS:** Yeah.

14 **THE COURT:** So they had data about when they last
15 farmed?

16 **THE WITNESS:** Yes, yes.

17 **THE COURT:** Okay.

18 **THE WITNESS:** I think so. That's what -- I think
19 they asked them actually when they had used and the years they
20 had used. And so that's the only way they can actually look at
21 latency.

22 They didn't explicitly say it, I think, but the only way
23 they could have actually constructed these variables was by
24 asking them; right?

25 And so 20 years-plus is probably harder for Ericksson to

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1 get to because people used other pesticides, and I think the --
2 the glyphosate use came in vogue in Sweden in the '80s, more in
3 the mid-'80s. So we kind of have that span of 20 years where
4 glyphosate exposure could have had happened.

5 So just because of that data structure, it is unlikely
6 that you find a lot of people who have more than 20 years'
7 latency just because the exposure couldn't have happened so
8 early.

9 You're restricted in your data. I mean, you want to
10 really estimate this as good as you can, but you're restricted
11 by real-world situations where, okay, when did the exposure
12 happen? How long did I follow these people? When did they get
13 sick? At what age were they exposed? And you kind of deal
14 with it by looking at your data in different ways. And I
15 thought they actually did a pretty good job of doing that.

16 **THE COURT:** I'm kind of ready to turn away from the
17 issue of latency. Is there anything else that you wanted to
18 say about that?

19 **THE WITNESS:** I think we covered it. Yeah.

20 **THE COURT:** Okay. Now, this -- this is an issue
21 we've talked about a little bit today and we've talked a little
22 bit about during your last testimony, but I want to explore it
23 further.

24 In the opinions that you provide in your reports and in
25 your testimony, you -- you place very heavy emphasis on numbers

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1 that are not adjusted for other pesticide use. And I wanted to
2 ask you sort of a methodological question, I guess, which is:
3 Is it okay in, you know, forming an opinion like this to place
4 such heavy emphasis on numbers that are not adjusted for other
5 pesticide use when you have numbers that are adjusted for other
6 pesticide use that you could be emphasizing instead?

7 **THE COURT:** I'm actually a little shocked that you
8 say that because I didn't feel that I did that. And I feel
9 very misunderstood if that's what you read.

10 Definitely, I want to look at adjusted estimates. I
11 looked at adjusted estimates. But for the early studies, as I
12 said, I would be just as worried about that sparse data bias
13 which you throw everything in to the model. And sometimes with
14 the multiply adjusted estimates, I'm a little worried about
15 them putting things in there that they shouldn't be putting in
16 there.

17 So if my critique came across as if I'm not -- I'm asking
18 not to adjust for other pesticides, that's not what I meant. I
19 just -- what I tried to convey is that even though we are
20 generally having a knee-jerk reaction of, oh, just put
21 everything into the model, that is probably the wrong approach.
22 You have to think about which of the pesticides are risk
23 factors, are associated with glyphosate. The number issue.
24 Can I adjust without introducing bias? And all of that goes
25 into my evaluation.

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1 And, yes, if I'm able to adjust for as much as I want to,
2 I definitely want to see those numbers, and I think that the
3 De Roos paper did a really good job in that.

4 So if it came across like I didn't look at those, that's
5 not what I intended.

6 **THE COURT:** If you were asked to look only at numbers
7 that are adjusted for other pesticide use, and kind of assume
8 for the sake of argument that numbers that are not adjusted for
9 other pesticide use are not particularly useful, would that
10 change your conclusion about glyphosate causing non-Hodgkin's
11 lymphoma?

12 **THE WITNESS:** Actually, I did put a plot together
13 where I just put the adjusted ones on. And I still have all of
14 the estimates except for the AHS study on the right side of
15 that graph, that one. Some of the confidence levels straddle
16 the one or go across.

17 However, those are the plain numbers that I could extract
18 where they did not do dose-response analyses, for example, or
19 where they didn't exclude the occasional users.

20 So as a scientist, I want to put that into the perspective
21 of what also happens if I try to exclude the occasional users
22 and only use the heavy users or if I try to get at a
23 dose-response like Ericksson actually did. And if I put all of
24 that together, then, yes, I still believe that what I said is
25 correct; that even after fully adjusting, or maybe even

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1 over-adjusting in my book, I would see that there is a risk
2 increase, except for the Andreotti study and the AHS.

3 **THE COURT:** But is that -- but the numbers become
4 less stark when you adjust for other pesticide use. And so the
5 question is, you know, you see an association, you query to
6 what extent it's statistically significant; right?

7 **THE WITNESS:** Right.

8 **THE COURT:** Is that enough, you know, when -- if you
9 combined it with the animal studies and the mechanistic data,
10 is that enough to conclude that glyphosate is currently causing
11 NHL in human beings?

12 **THE WITNESS:** Well, when I put it all together, it
13 was enough. And I have done a lot of pesticide studies and I
14 know what happens when you put a lot of pesticides in the same
15 model. The estimates always shrink because farmers don't just
16 use one agent; right? We wish we could do those studies. We
17 really wish, but they don't exist.

18 So in human populations I just have to deal with the
19 reality of what's out there. And sometimes, yes, they use two
20 carcinogens. Sometimes one uses one and the other uses the
21 other. And my -- my model can only do what it does. And I
22 know what it does when I put two very highly colinear or
23 collated variables into the same model. The estimates will
24 shrink towards the one. That's just -- that's how it works.
25 So that doesn't concern me too much.

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1 What really concerns me is is there a systematic bias I
2 can figure out that would explain all of these increased
3 estimates, and that I did not see.

4 And the other thing I also didn't see was reversals of
5 trends or, you know, something that all of a sudden didn't make
6 sense anymore and jump around. The whole picture was still
7 quite consistent.

8 **THE COURT:** I guess another way to get at this
9 question is to put it in the context of the Bradford Hill
10 analysis; right? And what we're talking about here is strength
11 of association, I guess.

12 **THE WITNESS:** Right.

13 **THE COURT:** And as I understand, I don't remember
14 whether you said this or other witnesses, but I -- I think
15 everybody agreed that strength of association is a very
16 important factor in the Bradford Hill analysis.

17 **THE WITNESS:** It is one criterium or one guideline.

18 **THE COURT:** And the -- and so -- sorry to interrupt,
19 but so -- so it -- I mean, obviously -- I mean, I think in your
20 report you already -- I can't remember what you said. I'll
21 pull it up.

22 Let me get out of the Ericksson study here. One moment.

23 (Brief pause.)

24 **THE COURT:** You talk about the strength criterion in
25 your report on Page 23, and you refer to it as having been

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1 partially met and you describe a weak to moderate size
2 association.

3 **THE WITNESS:** Yes, but that's for the ever/never. So
4 the weak to moderate size is really the ever/never. And I
5 consider that the worst analysis or the weakest analysis you
6 can do.

7 So I -- I then continued to say that, you know, for the
8 studies that actually looked at heavy exposure, you see odds
9 ratios of 2 and 3, and that was what convinced me.

10 **THE COURT:** But those are -- those numbers that you
11 are giving are numbers that were not adjusted for other
12 pesticide use, correct?

13 **THE WITNESS:** That is correct.

14 **THE COURT:** And so my question is: How does -- you
15 know, if you're being asked to place heavy emphasis on the
16 numbers that are adjusted for pesticide use -- for other
17 pesticide use, as opposed to the numbers that are not adjusted
18 for other pesticide use, how does that affect your assessment
19 of that -- that Bradford Hill criterion, the strength of
20 association?

21 **THE WITNESS:** First of all, I think a 50 percent
22 increase, we call it moderate, is actually quite a warning sign
23 in occupational and environmental epidemiology because we know
24 that we are underestimating due to exposure assessment issues
25 all the time. So 50 percent is really a warning sign.

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1 If I then go to the dose-response -- and, yes, I wish that
2 some of them had been adjusting for other pesticides, but I can
3 see how the estimates behave. And generally when we break up
4 from ever/never into different categories, you can kind of see
5 how these estimates become either unreasonable or if you would
6 combine them, they would give you back the adjusted estimate.
7 And that's how I assessed it.

8 And I -- I did not see anything totally unreasonable
9 happening. It was as I, from what I know about data
10 analysis -- and I've done a lot -- it was very reasonable and
11 it was something that I would expect.

12 **THE COURT:** Can you talk to me a little more about
13 how one sort -- sort of mechanically how you adjust for other
14 pesticide use?

15 **THE WITNESS:** Yes. So there are two ways. One is
16 you stratify, but that's -- or standardize. That's not what's
17 done here.

18 What they -- what most of these analysts are doing is they
19 use a regression model. So they use a regression model and
20 they add these variables into the regression. So they are
21 making assumptions about the association that these variables
22 have with the outcome, and that is what we are usually calling
23 adjustment, is adding these variables into the regression
24 model.

25 **THE COURT:** Is there any issue with -- let's say --

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1 let's take De Roos, for example. Is there any issue with how
2 the adjustment for other pesticide use is done? I haven't -- I
3 haven't seen any criticism of -- I haven't seen anything like
4 that; right? Well, this study adjusted for other pesticide
5 use, but they didn't do in it a --

6 **THE WITNESS:** In the proper way.

7 **THE COURT:** -- proper way.

8 I mean, the one thing I recall is your -- your discussion
9 of adjusting for all 47 other pesticides. And maybe that's not
10 particularly reliable, but other than that, I don't recall any
11 criticism of any of the studies for the way in which they
12 adjusted for other pesticide use. Is that an issue in the --
13 with these studies at all?

14 **THE WITNESS:** It is always an issue, how well you
15 measure everything. And the better you measure covariates --
16 we call them covariates -- the higher your chance to actually
17 adjust properly.

18 But, I mean, reality again hits you in the face. I mean,
19 how many variables in how many different ways can you put in?
20 And I think what they mostly did is say yes or no exposed or
21 high or medium exposed. And that's how far it went.

22 Because even for glyphosate, that's mostly what they did;
23 right? They used a ever/never. So most of these studies
24 probably used ever/never for the covariate adjustments in the
25 same way.

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1 **THE COURT:** On the issue -- since you raised
2 dose-response, on that issue, talking about the NAPP data, I --
3 I recall you -- I believe it was you who focused on the -- the
4 numbers associated with people who used -- who exposed -- were
5 exposed to glyphosate more than two days per year.

6 **THE WITNESS:** Correct.

7 **THE COURT:** And you referred to those folks as
8 routine users.

9 **THE WITNESS:** Uh-huh.

10 **THE COURT:** And as I recall, the -- the odds ratio
11 for people who were exposed to glyphosate more than two days
12 per year was either statistically significant or barely not
13 statistically significant, depending on which slides you're
14 looking at; right?

15 **THE WITNESS:** Yeah.

16 **THE COURT:** But, in any event, noteworthy odds
17 ratios.

18 **THE WITNESS:** Correct.

19 **THE COURT:** And then, if I recall, there was also a
20 category of users, and it was people who -- who were exposed to
21 glyphosate more than seven days in their lifetime? Do you
22 recall that?

23 **THE WITNESS:** I think it was -- I think it was a
24 multiplication of years and days. Could that be?

25 **THE COURT:** Yeah, that sounds right. I'm looking at

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1 this -- I'm looking at -- here, maybe I'll hand you this. This
2 is a chart. I don't remember who testified about it. I think
3 you probably did. But it's Exhibit 1278.

4 Kristen, do you want to hand this down?

5 (Whereupon document was tendered to the witness.)

6 **THE COURT:** So I don't remember exactly where this
7 came from, but this is the -- this is the chart that delineates
8 between proxy and self-respondents; right?

9 **THE WITNESS:** Right.

10 **THE COURT:** And it has these different categories.
11 And one of the categories is called Lifetime Days.

12 **THE WITNESS:** Right.

13 **THE COURT:** And they are looking at people -- people
14 who had between zero and seven lifetime days of exposure and
15 greater than seven.

16 So I wanted -- my question for you is, I guess, first, can
17 you explain what this Lifetime Days category means?

18 And, second, can you explain why you think the previous
19 category that we just discussed, greater than two days per
20 year, is a more illuminating category than this one?

21 **THE WITNESS:** Right. So, actually, what you want to
22 do is also look at duration, number of years. And you can see
23 that there is absolutely no increase in the -- by duration,
24 right, by those two categories, between zero and 3.5 years and
25 then greater than 3.5 years.

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1 And so I'm not surprised to see that the lifetime number
2 of years times days per year, greater than seven, also show no
3 great increase at all. And what that tells you when you then
4 compare to it frequency of days per year, more than two, that
5 this is about intensity and not duration of exposure.

6 So I've seen this before for silica, where you can where
7 you can find lung cancers in silica-exposed workers for peak
8 exposure per day in fibers, but you don't see it for duration
9 of exposure or average or cumulative fibers over a lifetime.

10 In the silica we know it's a biologic principle that our
11 lungs, the cilia of the bronchial system, can actually clear
12 dust when it's not overwhelming them. So if you have fibers
13 under a certain threshold, your lungs take care of it. If you
14 overwhelm them, then, you know, you get inflammation and you
15 get the process of cancer going.

16 And so what this suggests, we should really look at
17 intensity of exposure and not at duration because it seems like
18 your body can handle it if you get exposed here and there.
19 It's actually nice to -- to look at. I mean, it's interesting
20 to look at, but if you overwhelm your system, you use it day
21 after day after day and the system has no way to recover,
22 that's maybe where we should be looking.

23 **THE COURT:** What do we know about the range of days
24 per year that this group covers?

25 **THE WITNESS:** All they are telling us here is more

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1 than two.

2 **THE COURT:** But do we know -- I mean, looking at the
3 data, do we know anything about --

4 **THE WITNESS:** They -- the NAPP study didn't tell us
5 that. But we could ask the authors, yeah. They would have the
6 data. It's not published yet and there is only a draft, a
7 draft manuscript, and it's not explained.

8 **THE COURT:** This may be a weird question, but I want
9 to give you a hypothetical.

10 So let's say you have four case-controlled studies. Take
11 it out of the realm of glyphosate and NHL. Let's say you have
12 four case-controlled studies. One of the things that is clear
13 from all of the testimony we've heard in this case is that
14 there are always going to be concerns, problems, potential
15 problems with studies, case-controlled studies, cohort studies,
16 epidemiological studies; always concerns about ways in which
17 the studies might err or the numbers might be off; right?

18 **THE WITNESS:** Right.

19 **THE COURT:** Just hypothetically let's say you have
20 four case-controlled studies and you have about the same level
21 of confidence in their reliability; right? You have -- there
22 are questions about all of them. There are concerns about all
23 of them.

24 But let's say you think they are within the range of
25 reliability and they are all about the same in that regard.

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1 And two of the studies show a slightly statistically
2 significant odds ratio, and two of them are close to the null.
3 All right?

4 What do you -- what conclusion do you draw from that
5 about -- I mean, is that -- will you -- do you conclude that we
6 don't have enough information to know whether this particular
7 substance causes this particular disease?

8 **THE WITNESS:** This is not how I look at studies,
9 really. I -- I rarely would rank every study the same. And I
10 really would want to look at dose-response patterns, at, you
11 know, latency, at exposure assessment, at, you know, everything
12 they did. And sometimes one well-done study can convince me
13 that there is something, and nine other studies that didn't see
14 something, I know exactly why they wouldn't see it. And then
15 that one study makes me want to go out there and do more
16 studies and, you know -- and show with additional studies. And
17 I wish somebody had done that, but we don't often have second
18 and third chances.

19 And then all we have to do is use the data that we have in
20 front of us and say: Well, you know, are these weighing
21 heavily enough in my scientific assessment together with the
22 animal data, together with the mechanistic data, and I can wish
23 as I want for better studies in humans. I won't get them, but
24 I have to make a decision. And that's how I do it.

25 And, yes, I might be frustrated with the process. I often

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1 are -- am, and wish I had better data. We all wish. My
2 students always try to conclude at the end, and future studies
3 should.

4 I say: There might not be a future study. Could you
5 maybe conclude something from yours? They have a hard time
6 doing that. It's amazing. Because we teach them so well to be
7 skeptical. One thing we teach in epidemiology is to be really
8 skeptical. And sometimes a bit too much because they then have
9 a hard time concluding. But we have to, as -- you know, as
10 public health people, we have to conclude something.

11 **THE COURT:** I think this is probably a relatively
12 minor issue, but one of the issues that Monsanto brings up is
13 the issue of publication bias. And they -- and as I understand
14 it -- and maybe I'm not understanding it correctly, but as I
15 understand the argument, you know, your study is more likely to
16 be published if you show an association, and your study is less
17 likely to be published if you don't -- if it doesn't show an
18 association. Because people are more interested in reading
19 about associations than non-associations.

20 Is -- do you think that that could be a concern in this
21 case? And why or why not?

22 **THE WITNESS:** I really doubt it. Because I don't
23 think -- especially the 1980s studies. They didn't go out
24 there to investigate glyphosate. They were worried about
25 farmers and what farmers were using. And they published no

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1 matter what they saw. And they usually found at least one
2 pesticide causing something; right?

3 So in this case when they find glyphosate, if they found
4 another pesticide causing NHL, they would still put the
5 glyphosate data in there. So we would have accrued a lot of
6 null glyphosate results if that was the case and other
7 pesticides were causing NHL. Because I get my study published
8 whether it's MCPA, 2,4-D, malathion or glyphosate.

9 And I always tell my students: Well, you only get this
10 chance, so please put all your data in there. And that's how
11 we do it.

12 And we're actually asked by the reviewers as well. You
13 know: Didn't you have these other pesticides? What's the
14 result for them? Because they also know about publication
15 bias.

16 So we say -- nowadays we can say, well, there is a lengthy
17 appendix. We put all that data in the appendix, like we saw in
18 Andreotti. So I wouldn't be as worried -- in the realm of
19 pesticide research that I'm familiar with, I wouldn't be
20 worried about that.

21 **THE COURT:** And then another sort of general
22 question, what do we know about, you know, the association or
23 lack of association between glyphosate and other types of
24 cancer, and does that knowledge affect your view of the link
25 between glyphosate and NHL?

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1 **THE WITNESS:** It affects my view and so far, as I can
2 exclude, recall bias.

3 And I think Dr. Weisenburger was one of the them who
4 explained that very nicely; that if really all farmers believed
5 that glyphosate was causing cancer, they would all report it
6 for every cancer; right? So it relieves me of that worry.

7 On the other hand --

8 **THE COURT:** Tell me more about that. Remind me --

9 **THE WITNESS:** Of the discussion? Yeah. It was the
10 first day, I know.

11 **THE COURT:** Background information behind what you
12 just said.

13 **THE WITNESS:** Right. So if there is the general
14 knowledge among farmers that they are handling a carcinogen,
15 then no matter what the cancer is they will suspect that agent
16 to have caused it.

17 And recall bias would be if the farmers would say: Ahh, I
18 used a carcinogen. I know that -- my suspicion is it must be
19 glyphosate because somebody told me it's a carcinogen; right?
20 And the people who developed the cancer would, therefore,
21 report it much more accurately or just recall it more than
22 people who don't have cancer.

23 And that seems to not be the case, because if all the
24 other cancers didn't show that result, it didn't -- it means
25 that farmers, at least the farmers who developed other cancers,

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1 didn't think that glyphosate was a carcinogen and, therefore,
2 reported, it more heavily. So that -- that worry I don't have.

3 On the other hand --

4 **THE COURT:** So are these -- just a clarification
5 question on that. Are these in the same studies that we have
6 been talking about or are these in different case-controlled
7 studies about other cancers?

8 **THE WITNESS:** Other cancers, but in the same areas.
9 Like, for example, the same -- I mean, these researchers are
10 not just interested in NHL; right? They do the -- I mean, the
11 ALGA health study would not have been funded if they had looked
12 at all cancers.

13 So these same authors, actually I know, have a lot of
14 other case-controlled studies going on that they do in the same
15 way for other cancers and they do them in the same regions for
16 the same reasons. Because they are regions where farmers were
17 using pesticide. So if I want to learn about pesticides,
18 that's where I'm going; right?

19 And I do all of my cancer studies in those areas about the
20 same time periods, about the same questionnaires; right? I use
21 what I learned works, so I use it in all of my studies. And
22 that's why I'm saying that.

23 **THE COURT:** And so --

24 **THE WITNESS:** But they are definitely different
25 studies.

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1 **THE COURT:** They are different studies. And so --
2 but what -- what people are saying, what farmers or the people
3 who have these other cancers in these other studies are saying
4 about their glyphosate exposure is not resulting in increased
5 odds ratios for glyphosate and these other cancers, is that --

6 **THE WITNESS:** Correct. Absolutely right, yes.

7 **THE COURT:** Okay. And so the -- so is it right to
8 say that the only utility of that information is that it causes
9 you to be much less worried about recall bias in the NHL
10 studies? I get the point.

11 **THE WITNESS:** Yeah, yeah.

12 **THE COURT:** I understand. And, in fact, I think
13 Dr. Mucci eventually agreed that recall bias is not a real
14 concern here with these case-controlled studies; right?

15 **THE WITNESS:** Correct.

16 **THE COURT:** So I get that point. But is that the
17 only utility of these conclusions in these other studies --

18 **THE WITNESS:** Actually, there is another one, and
19 that's specificity. And that's a Bradford Hill criteria.

20 So if we have an agent that causes all cancers, I'm much
21 more suspicious. Of course, we know that smoking causes a lot
22 of different cancers; right? And now we know -- we start to
23 understand the biology of that as well. It causes cervical
24 cancer and, you know, who would think so. But the biology is
25 there.

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1 But, actually, the fact that it causes one cancer and not
2 all of the others --

3 **THE COURT:** The fact that there is an association
4 between studies in cancer and not this one.

5 **THE WITNESS:** Right. So presumed causation in
6 that -- from those studies. In that case I would say: Well,
7 there must be something about the immune system and what we
8 really need to do is study what is happening in a human immune
9 system that's aging.

10 And, yeah, for me that's -- that's another specificity
11 issue that these studies point to.

12 **THE COURT:** The rest of my questions I think are
13 probably kind of less significant, but I'm going to ask them
14 anyway since I have you here.

15 You talked about -- at one point in your testimony when
16 you were last here you talked about collider bias. And I think
17 you were discussing that in the context of the Ericksson study.

18 **THE WITNESS:** Right.

19 **THE COURT:** And I couldn't figure out when I was
20 looking back over your testimony what collider bias is and what
21 its significance may or may not be in this case.

22 **THE WITNESS:** It's just a fancy word for what we
23 already described. What happens when you are excluding the
24 other people, the people with other pesticide exposure from the
25 control group. That's what we call a collider bias. And it

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1 is --

2 **THE COURT:** Say that one more time.

3 **THE WITNESS:** It is exactly the -- we also call it
4 selection bias, collider or selection bias. It is exactly what
5 we did when we selected out from the control group the
6 individuals with other pesticide exposure.

7 And why we call it "collider" is because we draw these
8 nice little graphs and then two arrows go into one variable
9 selection by that factor. That's all. And so these arrows
10 collide on that variable. That's all. It's technical.

11 **THE COURT:** Okay.

12 (Brief pause.)

13 **THE COURT:** There was another part of your testimony
14 that Monsanto criticized you for and I wanted to point to it
15 and give you a chance to address it. And this is -- I don't
16 know. You have your testimony there, yeah?

17 **THE WITNESS:** Yes.

18 **THE COURT:** This is on Page 27.

19 **THE WITNESS:** Is that the expert --

20 **THE COURT:** No, the --

21 **THE WITNESS:** Rebuttal?

22 **THE COURT:** Your testimony here in court.

23 **THE WITNESS:** In court.

24 **THE COURT:** Do you have that in your binder?

25 **MR. WISNER:** Yes. It says "Daubert Day One."

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1 May I approach, Your Honor?

2 **THE COURT:** Sure.

3 (Whereupon document was shown to the witness.)

4 **THE WITNESS:** Got it.

5 **THE COURT:** Page 27?

6 **THE WITNESS:** Yes.

7 **THE COURT:** You were talking about adjusting for
8 MCPA?

9 **THE WITNESS:** Yes.

10 **THE COURT:** And let me also go back -- take a second
11 to go back over it, and I'm going to do the same.

12 I think you were saying here, and I may be wrong, and this
13 is why I want -- wanted to give you a chance to address it. I
14 think you may have been saying that it's -- it would not be a
15 good idea to adjust for MCPA use, and you said that you didn't
16 see any literature that told you that MCPA was truly an NHL
17 risk factor.

18 **THE WITNESS:** Yes.

19 **THE COURT:** So it may be that I'm misstating your
20 testimony, but Monsanto was criticizing you for saying that and
21 so I thought I would ask you to address it.

22 **THE WITNESS:** Right. That brings back this issue of
23 how do I select confounders. And confounders are -- first of
24 all, have to be risk factors for the outcome. So I have to
25 convince myself -- and they have to be strong risk factors for

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1 the outcome. And then they have to be strong --

2 **THE COURT:** Sorry to interrupt, but I just want to
3 ask one clarification question about that.

4 I'm not sure that I understand the concept that you need
5 to know that something is a risk factor before you adjust for
6 it.

7 I mean, I would think that you would -- if something is a
8 possible risk factor or if there is a -- you know, if there is
9 a reasonable -- if there is a reasonable possibility that this
10 might be a risk factor, that we would just for it to see what
11 happens.

12 **THE WITNESS:** That's the second point.

13 So we -- we don't always have the data. So, for example,
14 we might have forgotten to ask about MCPA in my study; right?
15 Could have happened. So that doesn't excuse me if it -- if
16 it's truly known to be a risk factor.

17 And so the first thing that we teach is, you have to know
18 the literature. Go to the literature and see whether anybody
19 established risk factors for this disease. If they have,
20 please plan your study accordingly and measure those; right?

21 But if we are not sure that something is a risk factor,
22 then we have a second tool. And the second tool is I measure
23 it and I look whether it's distributed between the exposed and
24 non-exposed, the exposure of interest, in a way that is
25 differential; meaning, everybody who is exposed to glyphosate

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1 is also exposed to MCPA. Nobody who is not exposed to
2 glyphosate is exposed to MCPA.

3 Then I have 100 percent colinearity. If I now put MCPA
4 into my model, what happens is something that we formerly
5 call -- or technically call splitting of the variants, because
6 both predict -- both are predictors of each other; right? They
7 are 100 percent correlated. So they must -- if one of them is
8 truly a risk factor, the other one will be as well. It's the
9 breath mint -- if we say breath mints are only taken by people
10 who smoke, and I measure breath mint chewing and I measure
11 smoking, both will explain NHL or lung cancer in this case.

12 So at that point my data doesn't help me anymore. So I
13 have to go back and actually decide: Is that truly a risk
14 factor and should I truly adjust for it, or is it just a breath
15 mint? That's it.

16 And that's why, you know, we go back and forth. We play
17 with our data and we test things in our data, our hypothesis.
18 But we also need to put it back into the context of what we
19 know about biology and what we know about other studies and
20 what we know about the real world. And that's where we go back
21 and forth and back and forth. And that's where this comment
22 comes from.

23 **THE COURT:** But -- but you seem to -- seem to be
24 saying in this testimony that -- and, again, it's quite
25 possible that I'm misunderstanding it, but you seem to be

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1 saying that it's not a good idea to adjust for MCPA use.

2 **THE WITNESS:** At least if you do it, be aware. And
3 the aware is, you can say: Well, I wanted to be absolutely
4 conservative. I believe MCPA is causing NHL, and all I want to
5 do is estimate glyphosate adjusting for MCPA, but you have to
6 then really say my assumption. You have to state that very
7 clearly, is that MCPA is a true confounder. If I say that,
8 then it means it's a true risk factor for NHL.

9 I'm not excused -- I'm not excused by my data because the
10 data doesn't tell you the truth. The data just tells you there
11 is a high colinearity. It does not help you distinguish
12 between it being truly a risk or a cause for NHL or being just
13 an indicator of glyphosate use. That is something we have to
14 decide how we look at it.

15 However, when we put them both in the model and there's
16 still an effect for glyphosate, then I would say: Hmm, okay.
17 No matter what, even if MCPA is a true risk factor for NHL, it
18 doesn't remove all of the effect of glyphosate.

19 **THE COURT:** But you adjust for the MCPA use?

20 **THE WITNESS:** Yes. Yes.

21 **THE COURT:** I guess maybe what I should ask you now
22 is: Should one adjust for MCPA use in these studies?

23 **THE WITNESS:** I would try it and see what happens.
24 And as long as the estimate that I get for glyphosate is then
25 not going to one, I would still be concerned.

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1 **THE COURT:** So were you saying -- I mean, if you want
2 to take time to look at the transcript, you should feel free,
3 but I thought you were saying here that one shouldn't -- that
4 it was not a good idea to adjust for MCPA use, partly because
5 you didn't see any literature that told you that MCPA was truly
6 an NHL risk factor.

7 So if I'm misunderstanding your prior testimony, please
8 take your time and look at it and tell me.

9 **THE WITNESS:** Yes. From what I know, I would think
10 MCPA has not convincingly been shown to be an NHL risk factor.
11 So if I go by my rules, I really shouldn't put it into the
12 model.

13 However, if I want to be careful and say maybe we don't
14 know enough about MCPA yet, then I would do what I just said,
15 which is test it in my model and put it in and see what happens
16 to the effect estimate for glyphosate. And if that is still --
17 but do it very consciously because I know what I'm doing. I'm
18 putting two very highly colinear variables into the same model.
19 So I expect both estimates to reduce towards the null. The
20 MCPA one, if there is one, as well as glyphosate.

21 And that's actually what Ericksson showed. They had a
22 MCPA estimate of 2.6, and I think it went to 1.8. And the
23 glyphosate one went from 2.1 or something like that to 1.5.

24 **THE COURT:** But if you adjust for breath mint use, it
25 shouldn't affect your number for cigarette use.

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1 **THE WITNESS:** It will.

2 **THE COURT:** It will?

3 **THE WITNESS:** Yes.

4 **THE COURT:** There is something I'm missing.

5 **THE WITNESS:** It will. Absolutely.

6 **THE COURT:** Explain that to me.

7 **THE WITNESS:** So if you had a -- for heavy smokers,
8 let's say, an odds ratio of 5 for lung cancer, and if truly
9 everybody who smokes -- or 80 percent of the smokers also
10 always use breath mints and maybe only 20 percent of the
11 non-smokers do, because they have bad breath, then that high
12 correlation with smoking guarantees you that the estimate for
13 cigarettes will reduce to the -- towards the one. Because they
14 are positively associated.

15 If -- if the breath mint was negatively associated, then
16 something else would happen. But if they are positively
17 associated, I can guarantee you that that 5 would end up being
18 maybe a 2.5. And you would also see an odds ratio of about 2
19 or 2.5 for breath mints.

20 So both would kind of look like they are predictors of the
21 outcome.

22 (Brief pause.)

23 **THE COURT:** Last topic, at least for metrics I think.
24 I can't guarantee.

25 **THE WITNESS:** That's fine.

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1 **THE COURT:** Non-differential exposure
2 misclassification.

3 **THE WITNESS:** Good one.

4 **THE COURT:** So we have these AHS numbers, right, that
5 sort of -- regardless of which sort of quartile exposure you're
6 looking at, the numbers -- the odds ratio comes out in the
7 eights, usually; right? .8 -- .83, .87, somewhere around
8 there; right?

9 **THE WITNESS:** Right. Uh-huh.

10 **THE COURT:** And, you know, we have this statement
11 that everybody intones that non-differential exposure
12 misclassification will bias you towards the null; right?

13 In other words, if there is something else -- if there is
14 an association or if there is causation, it's going to be
15 concealed by non-differential exposure misclassification;
16 right?

17 **THE WITNESS:** By making the exposed and unexposed
18 more similar.

19 **THE COURT:** Right. And it's always going to -- what
20 everybody intones is it's always going to bias you towards the
21 null.

22 **THE WITNESS:** Correct.

23 **THE COURT:** And so the -- you know, one of the points
24 Monsanto seems to be trying to make is that if you have the .87
25 number and you have non-differential exposure

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1 misclassification, that's going to bias you towards one, and
2 it's not going to -- it's not actually, like, concealing any
3 true odds ratio that might be 1.5 or 1.7 or something like
4 that. That -- that is a concept I think that primarily came up
5 after you testified.

6 Is that something that you would like to address?

7 **THE WITNESS:** Yes. It's actually very important to
8 understand. And I -- yeah, I thank you for bringing it up.

9 We are always taking biases out of context. And I teach
10 it that way too. I'm guilty as -- as charged.

11 When I start teaching about biases, I start confounding,
12 most important, exposure misclassification; really important,
13 disease misclassification, et cetera, et cetera. And we are
14 using examples to show how this works. And what I then in the
15 end tell my students: But this only works this way as long as
16 we assume no other biases. In the real world, that's a wrong
17 assumption.

18 So while it is true that most of the time, in just about,
19 you know, all examples you can -- but also theoretically, if
20 you do the numbers, non-differential exposure misclassification
21 biases towards the null. So you are getting something very
22 close to the null. It wouldn't necessarily bring you on the
23 other side of the null.

24 So if we are saying that, well, we are coming from the
25 other side, we, first of all, have to assume that's actually

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1 true. So we would be reducing the risk of NHL by exposing
2 farmers to glyphosate. And under that scenario, we would move
3 that the estimate closer to the one, but then the true one
4 would be .6, .5; 50 percent reduction in NHL due to glyphosate
5 use. I truly don't believe that.

6 What I believe is that more than one bias is actually
7 happening here. First of all, there is also randomness, a
8 little bit is randomness.

9 But, most importantly, we have an additional bias. And
10 the additional bias comes probably from the way that they are
11 comparing the AHS, the people with glyphosate exposure in
12 categories to people that have never used glyphosate. That's
13 one group that seems to be consistently used in Andreotti, but
14 hasn't been used by De Roos.

15 When you look back at the De Roos 2005 study, she gives
16 you the numbers for the people who never -- it's a smaller
17 group, something like 9,000 people I think, who reported never
18 using glyphosate. And then she has a low and a high exposure
19 group. And when she does her comparisons, her dose-response,
20 she actually compares to the lowest exposed group. She never
21 compares to the never users. And that gave me an ah-ha, when I
22 saw what she did. And I realized why she did it.

23 The only reason an investigator would do that is because
24 they believe the counterfactual is not met; meaning, that the
25 comparison group is truly giving you the rate you would see if

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1 the others weren't exposed to glyphosate; meaning every other
2 risk factor is the same in that group except for glyphosate
3 use.

4 So these -- and actually that has been discussed in the
5 AHS. The group who never used glyphosate had a lot of other
6 characteristics that were different from the people who were
7 using. And so my guess is there is residual confounding by
8 other risk factors for NHL that they couldn't control for. And
9 the only way to do that is what Anneclaire De Roos did, is by:
10 Let's ignore the people who never used, and let's just look at
11 the spectrum of users and use the lowest exposed group.

12 **THE COURT:** And that reminds me of another question I
13 had, not about non-differential exposure misclassification, but
14 about the De Roos study. And you -- you said that she was
15 comparing low-dose users to higher-dose users. And what was
16 her definition of lower dose and higher dose there?

17 **THE WITNESS:** Yeah. She used -- remember that I
18 explained this very complex algorithm that Dosemeci came up
19 with?

20 **THE COURT:** No. Sorry.

21 **THE WITNESS:** So what she did is -- or better,
22 Dosemeci, who is a very, very good exposure assessor, he -- he
23 used that one question that they ask farmers in the
24 questionnaire about. After they asked them about 22
25 pesticides, they asked: How did you apply it? Did you use

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1 personal protective equipment? Did you clean your clothes.
2 When you used it, did you use a cab that was, you know,
3 pressurized? Et cetera.

4 And that -- and then they constructed a very complex
5 algorithm from that one variable to come to intensity of
6 exposure. And they used that intensity to weigh the exposures,
7 all of the exposures, the day of exposures that the farmers
8 reported using. And from that they -- they categorized low and
9 high exposure.

10 And that's really my problem with the study, is that
11 this --

12 **THE COURT:** The study you're talking about --

13 **THE WITNESS:** Is the AHS.

14 **THE COURT:** -- is the AHS study.

15 **THE WITNESS:** Right.

16 **THE COURT:** Okay.

17 **THE WITNESS:** And so the problem I have with that is
18 that they did not ask after every pesticide. They asked after
19 22, what did you do. So it was left to the farmer to decide on
20 what pesticide to report or on what practice to report. And my
21 guess was that they probably reported the most inclusive or the
22 most average they did. They didn't necessarily report what
23 they were doing for glyphosate.

24 And, therefore, by definition you would actually introduce
25 a lot of misclassification by using this algorithm for a

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1 pesticide that farmers at baseline in the '90s still didn't
2 believe was very toxic.

3 So they probably reported their, you know, use of
4 equipment, their use of washing -- their washing of hands and
5 their suiting up and their whatever, repairing equipment for a
6 lot of pesticides that were a lot more toxic than glyphosate.

7 So what they really did when they sprayed glyphosate, I
8 don't know, but it was presumed it was the same as if they, you
9 know, applied malathion or anything else.

10 **THE COURT:** Okay. Let's see. It's a little bit
11 after 12:00. We can turn to your presentation or we can take a
12 lunch break. Maybe would now be a good time to take a lunch
13 break?

14 **MS. FORGIE:** That's fine.

15 **MR. LASKER:** If I could just ask, how long do we have
16 Your Honor for today?

17 **THE COURT:** Til midnight if you want.

18 **MR. LASKER:** That's fine.

19 **MS. WAGSTAFF:** Do not say that.

20 **THE COURT:** Why don't we take a lunch break and we'll
21 return at 1:00 o'clock?

22 **MS. FORGIE:** Thank you, your Honor.

23 **THE WITNESS:** Thank you.

24 **THE CLERK:** Court is in recess.

25 (Whereupon at 12:10 p.m. until 1:09 p.m. proceedings

PROCEEDINGS

1 were adjourned for noon recess.)

2 **THE COURT:** I mentioned we were available until
3 midnight.

4 **THE CLERK:** One of us is.

5 **THE COURT:** I forgot to consult with Judge Petrou
6 about this. She has to leave at 2:45.

7 **JUDGE PETROU:** I'm going to leave at 2:45, which is
8 not an issue at all, because everything is being recorded. I
9 will have an opportunity to do it. I wanted you to know I was
10 on Court Call when the oral argument took place, so I did have
11 an opportunity to hear that as well.

12 **THE COURT:** We don't have to stop at 2:45 p.m., but
13 we will take a break at that time -- if we're still going, we
14 will take a break around that time to let Judge Petrou go.

15 **MS. FORGIE:** Thank you, your Honor.

16 Dr. Ritz actually has a flight, too, that she has to
17 catch. I'll try to be pretty fast and pretty limited.

18 **THE COURT:** I think you should take as much time as
19 you think you need to flesh everything out.

20 **MS. FORGIE:** Thank you, your Honor.

21 **MS. WAGSTAFF:** I didn't know if Judge Petrou if any
22 questions or not.

23 **JUDGE PETROU:** No.
24
25

DIRECT EXAMINATION

1
2 **BY MS. FORGIE**

3 **Q.** Dr. Ritz, the first think I wanted to do, please, is just
4 clarify a couple of things that you were asked about.

5 One is, you keep mentioning, or at least I kept hearing
6 you say, convince yourself, convince yourself. Can you explain
7 what you mean by that?

8 **A.** Yeah. Since I am a teacher, and I just come out of
9 teaching my big methods class at UCLA, it's actually some --
10 it's a teaching tool that I use to professionalize
11 epidemiologists in the way that we are thinking critically
12 about our subject matter. So it's really the method. So
13 applying the method of epidemiology in a critical way to -- and
14 come to a conclusion.

15 So convincing myself doesn't mean myself, but, you know,
16 it means be critical. Look at all the evidence. Look at it
17 from different angles. And when you're then convinced that the
18 study is valuable, then come to a conclusion.

19 **Q.** Okay. Thank you.

20 And you were asked some questions about latency with
21 regard to the 2003 De Roos study. Do you remember those
22 questions?

23 **A.** Yes.

24 **Q.** And notwithstanding the relatively short latency in
25 De Roos 2003 study, do you believe that the NHLs that were

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1 observed with glyphosate use could, from a biologically
2 plausible perspective, have been caused by exposure to
3 glyphosate?

4 **A.** Yes, I do.

5 **Q.** Okay. And your concerns about latency in De Roos are --
6 apply equally to all the studies, even the so-called positive
7 studies; is that correct?

8 **A.** Yes.

9 **Q.** Okay. And would you expect to see even stronger
10 associations in De Roos 2003 if latency were longer?

11 **A.** I would guess, yes. I mean, when I say "guess," I mean, I
12 would expect -- I would expect stronger effects.

13 **Q.** And can you explain why that is?

14 **A.** Because we are really harvesting the earliest cases in
15 De Roos. And if we -- if we think that we did not hit the peak
16 onset in terms of age, as well as timing of the exposures, then
17 the longer we are waiting, the more we are actually inclusive
18 in terms of the kind of cases that occur. So right now we are
19 probably just seeing the tip of the iceberg.

20 **Q.** Okay. And I want to go back a little bit to some -- just
21 some basics on confounding and adjustment and proper
22 adjustment. So could you explain briefly what confounding
23 actually means?

24 **A.** Right. So confounding is a principle in which we are
25 first assessing whether a factor is a true risk factor for the

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1 outcome. Because all true risk factors for the outcome, we
2 have to consider if and only if they also are related to the
3 exposure, meaning -- related means are these risk factors
4 distributed in the same way in the exposed and non-exposed or
5 are, for example, the unexposed exposed to everything else and
6 the exposed only exposed to the factor I'm investigating.
7 Clearly, if the unexposed are only exposed -- are exposed to
8 everything else, then their risk would be higher due to all the
9 other exposures.

10 And then I'm comparing exposed to exposed, right? So what
11 I'm hoping to get is an equal distribution of all the other
12 risk factors for the outcome among the exposed and non-exposed,
13 but, really, only for the risk factors for the outcome that
14 actually influence the risk of disease.

15 Q. Okay. And I'd like you to please --

16 MS. FORGIE: Mr. Wisner, could you please pull up a
17 new exhibit --

18 A. I'm not seeing anything on this.

19 BY MS. FORGIE

20 Q. We're just pulling it up.

21 MS. FORGIE: Exhibit 460, please.

22 THE WITNESS: It's not up.

23 MS. FORGIE: It's up on ours.

24 MR. WISNER: May I approach, Your Honor?

25 THE COURT: Sure.

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1 (Brief pause.)

2 **MS. FORGIE:** Would that be okay? We'll give her a
3 hard copy?

4 **THE COURT:** Of course.

5 (Whereupon document was tendered to the witness.)

6 **BY MS. FORGIE**

7 **Q.** Turn to the chart.

8 **A.** Uh-huh.

9 (Witness complied.)

10 **Q.** Do you have it, Doctor?

11 **A.** Yes.

12 **Q.** Okay. Can you explain what is the difference between --
13 well, how do you define "properly adjusted"?

14 **A.** So properly adjusted means I'm identifying the actual
15 confounders, meaning the risk factors for the outcome that also
16 are associated with the exposure of interest. And then I'm --
17 I am putting those and only those in the model.

18 And I'm not putting proxies for the exposure in the model.
19 I'm not putting intermediates in the model. I'm actually just
20 putting true risk factors for the outcome in that are related
21 to the exposure.

22 **Q.** Okay. And can you tell me what this chart on Exhibit 460,
23 what it shows you and explain what is the top part, and then
24 afterwards what is the bottom part please?

25 **A.** Right. So this is another plot, a visualization of data

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1 in which we see on the -- on first the upper part the
2 ever/never exposed, not adjusted for other pesticides. And
3 below we have the ever/never exposed -- in addition -- I mean,
4 the ones on the top are adjusted. They are not crude ratios.
5 They are justed for age and sex and some of them medical
6 history, et cetera, but the ones on the bottom are also
7 adjusted for other pesticides.

8 **Q.** Okay. I'd like you to look at the -- let's talk about the
9 Hardell study. Okay?

10 At one point --

11 **THE COURT:** I'm sorry. Could I ask a quick question?
12 On this slide, where did this come from?

13 **THE WITNESS:** I made that.

14 **THE COURT:** You mean in anticipation of today?

15 **THE WITNESS:** Yes, yes.

16 **THE COURT:** Okay. Thank you.

17 **MS. FORGIE:** After so many questions from the *Daubert*
18 hearing about adjusted and not adjusted.

19 **THE COURT:** Got it.

20 **BY MS. FORGIE**

21 **Q.** So with regard to the Hardell odds ratios, at one point is
22 there a very high odds ratio in Hardell?

23 **A.** Yes, it's extremely high. You can see that the point
24 estimate approaches 6. The confidence intervals are quite
25 wide. They also straddle the one. And you can see from the

1 whole graph that this odds ratio seems like an outlier, and it
2 truly is an outlier.

3 And the reason why that is is if you compare it to the not
4 adjusted for other pesticides, you can see that that odds ratio
5 was around 2.3. Also, wide confidence intervals.

6 But what happens now when you're putting all the other
7 pesticides, and Hardell had a lot of other phenoxies, but also
8 some others in there, into the model, exactly what I tried to
9 explain at the beginning happens, and that is we have now
10 sparse data bias.

11 So the fully or the most adjusted estimate is actually the
12 wrong estimate, or better the improper adjusted estimate. We
13 cannot adjust in Hardell for these other pesticides without
14 introducing this kind of sparse data bias.

15 **Q.** Okay. Let me break it down a little bit slower for me,
16 for a layman. You see this odds ratio that's almost 6;
17 correct?

18 **A.** Right.

19 **Q.** And that was adjusted for other pesticides; is that
20 correct?

21 **A.** That is correct.

22 **Q.** So can you explain -- and would you call this a fully
23 adjusted for other pesticides odds ratio?

24 **A.** Absolutely, yes.

25 **Q.** Okay. And so can you explain how sometimes you add in

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1 what might be confounding factors and then you take them out?
2 And can you explain why you do that and how you make that
3 decision?

4 And then after you do that in a general sense, we'll do it
5 specifically with Hardell.

6 **A.** Yes. So -- so that was one way if you're not convinced or
7 if you -- if you are thinking, well, maybe this pesticide also
8 causes NHL, so I better take care of it. Right? I better
9 adjust for it so that I get the true causal odds ratio for
10 glyphosate after adjusting.

11 And in this case Hardell did that. They knew that
12 phenoxyherbicides are suspected at the time. Now we know some
13 of them are actually causing NHL. So we should be adjusting
14 for pesticides. And then they throw all of these pesticides
15 into the model. And what happens is what we call it explodes
16 the model.

17 So the data was not sufficient to do this kind of
18 adjustment. And you can see that it actually creates a bias
19 away from the null. And this is very well known. It's called
20 sparse data bias. And it's something I -- I warn my students
21 against. You cannot just throw everything in a model and
22 expect to know the truth or to -- you can't expect that that
23 kind of fully adjustment is proper adjustment. It's really
24 not.

25 **Q.** And, in fact, Dr. Rider agreed with you with regard to

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1 this particular issue in terms of throwing in the kitchen sink
2 and everything else for adjustment; is that correct?

3 **A.** That is correct.

4 **Q.** Okay. So in the --

5 **MS. FORGIE:** And can we just put up that one section
6 up from Dr. Rider's deposition?

7 (Document displayed)

8 **BY MS. FORGIE**

9 **Q.** Is it -- you don't have a screen. Hold on. Let me get
10 you a hard copy.

11 (Brief pause.)

12 **MR. WISNER:** Don't have a hard copy.

13 **BY MS. FORGIE**

14 **Q.** Okay. Well, in any event, you're familiar with the
15 deposition testimony of Dr. Rider; correct? And you're aware
16 after having read that deposition testimony that she agrees
17 with your position on that; correct?

18 **A.** Yes.

19 **Q.** And, in fact, in Hardell, what happened was you put in --
20 you adjust for all these other pesticides. The odds ratio goes
21 up very high; is that correct?

22 **A.** Correct.

23 **Q.** And then you make a determination as to whether or not you
24 should leave in all those adjusting for pesticides or take it
25 out; is that correct?

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1 **A.** That is correct. Actually, when you read the Hardell
2 study, you see that the univariate analysis, meaning where just
3 one pesticide at a time is in the model, is represented in a
4 table. This estimate of 5.8, you can find in the text, but the
5 authors never refer to it again.

6 They do it because reviewers ask for it. They ask for a
7 fully adjusted odds ratio, but they also interpret the
8 univariate as the most reliable one.

9 **Q.** Okay. So in other words, it was fully adjusted for other
10 pesticides. And then they removed those because of the reasons
11 you just explained; correct?

12 **A.** Correct.

13 **Q.** So in that case -- in that sense Hardell actually is fully
14 adjusted; correct?

15 **A.** Yes.

16 **Q.** It's just not referred to that way because they actually
17 ended up taking out the pesticides after they determined it
18 wasn't appropriate to throw in the kitchen sink; is that
19 correct?

20 **A.** Right. Otherwise we would believe it's a six-fold risk
21 increase; right?

22 **Q.** Right.

23 **A.** And they did not want to believe that. They said, well,
24 2.3 is -- is scary enough and it's probably the better model.

25 **Q.** And do you agree with the Hardell authors and co-authors

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1 that it's appropriate -- that the almost 6 odds ratio is
2 inappropriate and that it was appropriate to take out the
3 pesticides; is that correct?

4 **A.** Absolutely.

5 **Q.** Okay. And then turning to the McDuffie study briefly,
6 which is Exhibit No. 21. Can you please turn to that? I
7 believe it's in your book. I'll wait until everyone gets
8 there.

9 And I'd like you to turn to Page 1160, and looking at
10 Tables 6 and 7.

11 **A.** Right.

12 **Q.** Are you there?

13 **A.** Yes.

14 **Q.** And you see the -- they are not really footnotes, but the
15 explanations right in between the actual table and where it
16 says Table 6 and Table 7. Do you see that?

17 **A.** Yes.

18 **Q.** Can you tell me what exactly they mean when they say --
19 for example on Table 7 it says:

20 "Among individual pesticides, carbaryl, lindane,
21 DDT and malathion insecticides and captan fungicide
22 user/nonuser were included in the initial multivariate
23 model and found not to contribute significantly to the
24 risk of NHL."

25 Do you see that?

1 **A.** Yes.

2 **Q.** Can you explain what that means and ultimately what they
3 did in the McDuffie study in terms of the univariate model and
4 removal of pesticides?

5 **A.** Yeah. What they do is describe the mechanics of fitting
6 models. And in this case it's a regression model again. And
7 so they are watching the estimates of the exposure of interest
8 and then putting other pesticides into the same model. And
9 they see all of these pesticides in the multivariate model are
10 not significantly contributing to NHL, which then justifies
11 removing them from the model.

12 So if they are not risk factors for NHL, then they are
13 not -- then they are not subclassing one criterion for being
14 actually a confounder, but they go beyond that. They don't
15 just say: Oh, they are not confounders because in our models
16 they are not predicting NHL. But they actually tested it out
17 and that's what we usually do.

18 We first think about: Is it a risk factor? Is it related
19 to the exposure? But then we go the next step and put a
20 variable in. Put the pesticide in. If it doesn't change
21 anything, we can take it out.

22 And then the appropriately adjusted model is the one
23 without control for the other pesticide.

24 **Q.** So in that sense McDuffie, as it's ultimately published,
25 isn't adjusted for other pesticides, but, in fact, it is

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1 because they put it in and then took it out; is that correct?

2 **A.** That's correct.

3 **Q.** Would it be fair to say, for example, if you have other
4 pesticides -- for example, malathion, just because that's one
5 that was used in Table 7. If both the cases and the controls
6 are using malathion -- which is often the case; correct, as
7 they are farmers?

8 **A.** Correct.

9 **Q.** -- then it's fair to take it out because you know it's not
10 affecting the outcome because they are both -- cases and
11 controls are using it, just as an example; is that correct?

12 **A.** Actually, what -- what you're saying is that in my study
13 it's not a risk factor for NHL, but more importantly, it is not
14 related to glyphosate exposure.

15 So whether or not you're exposed to glyphosate, you may or
16 may not be co-exposed to malathion, but not in a way that is
17 different in terms of exposure. So the exposed to glyphosate
18 and the exposed -- the unexposed to glyphosate may have
19 malathion exposure, but kind of at a comparable rate.

20 **Q.** And so in that sense, McDuffie is also adjusted for other
21 pesticides; is that correct?

22 **A.** Yeah, appropriately adjusted.

23 **Q.** And we've already talked about De Roos and that being
24 adjusted; is that correct?

25 **A.** In the same manner.

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1 Q. So McDuffie, Hardell, De Roos and NAPP are all adjusted
2 for other pesticides; is that correct?

3 A. They all went through this procedure, yes.

4 Q. Okay. And then one of the things that was talked about a
5 fair amount in the *Daubert* argument, which you weren't present
6 for, but you actually read the transcript of that hearing; is
7 that correct?

8 A. Yes.

9 Q. And there was some discussion in there about what you call
10 a visual representation and what others have called the forest
11 plot. Do you remember that discussion?

12 A. Yes.

13 Q. Okay. And, in fact, on Page 153 of your original
14 deposition --

15 MS. FORGIE: Which I'd like you to pull up, please.

16 (Document displayed)

17 MR. LASKER: Just a second. Where is that?

18 THE WITNESS: The September one, right?

19 MS. FORGIE: Let me know when you've got it.

20 MR. LASKER: I'm asking where it is.

21 MS. FORGIE: Oh, 153 of the original.

22 MR. WISNER: It says "Deposition of September 17."

23 THE COURT: The depositions are not in the index.

24 MR. LASKER: What page?

25 MS. FORGIE: Oh, 153. It's okay. There's lot of

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1 documents flying around.

2 **THE COURT:** So it's in the binder?

3 **MS. FORGIE:** Yes.

4 **THE COURT:** What tab is it?

5 **THE WITNESS:** Second tab.

6 **MS. FORGIE:** Exhibit --

7 **MR. WISNER:** It's not --

8 **MS. FORGIE:** Oh, it's not in there.

9 **MR. WISNER:** It just says "Depo."

10 **MS. FORGIE:** It's the first one, where it says --

11 **MR. WISNER:** No, second one.

12 **MS. FORGIE:** It says "Deposition September 17."

13 Everybody have it? Okay.

14 **BY MS. FORGIE**

15 **Q.** On Page 153 of the deposition, do you see where you were
16 asked about whether or not it was a -- you were asked questions
17 about the forest plot. And then on Line 4 through 6 can you
18 read what you said there?

19 **A.** Yes. My answer was:

20 **"ANSWER:** You can call it a forest plot. I would just
21 call it a visual representation of results from
22 different studies."

23 **Q.** Okay. And can you explain -- I mean, that's just not
24 semantics, calling it a visual representation versus calling it
25 a forest plot; is that correct?

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1 **A.** That is very much correct, yes.

2 **Q.** Okay. And can you explain -- let's start with first
3 explaining what a forest plot is.

4 **A.** So technically we use forest plots in meta-analyses. And
5 what meta-analyses strive to do is summarize estimates across
6 studies. In order to be able to do that, we have to pull out
7 of every study the odds ratios or rate ratios that are most
8 similar to each other; meaning, the lowest common denominator
9 odds ratio is being pulled out. So we're striving for
10 similarity, right? We want the estimate that are most
11 comparable.

12 In fact, a forest plot often on the side has something
13 called a measure of heterogeneity that actually indicates how
14 much these individual estimates differ from each other. And we
15 hope that that's not statistically significant, because if they
16 really are heterogeneous, we shouldn't be summarizing them.

17 Okay?

18 And then at the bottom you see a summary estimate. And
19 that is the one that summarizes all of these -- these
20 individual study estimates with weights to one common estimate.
21 And that's a meta-analytic tool that strives to represent the
22 most common denominator you can pull out of studies. That's
23 not what I did with my visual representation.

24 **Q.** Okay. Can you explain what was the purpose of your visual
25 representation, please?

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1 **A.** Yes. I actually used it as a reminder for myself to talk
2 about the individual studies and estimates that I was taking
3 from these studies as making points about the validity of the
4 study.

5 For example, is the 5.8 a valid estimate or should I take
6 the 2.3 instead from Hardell? And I wanted to remind myself
7 that that's an issue. I wanted to remind myself that Lee
8 actually distinguished between asthmatics and non-asthmatics
9 and that both estimates are kind of the same.

10 I also wanted to show that individual studies that later
11 were summarized by other studies showed estimates that were
12 quite comparable to the study that then summarized these
13 estimates, but used slightly different methods. Or better, if,
14 in the smaller studies, you couldn't adjust for other
15 pesticides, see what happens when De Roos actually summarized
16 them into one study. She was able to adjust for other
17 pesticides. She did it and the result was still positive and
18 it was statistically significant and it was in the range, of
19 course, of the other studies, but now it was fully adjusted.

20 **Q.** So would it be fair to say that the purpose of your visual
21 representation was actually to remind you of some of the
22 differences between the various studies and, also, some of the
23 high points of the different studies?

24 **A.** Indeed.

25 **Q.** And was there anything else about your visual

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1 representation that you were trying to assist yourself with in
2 creating that graph?

3 **A.** I definitely didn't intend it to be a tool for a
4 meta-analysis. It really was a tool to remind myself to talk
5 about these different studies in a certain way, critical way,
6 but also a way of comparing results against each other and
7 reminding myself what I thought was most important about these
8 studies.

9 **Q.** Is there any reason why -- it might have been simpler if
10 you had just told everyone at the hearing that it wasn't a
11 forest plot. Is there any reason you didn't tell us that at
12 the time?

13 **A.** Well, it wasn't my first time and I was told to just
14 answer questions. And I thought that a memory tool would not
15 make such a big splash.

16 **Q.** Anything else?

17 **A.** That's it.

18 **THE COURT:** So when you called it a forest plot in
19 your expert report, you made a mistake?

20 **THE WITNESS:** I used that word and I might not -- I
21 should probably not have used it. It was really a -- did I
22 call it a forest plot? Then, yeah, that was a mistake.

23 **THE COURT:** Okay.

24 **MS. FORGIE:** Go ahead.

25 **THE COURT:** Okay.

RITZ - DIRECT EXAMINATION / FORGIE

1 **BY MS. FORGIE**

2 **Q.** So then a couple other questions from your earlier
3 testimony today.

4 You were asked questions about ever/never use in some of
5 the studies and heavy exposure, particularly with regard to the
6 De Roos study. Do you remember that?

7 Let me see if I can rephrase it. You look confused.
8 Let's turn to Page 23 of your expert report.

9 **A.** Where is it? Oh, my expert report, yes.

10 **Q.** Which I believe is --

11 **MR. WISNER:** Exhibit 1.

12 **BY MS. FORGIE**

13 **Q.** -- Exhibit 1 in your book.

14 **A.** Yes.

15 **Q.** On Page 23 you mention that it's a weak to moderate
16 association with regard to ever/never use. Do you remember --
17 oh, I'll wait till you find it.

18 **A.** 23. Yes, I see it.

19 **Q.** Okay. And you mention there that it's a weak to moderate
20 association for ever/never use with regard to De Roos; is that
21 correct?

22 **A.** Yes.

23 **Q.** Okay. And when you look at odds ratios for more heavy
24 exposure, what do you find there?

25 **A.** Well, we see that whenever I get rid of the occasional

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1 users and are able to look at data that actually distinguishes
2 occasional and heavy users, the odds ratios behave in the way
3 that you would expect if there was a causal association;
4 meaning, that the heavier users are showing the effect, which
5 is generally above 2, while the occasional users don't or show
6 less effect.

7 **Q.** Okay. And I think you were asked earlier whether or not
8 those adjusted -- I mean, whether or not those numbers, those
9 odds ratios, for example, in the De Roos study were adjusted or
10 not. And I think you said that they weren't adjusted, but let
11 me -- let's just clear that up.

12 With regard to De Roos, are the numbers adjusted for other
13 pesticides?

14 **A.** De Roos 2003, yes, they are adjusted.

15 **Q.** And as we just discussed, the same is true for McDuffie,
16 Ericksson and Hardell; is that correct?

17 **A.** That's correct.

18 **THE COURT:** Yeah, but -- if I could just follow up on
19 that. That sentence that says:

20 "However, the effect estimates for longer or more
21 extensive use in several studies were larger, i.e.,
22 between 2 and 3, and this can be considered a stronger
23 endorsement of a causal relation."

24 You told me that that -- those numbers were not adjusted
25 for pesticide use. Did you misspeak?

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1 **THE WITNESS:** The Hardell one, as far as I know, is
2 not adjusted.

3 **THE COURT:** Let me ask --

4 **THE WITNESS:** But the De Roos one is.

5 **THE COURT:** Let me ask the question this way. When
6 you wrote that sentence -- or when that sentence was written,
7 was it -- what were -- what is the -- what are those numbers
8 referring to? "The several studies being larger, i.e., between
9 2 and 3."

10 **THE WITNESS:** McDuffie and Hardell and De Roos. And
11 NAPP, actually.

12 **THE COURT:** Okay. So -- and which of those numbers
13 are -- that are between 2 and 3 are adjusted for other
14 pesticide use?

15 **THE WITNESS:** So in the sense that McDuffie actually
16 tried to adjust and found that, you know, it didn't matter, we
17 can consider that the most appropriately adjusted estimate.
18 De Roos is definitely an appropriately adjusted estimate.

19 **THE COURT:** But where is the number from De Roos
20 that's between 2 and 3?

21 **THE WITNESS:** Which De Roos -- we are talking 2003?

22 **THE COURT:** Yeah.

23 **THE WITNESS:** Can we look at it?

24 **THE COURT:** Sure. What exhibit is it?

25 **MS. FORGIE:** It's 21 -- no, no, no. It's 15. Sorry.

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1 (Brief pause.)

2 **A.** I have the De Roos wrong. It's the 2005. But that's
3 not -- that's not appropriate.

4 **BY MS. FORGIE**

5 **Q.** And -- well, I'll wait until your -- let me know when
6 you're finished, please.

7 (Brief pause.)

8 **A.** So the adjusted one in De Roos is actually the overall
9 one.

10 **Q.** And do you -- can you give us a reference of the page and
11 number, please?

12 **A.** It is on Page 5.

13 **Q.** And then also with regard to the NAPP --

14 **THE COURT:** Wait. Hold on.

15 **MS. FORGIE:** I'm sorry.

16 **THE COURT:** I'm trying to understand what we're
17 looking at on Page 5 of De Roos.

18 **MS. FORGIE:** I'm sorry, Your Honor.

19 **THE COURT:** Where are you pointing us to?

20 **THE WITNESS:** Where are we? We're looking at
21 glyphosate. That's a 2.1.

22 **THE COURT:** Okay.

23 **THE WITNESS:** With a 1.1 to 4 confidence interval in
24 the logistic regression.

25 **THE COURT:** And you said that is the overall number?

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1 **THE WITNESS:** Yes, that's the overall one, exactly.

2 **THE COURT:** Okay. And then where is the number for
3 longer or more extensive use?

4 **THE WITNESS:** She did not do this. She just counted
5 pesticides after that. So we do not have it for specific
6 glyphosate. She just counts pesticides and she has all the
7 potentially carcinogenic ones, and she explains in the text how
8 she categorized those. And you can see that we get a very
9 strong increase with the number of those pesticides.

10 So 25.9, I wouldn't believe that one. But it goes from
11 1.6 to 2.7 to 25.9. That's a dose-response, but it includes
12 all of -- potentially carcinogenic pesticides, which she
13 defines in her text. That was her attempt at getting at
14 dosage. But it wasn't specific to glyphosate. But the one
15 that's specific to glyphosate is a 2.1, and it's fully
16 adjusted.

17 **THE COURT:** Okay. And then the ones -- so this
18 sentence:

19 "However, the effect estimates for longer or more
20 extensive use in several studies were larger."

21 **THE WITNESS:** That is McDuffie and Ericksson and the
22 NAPP.

23 **THE COURT:** Okay. And so -- and those are -- just to
24 make clear, are those numbers that you are referring to
25 adjusted for use of other pesticides?

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1 **THE WITNESS:** As we discussed before, that was
2 actually -- they tried these pesticides in the models and then
3 took them out again.

4 So I consider that appropriate, but they didn't do what
5 De Roos did in her ever/never analysis, which is keep them all
6 in there. De Roos could do it because she had enough data to
7 do it, and that's why she did it.

8 **THE COURT:** And which were the -- for McDuffie, which
9 were the pesticides that they -- the other pesticides that they
10 looked at? Did they look at --

11 **THE WITNESS:** Malathion, DDT. Yeah, they list them
12 in that table, 6 and 7.

13 **THE COURT:** And what about, like, 2,4-D and dicamba?

14 **THE WITNESS:** Let's look. Where is it? They list
15 them.

16 **MS. FORGIE:** It's Page 1160.

17 **THE COURT:** Which tab is --

18 **MS. FORGIE:** I'm getting it right now.

19 **THE WITNESS:** They actually did two different
20 things --

21 **MS. FORGIE:** Hold on. It's -- let's get there. It's
22 Exhibit 21, Your Honor.

23 **THE WITNESS:** In Table 6 they use
24 phenoxyherbicides --

25

RITZ - DIRECT EXAMINATION / FORGIE

1 **BY MS. FORGIE**

2 **Q.** Hold on. Let's make sure everybody is there.

3 **A.** They use phenoxyherbicides as a group. So they say any of
4 these. Or carbamates as a group. Or organophosphate
5 insecticides as a group. Fungicides as a group. And then
6 also, added carbon tetrachloride.

7 And then in Table 7 they say they also tried this kind of
8 adjustment with individual pesticides. So not just doing
9 groups, but then using carbaryl, lindane, DDT, malathion,
10 captan.

11 **Q.** On 2,4-D is an phenoxyherbicide; correct?

12 **A.** It's an phenoxyherbicide. So it's under that group.

13 **Q.** Correct. Because I think the judge was asking about that
14 one.

15 **THE COURT:** Okay.

16 **BY MS. FORGIE**

17 **Q.** And then, Doctor, just to be clear, you believed to a
18 reasonable degree of scientific certain that the epidemiology
19 as a whole provides evidence that glyphosate exposure causes
20 non-Hodgkin's lymphoma even based on the numbers that are fully
21 adjusted to exposures to other pesticides; is that correct?

22 **A.** Yes.

23 **Q.** Okay. And then to be clear, I think -- I think we covered
24 that, but the NAPP study is also fully adjusted and -- is that
25 correct?

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1 **A.** That is correct.

2 **Q.** Okay.

3 **A.** That's why they pooled it. They wanted to be able to
4 adjust.

5 **Q.** Exactly. Okay. And then, Doctor, I would like you to --
6 I want to show you some things about your testimony that were
7 also discussed in the *Daubert* argument.

8 **MS. FORGIE:** So, Mr. Wisner, can you please pull up
9 Page 20 from the transcript of the hearing? And the exhibit
10 number for that -- oh, no. It's not an exhibit number.

11 **THE WITNESS:** Which one?

12 **JUDGE PETROU:** It is simply entitled "*Daubert*
13 Argument."

14 **MS. FORGIE:** Thank you.

15 **THE WITNESS:** Got it.

16 **BY MS. FORGIE**

17 **Q.** And go to Page 20, please.

18 **A.** Yes.

19 **Q.** Okay. Let me know when you're there, please.

20 **A.** I'm there.

21 **Q.** Okay. In looking at Lines 9 through 21, talking about the
22 Ericksson study. Do you see that?

23 **A.** Yes.

24 **Q.** And do you see where Mr. Lasker says:

25 "And everyone, at least in this record, including

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1 IARC, including plaintiff's other experts, you asked
2 Dr. Weisenburger about this at Page 181, 182. The
3 study, itself, states that the analysis was cumulative
4 days. Dr. Ritz -- and this is the first time she
5 offered this opinion. I didn't have any -- she never
6 offered this opinion before -- all of a sudden starts,
7 argues that it's days per year. Again, this is minor.
8 But there are various places in the testimony where
9 she just sort of changes things. And I can point to
10 others, sort of a litany of situations like that,
11 where things all of a sudden just change a little bit,
12 with no basis in the actual study language or in the
13 data, and that can give one pause."

14 Do you see that?

15 **A.** Yes.

16 **Q.** Doctor, I'd like to have Mr. Wisner pull up your original
17 deposition testimony, which is --

18 **A.** September?

19 **MR. WISNER:** September 2017.

20 **BY MS. FORGIE**

21 **Q.** It just says Ritz depo, 9-17-17. And I would like you to
22 look at Page 340, please.

23 (Witness complied.)

24 **A.** I have it.

25 **Q.** Okay. Hold on. I'm getting there.

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1 All right. And please look at --

2 **MS. FORGIE:** Is the Court there as well?

3 **BY MS. FORGIE**

4 **Q.** All right. Please look at Lines 9 through 19. And do you
5 see where Mr. Lasker asked:

6 **"QUESTION:** The two data points we have from
7 Ericksson, it was ten days -- more than ten days or
8 less than ten days; correct?"

9 And then you answered:

10 **"ANSWER:** Yes, but I'm not sure that it was ten days
11 per year or ten days cumulative."

12 And then Mr. Lasker asked you:

13 **"QUESTION:** Okay. I'll represent, and if I'm wrong,
14 the Court will know and everybody will know that it
15 was ten days cumulative?"

16 Do you see that?

17 **A.** Yes.

18 **Q.** Okay. And do you know whether the Ericksson study is ten
19 days cumulative or ten days per year?

20 **A.** Ten days per year.

21 **Q.** And how do you know that?

22 **A.** Well, I went back to the study and looked at the
23 statistics section, and where it talks about exposure
24 assessment they say days per year.

25 **Q.** So Mr. Lasker's representation to you that the Ericksson

RITZ - DIRECT EXAMINATION / FORGIE

1 study was based on ten days cumulative is not correct, is it?

2 **A.** No.

3 **Q.** And then I'd like you to go back to the *Daubert*
4 proceedings again and look again back to Page 20. The one we
5 were just looking at.

6 Let me know when you're there.

7 **A.** Yes.

8 **Q.** On Line 9, again, Mr. Lasker says:

9 "And everyone, at least in this record, including
10 IARC, including plaintiff's other experts, the study
11 itself states the analysis was cumulative days."

12 Do you see that?

13 **A.** Yes.

14 **Q.** And is that representation correct?

15 **A.** No, it's not.

16 **Q.** And with regard to IARC, do you know -- are you familiar
17 with what IARC says about Ericksson and whether it's cumulative
18 or days per year?

19 **A.** Yes. It says days per year. There is clearly a table in
20 IARC where they are specifying the methods. And in that table
21 they clearly state days per year.

22 **MS. FORGIE:** Okay. Mr. Wisner, can you pull that
23 table up, please?

24 And it is, I believe Exhibit 57. 57 in your books, Your
25 Honor. And then Page 23, I believe.

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1 **BY MS. FORGIE**

2 **Q.** Are you there, Doctor?

3 **A.** Yes, I am.

4 **Q.** And can you just identify for the record where the IARC
5 states that it's ten days?

6 **A.** The first column is labeled exposure category or level.
7 And it says one -- the less equal to ten days per year and
8 greater than ten days per year in, like, the fifth or sixth
9 line.

10 **Q.** Okay. And so, Dr. Ritz, just to be clear, was it ten days
11 per year or ten days cumulative with regard to the Ericksson
12 study?

13 **A.** According to the authors and according to IARC it's ten
14 days per year.

15 **Q.** And you didn't testify anywhere that it was ten days
16 cumulative with regard to the Ericksson study, did you?

17 **A.** No, no.

18 **Q.** Okay. Now, I'd also like you to look at something else
19 again from the *Daubert* testimony. And -- or *Daubert* argument.

20 **MS. FORGIE:** And I'd like you, Mr. Wisner, to please
21 pull up Page 45 of those proceedings.

22 And those are marked, so please let me know when everybody
23 is there. Page 45 of the *Daubert* proceedings.

24 **THE WITNESS:** Oh, that's the argument.

25 **MR. WISNER:** That's correct.

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1 **BY MS. FORGIE**

2 **Q.** That's correct. If you've got the *Daubert* argument,
3 that's correct.

4 **A.** 45.

5 **Q.** Page 45.

6 **A.** Yes.

7 **Q.** Okay. And I'd like you to look, please, at Lines 4
8 through 15. Do you see that?

9 **A.** Yes.

10 **Q.** Or 5 through 15. It says:

11 "But the issue again is plaintiffs have the
12 burden of proof here. And what Dr. Ritz is relying
13 upon is something that she acknowledges is not likely
14 as a basis for dismissing the Ag Health study, and not
15 only that it's unlikely, but she then doesn't consider
16 all of the validation studies, all of the sensitivity
17 analyses. And, you know, in her deposition she said:
18 I'd give it no weight whatsoever. And it's again --
19 that's not" --

20 And then the Court says:

21 "That's pretty -- I mean, to give weight to the
22 Ericksson study and not to the AHS is pretty amazing."
23 Do you see that testimony, Doctor?

24 **A.** Yes, I do.

25 **Q.** Okay. Now, I would like you to look, please, at your

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1 deposition, your original deposition --

2 **MR. WISNER:** January.

3 **MS. FORGIE:** I'm sorry, your January deposition.

4 Nice to have somebody that's on top of it.

5 **BY MS. FORGIE**

6 **Q.** On page -- hmm.

7 The January deposition was the deposition that was all
8 about the Agricultural Health Study; correct?

9 **A.** Yes.

10 **Q.** Okay. Let me just find the page number here.

11 (Brief pause.)

12 **MR. WISNER:** Page 160.

13 **MS. FORGIE:** Hold on. I've got it.

14 I guess you beat me to it.

15 **BY MS. FORGIE**

16 **Q.** It's 160 through 162.

17 **A.** Yeah, I got it.

18 **MS. WAGSTAFF:** January 2018 deposition, first tab.

19 **MR. WISNER:** I believe it says "Depo January 2018" on
20 the tab.

21 I apologize. This is so confusing.

22 (Brief pause.)

23 **MS. FORGIE:** Are you there?

24 **MR. LASKER:** Yeah.

25 **MS. FORGIE:** Okay.

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1 **BY MS. FORGIE**

2 **Q.** So on Page 160 at the bottom, starting with Line 24, do
3 you see where it says:

4 **"QUESTION:** Okay. You were also asked a question
5 about what weight you would give the AHS study, the
6 2018 AHS publication with regard to your opinions in
7 this case? Do you remember that question?"

8 And you answered:

9 **"ANSWER:** Yes."

10 And then you were asked:

11 **"QUESTION:** Can you clarify or expand upon what weight
12 exactly you would give the 2018 AHS study?"

13 Do you see that?

14 **A.** Yes.

15 **Q.** Because you had previously been asked questions about
16 weight to give the AHS study, and this whole deposition was
17 about the AHS study; is that correct?

18 **A.** Correct.

19 **Q.** Can you just read your answer please?

20 **A.** Yeah. So I said:

21 **"ANSWER:** It definitely has to be reviewed, and it
22 definitely needs to be considered. However, I tried
23 to explain there is some weight to every study. Some
24 studies have a larger weight than others. The way I
25 determine that is by looking at the potential biases

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1 that these studies may have as well as the size of the
2 study and sensitivity analyses that do help me or
3 don't help me to determine whether these biases
4 have been taken care of. And overall I feel these
5 sensitivity analyses done in this 2018 publication --
6 let's call it 2018 -- all make a lot of assumptions
7 under which I wouldn't -- under which I wouldn't agree
8 with. Each of the sensitivity analyses make another
9 assumption that would only give you a piece of the
10 puzzle. It never considers the whole realm of biases
11 that you have to actually consider."

12 **Q.** Okay. So actually you did give some weight to the AHS
13 study; is that correct?

14 **A.** Yes.

15 **Q.** And you still give some weight to the AHS study; is that
16 correct?

17 **A.** Absolutely, yes.

18 **Q.** And then Mr. Lasker, as we just read on Page 45 of the
19 *Daubert* argument, also stated that you didn't consider the --
20 all of the validation studies and all of the sensitivity
21 analyses. Do you remember that section that I just read you?

22 **A.** Yes.

23 **Q.** Did you actually look at the validation studies?

24 **A.** Extensively.

25 **Q.** And just to refresh everybody's understanding, what are

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1 the validation studies and what did you look at?

2 **A.** Well, I looked at Dr. Blair's study. That was the study
3 where he repeated the questionnaire assessments in some of the
4 participants.

5 I looked at lots of studies that I'm not sure conducted in
6 the field with urine sampling. I looked at the Heltshe study.
7 And I looked at Monsanto's own study of glyphosate, urine
8 levels and questionnaire data.

9 **Q.** And on Page -- let me just find this.

10 Going to your original deposition, which is tabbed in your
11 book. It's the first tab, where it says "Ritz Depo,
12 January 18th, 2018."

13 **A.** Yes.

14 **Q.** Okay. Turning to Page 74, please.

15 **MS. WAGSTAFF:** That's not her original deposition.

16 **MS. FORGIE:** I'm sorry, you're right. It's the
17 second one, second tab dated 9/17/17.

18 **A.** Got it.

19 **BY MS. FORGIE**

20 **Q.** Turning to Page 74, please.

21 **A.** Uh-huh.

22 **Q.** And you see Lines 16 through 22?

23 **A.** Yes.

24 **Q.** Do you see that? And can you just -- and you see where
25 you talk about the sensitivity analyses in that; correct?

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1 **A.** I might have the wrong one.

2 **Q.** Okay. It should be -- I'm sorry. That's my fault. Your
3 original -- it's January 19th.

4 **A.** Yes.

5 **Q.** So it is the first tab, but I gave you the wrong date.
6 I'm so sorry. So go to the first tab.

7 **A.** Yes.

8 **Q.** And go to Page 74?

9 **A.** Yeah, I got it.

10 **Q.** And look at Lines 16 through 22.

11 **A.** Uh-huh.

12 **Q.** Do you see that?

13 **A.** Uh-huh.

14 **Q.** And you said that this is discussed on Page 4 of the
15 paper, a number of sensitivity analyses. Do you see that?

16 **THE COURT:** She didn't say that. That's Mr. Lasker's
17 question.

18 **MS. FORGIE:** I'm sorry. I'm befuddled here. Let me
19 rephrase this.

20 **"QUESTION:** Now the investigators then -- and this is
21 discussed on Page 4 of the paper -- do a number of
22 sensitivity analyses. I want to walk through them and
23 make sure we have a common understanding of what was
24 done. So we'll mark this -- this is now 30-12."

25 Do you see that?

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1 **A.** Yes, I do.

2 **BY MS. FORGIE**

3 **Q.** Okay. And so you talked about sensitivity analyses there,
4 and later you talked about validation studies; is that correct?

5 **A.** That's correct. I actually remember Mr. Lasker having
6 made these charts, where he explicitly walked with me through
7 the different sensitivity analyses on the chart. And I think
8 we also discussed it the first day I testified in court so you
9 should have those charts.

10 **Q.** Okay. Can you explain briefly about validation, what you
11 mean by validation reports and validation analysis?

12 **A.** Yes. So validation analysis is a sub-analysis in a larger
13 study in which I try to assess how valid my exposure assessment
14 has been. Of course this has to be taken with a grain of salt
15 because I'm doing this in realtime now, but I'm trying to
16 estimate exposures in the past.

17 So I'm trying to evaluate whether what I'm learning from
18 field trials where I'm watching farmers applying pesticides and
19 then go and collect their urine and make them fill out the same
20 questionnaire that the AHS -- the Agricultural Health Study
21 made them fill out, comparing the urine level with the
22 self-reported use of protective equipment, use of equipment,
23 et cetera and then say: Well, my algorithm of generating this
24 exposure, this exposure measure is actually valid because I now
25 have a golden standard, which is the urinalysis. And I watched

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1 these farmers doing the applications.

2 However, I make a lot of assumptions when I do this kind
3 of validation. I'm assuming that what the farmers did under
4 observation on that day represents what they have done for the
5 last 20 years or they reported to me. That's a large
6 assumption to make.

7 **Q.** Okay. And then, finally, could you turn please to
8 Exhibit 301.

9 (Witness complied.)

10 **Q.** And there is a section there at the bottom -- let me know
11 when you're at 301.

12 **A.** Yes.

13 **Q.** And then at the bottom you see some numbers. MONGLY, do
14 you see those?

15 **A.** MONGLY, yes.

16 **Q.** If you go to 494.

17 **A.** Yeah.

18 **Q.** Okay. Just a quick question. This is a presentation in
19 the NAPP study; correct?

20 **A.** That's correct.

21 **Q.** And I just want to ask you: Does this show that for more
22 than two days of use that the -- that this was adjusted for
23 other pesticides?

24 **A.** Yes. Actually the odds ratio has a little star. And it
25 refers to the footnote in which they actually say it was

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1 adjusted for. And you can see that it was actually adjusted
2 for a lot of different variables, including 2,4-D, dicamba and
3 malathion.

4 **Q.** And what is the odds ratio?

5 **A.** The odds ratio --

6 **Q.** The adjusted odds ratio.

7 **A.** The odds ratio is 1.98 with a confidence interval 1.16 to
8 3.4, for the overall NHL.

9 **MS. FORGIE:** Okay. I don't have anything else, Your
10 Honor.

11 (Brief pause.)

12 **THE COURT:** It's being suggested that we take a
13 five-minute break to see if we can fix the witness's screen.

14 **MR. LASKER:** Thank you.

15 (Whereupon there was a recess in the proceedings

16 from 2:03 p.m. until 2:08 p.m.)

17 **CROSS EXAMINATION**

18 **BY MR. LASKER**

19 **Q.** Good afternoon, Dr. Ritz.

20 **MR. LASKER:** Could we put up Exhibit 460 again? That
21 was the exhibit that we showed which was the new --

22 **MR. WISNER:** Are you talking to me?

23 **MR. LASKER:** Yes. One of you.

24 **MR. WISNER:** I'm not set up.

25 **MR. LASKER:** Exhibit 46 is the new depiction of

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1 forest plot.

2 **MS. WAGSTAFF:** Hold on. He has to turn it on.

3 **MR. WISNER:** I didn't know you needed my help.

4 (Brief pause.)

5 **MR. WISNER:** What page?

6 **MR. LASKER:** Second page. Thank you.

7 **BY MR. LASKER**

8 **Q.** And I just want to make sure that I understand what we're
9 looking at here. You have depicted in this forest plot, first
10 you have Hardell 1999 and you also have Hardell 2002; correct?

11 **A.** That's correct.

12 **Q.** And Hardell 1999 was pooled into Hardell 2002; correct?

13 **A.** Not that I -- Hardell -- it was -- wasn't it in Ericksson?
14 No, no. 2002, yes. Right. Yes.

15 **Q.** So the Hardell data from 1999 is part of Hardell 2002;
16 correct?

17 **A.** Yes.

18 **Q.** You also have listed here separately McDuffie and De Roos
19 2003. That data is pooled into NAPP; correct?

20 **A.** Part of that data.

21 **Q.** The -- you have the two versions of NAPP. You have the
22 version from Canada and that was in June. And then you have
23 the version from Brazil that was in August; correct?

24 **A.** Right.

25 **Q.** So you have both of those in there as well.

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1 And you also have the first AHS study, De Roos 2005. And
2 then you have the Andreotti 2018 study in there; correct?

3 **A.** That's correct.

4 **Q.** Okay. And so we went through this, a similar analysis of
5 the prior visual aid that you had for us. But if we were to
6 take out the -- the studies that are sub-studies of pooled
7 analyses and only look at the pooled data and the most recent
8 data, then we would have Hardell 2002, which only had eight
9 cases, right?

10 **A.** Eight cases of what?

11 **Q.** Well, either non-Hodgkin's lymphoma or hairy cell
12 leukemia; is that correct?

13 **A.** There were more than eight cases in Hardell 2002.

14 **Q.** Okay. Well, let's take this a little bit -- in terms --

15 **A.** That was, what was it, several hundred cases.

16 **Q.** I'm sorry, exposed to glyphosate.

17 **A.** I would have to look that up.

18 **Q.** Okay. If you want to do that, it's in your scientific
19 binder.

20 **THE COURT:** You don't have the smaller binder there,
21 Dr. Ritz?

22 **MR. LASKER:** They are right over there.

23 **THE CLERK:** You don't have another copy for the Law
24 Clerk?

25 **MR. LASKER:** Oh, I'm sorry.

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1 **JUDGE PETROU:** Counsel, since there is no index on
2 this one, which exhibit number is it?

3 **MR. LASKER:** If we're doing the scientific binder,
4 it's Tab 9.

5 (Whereupon binder was tendered to the witness.)

6 **BY MR. LASKER**

7 **Q.** And I can direct you if you want to Page 1044, that's
8 Table 1, where it presents the glyphosate data. It's the
9 fourth row on the table. Glyphosate number of exposed cases,
10 eight.

11 **A.** Yes, the number of exposed cases and exposed controls is
12 eight, too.

13 **Q.** Okay. All right. And then -- so going back to your plot
14 here. Then we would also have the NAPP study as the most
15 recent pooled analysis. We would have Andreotti 2018. We
16 would have Orsi and we would have Ericksson; correct?

17 **A.** Yes.

18 **Q.** And you provided some testimony in response to questions
19 from plaintiff's counsel about the Hardell study and the
20 impact, the problem that that study had for -- in adjusting for
21 exposures to other pesticides. You talked about sparse data.
22 Do you recall that testimony?

23 **A.** Yes.

24 **Q.** And the Hardell 1999 study only had four exposed
25 glyphosate cases with three controls; correct?

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1 **A.** That's correct.

2 **Q.** And that was why there was a problem of sparse data,
3 because the numbers were so, so small in that study; correct?

4 **A.** They were too small to adjust for these other pesticides,
5 yes.

6 **Q.** And with our other studies, certainly with the NAPP, we
7 have much other larger numbers of exposed cases and controls;
8 correct?

9 **A.** That's why we pool, yes.

10 **Q.** Let me ask you a bit about -- about latency. And I want
11 to -- you discussed a lot of this with Judge Chhabria so I
12 don't want to repeat all of that discussion, but I would like
13 to turn you to Page 25 of your expert report. And that is
14 Tab 1 -- not in our science binder, but in our -- I think we're
15 done with the science binder.

16 Tab 1 in the binder we provided you.

17 **THE COURT:** Page 25 of her original expert report?

18 **MR. LASKER:** That's it.

19 **THE WITNESS:** The big one?

20 **BY MR. LASKER**

21 **Q.** Not -- I'm sorry. It's going to be that one. I'm sorry.

22 (Whereupon binder was tendered to the witness.)

23 **MR. WISNER:** Your Honor, can I approach to get the
24 big one off --

25 **THE COURT:** Feel free. You don't need to ask

1 permission.

2 (Brief pause.)

3 **BY MR. LASKER**

4 **Q.** Are you in Tab 1?

5 **A.** Uh-huh.

6 **Q.** So Page 21.

7 And the very -- right before the final paragraph in your
8 report, the last sentence in the first paragraph of your
9 conclusion, you state:

10 "Studies that assess those also generally found a
11 higher level of exposure associated with increased
12 risk, and importantly in the one study that did assess
13 the importance of having been exposed more than ten
14 years prior to a diagnosis of cancer, the results
15 clearly pointed to those exposures as the relevant one
16 as compared to more recent exposures within ten years
17 increasing the plausibility of associations greatly."

18 Correct?

19 **A.** Uh-huh.

20 **Q.** Do you see that?

21 **A.** Yes.

22 **Q.** And that's still your opinion today; correct?

23 **A.** It is one argument, yes, for plausibility.

24 **Q.** And that is your opinion today; correct?

25 **A.** I don't understand.

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1 Q. You stated that it's one argument. I just want to make
2 sure that that's still your opinion today.

3 THE COURT: What is still the opinion? The sentence
4 that is written in that -- in that -- that you just read? Is
5 that what you're asking?

6 MR. LASKER: Yeah. The sentence that says that
7 exposures -- that the findings -- I assume you're referring to
8 the Ericksson study here; correct?

9 A. I would have to read through this to make sure.

10 BY MR. LASKER

11 Q. Okay. Well, let me just ask this question, and if you
12 can't answer it, we can move on.

13 But is it your opinion that the exposures that took place
14 more than ten years prior to the diagnosis of cancer as
15 compared to more recent exposures are the relevant ones?

16 A. This is taken out of context. I'm making an argument for
17 validity across studies looking at them in different ways. In
18 one of the ways is to look at the recency or non-recency of
19 exposure.

20 Q. Okay. And with regard to the De Roos study, and I -- I
21 think -- I asked you this question in your deposition and I
22 think you gave a similar answer, but I want to just confirm.

23 Is one of your -- one of the issues that you believe may
24 be at play in the De Roos study the fact that the individuals
25 who were the first users of glyphosate may have been heavier

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1 users of glyphosate?

2 **A.** Are you referring to what I said today?

3 **Q.** Well, I'm asking you -- we can go to your deposition,
4 because I asked you that in your deposition; do you recall?

5 **A.** No, I don't.

6 **Q.** Okay. So then let's go to your deposition. It's Tab 2.
7 It's Page 209, Line 9 through Page 210 -- Page 210, Line 6.

8 And for context, and you can read before and after, we're
9 talking during this part of the deposition about the De Roos
10 2003 study and the issue of latency.

11 And you can read the question and answer yourself, but as
12 I understand it, and correct me if I'm wrong, one of the
13 arguments you were making was that the latency might not be an
14 issue because the early users of glyphosate may have been using
15 it more heavily.

16 Am I understanding that correctly? Or if I'm not, maybe I
17 misunderstood this.

18 **A.** Well, that would be one argument you might want to make.
19 However, as I said this morning --

20 **THE COURT:** Well, let's -- if I can direct you?

21 **THE WITNESS:** Yeah.

22 **THE COURT:** Maybe we can just take a little time to
23 look at the deposition testimony.

24 And I think Mr. Lasker is first trying to establish that
25 you were testifying to a certain point; that you made a certain

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1 point in your deposition and he is characterizing the point
2 that you -- that he says you were making.

3 But I want you to look at it, and you should agree or
4 disagree with him about what point you were making in the
5 deposition.

6 **THE WITNESS:** So which page would you like me to --

7 **BY MR. LASKER**

8 **Q.** Again, we're on 209 Line 9 through 210, Line 6. And my
9 question -- I guess my first question --

10 **THE COURT:** Why don't you let her read through it and
11 then you can ask the question?

12 **MR. LASKER:** Okay.

13 (Brief pause.)

14 **A.** Okay.

15 **BY MR. LASKER**

16 **Q.** And my question to you is: Am I understanding, at least
17 your testimony at your deposition correctly, that one of the
18 issues you raised with respect to latency and the De Roos 2003
19 study was that the individuals in that study who first used
20 glyphosate may have been heavy users of glyphosate and,
21 therefore, latency would not be as much of a problem?

22 **A.** That's not what this is about. It's not about De Roos.

23 This is about one study or two studies that had cases in
24 the very early -- end '79 and early '80s, and when I read
25 through this, I mean, that's what you have been asking me

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1 about, to talk about the latency with respect to 1974 or '75
2 out to the studies that looked at cases in 1979 through '86.
3 Right?

4 But De Roos actually included a lot -- included all of
5 them and had, therefore, a median latency that was much longer,
6 on average.

7 So it was just not five years, is that what you're saying?

8 **Q.** No. We may be miscommunicating.

9 My question was -- and I think we've already established
10 what years the NHL diagnosis were in De Roos 2003.

11 My question is: Is it your testimony or is it your
12 opinion -- and we can ask it now. If it's not, we will move
13 on.

14 Is it your opinion that the issue of latency in those
15 North American studies might not be a problem because the early
16 users of glyphosate were very heavy users of glyphosate?

17 **A.** Actually, I'm saying in my testimony here it might be the
18 case, but I don't know. I did not investigate that.

19 **JUDGE PETROU:** Counsel -- finish your answer and then
20 I'd like to jump in.

21 **THE WITNESS:** What was that? Sorry.

22 Yeah, yeah. I had proposed that that could be a
23 possibility. However, I said here clearly I don't know. I did
24 not investigate that.

25 **JUDGE PETROU:** All right. So this morning you were

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1 answering some questions along the same lines, and I thought we
2 had established that you, in fact, said that the cases that
3 showed input that 6- to 11-year time period after 1975 were due
4 most likely to either heavy use --

5 **THE WITNESS:** Yes.

6 **JUDGE PETROU:** -- and/or use without adequate safety
7 precautions; is that correct?

8 **THE WITNESS:** Yes. Those were two hypotheses that we
9 can have.

10 And the third one was that it was really in a vulnerable
11 period of their life because these individuals, of course, got
12 their NHL in their 60s. So they were clearly exposed at a
13 later age.

14 **JUDGE PETROU:** And did you also have another theory
15 that was not discussed this morning, but which I seem to see
16 here in the deposition transcript around Page 208, that there
17 were users, potentially, of glyphosate prior to it being
18 approved?

19 **THE WITNESS:** Correct, yes.

20 **JUDGE PETROU:** So you have four different theories?

21 **THE WITNESS:** Yes.

22 **JUDGE PETROU:** And am I correct that we don't
23 actually have evidence as to these four different theories. We
24 don't know, was it heavy usage? Were they not using safety
25 equipment? Were they using it pre-approval?

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1 **THE WITNESS:** Correct. We don't know this. However,
2 we see increases in risk. So some of this must be the case.

3 **JUDGE PETROU:** Okay. So of the four theories, the
4 one that we have some actual concrete information about, has to
5 do with the age at time of exposure.

6 **THE WITNESS:** That's correct.

7 **JUDGE PETROU:** All right. Thank you.

8 **BY MR. LASKER**

9 **Q.** And with respect to the level of use during that time
10 period in the early years, in your rebuttal expert report you
11 actually did address that question about when there was heavy
12 use of glyphosate during -- over the time period that
13 glyphosate has been approved. Do you recall that in your
14 expert report?

15 **A.** Would you mind showing me?

16 **Q.** Sure. It's Tab 8. It's your rebuttal report at Page 3.

17 **A.** Yes.

18 **Q.** And if you can look about seven lines from the top, you
19 talk about the usage of glyphosate during these first 13 years
20 of approval; correct?

21 **A.** Yes.

22 **Q.** And you talk about the fact that during that period there
23 was only about 6 to 8 million pounds applied by farmers and
24 ranchers as of 1987; correct?

25 **A.** That's correct.

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1 Q. And you note that during those first 13 years, glyphosate
2 was approved only for -- well, glyphosate was only used to kill
3 weeds before planting of crops or spraying for weed control in
4 pastures and non-crop areas; correct?

5 A. That's correct.

6 Q. And that's because this was prior to the adoption,
7 development of Roundup Ready crops; correct?

8 A. That's correct.

9 Q. And you make the point that the usage of glyphosate
10 actually became far greater in later years after the approval
11 of Roundup Ready crops; correct?

12 A. Yes. And I mean it's reflected in all of the studies.
13 The exposure problems and controls was about 5 percent or less
14 in the early years, and it was 85 percent and more in the AHS.

15 Q. Okay. And with respect to the De Roos 2003 study and
16 these early North American case-controlled studies, these were
17 population-based studies; correct?

18 A. Yes, population-based case-controlled studies.

19 Q. So as people came into the hospital and they had NHL, they
20 would identify them and they would then become the cases in the
21 study; correct?

22 A. No, that's not exactly how they do it. They actually have
23 cancer registries and they use the cancer registries. It's not
24 hospital based.

25 Q. Unlike the AHS study, though, this is not a study limited

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1 to farmers. It is a population-based study; correct?

2 **A.** It is a population-based study in areas that were heavily
3 farming. So if you go to Cantor, you actually see the
4 60 percent of these individuals were farmers.

5 **Q.** And when Judge Chhabria was asking you questions about
6 other exposures, such as diesel or sun, with respect to these
7 individuals, there have been studies and there have been
8 studies in, for example, with the AHS, that found that farmers
9 are at an increased risk of NHL because of -- or at least
10 associated with diesel and sun and I think also certain types
11 of farming; correct?

12 **A.** There are some diesel studies on farmers, but there are a
13 lot more diesel studies on other types of workers that are part
14 of a population-based study.

15 **Q.** And you would agree -- well, let me ask you if you agree.

16 Dr. Weisenburger testified last month that 70 percent of
17 NHL cases have no known cause. Do you agree with that?

18 **A.** I wouldn't venture in that direction.

19 **Q.** Okay. Do you have an opinion one way or the other on
20 that?

21 **A.** No.

22 **Q.** Let's talk about the Ericksson study. And if I'm -- I
23 want to go back to this issue of days per year in the Ericksson
24 study.

25 **MR. LASKER:** What tab is that, Grant?

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1 **MR. HOLLINGSWORTH:** Tab 23.

2 **BY MR. LASKER**

3 **Q.** Tab 23. So it's the last tab. And -- I'll wait until
4 you're there. I'm sorry.

5 (Brief pause.)

6 **Q.** Are you there?

7 **A.** Yeah.

8 **Q.** Okay. And you mentioned that the authors in the
9 Statistical Analyses section of this paper state -- first of
10 all -- well, they state that their exposure assessment is in
11 days per year. Do you recall that testimony?

12 **A.** Yes.

13 **Q.** Can you point me to that statement in this study?

14 **A.** Under assessment of exposure, middle paragraph.

15 **Q.** Yes.

16 **A.** (As read):

17 "For all pesticides, not only number of years and
18 number of days per year, but also maximum lengths of
19 exposure per day was questioned."

20 **Q.** Okay. Is there anything necessarily in this study that
21 you're relying upon in support of your view that the exposure
22 assessment was in days per year?

23 **A.** IARC concluded that it was days per year.

24 **Q.** Okay. I'm ask in this study. Is there any other language
25 anywhere in this publication that you rely upon for your

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1 opinion that the analysis that's presented in the tables is in
2 days per year?

3 **A.** This is what I relied upon.

4 **Q.** And all of the studies, I believe, that we have been
5 talking about, including the NAPP, including the AHS studies,
6 they all ask for information about exposure for a number of
7 years and also days per year; correct?

8 **A.** You're saying all studies?

9 **Q.** All of the glyphosate studies that we're dealing with in
10 this case.

11 **A.** No. Cantor didn't. And there were some others who
12 didn't, who didn't specify this.

13 **Q.** How is it your understanding that cumulative days of
14 exposure was calculated in the NAPP?

15 **A.** They did not calculate cumulative days.

16 **Q.** In the NAPP. Remember, we have seven days. We had the
17 number of years --

18 **A.** That was number of years times days per -- days per year.

19 **Q.** Okay. And Cantor is pulled into the NAPP; correct?

20 **A.** But not for those analyses because they wouldn't have had
21 the data.

22 **Q.** Is it your understanding that they don't have days per
23 year of data in Cantor?

24 **A.** They only use those analyses for the studies where they
25 must have had those numbers.

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1 Q. Let me -- let me ask you to look at Tables 2 and Tables 4
2 in the Ericksson study.

3 A. Where is it?

4 Q. We're still in Ericksson.

5 A. Okay.

6 Q. And, again, this is a population-based study; correct?

7 A. Ericksson, yes.

8 Q. So there would be some farmers and some not farmers in
9 this study; correct?

10 A. That's correct.

11 Q. Is it your understanding then that the median exposure in
12 this study for this -- this population-based study for
13 phenoxyacetic acids was 45 days per year?

14 A. It says 45 days.

15 Q. I understand. But this is the same table where we have
16 glyphosate as ten days.

17 A. Right. But they don't specify so I wouldn't know.

18 Q. Okay. So you don't know if phenoxyacetic acids are days
19 per year or cumulative days?

20 A. Well, all they give us here is days. It doesn't say
21 cumulative.

22 Q. Okay. But for glyphosate, which is on the same table,
23 that you believe is days per year?

24 A. Because I looked at IARC and in IARC it says more than ten
25 days per year, and I imagine when IARC does an evaluation they

1 actually go back to the original authors and ask them.

2 Q. Do you have any information to -- upon which to -- you
3 base that opinion --

4 A. No.

5 Q. -- that they went back and talked to the original authors?

6 A. I haven't talked to them.

7 Q. So you're relying upon IARC for your opinions in this
8 case, at least with respect to the Ericksson study?

9 A. No. Just to clarify, there are two places where days per
10 year are mentioned. One is in Ericksson itself and the other
11 is in the IARC monograph.

12 Q. Let's talk some more about adjustments for the pesticides.
13 And you testified earlier today that you relied upon, if I
14 could understand you correctly, the adjusted odds ratios in
15 reaching your expert opinion in this case; is that correct?

16 A. Yes.

17 Q. Okay. And when I asked you about this issue during your
18 deposition, you testified that you -- you used the unadjusted
19 odds ratios because you believed them to be the most valid
20 data; correct?

21 A. Can I see that?

22 Q. Sure. If we could go to your original deposition. And
23 this is Tab 10 in our binder, which is your September 18, 2017
24 deposition.

25 **MR. HOLLINGSWORTH:** Tab 2.

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1 **MR. LASKER:** I'm sorry, Tab 2. My mistake. Thank
2 you. It says that right there.

3 **BY MR. LASKER**

4 **Q.** And starting at Page 152, Line 24. This is starting --
5 just to give you context, this is where we're talking about
6 your -- the slide that you presented in the last hearing with
7 all of the different odds ratios. And we're walking through
8 sort of like we did in your testimony in March.

9 And I would like to -- I want to just position you because
10 I'm going to take you a little bit further in to Page 157,
11 where we start talking about using adjusted versus unadjusted,
12 but I wanted you to at least have a grounding of what we're
13 talking about here. But I'm then going to ask you to turn to
14 Page 157, starting at Line 20.

15 **A.** What did you want me to read now? 53?

16 **Q.** So at Page -- if you are situated at Page 157 at Line 20,
17 we're talking about the Hardell study. Do you see that?

18 **A.** Yes.

19 **Q.** And my question is that you do not present the most
20 adjusted, highly adjusted odds ratios reported by the authors
21 in that study; correct?

22 **A.** It says, yes.

23 **Q.** And your answer was that you're presenting the odds ratio
24 that you believe has the most validity given what they present
25 in their paper; correct?

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1 A. Yes.

2 Q. Okay. And just to put this in context, you mentioned that
3 you have done research independent of this litigation where
4 you've published your own studies looking at pesticides and
5 certain cancers or other health outcomes; correct? You've done
6 your own studies?

7 A. Yes, yes.

8 Q. In your own studies that you have published, you have
9 presented -- when you've presented your odds ratios, you've
10 presented odds ratios that were adjusted for exposure to other
11 pesticides; correct?

12 A. We tried to adjust as much as we can, yes.

13 Q. Okay. So if I could take you, for example -- and this is
14 at Tab 14 in your binder. This is a study that you published
15 with Dr. Clary. And it is entitled "Pancreatic Cancer
16 Mortality and Organochlorine Pesticide Exposure in California,"
17 correct?

18 A. Yes.

19 Q. And if you turn to Page 309, Table 3 --

20 A. Yes.

21 Q. -- you present your odds ratios; correct?

22 A. Yes.

23 Q. And there is a footnote on that table, on Page 310 --

24 A. Right.

25 Q. -- where you note that all of the odds ratios that you

1 present, and I think it's all the odds ratios that you present
2 in your study, are adjusted for all 17 pesticides used in this
3 study simultaneously; correct?

4 **A.** That's correct.

5 **Q.** And you do not present anywhere in your paper actually
6 odds ratios that are not adjusted for exposure to other
7 pesticides; correct?

8 **A.** They are not in this paper in the main -- I don't know.
9 Was there a supplement? If not, then --

10 **Q.** Not that I'm aware of.

11 **A.** If not, then that's all we did.

12 **Q.** And you adjusted these odds ratios for other pesticides
13 despite the fact that you did not know whether these other
14 pesticides were, in fact, risk factors for pancreatic cancer;
15 correct?

16 **A.** We actually have 640 different pesticides to choose from.
17 We chose 17 because they were considered due to the literature
18 as carcinogenic in some way. And this was an exploratory
19 study. This was not a confirmative study so we wanted to use
20 all possible carcinogens and test them out, and that's what we
21 did.

22 **Q.** Okay. And we heard about exploratory studies and -- in
23 connection with Dr. Neugut's testimony last month.

24 But just so I'm clear, is it your testimony that we know
25 that every other pesticide in this study causes pancreatic

1 cancer?

2 **A.** We don't know this. I said we had 640 agents to choose
3 from and we chose most used -- okay. There might be a
4 carcinogen where only one case or two cases are exposed. I
5 have no way to estimate that odds ratio in a study like this.
6 So we made two distinctions.

7 We first said what is out there in any study, because this
8 is exploratory. This is not a confirmative study, right? This
9 is hypothesis generating.

10 So what we're doing is we say we have all this data. We
11 cannot put 640 agents into the model. That won't work. And it
12 won't make any sense to do that. So what we're doing is we are
13 looking at all the literature that suggests that a pesticide
14 might be a carcinogen, and then we're putting those in the
15 model, yes.

16 **Q.** Let me ask you to turn to Tab 16. And this is a more
17 recent publication of yours from 2014 entitled "The Association
18 Between Ambient Exposure to Organophosphates and Parkinson's
19 Disease Risk;" correct?

20 **A.** Yes.

21 **Q.** And if you could turn -- are you there?

22 **A.** Yes.

23 **Q.** If you could turn to Table 2, and it's at the back of this
24 publication in the appendix. This is the author's manuscript
25 so they put them at the end. It's Pages 16 and 17.

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1 A. Yes.

2 Q. And here you are presenting your odds ratios for, again,
3 the pesticides that you were looking at --

4 A. 16, 17?

5 Q. Yes. You have to -- oh, it goes past the --

6 A. Oh, pass it. Yeah. Yes.

7 Q. And for your analysis in this study, again, if you look at
8 the footnote for all the odds ratios that you present in this
9 study they are adjusted for exposure to other pesticides;
10 correct?

11 A. Well, this is not pesticides, this is OPs. This is just
12 in the class of organophosphate pesticides.

13 Q. I understand. The footnote, though, the bottom of the
14 table, the asterisk, notes that all of the odds ratios are
15 adjusted for other pesticides; correct?

16 A. Other pesticides in this table.

17 Q. Okay. And do we know that all these other pesticides
18 cause Parkinson's disease?

19 A. We suspect since they are OP pesticides that all of them
20 contribute in the same way because they have the same
21 mechanism, yes. That was actually the part of this exercise,
22 to see whether, you know, all of the OPs have that effect.

23 We actually showed in another publication that there is a
24 gene environment interaction with OP pesticides. And we have
25 also have methylation data and other data that show that all of

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1 these OPs actually contribute.

2 **Q.** If I could take you back now to your testimony with regard
3 to adjusting for the pesticides in this case. And we talked
4 about -- we were talking about your testimony with regard to
5 the Hardell. So if I could take you back again to Tab 2. And
6 this is your September 2017 deposition.

7 **A.** I would like to point out these had hundreds of cases
8 exposed, and this is a heavily exposed population in the
9 Central Valley where 60 percent of all cases are actually
10 exposed.

11 **Q.** So are you back in your September 2017 deposition,
12 Page 158?

13 **A.** Yes.

14 **Q.** And at Lines 7 through 21, I asked you about your use of
15 the unadjusted odds ratios from the NAPP. And, again, you
16 explain that you were presenting what you believed to be the
17 most valid model, and that that does not necessarily mean the
18 most fully adjusted model; correct?

19 **A.** Yes. Not necessarily.

20 **Q.** And then continuing on, at Page 158, Line 23 through
21 Page 159, Line 9, you explain that while IARC had concluded --
22 or we're discussing about the fact that IARC had concluded that
23 it should look at the most highly adjusted odds ratios in these
24 epidemiologic studies, that was based off their criteria not
25 yours; correct?

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1 **A.** That's correct.

2 **Q.** And then if we continue at 159, Line 11 through 160,
3 Line 2, you testified that you did not consider what IARC had
4 done, which was look at the most adjusted odds ratios as being
5 the most valid approach; correct?

6 **A.** Not necessarily. And I think I explained that multiple
7 times, that you can actually create bias by throwing too many
8 pesticides in a model that can't take it.

9 **Q.** And we also talked in your deposition, your first
10 deposition about the NAPP, and you testified then that you had
11 validity concerns about the NAPP analysis that adjusted for
12 dicamba, malathion and 2,4-D; correct?

13 **A.** Well, indeed, you could argue whether all three should be
14 in the same model. Not because they are or aren't carcinogens,
15 but because you have multi-colinearity and you want to examine
16 what happens when you put even four pesticides that are highly
17 correlated into the same model.

18 It's different from the analyses that I did in my
19 population because my population wasn't farm workers. It was
20 home and ambient exposure. So the correlations aren't as
21 strong as in farmers.

22 **Q.** And, Dr. Ritz, in your initial expert report when you
23 presented data from the NAPP and from Ericksson, from Hardell,
24 you did not mention in your expert report anywhere any of the
25 adjusted odds ratios; correct?

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1 **A.** Oh, I would -- I would doubt that. That's -- that can't
2 be.

3 **Q.** Okay. Well, let's take a look.

4 Let's go to your expert report. It's Tab 1. And we can
5 start at Page 15 to 16. And this is your discussion of the
6 NAPP data; correct?

7 **A.** Yes.

8 **Q.** And here you are talking about the June data not the
9 August data; correct?

10 **A.** Yes, but this was actually before I had been presented
11 with these tables (indicating).

12 **Q.** Okay. So you can -- you'll agree that none of the data
13 that you provided for the NAPP in your initial expert report
14 are adjusted for other pesticides; correct?

15 **A.** Let's see. I would have to compare that. So does it
16 quote 2.12?

17 It's different numbers. Oh, yeah. We have multiple
18 versions. It's different numbers, so I can't confirm that
19 right now.

20 **Q.** You don't know one way or the other?

21 **A.** I can't confirm that these numbers are from the adjusted
22 or unadjusted. I have to look back at the document.

23 **Q.** Let's look at Ericksson. Page 17 of your initial expert
24 report.

25 **A.** Yes.

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1 Q. You represent a number of odds ratios in -- on that page
2 for Ericksson; correct?

3 A. Yes.

4 Q. And we know that the multivariate adjusted odds ratio is
5 1.51 for Ericksson; correct?

6 A. That's what he represented in that model, yes.

7 Q. And you present in your expert report, I believe it is
8 every odds ratio in the Ericksson study for glyphosate except
9 for that 1.51 number; correct?

10 A. I'm talking here about subgroups, and I'm making the
11 argument about the subtypes of NHL. And he never -- he never
12 adjusted for any of the pesticides, other pesticides in these
13 subgroup analyses. So on Page 17 you can see that.

14 Q. I'm sorry, Dr. Ritz, if you look a little bit higher on
15 the page you have about, halfway through the first paragraph:

16 "Ericksson reported a two-fold increase in NHL
17 risk with glyphosate exposure. OR equals 2.02."

18 Correct?

19 A. Yes.

20 Q. That's the unadjusted ever/never odds ratio; correct?

21 A. Yes.

22 Q. And you do not report anywhere on this page or in this
23 expert report or in any of your expert reports the 1.51 odds
24 ratio that was adjusted for other pesticides; correct?

25 A. This comparison is made, because I then go on saying:

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1 "There's evidence for a dose-response, and that
2 more than ten days use has that dose-response."

3 And I wanted to make those estimates be comparable.

4 **Q.** Okay.

5 **A.** So you cannot compare 1.53 multiple adjusted that even
6 Ericksson says is probably the wrong way. And you can read the
7 conclusions of Ericksson. It actually says we have
8 multi-collinearity. We shouldn't be adjusting for MCPA and
9 glyphosate at the same time. So they actually recommended to
10 use this odds ratio.

11 Plus, you cannot compare two differently adjusted odds
12 ratios when you're comparing an ever/never to a dose-response.

13 So the -- the exercise here I'm making is actually doing
14 exactly that, comparing apples to apples and not to oranges.

15 **Q.** Okay. I'll ask it one more time and we can move on.

16 Do you ever in any of your expert reports in this
17 litigation mention the 1.51 adjusted odds ratio for Ericksson?

18 **A.** For Ericksson? I don't know.

19 **Q.** Okay.

20 **A.** I have to look it up. But I definitely have De Roos in
21 there.

22 **Q.** Okay. We're going to talk about De Roos in a second.

23 But let's talk about the Hardell study, and this is the
24 Hardell study that was two -- two studies that was pooled into
25 a larger study --

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1 A. Yes.

2 Q. -- that had a multivariate analysis when the data was
3 pooled. You report the 3.04 odds ratio that was statistically
4 significant in the pooled data. And that's at the top of
5 Page 18.

6 A. Right.

7 Q. Do you see that?

8 A. Yes.

9 Q. There was a multivariate odds ratio in that study that was
10 somewhere around 1.6 or so that was not statistically
11 significant. You put it up earlier today. You don't include
12 that anywhere in your expert report; correct?

13 A. Again, I am comparing it to an earlier report. And,
14 again, if you want to make those comparisons, you have to use
15 the same kind of estimates.

16 Q. You mention -- I'm sorry.

17 A. If you read this it says, likely limitations, et cetera.
18 And then I'm comparing these 3.04 and 3.1 estimates that are
19 similarly adjusted.

20 Q. And -- skip over to the Cantor study, because you do
21 mention -- you do talk about the Cantor study in your expert
22 report; correct?

23 A. Yes.

24 Q. And the Cantor study actually adjusted for the pesticides
25 in their analysis; correct?

RITZ - CROSS EXAMINATION / LASKER

1 **A.** I believe so.

2 **Q.** And if you look at your expert report, and I believe it's
3 at Page 18 and 19, the Cantor study had a 1.1 odds ratio that
4 was not statistically significant, correct, for glyphosate?

5 **A.** It's not stated here.

6 **Q.** Okay. Well, that was my point. You didn't mention the
7 odds ratio -- the adjusted odds ratio for Cantor anywhere in
8 your expert report; correct?

9 **A.** I don't mention any odds ratio because I refer to this
10 study as being very preliminary, and then the Lee study as
11 utilizing Cantor and the Nebraska data and actually doing
12 proper analysis.

13 **Q.** And you talked about the McDuffie paper, and I want to go
14 back to that because I -- I thought that we had discussed this
15 previously. But for the glyphosate data in McDuffie, that --
16 and the odds ratios they present for glyphosate, that was not
17 adjusted for exposures to other pesticides; correct?

18 **A.** Well, as we discussed here previously, they actually tried
19 out adjustments and then decided what to adjust for and not.
20 So after seeing that in their study, all these other pesticides
21 did not predict NHL. They kept them out of the model. And
22 they explain that in their -- in their discussion.

23 **Q.** Okay. Let's look at that. And this is --

24 **MR. LASKER:** What tab are we at? I'm sorry.

25 **MR. HOLLINGSWORTH:** 12.

1 **BY MR. LASKER**

2 **Q.** Tab 12. And -- I'm sorry.

3 At Page -- you were referring to Page 1160 in your
4 testimony earlier today and the fact that they tried adjusting
5 for other pesticides in these analyses; correct?

6 **A.** Well, what they are saying is they are using the groups,
7 and then they are using individual pesticides and see whether
8 or not they are actually associated with NHL to see whether in
9 their data there is a risk increase due to these groups.

10 **Q.** What they are looking here at in Table 6 and Table 7 is
11 whether exposure to those other pesticides impacted the odds
12 ratios that are reported in that -- in those tables; correct?

13 **A.** No. What this footnote actually says is that they are
14 putting these exposures into the model, and then they are
15 looking -- and they are finding in these multivariate models
16 that they do not contribute significantly to the risk of NHL.

17 So in multivariate models, these groups phenoxies,
18 carbamates, organophosphates, as well as these individual
19 pesticides, carbaryl, DDT, malathion, captan, are not
20 contributing to NHL.

21 **Q.** If we look at Table 8, which is the next page where they
22 present the data on glyphosate, they have a description at the
23 top of that table with respect to the models they used in that
24 analysis; correct?

25 **A.** Yes.

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1 Q. They do not state in Table 8 where they present the data
2 for glyphosate anything about other individual pesticides and a
3 multivariate model; correct?

4 A. What they are saying is:

5 "Models that included the time variable 'days per
6 year' and stratification for age and province of
7 residence were also assessed for the individual
8 herbicide compounds, bromoxynil 2,4-DB, diallate,
9 MCPA, triallate and treflan. No significant
10 associations were found."

11 So they tried these out in all of these analyses with
12 days. And they found them not to be significant.

13 Q. Just to be clear, it's 2,4-DB.

14 And because of that they didn't present data in Table 8
15 with respect to those pesticides where they did not find
16 associations; correct?

17 A. They did what?

18 Q. They did not report those individual herbicides that they
19 mentioned at the top. What they did by association is they are
20 explaining we did not put them in the table because we did not
21 find associations; correct?

22 A. That is correct.

23 Q. There some nothing in Table 8 where the glyphosate data is
24 presented that states that they did any adjustments for
25 exposures to other pesticides; correct?

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1 **A.** Well, in this table is glyphosate and -- in Table 8. And
2 it has an unexposed group, a more than zero and less than two
3 days per year use, and more than two days per use. And in
4 those analyses they tried out these other pesticides. MCPA is
5 one of them.

6 **Q.** And it's your understanding --

7 **A.** And it did not change anything according to what they say.

8 **Q.** Is your understanding that they did that? Because in
9 Table 6 and Table 7 they say they did that, but in Table 8 they
10 don't say they did that. Is that -- am I understanding your
11 opinion here?

12 **A.** That's convoluted. I don't know.

13 **Q.** I agree with that.

14 **A.** Sorry.

15 **Q.** I'm trying to understand where in Table 8 -- and maybe it
16 doesn't say it in Table 8, it says it somewhere else. But
17 where in this study do you see that they adjusted the odds
18 ratio for glyphosate in Table 8 for exposure to other
19 pesticides?

20 **A.** Because it states:

21 "Models that include the time variable days per
22 year and stratification for age and province were also
23 assessed for the individual herbicides compounds."

24 So that I read as meaning they put that in the model and
25 it wasn't significant so we don't see it.

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1 Q. And with respect to all the herbicides that are listed in
2 this table then, 2,4-D, mecoprop, glyphosate, dicamba,
3 malathion, going down the list, they didn't adjust for those
4 herbicides?

5 A. I'm not sure because they are not specific about that.

6 Q. Let's talk about the De Roos 2003 study.

7 THE COURT: Should we take a break before we do that?
8 So why don't we return at 10 after 3:00.

9 THE CLERK: Court is in recess.

10 (Whereupon there was a recess in the proceedings
11 from 2:59 p.m. until 3:17 p.m.)

12 THE COURT: Okay. You can resume.

13 BY MR. LASKER

14 Q. Dr. Ritz, before we turn to De Roos 2003, I wanted to ask
15 you a bit about the exposure measurements in the NAPP. You
16 talked about that earlier, I think both with Judge Chhabria and
17 with your counsel, and they had years and they had days per
18 year and they had cumulative days. Do you recall that?

19 A. Yes.

20 Q. Now, there has been testimony in this case -- and my first
21 question will be whether you're aware of this, but there was
22 testimony in the hearing in March by Dr. Weisenburger, and the
23 record will reflect if I've stated this correctly, but I think
24 something along the lines of that he would expect that it would
25 be about 8.5 years of cumulative exposure of glyphosate, that

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1 glyphosate would be needed before there could be a risk of
2 non-Hodgkin's lymphoma.

3 My first question to you is: Are you familiar with that
4 testimony?

5 **A.** No.

6 **Q.** Okay. Do you have any opinion with regard to how many
7 years of cumulative exposure to glyphosate would be necessary,
8 in your opinion, to cause non-Hodgkin's lymphoma?

9 **A.** I wouldn't venture to say anything about cumulative
10 exposure.

11 **Q.** Let's turn to De Roos 2003. And the De Roos study
12 actually presents two odds ratios. It presents -- and its
13 Tab 6 in your binder.

14 And if you look at Table 3, De Roos presents two odds
15 ratios for all the pesticides, a logistic regression and a
16 hierarchical regression analysis; correct?

17 **A.** That's correct.

18 **Q.** And for glyphosate, for the logistic regression analysis
19 it was a 2.1, which was statistically significant; and for the
20 hierarchical regression, it was a 1.6 odds ratios that was not
21 significant; correct?

22 **A.** Yeah. The confidence level is .9 to 2.8.

23 **Q.** You discussed the hierarchical regression approach
24 generally in your initial expert report; do you recall that?

25 **A.** Yes.

1 Q. So let's turn to that. This is Tab 1, and Page 5 of your
2 expert report.

3 And you have a section for Hierarchical Regression;
4 correct?

5 A. Yes.

6 Q. And you start off your discussion by noting that farmers
7 and pesticide applicators generally have many correlated
8 exposures to different pesticides; correct?

9 A. Yes.

10 Q. And you discuss a hypothetical of co-exposure to
11 glyphosate and dicamba, where both of them have odds ratios of
12 2.0 because they are correlated even if dicamba is not a
13 carcinogen; correct?

14 A. Yes.

15 Q. And that theoretically could work the other way, of
16 course; correct? You could have dicamba and glyphosate having
17 odds ratios of 2.0 even though glyphosate is not a carcinogen;
18 correct?

19 A. Well, if we ignore prior knowledge, yes.

20 Q. And you then discuss the possibility that both of the
21 pesticides have some effect and that adjusting for co-exposure
22 could lower the odds ratios for each so that you no longer see
23 an association.

24 I think you were talking with Judge Chhabria about that
25 earlier today; correct?

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1 **A.** Correct.

2 **Q.** And you explain that hierarchal regression is used to
3 tease apart such correlations in order to determine which
4 pesticides are the ones driving the increase in NHL and narrow
5 down the long list of pesticides to find the bad actors which
6 are increasing the risk of NHL; correct?

7 **A.** Yes. But I also say that:

8 "This approach makes a number of assumptions, for
9 example, that either all pesticides considered or
10 pesticides within certain groups have similar effects
11 on the outcome and that these assumptions may be quite
12 incorrect."

13 **Q.** And you have used hierarchal regression in your own
14 epidemiologic research outside of this case; correct?

15 **A.** Correct.

16 **Q.** And let's -- if you could turn to Tab 17 in your binder?
17 (Witness complied.)

18 **Q.** And for the record, this is a study that you published
19 with Drs. Rull and Shaw in 2016 entitled "Neural Tube Defects
20 and Maternal Residential Proximity to Agricultural Pesticide
21 Applications;" correct?

22 **A.** Yes.

23 **Q.** And you are familiar with this study; correct?

24 **A.** Oh, yes.

25 **Q.** And if you turn to Page 748 in your publication, in the

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1 statistical --

2 **MR. LASKER:** I'm sorry, Your Honor.

3 **THE COURT:** You're fine.

4 **BY MR. LASKER**

5 **Q.** On the left-hand column, the Statistical Analyses section,
6 the second paragraph you state:

7 "We used hierarchical multi-level logistic
8 regression" -- and then you explain the program you
9 used -- "to reduce the possibility of false-positive
10 results when simultaneously evaluating a large number
11 of pesticides."

12 Correct?

13 **A.** Yes.

14 **Q.** And "false-positive" means that a pesticide is reported as
15 being associated with a health outcome when, in fact, it's not
16 associated, correct, or not causally associated?

17 **A.** Correct.

18 **Q.** And then you cite -- you have Footnotes 30 and 31, and
19 those are citations, if you look at the back, to two papers by
20 Dr. De Roos, the 2003 study that we have been talking about,
21 and then an earlier 2001 study; correct?

22 **A.** Yes.

23 **Q.** So I want to take a look at earlier 2001 study. It's
24 Tab 18 in your binder.

25 **A.** Yes.

1 Q. And for the record, this is entitled "An Application of
2 Hierarchical Regression in the Investigation of Multiple
3 Paternal Occupational Exposures and Neuroblastoma in
4 Offspring;" correct?

5 A. Yes.

6 Q. And if you turn to page -- or if you actually start at the
7 first page of her study at 477, in the Introduction, and
8 starting in that first paragraph and then carrying over to the
9 next page, she's talking about the hierarchical method,
10 methodology that she's using; correct?

11 A. She's talking about conventional and hierarchal
12 regression, yes.

13 Q. And she starts off by discussing some of the problems that
14 exist with respect to doing logistic regression analyses;
15 correct?

16 A. Yes. And I think I explained those already.

17 Q. Yes. And, in fact, she mentions the same as you did.
18 The third -- the third point she raises is the same point you
19 made, the possibility of false-positives; correct?

20 A. Right.

21 Q. And in her next full paragraph on Page 478 in that same
22 column, starting "Hierarchal regression," Dr. De Roos states:

23 "Hierarchal regression, also known as multilevel
24 or random-coefficient modeling, is a statistical
25 method that can greatly improve the accuracy of

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1 unstable estimates, especially when studying effects
2 of multiple exposures with limited data."

3 Correct?

4 **A.** Yes.

5 **Q.** If we go back to your study, which is Tab 17, you present
6 the results of your analyses in this paper in Table 2, which is
7 Page 746, and carries over to Page 747; correct?

8 **A.** Yes.

9 **Q.** And for your logistic regression analysis you actually
10 have two models, a single pesticide model and a multiple
11 pesticide model. And that's indicated in the -- at the top of
12 the table; do you see that?

13 **A.** Uh-huh.

14 **Q.** And in the single pesticide model, and we can -- I'm going
15 to be referring to the abstract, but you can look throughout
16 the entire study. I don't know if that helps.

17 But if you go to the beginning of the study on 743 and you
18 look in the abstract, you explain the single pesticide model.

19 **A.** It's one by one, yes.

20 **Q.** So in the abstract at 743 about halfway down you state
21 that:

22 "In the single pesticide models several
23 pesticides were associated with NTDs after adjustment
24 for study population, maternal ethnicity, educational
25 level, cigarette smoking and vitamin use."

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1 Correct?

2 **A.** Yes.

3 **Q.** And you did not adjust in the single pesticide model for
4 exposures to other pesticides; correct?

5 **A.** That's what a single pesticide model is, yes.

6 **Q.** So you can do a logistic regression analysis. That
7 doesn't answer the question whether or not you are adjusting
8 for other pesticides. You can do it either way; correct?

9 **A.** Exactly.

10 **Q.** And --

11 **A.** But it doesn't tell you which model is the better one.

12 **Q.** Right. In the conclusion of the your paper -- we're
13 talking about your paper right now -- when you present the
14 results of your study, it's the last paragraph.

15 **A.** Uh-huh.

16 **Q.** The pesticide that you cite, which is benomyl by name --

17 **A.** Benomyl.

18 **Q.** Benomyl, I'm sorry.

19 That is the one pesticide that the came out of your
20 hierarchal regression analysis; correct?

21 **A.** It came out of all analyses -- no. Actually, in the
22 hierarchical it's not statistically significant any more.

23 **Q.** If you can go to Page 748 in your paper. In the Results
24 section in the second paragraph.

25 **A.** Yes.

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1 Q. You in this paper had a different definition that you were
2 using to identify exposures to pesticides that were at least of
3 interest to you, which was an odds ratio of greater than 1.4
4 with a confidence interval lower limit greater than 0.9;
5 correct?

6 A. Yes.

7 Q. And then at page --

8 A. As possibly associated.

9 Q. Right. And then at Page 749 the left column, the top, you
10 discuss that the:

11 "The hierarchical multiple-pesticide model drew
12 the effect estimate for each pesticide toward the mean
13 of all agents in the category, and only benomyl was
14 still associated with neural tube defects."

15 Correct?

16 A. Yes.

17 Q. And then, again, as we mentioned in the conclusion, your
18 concluding paragraph, the only pesticide you identify, despite
19 the fact that you had a number of pesticides that popped out in
20 the earlier analysis, the only one that you mention in your
21 conclusion is benomyl; correct?

22 A. Well, I mentioned that because I then put it into the
23 context of teratogenicity for lab animals.

24 So I'm putting this in the conclusion, back into prior
25 knowledge and in laboratory animal biologic plausibility that

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1 we have for benomyl and not for other agents.

2 **Q.** Okay. And you don't identify any of the other agents that
3 came out of your analysis in any of the other models that you
4 used. Benomyl is the only one that comes out in the hierarchal
5 regression analysis and it's the only one that you discuss?

6 **A.** As a singular pesticide. However, I make a lot of
7 statements about multiple exposures and exposures in certain
8 categories of pesticides.

9 **Q.** Again, this is another study that you published in which
10 you again adjusted for exposures to other pesticides; correct?

11 **A.** We did single pesticide models, multiple pesticide models
12 and hierarchical models.

13 **Q.** Okay. So let's look back now at De Roos 2003.

14 **A.** But, again, these -- all these pesticides were
15 pre-selected.

16 I can tell you again, we have 640 agents. We did not put
17 640 agents in here. We used prior knowledge to select classes
18 of pesticides.

19 **Q.** Okay. If we can go back to Tab 6, and this is De Roos
20 2003. Are you there?

21 **A.** Yes.

22 **Q.** And you testified both here and in the March hearing that
23 both, in your opinion, the logistic regression analysis and the
24 hierarchal regression analysis are adjusted for exposure to
25 other pesticides; correct?

1 **A.** Correct.

2 **Q.** I'd like to ask you to look at the Statistical Analyses
3 section of the De Roos paper. It's on Page 2.

4 **A.** Yes.

5 **Q.** And if you look about halfway down that first paragraph
6 in -- under Statistical Analyses there is a line that starts,
7 paren, 75.2 percent. Do you see that?

8 **A.** Yes.

9 **Q.** The author states:

10 "We employed two approaches to our analyses;
11 standard logistic regression analysis and hierarchal
12 regression."

13 Correct?

14 **A.** Yes.

15 **Q.** And they state that:

16 "Each model included variables for age and
17 indicator variables for study site."

18 Correct?

19 **A.** Yes.

20 **Q.** They then state that:

21 "Other factors known or suspected to be
22 associated with non-Hodgkin's lymphoma, including
23 first degree relative with haematopoietic cancer,
24 education, and smoking, were evaluated and found not
25 to be important confounders of the associations

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1 between NHL and pesticides."

2 Correct?

3 **A.** Right.

4 **Q.** And there is no mention, in this first paragraph at least,
5 about adjusting for potential confounding effects of other --
6 of exposure to other pesticides; correct?

7 **A.** No. Because the next sentence actually gives that away:

8 "The standard logistic regression model did not
9 assume any prior distribution of pesticide effects, in
10 contrast to the hierarchal regression modeling."

11 So I am --

12 **Q.** Right. And --

13 **A.** Yeah.

14 **Q.** And then the hierarchal regression model is where they
15 talk about hierarchical regression of multiple pesticide
16 exposures; correct?

17 **THE COURT:** Wait. Hold on a second.

18 Dr. Ritz, you just said the last sentence gives it away.

19 **THE WITNESS:** Yes.

20 **THE COURT:** I didn't understand what was being given
21 away by the last sentence. Can you explain that?

22 **THE WITNESS:** That they are using multiple pesticide
23 models, not singular pesticide models, because they are talking
24 about the assumptions they are making for the pesticide
25 effects.

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1 **THE COURT:** So in other words, they are not in the
2 logistical regression -- logistic regression analysis, they are
3 not making assumptions about --

4 **THE WITNESS:** The distributions, yeah.

5 In the hierarchical they are making assumptions about
6 that. That's what they are saying.

7 **THE COURT:** What does it mean to make assumptions
8 about prior distribution of pesticide effects?

9 **THE WITNESS:** That's exactly what hierarchical
10 regression does that logistic regression doesn't do. Logistic
11 regression treats the data as is. Hierarchical regression
12 says, well, what do you think the effects are?

13 And then you put weights for that belief into your model.
14 And the weights are actually given in Table 1. And you can see
15 it's the carcinogenic probability that they are assigning, and
16 each single pesticide has a probability for causing NHL. And
17 you can see that glyphosate here is among the lower probability
18 agents.

19 So -- which one is this? There is one with a one.
20 Chlordane, I guess. It's hard to see. But that last -- that
21 last column is Carcinogenic Probability. And when you look at
22 glyphosate, you see that it -- they give it a 30 percent
23 probability .3 is a 30 percent probability to be carcinogenic,
24 which is the lowest -- one of the lowest.

25 There is one that has even less, and that's bentazon, with

1 a 10 percent.

2 But there are lots of agents that they rate much higher in
3 terms of carcinogenicity. And that's the distribution that
4 they are putting across these pesticides.

5 **THE COURT:** It says here:

6 "Carcinogenic probability value is created by
7 combining the classifications from the IARC Monographs
8 Programme and the U.S. EPA Integrated Risk Information
9 System."

10 **THE WITNESS:** Right.

11 **THE COURT:** So at this time, of course, we don't have
12 the IARC classification.

13 **THE WITNESS:** Exactly. Yes. So they are just going
14 with what they have, which is all we can do; right?

15 Prior knowledge is time dependent. So they are giving a
16 time dependent estimate of what the carcinogenicity is. And
17 they are telling you that they are actually weighing down the
18 carcinogenicity probability for glyphosate considerably when
19 they run the hierarchical model. And that may be wrong and you
20 can dispute.

21 Now, you know, if they would redo this, they would
22 probably give it a much higher probability. What then happens
23 is, and I've done this before in my other studies, as we have
24 seen, you're actually -- the hierarchical model -- if you give
25 it a one, the hierarchical model will actually give you

1 probably exactly the same as the logistic.

2 But when you down weigh these probabilities, these
3 distributions, then you will get less and less influence from
4 what your data tells you and more and more influence from this
5 prior probability. That's all.

6 So what we're actually doing when we're running
7 hierarchical regressions is arguing with the reviewers all the
8 time about these assumptions, and there are lots of opinions
9 and it's actually why it hasn't caught on.

10 So the papers that Mr. Lasker is actually citing were from
11 the early 2000s, where we tried to do this and convey the
12 messages by putting this prior information in and it didn't
13 come across very well. The reviewers generally don't like it.
14 They just want to see what the data says.

15 **Q.** And if we can, though, go back to the issue we were
16 discussing. This issue of prior covariates is not discussing
17 adjustment for other pesticide exposures. It's a separate --
18 in fact, there are two steps in the hierarchical regression
19 analysis in this paper; correct?

20 **A.** Two steps?

21 **Q.** Well, if you look at the hierarchical regression of
22 multiple pesticide exposures, again where we were --

23 **A.** Uh-huh.

24 **Q.** -- that's hierarchical regression of multiple pesticide
25 exposures; correct?

1 I'm sorry. Page 2, where you were on the Statistical
2 Analyses.

3 **A.** Yes.

4 **Q.** And they talk about hierarchical regression of multiple
5 pesticide exposures; correct?

6 **A.** Yes.

7 **Q.** (As read)

8 "In the first-level model of the hierarchical
9 regression analysis NHL disease status was regressed
10 simultaneously on the 47 pesticide exposures, age, and
11 study site."

12 Correct?

13 **A.** Yes.

14 **Q.** So they are adjusting for all 47 of the other pesticides
15 in this first-level middle for the hierarchical regression;
16 correct?

17 **A.** They are estimating, yes, in a multi-pesticide model.

18 **Q.** Okay. And then just so we can continue on to the top of
19 the second column, on Page 2 of 9, they talk about, the third
20 line, the second-level model then incorporates these prior
21 covariates; correct?

22 **A.** Yes, but you actually -- you can explain it this way, but
23 the model runs together. It doesn't run individually. You get
24 one estimate.

25 So that's -- it's called hierarchical, but it is really

1 going back and forth between these two levels.

2 **Q.** And just so we are clear then though, at least in the
3 Statistical Analyses section of this paper, they first discuss
4 adjusting for other pesticides in the hierarchical regression
5 analysis?

6 **A.** The hierarchical regression analysis automatically adjusts
7 because of the way you set it, the model up.

8 **Q.** There is nothing --

9 **A.** It's just adding a second level, which is -- and the
10 second level kind of weighs these prior probabilities.

11 **Q.** Okay. And with respect to your testimony that the
12 logistic regression analysis adjusts for exposure to other
13 pesticides, first of all, let's take this in steps, that's not
14 stated in the Statistical Analyses section that we just looked
15 at; correct?

16 **A.** Well, it's also stated at the -- in the footnote of
17 Table 3.

18 **Q.** Yeah, and I want to get there. I do have questions about
19 that, but I first want to find out from you if -- other than
20 that footnote in Table 3, if there is anything in the
21 Statistical Analyses discussion that states that there was
22 adjustments for other pesticide exposures in logistic
23 regression analysis?

24 **THE COURT:** She testified that the last sentence of
25 that first paragraph in Statistical Analyses shows that the

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1 logistic regression includes adjustment for the pesticides.

2 **MR. LASKER:** Let me go back to that, because I want
3 to make sure I'm clear on that.

4 **BY MR. LASKER**

5 **Q.** The issue that's being raised in that last sentence talks
6 about prior distribution of pesticide effects, which is
7 Table 1; correct?

8 **A.** Okay. There is actually another sentence in Statistical
9 Analyses.

10 "Because these analyses of multiple pesticides
11 modeled themselves" --

12 **Q.** I'm sorry. Where are you?

13 **A.** Under Statistical Analyses.

14 **THE COURT:** The paragraph immediately under that
15 heading?

16 **THE WITNESS:** Yeah.

17 **A.** And about the fourth or fifth line.

18 "Because these analyses of multiple pesticides
19 modeled the pesticides simultaneously, any subject
20 with missing or 'don't know' response for any one of
21 the 47 pesticides of interest was excluded from all
22 analyses."

23 **BY MR. LASKER**

24 **Q.** Okay. So there were analyses that were of multiple
25 pesticides and there were analyses that were not of multiple

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1 pesticides?

2 **A.** No, they were all of multiple pesticides. That's why you
3 actually have to exclude everybody who doesn't have all data.
4 It's a complete data analysis.

5 **Q.** I understand that. I'm just trying to figure out what in
6 that sentence you read as stating that all of the models
7 adjusted for multiple pesticides.

8 I mean, maybe I'm misunderstanding. It seems to read that
9 there were different models --

10 **A.** No.

11 "Analyses of multiple pesticides, modeled the
12 pesticides simultaneously."

13 That means you're putting them all in the model. When you
14 put them all in the model, you -- your model throws out any
15 person who has a missing value.

16 So this is a complete subject analysis based on all
17 pesticides simultaneously. That's what this says.

18 **Q.** I understand. And they state that because of that they
19 excluded those responses from all analyses.

20 And my question is: There is other analyses, at least as
21 I'm reading that, that don't adjust for other pesticides. Am I
22 not reading that correctly?

23 **A.** No, you don't.

24 **Q.** Okay.

25 **A.** This is very technical and, you know, this is how we

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1 write. Unfortunately. But my reading of this technical text
2 is exactly what I just said.

3 They did simultaneous adjustment and because they had to,
4 therefore, use only data for complete -- for all -- I mean,
5 they needed the data for every single pesticide in order to do
6 these analyses, so they had to exclude the people who didn't
7 provide that data for each and every single pesticide. So
8 that's why they reduced the number to these 650 and 1933.

9 **Q.** Is there anything else in the text -- I want to turn to
10 Table 3 next, but is there anything else in the text that you
11 rely upon for your opinion that the logistic regression
12 analysis was adjusted for other pesticides?

13 **A.** Well, I find that very clear, the explanation.

14 **Q.** Is there anything else in the text though, or is that --
15 that's what you rely upon?

16 **A.** When we write these papers, we have very limited space.
17 So we usually become very technical in the Methods section and
18 we don't repeat ourselves because then we have no -- you know,
19 no space to discuss.

20 **Q.** Okay.

21 **A.** So that's where you usually put this kind of information
22 and that's where I find it.

23 **Q.** Let's look to Table 3, because you also mentioned the
24 footnote on the asterisk that appears in Table 3.

25 **MR. LASKER:** And that is on Page 5, Your Honor, of

1 De Roos.

2 **BY MR. LASKER**

3 **Q.** And this asterisk, which is in the table that presents
4 logistic regression and hierarchical regression, states that:

5 "Each estimate is adjusted for use of all
6 pesticides listed in Table 3, age, and study site."

7 Correct?

8 **A.** Yes.

9 **Q.** And am I correct in my understanding that you interpret
10 this as indicating that the logistic regression odds ratio in
11 this table adjusted for exposure to other pesticides?

12 (Court reporter clarification.)

13 **Q.** Am I correct in my understanding that you rely, in part,
14 on this footnote in Table 3 as evidence that the logistic
15 regression analysis in De Roos 2003 was adjusted for the use of
16 other pesticides?

17 **A.** Yes, because it says "each estimate" and the header is for
18 all estimates.

19 **Q.** And if I could ask you to turn back to Tab 17, which is
20 your paper, the Rull publication.

21 And Table 2 presents, as we discussed, a single pesticide
22 model that did not adjust for other pesticides in the logistic
23 regression analysis, a multiple pesticide model that does
24 adjust for other pesticides, and then the hierarchical
25 regression that adjusts for other pesticides; correct?

RITZ - CROSS EXAMINATION / LASKER

1 **A.** Correct.

2 **Q.** And there is a footnote, a very similar footnote asterisk
3 to Table 2 in the title, that goes down to the bottom of
4 Table 2 that states: "Each estimate" -- are you with me, the
5 asterisk?

6 **A.** Yes.

7 **Q.** (As read)

8 "Each estimate was adjusted for the other
9 pesticides listed, study population, maternal,
10 education..."

11 And then they go on to list some other items; correct?

12 **A.** Yes.

13 **Q.** So at least in this instance that footnote, which likewise
14 says each estimate was adjusted for other pesticides listed,
15 does not mean that all the odds ratios in that table were
16 adjusted for other pesticides; correct?

17 **A.** Well, this table is differently structured. It actually
18 has a single pesticide, and that's a very clear description,
19 and a multiple pesticide model.

20 **Q.** I understand that, but I'm correct that while there's a
21 footnote that states identical -- very similar to the 2003
22 De Roos study, while there is a footnote to this table that
23 states "Each estimate was adjusted for the other pesticides
24 listed," at least in this table, in your paper that does not
25 mean that all the odds ratios reported in that table are

RITZ - CROSS EXAMINATION / LASKER

1 adjusted for other pesticides; correct?

2 **A.** As I said, this is a different kind of table. It actually
3 lists single pesticide and multiple pesticide models, and they
4 are very carefully labeled.

5 **Q.** And let's turn to the issue of --

6 **A.** And, by the way, I'm not the first author of this paper.
7 It's my student.

8 **Q.** Okay. The last issue I want to talk to you about is
9 non-differential exposure and misclassification. I want to
10 make sure I understood your testimony here this morning. And
11 maybe -- these are, for me at least, to sort of think about the
12 terms we have been using and that IARC used, for example, of
13 "bias," "confounding" and "chance."

14 And if I understand correctly, you're also looking at all
15 three of those issues with respect to the potential impact or
16 the potential issues in the -- risk ratios in the Andreotti
17 study.

18 Is that -- in explaining what happened with those odds
19 ratios, to get those odds ratios below one; correct?

20 **A.** Well, I generally look at every single study in that way.

21 **Q.** Okay. So with respect to non-differential
22 misclassification, that's a bias that biases the rate ratio
23 towards the one; correct?

24 **A.** Generally, yes.

25 **Q.** But that bias itself, putting for the moment chance and

1 confounding to the outside, but non-differential
2 misclassification by itself cannot push the rate ratio past
3 one; correct?

4 **A.** Well, there could be random fluctuation so you get an
5 estimate slightly under one, but the confidence intervals
6 conclude.

7 **Q.** Okay. But that -- maybe I'm misunderstanding, but random
8 is the confidence intervals concluded that's a play of chance;
9 correct?

10 **A.** Yes.

11 **Q.** Okay. So there is chance and there is confounding, but
12 for the non-differential misclassification, non-differential
13 misclassification biases towards the null but not beyond the
14 null; correct?

15 **A.** I explained that the beyond the null must be a different
16 kind of bias. It's not non-differential misclassification.
17 It's a different bias.

18 **Q.** Okay. I understand.

19 **A.** It's confounding.

20 **Q.** Okay. And I want to get to that because there is also --
21 I want to walk through these just to help me understand.

22 There is the issue of chance, or random movements. And
23 the play of chance with respect to the Andreotti study is
24 limited because of the size of the study and the tightness of
25 the confidence intervals; correct?

RITZ - CROSS EXAMINATION / LASKER

1 **A.** We wouldn't be as worried about chance, but we're
2 certainly worried about bias.

3 **Q.** I understand that. But, again, I'm trying to take this --
4 because I'm going to get to the confounding issue, which I know
5 is a separate issue.

6 But you have the non-differential bias and then you have
7 the play of chance.

8 And with respect to the play of chance, because of the
9 size of the Andreotti study, that is not going to have as big
10 of an effect to be able to get the odds ratio -- sorry, the
11 relative risk down to that .85 range; correct?

12 **A.** I haven't done the analyses, but I would think it's bias,
13 not chance.

14 **Q.** And when you say "bias," and I know this is different --
15 probably the same terminology for epidemiologists, but the bias
16 that you have mentioned is residual confounding. Am I
17 understanding that correctly?

18 **A.** That's one of the biases, yes.

19 **Q.** Okay. And so with respect to residual confounding, we'll
20 just break this down, the -- and I think you explained in your
21 rebuttal report that just claiming that something is a
22 confounder is not enough; correct?

23 **A.** Correct.

24 **Q.** And the 2018 Andreotti study in its analysis -- and let's
25 actually -- I'm sorry. Let's pull that up, Tab 3.

RITZ - CROSS EXAMINATION / LASKER

1 And we can actually -- if you could turn to Page 2 of the
2 Andreotti study? We could actually put some slides up here.
3 Slide 62 is where we're going to start.

4 And we are about two-thirds of the way, three-quarters of
5 the way down the page on the second column in Andreotti 2018;
6 correct?

7 **A.** Where are you?

8 **Q.** On Page 2, I'm sorry. The second column under Statistical
9 Analyses.

10 **A.** Yes.

11 **Q.** And if you go down, about three-quarters of the way down
12 you will see a sentence that starts "Continuous variable
13 period," and then "Risk estimates were adjusted."

14 **A.** Yes.

15 **Q.** So in the Andreotti study first they explain that risk
16 estimates were adjusted for age, cigarette smoking, alcoholic
17 drinks, family history of cancer, state of recruitment, and
18 five pesticides most highly correlated with glyphosate use;
19 correct?

20 **A.** Yes.

21 **Q.** And then moving down for a few more lines, they have some
22 other adjustments that they looked at which -- where they
23 start -- we can put it up. It's Slide 63, if I recall
24 correctly. I can't see the slides.

25 It starts:

1 "We evaluated other potential confounding
2 factors." Do you see that?

3 **A.** Yes.

4 **Q.** (As read)

5 "...including body mass index, pack-years of
6 cigarettes smoked."

7 Correct?

8 **A.** Yes.

9 **Q.** They also mention that because women and non-whites,
10 because the numbers are small, making it hard to -- making
11 it -- precluding adjustment, they ran sensitivity analyses to
12 assess the risks of men and whites alone; correct?

13 **A.** Uh-huh.

14 **Q.** And they continue to state:

15 "For lymphohematopoietic cancers, we additionally
16 adjusted for occupational exposure to solvents,
17 gasoline, x-ray radiation, engine exhaust, and
18 pesticides linked to lymphohematopoietic
19 malignancies."

20 Correct?

21 **A.** Yes.

22 **Q.** And then if you look in the Results section on Page 3,
23 when they are talking about, sort of towards the bottom, right
24 towards the end of that second paragraph. Second paragraph
25 talks about:

RITZ - CROSS EXAMINATION / LASKER

1 "Risk ratios for unlagged intensity-weighted
2 lifetime days."

3 Correct?

4 **A.** Where are you?

5 **Q.** So on Page 3, the first column on the left -- column on
6 the left. There is only one.

7 Under Results, and there is the second paragraph that
8 starts:

9 "Risk ratios for unlagged intensity-weighted
10 lifetime days."

11 Do you see that?

12 **A.** Yes.

13 **Q.** And if you go down towards the bottom of that paragraph
14 they state -- and it's about one, two, three, four, five -- six
15 lines from the bottom of the paragraph:

16 "These findings were unchanged in sensitivity
17 analyses, including further adjustments for additional
18 potential confounders or by exclusion of women and
19 non-whites."

20 Correct?

21 **A.** Yes.

22 **Q.** So the Andreotti investigators looked at a large number of
23 potential confounders and ran sensitivity analyses to determine
24 whether those potential confounders impacted their results;
25 correct?

RITZ - CROSS EXAMINATION / LASKER

1 **A.** Yes. They tried to do what they could.

2 **Q.** And they didn't find in their analyses any issue of
3 confounding that would explain their results; correct?

4 **A.** They did not have a variable that adjusted for -- we see,
5 for example, high school or less is 70 percent among the never
6 glyphosate users. And the median, the less than median, more
7 than median days, we have 60 and 50 percent less than high
8 school. And we know that less than high school education goes
9 along with a lot of lifestyle factors they probably don't have
10 any information on.

11 **Q.** All right. You don't have any information or data of
12 specific confounders that you can point to that would -- that
13 you can show push that relative risk numbers down below one, do
14 you?

15 **A.** Well, as I explained, De Roos actually suggests this in
16 her analyses, where she is not using the never glyphosate users
17 for good reason. And the good reason -- unless you want to
18 tell me the true effect as to it should be below one, there has
19 to be confounding.

20 **Q.** Well, again, the relative risks here are not statistically
21 significant --

22 **A.** Well, but your argument goes into the true risk ratio is
23 below one.

24 **Q.** Let me clarify one point on that. With respect to
25 non-differential misclassification of exposure -- I think we

RITZ - CROSS EXAMINATION / LASKER

1 talked about this last time -- if there is, in fact, no
2 association between an exposure and an outcome,
3 non-differential misclassification does not move the rate ratio
4 or odds ratio at all; correct?

5 **A.** Does not move it -- I didn't hear that last.

6 **Q.** If there is no association or no causal association
7 between an exposure and an outcome, non-differential
8 misclassification --

9 **A.** By definition, then it's one.

10 **Q.** And non-differential misclassification then does not move
11 the odds ratio in either direction?

12 **A.** Below one, no.

13 **Q.** And with respect to the De Roos 2005 study, they had a
14 Table 1 that looked at the characteristics of never used and
15 used as of 2005, and they had a comparison?

16 **A.** Uh-huh.

17 **Q.** And in this study they have different numbers because they
18 are looking at different -- people at different periods of time
19 and different people are exposed and not exposed in the 2018
20 analysis as compared to the 2005 analysis; correct?

21 **A.** But the never users are pretty similar.

22 **Q.** And the same authors -- many of the same authors in the
23 2005 paper are authors in the 2018 paper; correct?

24 **A.** Many, but not all.

25 **Q.** And let me ask one more time: Do you -- can you point to

RITZ - REDIRECT EXAMINATION / FORGIE

1 any confounder, any specific thing that you believe is a
2 confounder where you have data that shows that that confounding
3 drove the odds ratio lower?

4 **A.** I don't have too tell you that, because I don't believe
5 that glyphosate is a healthy agent that we should put into our
6 cereal. So I don't believe the true estimate is below one.

7 If this study shows an estimate below one, there is bias.
8 And one of the explanations is unmeasured confounding. And
9 De Roos had exactly that suspicion and that's why she did the
10 kind of analyses she did.

11 **MR. LASKER:** I have no further questions.

12 **THE COURT:** Okay. Any re-whatever-it-is before we --
13 before we wrap up?

14 **MS. FORGIE:** I have three whatever-it-is things, Your
15 Honor.

16 **THE COURT:** Okay.

17 **REDIRECT EXAMINATION**

18 **BY MS. FORGIE**

19 **Q.** Can you turn to Exhibit 12, please?

20 **MR. LASKER:** This is in your book?

21 **MS. FORGIE:** In her book, De Roos.

22 **MR. LASKER:** Tab 12.

23 **MS. WAGSTAFF:** Yes, our book.

24 **A.** Yes. Andreotti?
25

RITZ - REDIRECT EXAMINATION / FORGIE

1 **BY MS. FORGIE**

2 **Q.** No. De Roos 2003.

3 (Brief pause.)

4 **MS. FORGIE:** I'm sorry. It's Exhibit 15. Somebody
5 else got it wrong besides me.

6 **A.** Too many binders.

7 **BY MS. FORGIE**

8 **Q.** Okay.

9 **A.** Okay.

10 **Q.** Okay. Dr. Ritz, you were asked several questions by Mr.
11 Lasker about the De Roos 2003 publication. Do you remember
12 some of those questions?

13 **A.** Yes.

14 **Q.** Okay. And the implication of some of those questions is
15 that De Roos did not adjust for other pesticides; correct?

16 **A.** That's what I understood.

17 **Q.** Okay.

18 **THE COURT:** In the logistic regression.

19 **BY MS. FORGIE**

20 **Q.** In the logistic regression.

21 **A.** Yes.

22 **Q.** Thank you.

23 If you look at Page 7 of the De Roos paper, the authors
24 state that:

25 "The large number of exposed subjects allow" --

RITZ - REDIRECT EXAMINATION / FORGIE

1 **MR. LASKER:** Where are you?

2 **MS. FORGIE:** Page 7.

3 **THE COURT:** Where?

4 **MS. FORGIE:** Top of -- first paragraph. First full
5 paragraph, the top. Sorry. "The large number."

6 **THE WITNESS:** Yes.

7 **BY MS. FORGIE**

8 **Q.** So there the authors state that the large number of
9 exposed subjects allow for the use of other pesticides for the
10 adjustment; correct?

11 **A.** Yes.

12 **Q.** Okay. So at least the authors of the 2003 De Roos study
13 state that they adjusted for other pesticides; is that correct?

14 **A.** Obviously, yes. And as far as I know, Anneclaire De Roos,
15 she would never present a single pesticide model and compare
16 that to a hierarchical model and then draw any exclusions from
17 it. That's not what we do.

18 **Q.** Okay. And then the epidemiologic studies that we
19 discussed today and two weeks ago are peer-reviewed
20 publications; correct?

21 **A.** Yes.

22 **Q.** And with regard to the epidemiological methods, it's not
23 considered in epidemiology methodologically sound to rely on
24 peer-reviewed literature; is that correct?

25 **A.** That is correct.

RITZ - REDIRECT EXAMINATION / FORGIE

1 Q. And, finally, Dr. Ritz, Mr. Lasker asked you questions
2 about whether you copied various odds ratios into your expert
3 report. Do you remember those questions?

4 A. Yes.

5 Q. And just for clarification, did you consider all of the
6 odds ratios, both adjusted and not adjusted, in all of the
7 studies in forming your opinions as you've given them here
8 today and two weeks ago?

9 A. Yes, I did. That's what I usually do. In order to
10 understand the study, I use every single data point that the
11 study has.

12 However, when I described the study, especially in a
13 report that shouldn't be 500 pages long, then I just pull out
14 the estimates that makes sense for the argument I'm trying to
15 make and the argument depends on what the argument is.

16 Is it that there is a dose-response? Then I pull out the
17 overall estimate that most likely reflects the dose-response
18 and, also, an estimate maybe that is comparable, most
19 comparable to those.

20 Q. Okay. Thank you.

21 **THE COURT:** Any follow up?

22 **MR. LASKER:** No.

23 **THE COURT:** Okay. Congratulations. You're completed
24 your second day. We'll see you again in a couple weeks.

25 (Laughter.)

PROCEEDINGS

1 **THE WITNESS:** I really like San Francisco, but...

2 **THE COURT:** Thank you.

3 You can have some more water and then you can step down.

4 (Witness excused.)

5 **THE COURT:** Okay. So we meet again on Friday; right?

6 What time, 10:00?

7 **MR. LASKER:** I think 10:00.

8 **THE COURT:** 10:00 o'clock.

9 **MS. WAGSTAFF:** Your Honor, is there any possible way
10 we could start earlier if it's going to go as long, just
11 because it's a Friday afternoon and people may be wanting to
12 leave? If your schedule and your schedule and your schedule
13 arise?

14 **THE COURT:** Yeah. I think that's fine.

15 **MR. LASKER:** And Judge Petrou's schedule.

16 **THE COURT:** I haven't checked with her, but I think
17 she probably prefers starting earlier as well.

18 When do you want to start, 9:00?

19 **MS. WAGSTAFF:** 9:00 o'clock would be great.

20 **MR. LASKER:** 9:00.

21 **THE COURT:** Let's plan on starting at 9:00, unless
22 that doesn't work with Judge Petrou, and in which case we will
23 get back to you and tell you we're starting at 10:00. But as
24 of now, plan on starting at 9:00 notation.

25 **MS. GREENWALD:** Just so you know, your Honor,

PROCEEDINGS

1 Dr. Portier is available to stay the whole day. He's study not
2 flying ought until Saturday morning.

3 **THE COURT:** Oh, that actually reminds me. I mean, I
4 may --

5 **MS. GREENWALD:** I understand that it's not --

6 **THE COURT:** We may start off on Friday with me -- you
7 know, so it's pronounced Dr. Portier?

8 **MS. GREENWALD:** Correct.

9 **THE COURT:** I may start off, like we did today, with
10 me asking Dr. Portier questions, but maybe not, because he --
11 he never -- if I recall correctly, he did not testify at all
12 about the aspect of his opinion that discussed the
13 epidemiology, which is what we want him here for on Friday.

14 So -- so it -- if I have any questions at the outset, it
15 will probably be far fewer and you can go ahead and jump in and
16 have him present his opinion on the epidemiological studies.

17 **MS. GREENWALD:** That's very helpful. Thank you.
18 Appreciate it your Honor.

19 **THE CLERK:** Court is adjourned.

20 (Proceedings adjourned.)

21

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23

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I N D E X

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CERTIFICATE OF REPORTER

I certify that the foregoing is a correct transcript from the record of proceedings in the above-entitled matter.

Debra L. Pas

Debra L. Pas, CSR 11916, CRR, RMR, RPR

Wednesday, April 4, 2018