SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF SAN FRANCISCO

DEWAYNE JOHNSON,

Plaintiff,

vs. Case No. CGC-16-550128

MONSANTO COMPANY, et al.,

Defendants.

_____/

Proceedings held on Tuesday, July 31, 2018, Volume 20, Afternoon Session, before the Honorable Suzanne R. Bolanos, at 1:31 p.m.

REPORTED BY:

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Pages 4311 - 4467

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EXHIBITS

(None.)

Tuesday, July 31, 2018

1:31 p.m.

Volume 20

Afternoon Session

San Francisco, California

Department 504

Judge Suzanne Ramos Bolanos

PROCEEDINGS

13:30:18

THE COURT: Welcome back, Ladies and Gentlemen, Counsel, Dr. Mucci.

Ladies and Gentlemen, Dr. Mucci remains under oath, and, Mr. Wisner, when you're ready, you may

13:31:25 proceed.

MR. WISNER: Thank you, your Honor. May I approach with the binder?

THE COURT: Yes.

THE WITNESS: Thank you.

CROSS-EXAMINATION

BY MR. WISNER:

Q. Did you have a good lunch, Doctor?

A. Yes, thank you.

13:31:42 Q. Good. So I want to talk to you about a couple

of issues, and we've got a lot to cover, so I'll try to be quick. Thankfully I think we're actually going to agree with each other most of the time, so that should be good.

13:31:57 Let's start off with a couple things, you've actually never investigated glyphosate prior to working on this case; right?

A. No, I had not.

Q. In fact, you've never investigated a pesticide; 13:32:09 right?

A. No. I don't believe I have.

Q. So the first time that you've ever looked at whether a pesticide could cause cancer or specifically the epidemiological literature that was when Monsanto 13:32:22 called you?

A. Yes.

Q. Okay. And you're being paid for your time; right?

A. Yes.

13:32:30 Q. It's my understanding -- how much time have you been paid for this case?

A. Approximately -- I couldn't say. I know the total amount is probably around 90,000 to a 100,000 dollars.

13:32:46 Q. Okay. And that's money that goes to you; it

doesn't go to your university?

A. Correct.

Q. Because you're consulting not on behalf of Harvard School of Public Health, but you're consulting on behalf of yourself?

13:32:56

A. Yes. Correct.

Q. And I understand you're an associate professor?

A. Yes. That's right.

Q. I assume you hope to become an endowed professor at some point; right?

13:33:04

A. I guess you mean tenured professor.

Q. Oh, sorry. I thought those were the same thing. I'm not in academia so -- you're looking to become a tenured professor; is that right?

13:33:15

A. Yes. I'm currently under review for promotion to professor.

Q. Well, good luck.

A. Thank you.

Q. Let's talk about a few things. Now, you didn't review any of the toxicology data in this case; right?

13:33:24

A. No, I did not.

Q. And you didn't review any of the animal data or mechanistic data; right?

A. No. I did not.

13:33:33

Q. So you didn't consider the biological

plausibility of glyphosate being a carcinogen; right?

A. I reviewed it when I was reading the epidemiologic studies, so I'm aware of the knowledge, but I did not consider those in reviewing the epidemiology studies.

Q. So you reviewed it to the extent that it was in the epidemiological literature that you looked at?

A. Yes.

Q. Now, you understand IARC has done an assessment as well; right?

A. Yes, I am.

Q. You read it?

A. Yes, I did.

Q. And, of course, since you haven't looked at the animal data or the mechanistic data, you don't have any gripes with IARC for their assessments of that data; right?

A. No. I'm only commenting on the epidemiology studies.

Q. Okay. And from my understanding, IARC concluded the epidemiological literature was limited; right?

A. Yes, they did.

Q. And that's your opinion as well?

A. No. That's not my opinion.

Q. Well, I could have sworn you used the word

"limited" like 50 times. Did I miss something?

A. What I was referring to were the early exploratory case-control studies, specifically.

Q. Okay. All right. Isn't it true that you previously testified, I actually agree that there's limited evidence from the epidemiological studies?

A. I'm not sure what context that was said in.

Q. I think we were talking about IARC.

A. So that's different. Since IARC, there's been a number of additional publications that were discussed, and so that was -- I was in agreement with IARC that the studies they reviewed were limited.

Q. Okay. So that makes more sense. So my understanding is you agree with what IARC looked at? You agree that their assessment -- you agree with their assessment, what they looked at?

A. Well, I reviewed the same studies that they looked at in their assessment.

Q. That wasn't my question. I said, you agree with IARC to the extent of what they looked at?

A. I'm not -- I'm not sure what you're asking.

Q. Well, I asked you about that limited quote, and you said that was in the context of -- I believe you said it was -- I've looked at other data since; right?

A. That has been published since, yes.

Q. Okay. So well, data that's been published and that's also unpublished, right?

A. Or presented at scientific meetings, yes.

Q. Because the NAPP study's never been published?

13:35:56 A. Not in a peer-reviewed journal.

Q. Okay. But going back to IARC, based on what they viewed, though, you don't disagree with them is what I'm saying?

A. Based on their conclusions, yeah. Their

13:36:09 conclusion was that the epidemiology was limited and that they couldn't rule out that bias confounding or chance explained those associations.

Q. Okay. Great. So we all agree here.

And you understand that Dr. Portier also looked

13:36:24 at the epidemiology; right?

A. I believe so, yes.

Q. Well, you read his report?

A. Yes.

Q. It was a long one, isn't it?

13:36:33 A. Yes, it is.

Q. And a portion of it deals with epidemiology; right?

A. Yes, it does.

Q. And he did a Bradford-Hill analysis; right?

13:36:40 A. Yes, he did.

Q. You read Dr. Neugut's report; right?

A. I've read parts of each of these reports.

Q. You didn't read the whole thing?

A. No, I did not.

13:36:48 Q. I assume you read the portions that dealt with epidemiology?

A. Again, I read part of them, but not their entirety and part of the epidemiology discussion they had.

13:36:57 Q. I'm sorry. I don't understand. You read part of the epidemiology parts, or did you read the epidemiology part? I don't understand.

A. My main focus in reviewing all of the evidence was really focused on the epidemiology studies

13:37:09 themselves.

Q. So you read their epidemiology analysis, that's what I was asking?

A. I'm sorry?

Q. You read their epidemiology analysis; right?

13:37:17 A. I'm sorry -- to be confused. I -- myself, I spent most of my time reviewing the actual epidemiology studies. I spent some time reading the reports, but I didn't go into depth in reviewing the reports.

Q. Okay. I'm not trying to play games with you

13:37:32 here. Did you look at the epidemiology sections in the

reports or not?

A. I looked at -- yes. I looked at some of the epidemiology studies.

Q. All right. We established that. Again, I told you, I think a lot of this we're going to agree on.

And you understand that both Dr. Portier and Dr. Neugut also agreed that the evidence regarding epidemiology by itself was limited; right?

A. I'm not sure specifically what studies they were commenting on when they said "limited," so I think that's -- I'm just trying to be clear what you mean by "limited."

Q. Okay. We've been using the word "limited." You and I have been discussing it for, like, the last five minutes.

A. I understand what you mean by the word "limited."

Q. Okay.

A. I'm just not sure when Dr. Portier or Dr. Neugut was talking about the limited evidence, which of the studies he was referring to -- they were referring to when they said --

Q. They were looking at the same ones IARC looked at. You know that.

A. No. Actually, I wasn't sure of what studies. I

wasn't sure if they were talking about that in the context also of, you know, the NAPP study or the most recent JNCI publication.

Q. When you say you couldn't tell, is that because you don't remember or because when you read it, you didn't understand it?

13:38:35

A. No. I just don't recall.

Q. Okay. Well, they both testified to this jury and told them that the epidemiology by itself in isolation is insufficient to show causation. You understand that?

13:38:48

A. Again, I haven't heard what they've said specifically on testimony so --

Q. But that's also your testimony?

A. No. It actually is not. Actually, I think now the evidence -- there is accumulating evidence that shows no evidence of a positive association, and that's a different comment on the literature than saying the evidence is limited.

13:38:59

Q. That's actually where I was going. So it's actually your opinion that it's not that it's insufficient evidence to show causation, it's actually your opinion that there is no association; right?

13:39:15

A. That -- I believe that the epidemiology supports no evidence of a causal association.

13:39:27

Q. No association; right?

A. No evidence of a causal association.

Q. Okay. Well, I mean, that's actually not what you testified previously, Doctor. I mean, I'm not -- isn't it true that you said when you look at the body of epidemiological literature on this topic there is no --

MR. LOMBARDI: Can I have a page and line, please?

MR. WISNER: This is from the last time she testified, page 950, line 9 through 12.

Q. I'm not trying to impeach you. I'm just asking you if this is what you said. If you need to look at it, I'll show it to you.

MR. LOMBARDI: Improper use of the material.

MR. WISNER: Would you like to see it, Doctor?

THE WITNESS: Yeah, that would be wonderful. Thanks.

THE COURT: Mr. Wisner, is this deposition testimony, or is this a transcript from this morning?

MR. WISNER: No. This is from a prior time she testified under oath.

THE COURT: I see.

MR. LOMBARDI: And the proper use is either for refreshing recollection or for impeachment, and I don't think we've established either is in play at this point.

Q. BY MR. WISNER: Do you recall what you said?

A. I'm sorry. You're not -- I'm not sure where you're looking here on this document.

Q. Well, I asked if you had previously testified that there was no association. You didn't say "causal," you said "no association"; correct?

A. Again, if you could show me where you're referring to, I can have a chance to take a look at it.

Q. So now we established you don't recall?

A. I just would like to see --

Q. I know. I'm going through the steps here. You don't remember; you'd like to see your testimony?

MR. LOMBARDI: Your Honor, this is just an improper procedure.

THE COURT: Mr. Wisner, can you please direct Dr. Mucci to the portion of the testimony --

MR. WISNER: I was just told that I can't do that until I've established she doesn't recall.

THE COURT: Mr. Wisner, just please point her to the testimony that you're asking her.

MR. WISNER: Sure. It's on page 950. Starting at line 9 through 13, why don't you read silently to yourself and let me know when you're done.

THE WITNESS: Yes.

Q. BY MR. WISNER: So you previously testified you

didn't say "causal association"?

MR. LOMBARDI: Your Honor, he's now improperly using the transcript. If you're refreshing recollection, then you ask the witness what her recollection is now.

13:41:50 THE COURT: Mr. Wisner, do you have a copy of the transcript for me to look at, please?

MR. WISNER: Oh, sure.

THE COURT: All right. What page and line are you at, Mr. Wisner?

13:42:10 MR. WISNER: Page 950, lines 9 through 13.

THE COURT: All right. So can you please repeat the question to her, please?

MR. WISNER: All right. My question was -- I was asking what she previously testified to, but I was

13:42:41 objected to that, so I don't know if there was a ruling. So I don't know what to do.

THE COURT: Please, repeat your question.

MR. WISNER: Sure.

Q. So you previously testified under oath that

13:42:50 there was no positive association between glyphosate and NHL risk?

MR. LOMBARDI: Just for the record, your Honor, I object, but -- it's just not the proper procedure.

THE COURT: All right. She may answer.

13:43:02 THE WITNESS: So on page 950, that is what I

testified. And then on the following page, I use the actual words "causal association."

Q. BY MR. WISNER: Okay. This was in -- let's back up then. Let's look at the actual sequence of answers -- questions. So earlier in that question, Dr. Mucci --

13:43:19

A. I'm sorry, what page are you looking at now?

Q. Starting at the beginning of the first question page 949, starting at line 23.

You were asked, "Dr. Mucci, based on your review of the glyphosate epidemiological literature, have you reached an opinion as to whether there is evidence of an association between glyphosate-based herbicides and non-Hodgkin's lymphoma?"

13:43:32

Your response was, "Yes, I have."

And then the question is, "And what is that opinion?"

13:43:47

And then you give a description that you looked at a bunch of different stuff and then the answer we read previously is what you said. And you testified, "And when you look at the body of epidemiological literature on this topic, there is no evidence of a positive association between glyphosate and NHL risk." Then you said, "There's no evidence of dose response of associations for glyphosate and NHL risk."

13:44:00

That's what you said; right?

13:44:12

MR. LOMBARDI: And under the Rule of Completeness, I'd ask that page 951, lines 7 to 10 be read. It's what the witness referred to in her answer.

THE COURT: All right. Mr. Wisner --

13:44:25 MR. WISNER: They can do it on redirect, your Honor.

THE COURT: Mr. Wisner, please read lines 7 -- well, he already read lines 9 through 10, so you're asking --

13:44:34 MR. LOMBARDI: It's the next page your Honor, page 951, lines 7 to 10.

MR. WISNER: So your Honor, that actually is excluded.

THE COURT: Counsel, can you please approach?

13:44:47 MR. WISNER: Yes, your Honor.

(Sidebar.)

[redacted]

13:45:05 [redacted]

[redacted]

13:45:17 [redacted]

[redacted]

(End sidebar.)

THE COURT: All right. Mr. Wisner, you may ask another question.

MR. WISNER: Sure.

Q. So is it your opinion or not, that there's no association?

A. There is --

Q. Please answer my question "yes" or "no."

A. And by "no association," you mean looking at all of the epidemiology literature together?

Q. Yeah.

A. You know, based on the evidence together, there is no evidence of a positive association. There's no

evidence that would support a causal association.

Q. Okay. But that's two different opinions; right? One, there's no evidence to support a causal association. But there's also a different one; right? Because association is not the same as causation?

13:46:25

A. That is correct.

Q. But you actually take the stronger one. You say that there's no evidence of a positive association; right?

13:46:33

A. I'm taking -- you know, when you look at the epidemiological evidence as I presented when I showed the summary of the four studies, none of those really support a statistically significant positive association. Taking all of those studies together, there is no evidence that these studies would support a causal association. So both of those comments are correct.

13:46:53

Q. Okay. So that wasn't my question. And I'm actually on the clock here, so if you could just answer "yes" or "no," that would be really helpful. I understand your answer, and if you want to explain, Mr. Lombardi can ask you to explain. My question wasn't about causal association. It wasn't even about the overall evidence. It was really simply your opinion is that there was no association; correct?

13:47:12

13:47:21

A. One of my opinions is that there's no

association.

Q. Thank you. I want to talk to you about some of the biases that you were discussing or issues related to -- actually, before, I do that, you would agree with me, Doctor, that even if you have zero epidemiology, right, you can still determine that something causes cancer?

13:47:35

A. In what context? Do you mean that -- I'm sorry, I don't understand the question.

Q. What about my question didn't you understand, Doctor?

13:47:51

A. You know, I don't understand what you're asking me -- under what criteria would you be talking about? I'm sorry, I just don't understand the question you're asking.

13:48:05

Q. Well, you're a cancer epidemiologist, right?

A. Yes, I am.

Q. And the question's a simple one. You can still determine whether or not something causes cancer without epidemiology; right?

13:48:15

A. I don't think that's true.

Q. Okay. You wrote a book about cancer epidemiology; right?

A. Yes, I have.

MR WISNER: Permission to approach, your Honor?

13:48:25

THE COURT: Yes.

Q. BY MR WISNER: That's your textbook, Doctor?

A. Yes, it is.

Q. And I want to draw your attention to page 105.

13:48:49 MR. WISNER: Permission to publish, your Honor?

THE COURT: Very well.

Q. BY MR. WISNER: Are you there, Doctor?

A. Yes.

Q. Okay. So in your cancer textbook it reads, "The

13:49:00 classification" --

A. I'm sorry, where?

Q. Let me get it. Right here under "Contribution of Biomarker-Based Epidemiology to the Identification of Human Carcinogens."

13:49:15 Do you see that?

A. Yes.

Q. It reads, "The classification of an agent as a Group 1 carcinogen in the International Agency for Research on Cancer, IARC, a Monograph program, can be

13:49:28 used as a benchmark for the identification of human carcinogens."

Do you see that?

A. Yes.

Q. And if we turn to the next page, you have a

13:49:36 table, Table 5.4; right?

A. Yes.

Q. And here it says, "Group 1 agents with less than sufficient evidence in humans, but with strong mechanistic evidence."

13:49:52 Do you see that?

A. Yes.

Q. And you list all these different known human carcinogens that have inadequate or limited data; correct?

13:50:05 A. Yes, but that's different than saying there's no epidemiology evidence.

Q. Okay. So you -- fair enough. So then you agree then that it's possible to determine a carcinogen with inadequate or even limited epidemiology?

13:50:21 A. These are the classifications that IARC uses to determine causation, and that may differ than other agencies.

Q. I'm not even sure how it was clearly responsive to my question. My question is: You can determine how

13:50:37 something's a carcinogen with limited or inadequate epidemiology; right?

A. Well, it depends. What I'm trying to say is that there are certain organizations, such as IARC, that use certain criteria, and there's other agencies that

13:50:49 would use other criteria and they would weight the human

data potentially differently. That's why I'm trying to be clear that it really depends on what body is reviewing the evidence.

Q. And the body here is IARC; right?

13:51:01 A. In this particular case, but I wasn't clear from your question that you were asking specifically about IARC.

Q. But you say right here that it "can be used as a benchmark for the identification of human carcinogens"?

13:51:13 A. Yes.

Q. Okay. So we can play around with words here, but if IARC can serve as a benchmark and IARC has determined things to be known carcinogens with inadequate or limited epidemiology, then you would agree that it's

13:51:29 possible to determine a carcinogen with limited or inadequate epidemiology?

A. No. As I said, this is -- IARC is being used as a benchmark, but it's not the only source of information. And here, I think, in this particular case, the

13:51:46 epidemiology is not limited or inadequate.

Q. For all these different ones, you think it's not limited or inadequate?

A. No. I was talking specifically about the glyphosate and NHL risk.

13:51:59 Q. I wasn't talking about that. I was talking

about those Group 1 carcinogens. You know these are carcinogens; right? You don't dispute that?

A. I haven't looked at these for a while.

Q. Ethylene oxide, that's a carcinogen; right?

13:52:12 A. Again, I'm not an expert in the area of these carcinogens, so I wouldn't want to comment. So I -- I won't comment on those specifically.

Q. Okay. But this is your textbook of cancer epidemiology?

13:52:22 A. Yes, it is.

Q. And that table is in your textbook?

A. Yes, it is.

Q. And the language about it being a benchmark, that's in your textbook?

13:52:30 A. Yes. It is, but, again, it's not the only benchmarks that we use in cancer epidemiology. And I think if you look through the book, we state other ways in which we assess causation.

Q. Sure, let's actually look at that. It's pretty

13:52:44 interesting. If you actually go to page -- there's a section starting on page 111, and it reads "Concepts in Cancer Epidemiology and Etiology"; right?

A. Yes.

Q. And etiology, that's, like, the source or the

13:53:06 origins of disease?

A. Yes.

Q. And it goes through here and it goes through all these different issues of multi-causation and it covers confounding and a lot of the stuff we covered today; right?

13:53:17

A. Yes.

Q. And then in the section starting on page -- go to page 128 -- sorry, 127, the very bottom of it.

MR. WISNER: Permission to publish, your Honor?

13:53:33

THE COURT: Yes.

Q. BY MR. WISNER: Do you see that, Doctor? Do you see the bottom page?

A. Yes, I do.

Q. It says "Causal Inference in Epidemiology, General Principles"; right?

13:53:46

A. Yes.

Q. And if you turn the page, the table here is the Bradford-Hill criteria?

A. Yes.

Q. Those are the criteria you did not apply in this case; right?

13:53:51

A. No. This is -- one method for inferring causation is the Bradford-Hill criteria.

Q. Okay. And if you look at the next section, it goes IARC, doesn't it?

13:54:03

A. Yes, it does.

Q. It doesn't discuss any other agency or anything, does it?

A. No, it doesn't.

13:54:12 Q. Okay. You would agree IARC is a very prestigious organization?

A. It is an organization that is important in cancer -- dealing with cancer, yes.

Q. In fact, isn't it true if you run a search on 13:54:30 this book for IARC, you'll find 475 references to it?

A. Yes.

Q. If you do the same search for EPA, you get two?

A. It might be more than that, but yes, that's correct.

13:54:42 Q. Okay. And that's because in the world of epidemiology, the single greatest arbiter of cancer risk is IARC?

A. No. Actually -- but also I'd like to comment on another part of the textbook in which we comment that 13:55:00 they should not be confused with the establishment of causation based on scientific considerations alone. I think that is a important comment that we also mentioned in the book.

Q. Doctor, my question had nothing to do with that.

13:55:12 A. Yes, I know.

Q. So could you please not do that. Please answer my questions. Okay? I'm on a limited clock here.

MR. LOMBARDI: Your Honor, it's fine to ask questions, but he should direct the comments to you, not to the witness.

13:55:23

MR. WISNER: Your Honor, could you please instruct the witness?

THE COURT: Mr. Wisner, I'll allow her answer to stand. You may ask another question.

13:55:32

MR. WISNER: Your Honor, I wasn't striking the answer. Could you just instruct the witness to answer my questions?

THE COURT: Yes. I believe she's doing that. So please -- Dr. Mucci, please just answer Mr. Wisner's

13:55:42

questions.

Q. BY MR. WISNER: So my question was: That's because in the world of epidemiology, the single greatest arbiter of cancer risk is IARC? Do you agree with that or not?

13:55:52

A. No, I don't.

Q. Okay. Now, you've reviewed a publication written by Dr. Portier; correct? Related to IARC?

A. Could you just remind me which one you're discussing -- yes. I do, yes.

13:56:14

Q. Exhibit 293 in your binder, do you see it,

Doctor?

A. Yes.

Q. That's the publication you reviewed?

A. Yes.

13:56:27 MR. WISNER: Permission to publish, your Honor?

THE COURT: Any objection?

MR. LOMBARDI: No objection, your Honor.

THE COURT: All right. Very well.

Q. BY MR. WISNER: So we're looking at here --

13:56:39 that's on the screen. That's the second publication?

A. Yes.

Q. And this is signed by over a hundred scientists; right?

A. Yes, it is.

13:56:47 Q. And in this paper, these hundred scientists conclude that the weight of the evidence shows that, in fact, glyphosate is a probable human carcinogen.

Would you like me to show you where?

A. I'm sorry, so could you restate your question,

13:57:20 please?

Q. So these authors conclude that the weight of the science shows that glyphosate is a probable human carcinogen?

A. I'm not -- I think what they were talking

13:57:36 about -- I guess -- could you point specifically where

they say that in the text?

Q. Sure. Why don't you look on your screen. I'll just show it to everybody. "The most appropriate and scientifically based evaluation of the cancers reported in humans and laboratory animals, as well as supported mechanistic data, is that glyphosate is a probable human carcinogen. On the basis of this conclusion and in the absence of evidence to the contrary, it is reasonable to conclude that glyphosate formulations should be considered likely human carcinogens."

Do you see that, Doctor?

A. Yes, I do.

Q. That's what they said?

A. Yes, it is.

Q. Okay. When you decided to take on Monsanto as a client, had you read this document yet?

A. I'm sorry. I don't think I took Monsanto on as a client.

Q. Well, they're paying you; right?

A. I think they took me on as a client, just to clarify.

Q. Oh, okay. So you work for Monsanto now?

A. No. I'm working -- I'm providing expert testimony on behalf of this case.

Q. Okay. Let's continue, Doctor. All right.

Let's talk about some stuff --

MR. WISNER: Let's get the Elmo going.

Permission to publish one of the slides from earlier?

13:58:57 THE COURT: Very well.

Q. BY MR. WISNER: Well, before I do that -- actually, Doctor, you agree that there's something called recall bias; right?

A. Yes.

13:59:05 Q. And you agree that recall bias really isn't a problem in the epidemiology in this case?

A. Recall bias is a form of bias specific to case-control studies. I -- in reviewing this body of epidemiology studies, recall bias doesn't seem to be a

13:59:25 big concern.

Q. And you also -- you raised some other issues. You talked about confounders. You talked about proxy bias. Is that what you called it?

A. Yes.

13:59:34 Q. Let's start with proxy bias, okay? That's when you're collecting data and the person who is one of the cases -- the cancer cases passes away or are incapable of answering; right?

A. Yes.

13:59:50 Q. And so instead of asking -- you obviously can't

ask someone who's passed away, so you have to ask the next of kin?

A. Yes.

Q. Now, you said something earlier when we were talking about the NAPP that it's appropriate to remove the proxy responders. Is that your testimony? I don't know if I heard you properly.

A. It's appropriate because it addresses whether there is bias due to the proxies, yes.

Q. You are aware of something called selection bias; right?

A. Yes.

Q. And if you were to conduct a case-control study and blindly collect all these people with cancer but exclude all the people who had already died, you see how that could be a selection problem?

A. Yes, yes.

Q. So the proper solution isn't to exclude them, it's to adjust for them and see what happens; right?

A. No, it isn't actually. It's not going to get rid of the bias due to proxies.

Q. That's an interesting thing, because you say it's a bias due to proxies. But isn't it generally accepted in epidemiology that proxies will actually attenuate the risk towards the null?

A. Not in all situations, actually.

Q. Okay. In pesticide and agricultural cases, Dr. Blair has published that it will attenuate it towards the null; right?

14:01:12 A. Actually, what he published was that the proxies tended to under-report the problems of pesticides, and then the problem in the case-control studies was that the prevalence of proxies was higher in the controls. So then what that did is to inflate the relative risk in

14:01:31 this setting.

Q. Are you telling me that Dr. Blair has published that?

A. Yes, he has.

Q. In 1993?

14:01:37 A. No. I'll have to pull up the study. He describes -- so there's two pieces of information. One is he reports on prevalence.

Q. You're talking about prevalence of proxy.

A. Second --

14:01:54 Q. I never once talked about that.

A. Secondly, in the case-control studies --

Q. Doctor, I have a limited amount of time.

MR. LOMBARDI: Your Honor --

THE COURT: Please allow her to finish her

14:02:05 answer.

Please, finish your answer.

THE WITNESS: So we have that piece of data from Dr. Blair, and then the second part is -- because we know there were a lot more proxies in the control group than in the case group, we know that the bias would have led to an inflation of the relative risk.

Q. BY MR. WISNER: So generally in the world of epidemiology -- this was my question -- when you have proxy responders, it tends to, generally, bias it towards the null. That's the principle; right?

A. No. That's not true.

Q. Okay. You're an epidemiology professor; right?

A. Yes, I am.

Q. And you teach your students that use of proxy responders will inflate the risk estimate?

A. It can in certain settings if the proxy tends to -- it's like a form of recall bias where the proxies who have lost the family member to cancer may think more hard and over-report certain types of exposures. So it really depends on the setting. It really is study specific.

Q. So you're not actually saying proxy responders are a problem, you're saying there's a recall bias within the proxy responders?

A. Again, it depends, because sometimes there's under-reporting, so it really depends. Sometimes it will

be an overestimate, and maybe sometimes it will be an underestimate. In this case, we know it led to a bias that biased the results greater than the null value.

Q. It actually went below, didn't it, on the data you showed the jury?

14:03:30

A. That the bias was away from the null.

Q. All right. Turn to 682.

MR. WISNER: First, may I -- permission to approach, your Honor?

14:03:45

THE COURT: Yes.

MR. WISNER: Sorry, 681.

Permission to approach, your Honor?

THE COURT: Yes.

MR. WISNER: Would you like a copy?

14:04:06

THE COURT: Yes, please.

MR. WISNER: I'm handing the witness and the Court Exhibit 681.

THE COURT: Thank you.

Q. BY MR. WISNER: This is a publication by Dr. Blair; correct?

14:04:15

A. Yes.

Q. It's something that you've reviewed?

A. Yes. This is the article I was referring to.

Q. From 1993?

14:04:22

A. Yes.

Q. Okay. All right. Well --

Permission to publish, your Honor?

THE COURT: Very well.

Q. BY MR. WISNER: Okay. So we were looking at the same document on the screen; right, Doctor?

A. Yes.

Q. And this was done by Dr. Blair and Dr. Zahm; right?

A. Yes.

Q. And if we look into here in the -- so if we read what it said right here, it said -- it said, "Surrogate respondents often have been used in epidemiological studies of cancer. They're able to recall pesticide use with less detail than the farmers themselves."

These are proxies; right?

A. Yes.

Q. Yes. "The pesticides reported by surrogates were the same as reported by subjects themselves, but with less frequency. Comparison of reporting by cases and controls provided no evidence of case-response (differential) bias; thus, inaccurate recall of pesticide use by subjects or surrogates would tend to diminish risk estimate and dilute exposure-response gradients."

That's what it says; right?

A. Yes. This --

Q. That's enough. We'll move on. Let's talk about confounders.

MR. WISNER: Put the Elmo on.

Q. All right. Doctor, this is the chart you used for the jury; right?

14:06:14

A. Yes.

Q. You also have another one with cigarettes. I'll show that one, too. That might even be better.

And you talked a lot about how important for adjusting for confounding is; right?

14:06:26

A. Yes.

Q. And a confounder, you have it here, it's something that is correlated with the exposure?

A. Yes.

14:06:33

Q. Right? And it causes the outcome.

A. That's not correct.

Q. What am I getting wrong here?

A. It doesn't have to be a cause. It just has to be associated with the outcome.

14:06:51

Q. Fair enough. Okay. So it has to be -- well, okay that's fine. All right.

So it has to be correlated with the exposure.

A. Yes.

Q. Here, coffee and cigarettes smoking is correlated; right?

14:07:03

A. Yes.

Q. And it has to be associated with the outcome?

A. Yes.

Q. What if we got rid of coffee and just did matches -- use of matches; right? Matches would be correlated with smoking; right? And they would actually be associated with heart disease because of smoking; right?

A. If -- in what setting would it be associated?

Q. Well, we know smoking causes heart disease; right? We know that?

A. Yes.

Q. And we know smokers generally use matches more than people who don't smoke; right?

A. Yes.

Q. So in that context, if this was matches, that actually would be a situation where it is correlated with the exposure?

A. Yes.

Q. And it would be correlated, although incorrectly, with the outcome; right?

A. I guess I'm not sure. Are matches your exposure or your confounder?

Q. Either one.

A. Okay.

Q. Do you agree with that? In that circumstance, if you put matches right here, this would all be correct; right? As equally concerning; right?

A. Yes. If you were looking at the associations between use of matches and heart disease and you saw a positive association, you'd be worried that smoking would be a confounder.

Q. Exactly.

A. Yes.

Q. And if you were to control, right, for matches, you would eliminate any association with smoking and heart disease?

A. No. That's not correct because there -- among nonsmokers, there would be no association between carrying matches and heart disease.

Q. Yeah, but amongst the -- the people you have on the screen --

A. But that's --

Q. -- Doctor, wouldn't it be true that if you controlled for the matches something that was associated with the exposure but really not related to the outcome, you would eliminate the statistical power of your study and you would effectively lead to a false negative?

A. No, that's wrong. That's not how epidemiology works.

Q. Okay. I'm sure then, Doctor, you've researched carefully the effects of confounding in occupational epidemiology; right?

A. No. I haven't, but most -- these studies are not occupational studies. These are cancer epidemiology studies.

14:09:12

Q. Sorry. To be clear, is it your testimony to this jury that you have not studied the epidemiology of confounding in occupational studies?

14:09:27

A. I've studied in depth the subject of confounding, but I've not worked in occupational studies myself.

Q. Okay. Have you looked at -- and it's your testimony that these studies -- none of these are occupational studies?

14:09:41

A. These are cancer epidemiology studies.

Q. Yeah. Occupational epidemiology studies?

A. No, not exactly. These are really cancer epidemiology studies.

14:09:56

Q. Okay. So the AHS, that's not an occupational epidemiology study?

A. If I could explain what an occupational -- so --

Q. You said no; right?

A. It is a study of farmers and pesticide applicators who -- however the information that was

14:10:11

collected was collected just as you would in any typical cancer epidemiological study. They didn't use what's called work matrices or job matrices, which is what you typically think of with a occupational epidemiology
14:10:32 study, so I wouldn't classify it as an occupational epidemiology study.

Q. So to be clear, they were following an occupation? They were tracking exposures in the context of an occupation?

14:10:42 A. Yes.

Q. And they were estimating the health outcomes in an occupation, but you don't think that the AHS is a occupational epidemiological study?

A. Right. And the reason is, as I explained,
14:10:52 occupational epidemiology specifically is where you're using work history records and other information about the employment to try to estimate exposure, and that's not what we did here. What we have here are the actual questionnaires.

14:11:13 MR. WISNER: May I approach, your Honor?

THE COURT: Yes.

Q. BY MR. WISNER: Doctor, I'm handing you Exhibit 682.

A. Thank you.

14:11:21 Q. It's a document titled "Methodical Issues

Regarding confounder and Exposure Misclassification in Epidemiological Studies of Occupational Exposures."

Have you seen this before?

A. Yes, I have.

14:11:37 Q. Okay. Great.

MR. WISNER: Permission to publish?

THE COURT: Yes.

Q. BY MR. WISNER: So looking at this on the screen, this is an article written by Dr. Blair.

14:11:46 Do you see that?

A. Yes.

Q. And you reviewed this before; right?

A. Yes, I have.

Q. And in this study they're specifically

14:11:55 discussing the differences between exposure misclassification and confounding; right?

A. Yes.

Q. And they're trying to see what's more of a problem in these epidemiological studies: Exposure,

14:12:07 misclassification or confounding; right?

A. In this set of occupational studies, yes.

Q. And let's read the background, "Confounding and exposure misclassification are issues that concern epidemiologists because of their potential to bias

14:12:21 results of study and complicate interpretations."

And Doctor, I just want to be clear I don't remember you mentioning misclassification exposure at all on your direct; is that right?

A. We touched a little bit about it in the context of imputation.

Q. Is that something that you considered in forming to your opinions?

A. Yes.

Q. Okay. You just didn't discuss it?

A. As I mentioned, we talked about it in the context of the imputation, but there are other issues in this classification, yes.

Q. "In occupational epidemiology, both are routinely raised to argue that an observed result is either a false positive or a false negative finding. Although, it is important to consider the potential for limitations of epidemiologic investigations, judgment regarding their importance should be based on actual likelihood of occurrence."

Do you agree with that?

A. Yes. This is exactly what we should do in epidemiology.

Q. Okay. It goes on to say, "Results: Examples of substantial confounding are rare in occupational epidemiology. In fact, even for studies of occupational

exposures in lung cancer, tobacco-adjusted relative risks rarely differ appreciably from adjusted estimates. This is surprising because it seems like the perfect situation for confounding to occur."

14:13:51 I'll stop there. You actually used the example of cigarettes for confounding?

A. Yes.

Q. "Yet, despite the lack of evidence that confounding is a common problem, nearly every

14:14:08 epidemiologic paper includes a lengthy discussion on uncontrolled or residual confounding. On the other hand, exposure misclassification probably occurs in all studies. The only question is, how much? The direction and magnitude of nondifferential exposure

14:14:25 misclassification (the type most likely to occur in cohort studies) on estimates of relative risks can be largely predicted given the knowledge on the degree of misclassification, that is, relatively small amounts of misclassification can bias relative risks substantially

14:14:41 towards the null."

Did I read that right?

A. Yes, you did.

Q. And at the conclusion, it says right here, "We believe of the two major methodological issues raised in

14:14:54 epidemiological studies of occupational exposures, that

is, confounding and exposure misclassification, the latter" -- i.e., exposure misclassification -- "is of far greater concern."

Do you see that, Doctor?

14:15:06 A. Yes I do.

Q. So to be clear, it's your belief -- let me ask you: Do you believe there's any misclassification error considerations in the case-control studies?

A. I'm sorry. By "consideration," did they address

14:15:24 the issue of misclassification?

Q. Well, you critiqued them for having confounding problems. Do you think they have misclassification problems?

A. They may, yes.

14:15:33 Q. But you agree misclassification problems, they're bigger and more prominent in cohort studies; correct?

A. No. That's not correct.

Q. Okay. Let's go to the science, because I feel

14:15:51 like that's probably --

MR. WISNER: Can you get that Elmo going? I'm going to go back and forth, Brian.

Q. I'm putting up your -- you put up this exploratory NHL study slide.

14:16:07 Do you recall that, Doctor?

A. Yes.

Q. And you reported on certain results from these studies, didn't you?

A. Yes.

14:16:13 Q. Now, you didn't report on all of them; right?

A. I summarized here the ever-versus-never comparison, but I have detailed in my report more information about dose, et cetera.

Q. Okay. So, for example, you didn't include any

14:16:33 of the statistically significant results in these studies, did you?

A. I -- for this -- purposes of summarizing the information, what I've done is to present the ever-versus-never comparison.

14:16:43 Q. So you didn't present any statistically significant result in here; correct?

A. Not in this particular figure, no.

Q. Okay. This is the one you showed the jury; right?

14:16:54 A. Yes, it is.

Q. Let's go to Hardell 2002. That will be Exhibit 778. Should be in your binder, Doctor.

MR. WISNER: Permission to publish?

THE COURT: Yes.

14:17:12 Q. BY MR. WISNER: All right. Doctor, we're

looking at the Hardell 2002 article; right?

A. Yes.

Q. And this is written by Hardell and Eriksson; right?

14:17:20 A. Yes, it is.

Q. And these are some researchers out of Sweden; right?

A. Yes, they are.

Q. And they're using data from the Swedish

14:17:30 registries to find people who have NHL and do these case-control studies?

A. Yes.

Q. So they're drawing from millions of people to do -- to prepare these studies?

14:17:41 A. Yes.

Q. The background is -- it says, "The incidents of non-Hodgkin's lymphoma has increased in most Western countries during the last few decades."

Do you see that, Doctor?

14:17:51 A. Yes.

Q. You agree with that? You testified about that?

A. Yes.

Q. It says, "The current study was designed to further elucidate the importance of 150 of phenoxyacetic

14:18:00 acids and other pesticides in the etiology of NHL";

right?

A. Yes.

Q. All right. And then they used the population-based control study; right?

14:18:10 A. Yes.

Q. And so this isn't polling from an occupations; this is polling from actual people in Sweden?

A. Right.

Q. It says they found 442 cases and twice as many

14:18:22 controls?

A. Yes.

Q. Total of 404 cases and 471 controls answered the questionnaire?

A. Yes.

14:18:29 Q. And in this one, they actually had follow-ups on questionnaires by telephone; right?

A. Right.

Q. Just so if there was anything that was confusing, they clarified and checked with them; right?

14:18:40 A. Yes.

Q. And that's generally a good practice in the field of epidemiology; right?

A. It can be in some settings and not in others.

Q. Okay. And they did an assessment and in Table

14:18:54 1 -- let's actually just go to Table 7, because that has

the herbicides. So this Table 7, it presents the results for different exposures related to different herbicides; right?

A. Yes.

14:19:14 Q. It doesn't have glyphosate here identified. It's in the "Other herbicides" category; right?

A. Yes.

Q. Okay. And it had the multi-variate and the uni-variate analysis; right?

14:19:23 A. Yes.

Q. And the multi-variate one controls for other pesticides?

A. It's been a while since I've looked at this. I just want to make sure I'm correct. It says

14:19:45 multi-variate analysis was performed, but it's not clear, I guess, if they did or did not mutually adjust for other pesticides or whether just other factors. So it's not specifically clear, but we can say that it is adjusted partially.

14:20:01 Q. And then for the Table 1, they actually go over the specific pesticides, that's where glyphosate is actually shown. You said there's only a few cases. It has 2.3, right, but it's not statistically significant?

A. Just to clarify, this is the unadjusted

14:20:23 estimate.

Q. That's right.

A. Yes.

Q. You didn't put that up on the board, though, did you?

14:20:26 A. This Hardell study was part of the Hardell 2002. It was a pooling of this case control with another, so that's why I chose to (inaudible).

Q. Okay. So let's look at the 2002. I thought we were looking at that.

14:20:38 Let's look at Exhibit 777. This is the Hardell 2002; right?

A. Yes.

Q. And this is the one that Mr. Lombardi showed you?

14:20:51 A. Yes.

Q. And this one pooled in the one we just saw with some other data from another study; right?

A. Yes. It had four additional exposed cases.

Q. Okay. And this is also written by two of the

14:21:04 same authors?

A. Yes.

Q. And if we go into it, they do a specific -- let's go to Table 7, tends to be where the relevant stuff is.

14:21:16 And in Table 7, do you see this reflects the

various herbicide analysis?

A. Yes.

Q. And for glyphosate there's a 3.04 uni-variate number.

14:21:26 Do you see that?

A. Yes.

Q. And that has -- that's statistically significant?

A. Yes, it is.

14:21:31 Q. And you didn't include that on your Forest plot; right?

A. No, because it was not adjusted for the confounding.

Q. Okay. Now, you say there was confounding, and

14:21:41 so when they did adjust for other pesticides, it went down to 1.85; right?

A. Yes, it did.

Q. So the risk didn't disappear?

A. In this case, yes. The risk was attenuated, but

14:21:52 you can also see, given the width of the confidence interval, the information in that relative risk is not very informative. It's not reliable because of the very wide confidence interval.

Q. Okay. But you see that there's still an

14:22:07 elevated rate?

A. I really don't agree with that, and I think because of the width of this confidence interval -- because we're relying on eight exposed cases -- this does not really an informative study.

14:22:21 Q. I'm sorry, 1.85 that's greater than one; right?

A. That number is greater than one, yes.

Q. And if you actually look what the authors had to say about this, they actually concluded that glyphosate was a risk factor; correct?

14:22:38 A. Could you show me the specific language that they used?

Q. Sure. There we go. "Glyphosate is the herbicide now mostly used in Sweden. In this study exposure, to glyphosate was a risk factor for NHL."

14:23:00 Do you see that?

A. Yes.

Q. And you disagree with that?

A. Yes, and actually I believe IARC put very limited weight on this particular study as well.

14:23:11 Q. I didn't ask about IARC. I asked about you, Doctor?

A. Yes. And I also -- given the width of the confidence interval, given concerns about the use of proxies and given the small very number of exposed cases, 14:23:26 I don't put much weight into this study.

Q. So you disagree what the authors concluded?
A. In this particular case, I do.
Q. IARC included this in their meta-analysis?
A. Yes, they did.
14:23:38 Q. But you did not?
A. No, I didn't. However, the meta-analysis I showed you, when you include that data, it actually doesn't change the overall meta-analysis.
Q. So going back to your Forest plot here, the next
14:23:53 one you have is McDuffie; right?
A. Yes.
Q. And this one you have concerns with because of proxy respondents?
A. Yes.
14:24:01 Q. And there was no adjustments for pesticides?
A. Yes.
Q. Okay. Let's look at it. It's Exhibit 818 in your binder.
MR. WISNER: Permission to publish, your Honor?
14:24:09 THE COURT: Very well.
Q. BY MR. WISNER: All right. So this is the McDuffie article, and as you can see it's not just Dr. McDuffie but a bunch of other people as well; right?
A. Yes.
14:24:23 Q. Does it include Dr. Pahwa?

A. Yes.

Q. All right. And what they did here is they did a case-control study based in Canada; is that right?

A. Yes, it is.

14:24:33 Q. And they looked at a couple of different things, but one of the things -- I was looking through this you said they had a problem with proxy respondents; right?

A. Yes.

Q. I was reading through it, and right here it

14:24:45 says, "Surrogates for deceased cases were not contacted."

A. Yes. I can see that. However, there's another publication that used the same data where it describes the use of the proxy respondents.

Q. Who are the proxy respondents if the deceased's

14:25:04 contacts were not contacted?

A. You can see that's by Dr. Hohenadel where they discuss this, where they had included -- if you look at that paper, which used that same exact case-control study they, in fact, do include proxies.

14:25:20 Q. But the authors say they didn't right here.

A. I understand that that's what they say here, but in this other publication, they do, in fact, state that they used proxies.

Q. So you're saying this publication's wrong?

14:25:34 A. I'm saying it's not in agreement with another

publication using the exact same case-control study.

Q. Okay. Well, at least based on what they say, they say they didn't use them, didn't they?

A. Here they say -- at least the deceased's cases were not contacted.

14:25:53

Q. So if we take this study at face value, there's not really a proxy problem?

A. I can appreciate why you said that, but then there's the Hohenadel study which uses the exact same study from Canada which does describe the use of proxies.

14:26:06

Q. If we go right here, there's a table that you described to the jury.

Do you recall that?

A. Yes.

Q. This is where you have the glyphosate Roundup number of -- it's 2 point -- 1.26 and then more adjusted it's 1.2; right?

14:26:17

A. Yes. It is, yes.

Q. And that's not statistically significant; correct?

14:26:33

A. No, it is not.

Q. But 1.2 is greater than one, right?

A. The value of 1.2 is greater than one. And just to clarify, this is not adjusted for other pesticides.

Q. I was going to get to that. So your concern

14:26:44

with this number is that there's these confounders; right?

A. I'm confused, generally, in thinking about the validity of the results that there could be potential confounding. One thing in epidemiology is we can actually examine whether confounding is present or not.

Q. One way you do this is you basically run a regression and you see if those other things are associated with the outcome; right?

A. That's one of the steps that you would take, yes.

Q. Didn't they do that in this study?

A. They had that part of the analysis, yes. So in the tables, they present the association with the outcome, yes.

Q. So if we look here on Table 7, among individual pesticides -- and it lists a bunch -- "the user, non-user were included in the initial multi-variate model and found not to contribute significantly to the risk of NHL."

That's what it says; right?

A. Yes, it does.

Q. So they actually checked to see if these other pesticides contributed significantly to NHL, and it didn't?

A. And just to clarify, this may be a subtle point, but a factor doesn't have to be statistically significant to be associated with the outcome to actually be a confounder.

14:28:05 Q. Okay. And then if you look at the -- they did a dose-response analysis; right? This is not -- oh, yes, it is.

They did a dose-response analysis; right, Doctor?

14:28:18 A. Yes, they did.

Q. And I recall you commenting look at all these elevated rates that show systematic bias. That's what you told the jury?

A. Again, it may suggest systematic bias.

14:28:30 Q. Sure, but this table was just for reporting positive results. If you actually look at the top, it says, "Models that included the time variable 'days per year' and stratification for age and province of residence were also assessed for the individual herbicide

14:28:44 compounds," and it lists a bunch. "No significant associations were found."

Because this is the frequency of exposure to selected herbicides; right?

A. How many -- could you repeat what you said?

14:29:01 Q. I just read it. And so the reason why these are

all positive is not because there's systematic bias, but because the authors are just showing the positive results?

A. Well, that may be true. I think if you look back at Table 2, which may be also what we're talking about, there are number of positive associations that are seen in those tables where they're not doing the selected -- selected specific pesticides. They're presenting data on all the pesticides.

14:29:17

14:29:31

Q. And for glyphosate, we see at greater than two days per year use, there is a 2.12 odds ratio; right?

A. Yes.

Q. And it's statistically significant; right?

A. It is.

14:29:48

Q. And even though the other pesticides were not significantly associated with NHL, as we showed in Table 7, it's your opinion that this is a confounded result and, therefore, lacks credibility?

A. Actually, you can see from Table 8 because there are different pesticides associated with the use of NHL, these themselves could be the confounders of this association.

14:30:05

Q. Okay. But you don't know that, even though the authors said they looked at it and saw nothing?

A. No. What they looked at were these other --

14:30:20

they didn't look at it as a confounder. They looked to see whether the pesticides were associated with the outcome. That's something different than assessing whether these specific pesticides here confounded the association for glyphosate and NHL risk.

14:30:34

Q. But do you have any evidence that people who sprayed glyphosate disproportionality spray -- I don't know -- fumigant Carbon tetrachloride?

A. We don't know from the study because the authors didn't comment on it; however, we do know from other publications that people who use glyphosate are using other pesticides. Again, I'm not saying there is necessarily confounding, but it is something to be worried about, that these estimates may be confounded.

14:30:50

14:31:06

Q. I'm sure, Doctor, to make sure you were not throwing in unnecessary confounders, you made sure these things are actually something that caused NHL?

A. I'm sorry, could you say that again?

Q. I'm sure you went and checked to see if these other things that you say are potential confounders, you went to see, are they cancer causers; right? You actually looked?

14:31:22

A. Just to clarify, a factor doesn't have to be a cause to be a confounder. That is established epidemiology.

14:31:34

Q. You can say something's a confounder even if you don't know it causes the outcome?

A. As I showed in that other figure that illustrated the concept of confounding, it may be correlated with something else that actually is the cause. So it may not be that, for example, malathion is a cause, but malathion may be correlated with something else that is itself a cause. So by adjusting for malathion, we are getting rid of the confounding that may be due to the fact that malathion is correlated to these other things.

Q. But you're just speculating; right?

A. I think it's more than speculation, because we know -- so, again, with confounding, the factor has to be -- the confounder has to be associated with the outcome, which we can see several of these are in this table, and they have to be correlated with the exposure. But it is presented in other studies where we know glyphosate users were a lot more likely to use these other exposures, so it's pretty reasonable to be concerned about confounding in this study.

Q. What study exists that says that people who use glyphosate used Mecoprop. What study is that?

A. Again, I think it's a reasonable -- I don't know. I can't tell you specifically what study is there,

but I think we would want to know is it correlated and, therefore, could be a potential confounder. It's something we would want to know about. Actually, we do know, though, that malathion is a confounder in the Pahwa study. It's one of the factors they adjusted for in their analysis.

Q. Okay. Because that was associated with the outcome; right?

A. It was associated with the outcome, and it was correlated with exposure.

Q. There's absolutely not a single document, sentence or reference to any of the Pahwa articles, Doctor, that say glyphosate and malathion are associated.

A. Okay. That's true, but they were included in the multi-variate models, those three exposures.

Q. So to be clear, our concern that glyphosate is associated with every single pesticide that you say are potential confounders, you're just making that up?

A. Again, it's -- what I'm trying to raise the issue is that we're concerned about confounding because we do see here there are several of these pesticides that are associated. There's a systematic reason why so many -- some of these pesticides are positively associated. Could it be confounding? Could it be due to proxies? Could it be due to some other kind of bias? It just

raises concerns, and that's the concerns I talked about in my direct.

Q. Doctor, you said that one of the great accomplishments of epidemiology was that it helped expose that tobacco was associated with lung cancer; right?

14:34:11

A. Yes.

Q. And isn't it true that when that fight was happening in the epidemiology world, the tobacco companies kept saying, it's confounders?

A. Maybe. I'm sure they did, yes. And so -- but I think many studies have tried to investigate whether there is confounding present or not in the tobacco association, and it hasn't been found, any confounders.

14:34:25

Q. All right. Let's go back to the chart.

MR. WISNER: Thank you, Brian.

14:34:45

Q. So this is your -- your Forest plot again. And again, the McDuffie article says there were proxy respondents, although the article says there wasn't, and you said that there was no adjustment for pesticide. It doesn't mention that they did that analysis to see if they were associated; right?

14:35:01

A. Again, I can understand -- just to clarify, there were five pesticides in that table that were not included in the table because they were not associated; however, there are a number of pesticides that are

14:35:15

associated and, therefore, are potential confounders.

Q. And the number you give you don't give the dose-response number; right?

A. Again, we talked about the dose response, but -- in this table, I present the ever-never comparisons.

14:35:28

Q. All right. Let's move on -- I don't want to move on to Orsi for too long. You agree with me Orsi is not very helpful in this case; right?

A. The information is limited because of potential biases.

14:35:44

Q. In fact, in your report you discuss how you really don't even need to look at it; right?

A. It's one of the studies I did look at, actually. I looked at all of the epidemiological evidence.

Q. I know, but you said it doesn't tell you anything; right?

14:35:56

A. It has limited value; yes.

Q. But for some reason, that one did make it in your meta-analysis; right?

A. I included it. IARC included it as well.

14:36:05

Q. But IARC included Hardell 2002, but you kicked that one out?

A. As I mentioned in the Forest plot, I showed you I did not use Hardell there; however, I did evaluate whether Hardell would have had any impact on the results,

14:36:20

and it did not.

Q. So these aren't in date order. The next one you have Eriksson is. I'm going to jump to De Roos 2003 first, okay?

14:36:30 A. Okay.

Q. Before we get there, I want to talk about something that's come up a couple times that's called Bayesian analysis. Have you heard of that?

A. Yes, I have.

14:36:37 Q. And that's a type of statistical analysis that was popular in the mid-2000s and has sort of gone out of fashion?

A. That's not true, actually.

Q. Okay. Bayesian analysis, the way it does

14:36:50 statistics is it makes assumptions about the world before we look at the data?

A. That's actually not true.

Q. I'm sorry -- let me finish. I guess it's going to be no matter what I say after that.

14:37:01 Bayesian analysis tries to make *a priori* assumptions about what risks you think are or are not. Then you look at the data, and you list the data according to those assumptions?

A. That's not completely correct.

14:37:15 Q. Pretty close, though?

A. You make the *a priori* assumptions based on existing data.

Q. Sure. I didn't mean to suggest that it was you willy-nilly, you but you make *a priori* assumptions before you do the analysis. That's all I meant.

14:37:26

A. Because of existing data, yes.

Q. Okay. So let's go to De Roos 2003. That is Exhibit 710 in your binder, Doctor.

MR. WISNER: Permission to publish, your Honor?

14:37:36

THE COURT: Yes.

Q. BY MR. WISNER: All right. So we're looking at this is on the screen. This is Exhibit 710, and this is the De Roos 2003 paper.

A. Yes.

14:37:48

Q. De Roos, her name keeps popping up. She's been pretty prolific in the area of epidemiology; right?

A. For this topic, yes.

Q. Particularly in pesticide?

A. Yes.

14:37:59

Q. She's on this study. She's on the first AHS study, she's on the last AHS study; right?

A. I believe she is on the last AHS study, yes.

Q. She's also on the letter that Dr. Portier sent; right?

14:38:12

A. I can't recall. If you say so, yes.

Q. Okay. And we also have on here Dr. Blair; right?

A. Yes.

Q. Dr. Zahm; right?

14:38:21 A. Yes.

Q. Dr. Weisenburger; right?

A. Yes.

Q. And Dr. Cantor. And he was -- I believe it's a he; right?

14:38:28 A. Yes.

Q. Dr. Cantor, he's -- he did one of the original US case-control studies; right?

A. Yes.

Q. And so they did an analysis here and if you look

14:38:45 at the methods, it says, "During the 1980s, the National Cancer Institute conducted three case-control studies of NHL in the midwestern United States."

This essentially is pooling the data from that; right?

14:38:59 A. Yes.

Q. Now, if you actually go to the second -- third page, there's a Table 1.

Do you see that, Doctor?

A. Yes.

14:39:06 Q. And this is the table used to generate the

assumptions for the hierarchical analysis; right?

A. Yes.

Q. And these numbers -- the ultimate thing is the carcinogenic probability on the right; right?

14:39:24 A. Yes.

Q. And for glyphosate -- where is it? Down here on the bottom.

For glyphosate, they had a probability of .03; right?

14:39:32 A. Yes.

Q. Okay. Sorry .3.

A. 0.3.

Q. All right. And if we look at the bottom, what this actually involves, it actually involves IARC,

14:39:43 doesn't it?

A. Yes.

Q. It says, "Carcinogenic probability value is created by combining the classifications from the IARC Monographs Programme on the Evaluation of Carcinogenic

14:39:56 Risks to Humans and the US EPA Integrated Risk Information System"; right?

A. Yes.

Q. And today this number for glyphosate would not have been .3. It actually would have been .6, "probable

14:40:12 human carcinogen in one assessment and unclassifiable in

another"?

A. I think this is a good point. This study was done before IARC; however, I'm not sure which classification it would be because it actually was classifiable in the other. So it's not clear from this classification scheme, but I agree it's not 0.3.

14:40:24

Q. So if it was done today, it probably would have been higher; right?

A. Probably.

14:40:35

Q. It would have raised the hierarchical regression point estimate; right?

A. Not necessarily. We actually don't know what effect it would have had on the estimates of the hierarchical regression. I'm not sure what the effect would have been.

14:40:45

Q. Now, one of the things -- you talked a lot about adjusting for other pesticides?

A. Yes.

Q. And they adjusted for a lot of pesticides in this one; right?

14:40:54

A. Yes, they did.

Q. I think it's 47 different pesticides; isn't that true?

A. Yes.

14:40:59

Q. And they actually generate a table, Table 3.

And I'll pull it up here. See if you can read it.

This is the table; right?

A. Yes.

Q. And it has all the different pesticides that are being studied. And, in fact, every one of these estimates was adjusted for every one of these other pesticides and herbicides?

A. In the hierarchical, yes.

Q. Oh, you're saying it wasn't in the logistical regression?

A. You know, actually reading through this document a number of times, it remains unclear to me if they did or did not in the logistic regression.

Q. What if I could prove to you definitively, finally resolve this debate, that, in fact, it was adjusted for other pesticides? Would you agree that the proper number to use is the 2.1?

A. No, not necessarily.

Q. Why not?

A. I think in this case -- I mean, it might be, and it might not be. I think the hierarchical, when you look through it, when you're controlling for 47 different pesticides, when -- if we remember how many total cases were exposed to glyphosate, the number is actually pretty small. I think it was -- I remember 50 total cases.

When you're looking at 47 different pesticides, what can happen is you can really lead to a lot of imprecision in your estimate.

So in this situation, it might be more reasonable to consider the hierarchical, which doesn't lead to so much in precision.

I think they were both -- they both address confounding both ways. I'm not sure I would disregard one more than the other.

14:42:22

14:42:36

Q. Okay. If you look at the logistical regression, every other data point on your forest plot, the ones that you use for your meta-analysis, you always use logistical regression for that; right?

A. Because that was the only model used.

14:42:49

Q. And here, the logistical regression shows 2.1. That's statistically significant; right?

A. Yes, it does.

Q. And if you look at the bottom, it says, "Each estimate is adjusted for use of all other pesticides listed in Table 3, age and study site." That's what it says; right?

14:42:59

A. Yes, it does.

Q. And the title, it says, "Effect Estimates For Use of Specific Pesticides and NHL Incidents, Adjusting For Use of Other Pesticides." That's what it says;

14:43:16

right?

A. Yes. That's what the title says, yes. Just when you read through -- first of all, it's not specifically highlighting the logistic regression column.

14:43:28 And then, secondly, when you look through the actual written methods, it doesn't describe the adjustment for other confounders. So that's -- that's where the confusion is.

Q. Okay. Let's look at the De Roos 2005

14:43:40 publication. Okay?

A. Okay.

MR. WISNER: Permission to publish, your Honor?

THE COURT: Yes. And, actually, before we get into another study --

14:43:47 MR. WISNER: Your Honor, I just want to do this one little thing before we take a break.

THE COURT: Okay. Very good. Which one?

MR. WISNER: 709, your Honor.

THE COURT: Very well. We'll break after this.

MR. WISNER: Thank you. It's very quick.

Q. This is the same author; right, Doctor?

A. Yes, it is.

Q. Dr. De Roos, Dr. Blair; right?

A. Yes.

14:44:03 Q. And this is the first publication of the AHS?

A. Yes, it is.

Q. Okay. As it relates to glyphosate?

A. Yes.

Q. Okay. And then if we go down, actually into the discussion section, there's a whole discussion of the state of science.

And it reads, "The first report of an association of glyphosate with NHL was from a case-control study. But the evidence was based on only four exposed cases."

That's the first Hardell study we looked at; right? It's right on the screen, Doctor.

A. Well, you talked about two Hardell studies.

Q. The first one.

A. On my -- on my summary?

Q. No. This is the older one. This is the 1991 one.

A. Sorry. I see where you're reading, yes.

Q. Okay. If we go down here, they discuss De Roos 2003?

A. Yes, they do.

Q. It says, "A more extensive study conducted across a large region of Canada found an elevated risk of NHL associated with glyphosate use more than frequent than two days" -- that's McDuffie. I'm on the wrong one.

Where are we?

Here we go. "Similarly, increased NHL risk in men was associated with having ever used glyphosate."

And it gives the 2.1 ratio, doesn't it?

14:45:20 A. Yes, it does.

Q. And it says, "After adjustment for the other commonly used pesticides in a pooled analysis of National Cancer Institute's sponsored case-control studies conducted in Nebraska, Iowa and Minnesota"; correct?

14:45:35 A. Yes.

Q. And you assume Dr. De Roos, when she said this, she knew what she was talking about?

A. Yes. Actually, so that really does help clarify it.

14:45:43 Q. Okay. So we agree -- interestingly enough, when she decides to relate the results in the next published literature on this area, she doesn't mention any hierarchical analysis, does she?

A. No, she does not.

14:45:55 Q. She represents the logistical regression; right?

A. Yes, she does.

MR. WISNER: Okay. We can take a break, your Honor.

THE COURT: All right. Ladies and Gentlemen, 14:46:01 let's take the afternoon recess. We'll be in recess

until 3 o'clock. Please remember: Do not discuss the case.

(Recess.)

THE COURT: Welcome back, Ladies and Gentlemen, Counsel.

Dr. Mucci remains under oath.

And, Mr. Wisner, you may proceed.

MR. WISNER: Thank you, your Honor.

Q. Dr. Mucci, just before the break we were looking at this passage from the De Roos 2005 article.

And isn't it true the reports made by these authors report the unadjusted numbers; correct?

A. I'm sorry, was there -- did you end your question? I'm sorry. I couldn't hear you. You were --

Q. Oh, you couldn't hear me? I'm sorry. I was wondering --

A. Sorry.

Q. Isn't it true that the De Roos authors in 2005, when they discussed these other studies, they disclosed the unadjusted numbers; right?

A. I'd have to look through just to remind myself.

Yes.

Q. And so these authors felt that the most important piece of information from these study, at least to report in this paper, was not the adjusted numbers but

the unadjusted numbers; right?

A. Well, these are examples where there were not adjusted estimates to present, so they presented the estimates that they had.

15:03:05 Q. But there was an adjusted number for Hardell 2002. You showed the jury that, didn't you?

A. Yes. I'm sorry. That is correct, yes.

Q. And for McDuffie, I guess there was an adjusted there. They could have put the hierarchical analysis for

15:03:22 De Roos 2003, but they didn't; right?

A. Yes, they did not.

Q. Okay. Let's go back to De Roos 2003. That's the previous -- the next -- 710, Doctor.

And I just want to show you a couple things that

15:03:41 I thought were interesting.

So in De Roos, it states: "The large number of exposed subjects in this pooled analysis allowed adjustment for the use of other pesticides. And hierarchical regression modeling resulted in estimates

15:03:57 that, in some instances, were more stable than those from logistic regression models. However, the effect estimates from the logistical -- logistic and hierarchical analysis were quite similar overall, with a few standout exceptions."

15:04:14 Do you see that, Doctor?

A. Yes.

Q. In the next paragraph, it states: "Adjustment for multiple pesticides suggested there were few instances of substantial confounding of pesticide effects by other pesticides."

Do you see that?

15:04:23

A. Yes.

Q. And this is in a study where they looked at 49 different pesticides and their various interrelationships; right?

15:04:35

A. Yes.

Q. And they said there wasn't any real substantial confounding; right?

A. That's the statement they made, yes.

15:04:41

Q. Now, one of the criticisms you have of this study was that the latency period was not sufficiently long; right?

A. Yes.

Q. And you talked about how -- actually, could we go to the Elmo?

15:04:52

You talked about -- on your diagram here, about when the diagnoses occurred. And you said for De Roos 2003, it would have been between 5 and 12 years --

A. Yes.

Q. -- after exposure?

15:05:05

Your concern about that latency period being too short presumes that the latency period is longer than that; right?

A. Yes, it would.

15:05:21 Q. And if we're in this exploratory area, right, we have a study that we know fully adjusted for other pesticides, was statistically significant, showed a doubling of the risk, wouldn't that lend support to the idea that maybe it's not that the latency is too short, 15:05:41 but maybe the latency is just not that long?

A. In some circumstances, that could be possible, but not necessarily so.

Q. But it's a possibility; right?

A. Yes. And it's a possibility that the 15:05:55 Agricultural Health Study actually investigated as well, and they didn't see any short-term effects of glyphosate in that analysis.

Q. The Agricultural Health Study didn't see any effects.

15:06:07 A. For non-Hodgkin's lymphoma, they did not.

Q. So that doesn't really tell us much about latency, because there's no positive associations to look at; right?

A. Not really. If there were only a short-term 15:06:19 effect, you might see it in that subanalysis. But they

did not.

Q. Okay. But so you agree, then, that the De Roos study, if, in fact, the latency are shorter than 20, 30 years -- let's say they're -- they could be done in a few years, the De Roos study would be consistent with that theory; right?

A. If that were the case, it would be, yes.

Q. Okay.

A. Potentially. Also, Eriksson, just to add, did not see a shorter term effect of glyphosate in their study.

Q. Sure.

And so in De Roos 2003, you decided to put the hierarchical regression on here; right?

A. Yes.

Q. Why didn't you put the logistical regression here?

A. As I mentioned, at that time, it wasn't clear to me whether or not it would be logistically adjusted for all of the other confounders. We discussed that now.

And then at the same time, given that I was wrong in the number of cases, it was only 36 cases to include in the logistic regression, 47 -- 47 different variables can be a concern.

So it can be reasonable in this case to rely on

the hierarchical in that case, because it deals with these multiple exposures in a different way.

Q. So you think that adjusting for the 47 pesticides was too much?

15:07:37 A. It can -- when you have so few cases, it can be a problem, yes.

Q. Now, the last one on here is the Eriksson study, and I kind of want to go through all of them with you, but I want to do this one quickly and see if I can just

15:07:52 do it by talking about it.

A. Okay.

Q. The Eriksson study, again, was a population-based study; right?

A. Yes, it was.

15:07:56 Q. And, actually, all of these were population based?

A. Not Orsi, but the others were.

Q. Sorry. That's a hospital one.

A. Yes.

15:08:02 Q. But the rest of them are population based?

A. Yes.

Q. So they're pulled from people; right?

A. Yes.

Q. Gardeners?

15:08:07 A. A whole range of individuals in the population.

Q. It's not just professional pesticide applicators; right?

A. Correct.

Q. Okay. And so presumably they capture all sorts of different types of real-world human exposures?

A. Yes.

Q. All right. And the Eriksson study, that had a statistically significant doubling of the risk when it was not adjusted; right?

A. Correct.

Q. It was, like, 2.02; right?

A. Yes.

Q. It's not on here.

A. It is not on there, no.

Q. And then when you adjust for those other pesticides, you get 1.51; right?

A. Yes.

Q. Now, the authors didn't think that that adjusted number was right, though, did they?

A. I'm not -- I'm not sure. They --

Q. Let's look at it. It's Exhibit 758.

MR. WISNER: Permission to publish, your Honor?

THE COURT: Very well.

Q. BY MR. WISNER: So we're looking at Eriksson. The one we were talking about; right?

A. Yes. Sorry, I can't hear when you're looking there.

Q. Sorry. Fair enough.

We have Eriksson and Hardell again; right?

15:09:20 A. Yes.

Q. And now we've got these two new guys to the party; right?

A. Yes.

Q. And they're, again, looking at the Swedish data;

15:09:29 right?

A. Yes.

Q. And here they did another analysis. And let's just go to their conclusions.

You know, you mentioned that your only exposure

15:09:36 to the mechanistic data was from the epi studies; right?

A. Yes.

Q. So right down here it says, "Glyphosate is a broad-spectrum herbicide, which inhibits the formation of amino acids in plants. The US Environmental Protection

15:09:54 Agency and the World Health Organization has concluded that glyphosate is not mutagenic or carcinogenic. Since then, however, some experimental studies indicate genotoxic, hormonal and enzymic effects in mammals as reviewed. Of particular interest is that glyphosate

15:10:12 treatment of human lymphocytes *in vitro* resulted in

increased sister chromatid exchanges, chromosomal aberrations and oxidative stress."

Do you see that?

A. Yes.

15:10:25 Q. Did you take a look at those studies that they cite or no?

A. No.

Q. Okay. Do you have a reason to dispute this?

A. I -- what is stated there, no.

15:10:33 Q. So this would be what we call biological plausibility; right?

A. Yes.

Q. And don't worry. The jury has heard a lot about chromatid exchanges and oxidative stress, so we'll move

15:10:47 on to the next paragraph.

And that is -- it goes on talking about glyphosate. It says, "Glyphosate was associated with a statistically significant increased odds ratio for lymphoma in our study. And the result was strengthened

15:10:59 by a tendency to dose-response effect, as shown in Table 2."

And, in fact, what they saw was, in their data, if you were exposed to glyphosate for greater than ten days a year, you had a more than doubling of the risk;

15:11:12 right?

A. Yes. And that was unadjusted for other pesticides.

Q. Unadjusted aside, it was doubling. And it was statistically significant; right?

15:11:20 A. Yes.

Q. And, in fact, both McDuffie and Hardell are consistent in showing that greater use shows greater risk?

A. Well, the relative risks are positive. Again, 15:11:34 they're not adjusted for other pesticides.

Q. It says, "In our former study, very few subjects were exposed to glyphosate. But a nonsignificant odds ratio of 2.3 was found. Furthermore, a meta-analysis combining that study with an investigation on hairy cell 15:11:54 leukemia, a rare NHL variant, showed an odds ratio for glyphosate of 3.04."

That was statistically significant.

Do you see that?

A. Yes, I do.

15:12:03 Q. So, again, they're reporting the unadjusted numbers; right?

A. Yes, they are.

Q. And then it says, "Recent findings from other groups also associate glyphosate with different B-cell 15:12:16 malignancies, such as lymphomas and myeloma; right?

A. That's what it says, yes.

Q. And multiple myeloma is not considered NHL, is it?

A. Yes.

15:12:24 Q. "Glyphosate has succeeded MCPA as one of the most used herbicides in agriculture. And many of the individuals that used MCPA earlier are now also exposed to glyphosate. This probably explains why the multi-variate analysis does not show any significant odds

15:12:43 ratios for these compounds."

Do you see that?

A. Yes.

Q. Let's look at the table that they're referring to. It's Table 7. And it shows right here what they're

15:12:53 talking about. Glyphosate, by itself, is doubling of the risk, statistically significant; right?

A. Yes.

Q. And then in the multi-variate analysis, it decreases to 1.51; right?

15:13:03 A. Yes.

Q. And it's no longer statistically significant?

A. Yes.

Q. But, again, like we saw in the earlier study, and like we've seen in pretty much all the other studies,

15:13:13 it's still above 1, even when you adjust?

A. Well, that is true. It's not a statistically significant finding. And, in fact, actually, that comment that you highlighted in the text, highlights the issue of confounding.

15:13:30 Q. Well, it's -- it's caused issue collinearity. It's not necessarily --

A. Not collinearity, but the fact the exposures are co-occurring, and then when you adjust for them mutually, they are adjusting for other -- it is adjusting for other

15:13:43 confounders.

Q. But if MCPA doesn't cause NHL, then it's not a proved confounder; right?

A. That is incorrect.

Q. Okay. All right. So one of the things that I

15:13:57 wanted to ask you about -- actually, we can move on.

So if we go back to the odds ratios -- so this is your chart. And, again, the Eriksson study doesn't show the 2.2 statistically significant results; right?

A. That is correct.

15:14:17 Q. And it doesn't show the dose -- response dose of ten -- greater than ten days, does it?

A. No, it does not.

MR. WISNER: Your Honor, permission to publish Plaintiff's Exhibit 1022?

15:14:29 THE COURT: Any objection?

MR. LOMBARDI: No objection, your Honor.

THE COURT: Very well.

Q. BY MR. WISNER: So, Doctor, this is the forest chart that Dr. Portier showed the jury. And he reports the adjusted and unadjusted numbers, doesn't he?

15:14:47

A. Yes, he does.

Q. And he -- he even reports the hierarchical analysis, doesn't he?

A. Yes, he does.

15:14:59

Q. And he notes that you can't even do a never ever with Andreotti, because they actually didn't give you that number, did they?

A. That's actually not correct. You can calculate it from the data they provide you.

15:15:10

Q. How would you do that?

A. It's very simple. Just as you would do a meta-analysis of published estimates, you can take the estimates and do a weighted estimate to come up with it. Basically, it's a meta-analysis of the data.

15:15:20

Q. How did you do that?

A. I used a program to do the meta-analysis, taking each relative risk from each of the quartiles. I weighted them by the inverse of the number of cases in each group, and I came up with a summary estimate for the exposed group. That's a standard approach in

15:15:35

epidemiology.

Q. Okay. The -- so he shows all this data, and if you --

Now, if we go through this very quickly, because
15:15:57 we don't have all day, but if we go through this, the stuff that comes out to make it look like yours is this one (indicating), this one (indicating), this one (indicating). And you didn't discuss this meta-analysis; isn't that right, Doctor?

15:16:12 A. No, that's not correct. Because I used the results from Pahwa in my meta-analysis instead of De Roos and McDuffie.

Q. I'm talking about the one that's on the screen.

A. This is not a meta-analysis.

Q. I'm sorry.

A. This is just presenting a summary of the relative risks from those summaries.

Q. Fair enough.

In your summary that you reported, which was
15:16:32 Mr. -- Dr. Portier's summary, plot summary, right, to make it look like yours, we have to get rid of these ones that I marked red; right?

A. Let me just see.

Yes.

15:16:48 Q. You have to get rid of all the statistically

significant doubling of the risks; right?

A. The reason those were excluded, as I said, I -- which is a standard approach if you are doing a meta-analysis, would be to take the most fully-adjusted estimate. So that's the reason that I presented those estimates there.

Q. Okay. And you say that notwithstanding that, these same authors, in later publications, didn't report that; right?

A. They -- I'm not sure why they didn't highlight the adjusted -- fully-adjusted estimates. Although, IARC in their meta-analysis actually did take those fully-adjusted estimates.

Q. Could it be that the authors who actually did the study have a better sense of the data than you?

A. I -- well, if that is the case, then, I guess, why would IARC do what they do, which is the approach that I took?

Q. But IARC concluded, based on this data, that there was a credible causal association.

A. And they felt the epidemiology at the time was limited, and they couldn't allow bias with confounding and chance. Now, we actually have two additional sets of data to add to that.

Q. Do you know the definition of limited?

A. I -- in the context of IARC?

Q. Yeah.

A. Yes.

Q. And it's evidence of a credible causal association; right?

A. I don't believe that's the definition of limited.

Q. Let's take a look. 166. I'll come hand it to you.

MR. WISNER: Permission to approach, your Honor?

THE COURT: Yes.

Q. BY MR. WISNER: Doctor, I'm handing you Exhibit 166. This is the IARC preamble. This is what we're talking about; right? Right, Doctor?

A. Yes, it is.

Q. All right.

MR. WISNER: Permission to publish, your Honor?

THE COURT: Very well.

Q. BY MR. WISNER: So it's on the screen here, and the jury has seen this a lot. I don't want to spend too much time on it.

I just want to show you the definition of limited. Here we go -- here we go: "Studies of cancers in humans, qualities considered, temporal effects, criteria for causality."

Here we go. It's on page 19. And it's under "Carcinogenicity For Humans." And it says, "Limited evidence of carcinogenicity."

Do you see that on the screen, Dr. Mucci? Do you see that?

15:19:56

A. Yes.

Q. All right. It reads: "A positive association has been observed between the exposure of the agent and the cancer for which a causal interpretation is considered by the Working Group to be credible. But chance, bias or confounding cannot be ruled out with reasonable confidence."

15:20:07

That's the defense admission of limited; right?

A. That is a definition that they said -- that just sounds different than what you had said the definition was.

15:20:27

Q. Oh, I said they found a credible causal association. That's pretty much what that says; right?

A. Again, what you had said earlier just seems different from -- from what this is. But I can see what they've said here, yes.

15:20:39

Q. Okay. All right. Let's go back quickly to the -- the Elmo.

And, Doctor, you -- you presented to the jury the NAPP study. Do you recall that?

15:20:56

A. Yes.

Q. And the NAPP study, is that a combination of -- of what studies?

A. It includes the three US case-control studies that were summarized in De Roos 2003, as well as the Canadian study of McDuffie.

Q. So it's De Roos 2003 and McDuffie; is that right?

A. Yes.

15:21:22 Q. That would be what? Eight-seven?

A. Yes.

Q. Okay. So this is some of the results that you showed then; right?

A. Yes.

15:21:32 Q. And it says, "Overall 113"?

A. Yes.

Q. Where did the other ones come from?

A. I think in part with the De Roos analysis, there was substantial missing data on all 47 pesticides. So 15:21:44 some of the individuals dropped out from that analysis. I think some of the cases came back in there.

In addition, I believe -- I may be wrong -- that this particular analysis also included women. That may be the reason.

15:22:00 Q. You're guessing; right?

A. Well, I -- they don't tell you specifically the exact number of cases, but I do know from the De Roos study there were, I belive, at least 20 percent of the participants' data was missing. So that's a substantial number of cases. That may explain the difference.

Q. Okay. And it would be helpful to see a publication, so they could tell you where these other cases come from; right?

A. Yes. And I have seen a draft of the publication.

Q. Okay. We'll look at that in a second. But this is what you showed the jury, and I thought it was interesting, because you have the overall risk in these two numbers here; right?

A. Yes.

Q. And they're both adjusted for proxy responses; right?

A. Yes.

Q. And so this one right here has an elevated rate, even with the proxy respondents adjusted for; right?

A. It does. But that's not the correct way to deal with proxy bias. Proxies aren't confounders. You know, putting it in the model as adjusting for it as if it were confounder. This is a different type of bias that's not eliminated by adjustment for it that way.

Q. The adjustment for state and province. Are you saying state and province is a confounder?

A. If -- I'm not sure why they did or didn't include it. But if they -- if it was a confounder, if it was -- I believe the -- they considered variables that were associated with the exposure. Maybe the use of glyphosate differs in different states. And potentially the distribution of cases and controls varied in the different states. So that could have been a reasonable thing to adjust for.

Q. Now, you didn't discuss this other area. I notice down here there's the "other"; right?

A. Yes.

Q. And that refers to the other things that's not these three cancers; right?

A. Yes.

Q. And T-cell lymphoma would be in the "other"?

A. Yes.

Q. Which would include mycosis fungoides?

A. Yes. Although, I'm not sure if there were any cases of that in -- in this data.

Q. It would be good to see the studies; right?

A. Yes.

Q. All right. Now, this is the one --

A. I'm sorry, we do have the studies, actually,

because we have the original case-control studies. They just don't break out that distribution layer.

Q. Okay. Now, you understand that -- that in the area of lymphoma -- non-Hodgkin's lymphoma, T-cell is, like, 15 percent of the cases; right?

15:24:16

A. Yes.

Q. And then within the T-cell lymphoma umbrella, mycosis fungoides is, like, 1 percent?

A. It's very rare, yes.

15:24:24

Q. So it would be impossible, really, to do, for example, a cohort study on mycosis fungoides; right?

A. It would be very challenging, but not impossible.

Q. You would need, like, millions of people to do that; right?

15:24:38

A. Yes. For example, the National Cancer Institute has a pooling of 15 perspective cohort studies, which include over a million individuals. So potentially there you could study it.

15:24:51

Q. Yeah, but you'd have to get a lot of data from a lot of people to get there.

A. They pulled together all these 50 cohorts together already, so you could potentially look at it there.

15:25:00

Q. That's what I'm saying, is that when you get to

rarer cancers, you need more data to see anything?

A. When the cancer is rare, you need -- yes, you need a lot of follow-up and a large number in the cohort, yes.

15:25:11 Q. And, generally, you know, non-Hodgkin's lymphoma, even that is pretty rare?

A. It's relatively rare, yes.

Q. Okay. Now, I want to show the jury -- you showed the jury one --

15:25:21 Back up. You feel it's really important to present all the evidence; right?

A. Yes.

Q. And you didn't show the jury a bunch of other NAPP results, did you?

15:25:30 A. In the interest of time, no.

Q. So you showed them one presentation from August of 2015?

A. Yes.

Q. You didn't show them any of the three other

15:25:40 presentations, did you?

A. I have only seen two other presentations.

Q. Okay. You didn't show them the draft manuscript, did you?

A. No.

15:25:49 Q. All of those other ones contradict what you

showed them in that one, don't they?

A. No, that's not correct.

Q. Okay. Well, let's look at one of them, and let's see what it says.

15:25:59 Let's turn to -- let's turn to Exhibit 836. It should be in your binder.

Are you there?

A. Yes.

Q. This is one of those presentations; right?

15:26:31 A. Yes. It's a few months earlier than the one that I presented the results from.

Q. And it's one you didn't show the jury?

A. Correct.

MR. WISNER: Okay. Permission to publish, your

15:26:40 Honor?

MR. LOMBARDI: No objection.

THE COURT: Very well.

Did you say this is Exhibit 836?

MR. WISNER: Yes.

15:26:46 THE COURT: Very well.

Q. BY MR. WISNER: All right. Here we go.

It looks very similar to the one you showed the jury; right?

A. Yes.

15:26:54 Q. And it was presented on June 3rd, 2015; right?

A. Yes.

Q. And it says -- okay. So let's go through this. If you go through the slide, it talks about the increased use of glyphosate in the United States; right?

15:27:07 A. Yes.

Q. And it shows this picture?

A. Yes.

Q. And then it goes into -- talks about IARC?

A. Yes.

15:27:17 Q. And it goes on to talk about the study and how it works and who did the questionnaires; right?

A. Yes.

Q. Okay. And then it presents some data.

Let's go to -- let's go to the overall data; right?

15:27:32 A. Yes.

Q. So this one has an odds ratio of 1.22; right?

A. Yes.

Q. And if we go down here, it says, "Adjusted for age, sex, state, province, lymphatic or hematopoietic cancer in a first-degree relative, use of proxy respondents, use of protective personal equipment and use of 2,4-D, use of dicamba and use of malathion."

Do you see that?

15:27:58 A. Yes.

Q. So this result adjusts for, like, everything?

A. It adjusts for a number of factors, yes.

Q. And while the overall result is not statistically significant, it's pretty close.

15:28:10 A. Although -- actually, the relative risk is quite similar to what we saw in the August 2015 presentation. The relative risks are quite similar.

Q. Okay. But almost statistically significant, the overall risk; right?

15:28:24 A. I'm not sure what the P value would be there, but yeah.

Q. Okay. But then for the other, which is where we find our T-cell lymphoma, that is statically significant?

A. Yes, it is.

15:28:33 Q. After all those adjustments?

A. Yes.

Q. And if we go down, we have the duration of use; right?

A. Yes.

15:28:40 Q. And, again, this is for someone who's used it for -- it's broken into 3.5 years; right?

A. Yes.

Q. And if you used it for less than 3.5 years, you're in the first group. And then if you used it for

15:28:55 greater than 3.5, you're in the bigger group; right?

A. Yes.

Q. And, again, the overall risk it's elevated, and it's really close to being statistically significant; right?

15:29:04 A. Yes.

Q. Because it says, ".97."

Do you see that?

A. Yes.

Q. Okay. And then -- and that's for the middle

15:29:09 group. Then if we go to the middle group, I think -- and you understand Dewayne Johnson only used it for about two-and-a-half years; right?

A. Yes.

Q. Okay. So he'd been in this group?

15:29:18 A. Well -- yes. Although, I think the important consideration is this probably isn't the right estimate of dose. If he only used it for two years, but used it a lot more often, that's what's really important in terms of dose response. You want to look at not only the

15:29:36 number of years, but the number of days per year. Those two things are important.

Q. Couldn't agree more.

So "other," that would be the T-cell. And that would be the doubling of the risk. That's statistically

15:29:48 significant; right?

A. But that's for -- that is for the middle category. You don't see that same association --

Q. Sure. But for the middle category, where -- where we would put Mr. Johnson, that is statistically significant; right?

15:29:58

A. That one is, yes.

Q. And this is adjusted for all the same stuff: Proxy respondents and other pesticides; right?

A. Yes, it is.

15:30:05

Q. Okay. Let's go down to the next one.

This is two days per year. We've seen this in McDuffie; right?

A. Yes, we have.

Q. And your biggest gripe with McDuffie was it

15:30:18

didn't adjust for all the stuff?

A. No. That was only one of the gripes with their data.

Q. Fair enough.

But one of the issues was proxies and adjustment

15:30:29

for confounders; right?

A. Yes.

Q. Okay. This shows greater than two days overall, a 1.98 risk rate. That is statistically significant; correct?

15:30:39

A. Yes, it is.

Q. And adjusts for proxies, and it adjusts for other pesticides?

A. Again, it does adjust for other pesticides, but it doesn't deal with the issue of bias due to proxies.

15:30:50 Q. Okay. I understand you think that's not the right way to do it. I appreciate that. But they did adjust for proxies; right?

A. They did, but it's not going to get rid of the bias in the proxies.

15:31:01 Q. Okay. And, actually, the P trend statistic; right?

A. Yes.

Q. And that's statistical significance?

A. Yes, it is.

15:31:07 Q. So that means not only is the greater than two days statistically significant, it actually shows a statistically significant dose response?

A. In this particular measure of dose, yes.

Q. All right. All right. And this is finally the

15:31:22 last one. This is the greater than seven day -- lifetime days; right?

A. Yes.

Q. Now, this is a little confusing, but someone who, for example, used it once a day for seven years

15:31:32 would fall into this category; right?

A. Yes.

Q. So this doesn't reflect somebody who uses it, I don't know, 40, 50 times a year?

A. It would. They would be in that category as well.

Q. Yeah, but it would -- they'd be in the same category as the occasional user over seven years?

A. Yes.

Q. Okay.

A. Although, in this case, I think given the short amount of time that was being used, and when you look at the range of exposure in this population, I don't think you would have anybody in that category.

Q. Okay. And this is the results. And, again, this one is adjusted for all the things you like. And it doesn't show -- they're all elevated, but there's nothing statistically significant?

A. I wouldn't say that they're all elevated. I think some of them are very consistent with no association.

Q. Fair enough.

So that one's elevated; right?

A. That is not an elevated risk, no.

Q. It's above 1.

A. The number is above 1, but you wouldn't call

this necessarily an elevated risk.

Q. And all these numbers are above 1, as well; right?

A. Again, the same issues. The numbers are larger than 1, but -- again, I think while the numbers are potentially larger than 1, they don't suggest a positive association.

Q. Okay. So you didn't show this presentation to the jury, did you?

A. No, I did not.

Q. You showed the one from August; right?

A. Yes, I did.

Q. And is that because that's the last one?

A. That is because that was the one where that data was also used in the draft manuscript from Dr. Pahwa. So that's why -- that was the one I highlighted. That was the one they highlighted in their results in the draft manuscript.

Q. The draft manuscript, we'll bring it back. One second.

But that's the draft manuscript that says -- it confirms IARC?

A. It -- I would want to take a look at that.

Q. Okay. We'll do that in one second.

Doctor, you didn't show the jury this one,

because this doesn't really support your story, does it?

A. That wasn't the reason I didn't highlight this one. I think the findings for overall risks are very consistent across these two sets of slide decks here.

15:33:50 Q. All right. Let's look at the draft manuscript, 622. It should be in your binder.

MR. WISNER: Permission to publish, your Honor?

THE COURT: Any objection?

MR. LOMBARDI: No objection.

15:34:01 THE COURT: Very well.

Q. BY MR. WISNER: So this is the draft manuscript that we're looking at, Doctor; right?

A. Yes.

Q. It's dated September 2015; right?

15:34:09 A. Yes, it is.

Q. So this is after the presentation you showed the jury?

A. Yes, it is.

Q. And it has a bunch of authors on here; right?

15:34:15 A. Yes.

Q. It has Dr. Pahwa, and it has Dr. Blair.

Do you see that?

A. Yes.

Q. Actually, quite a few of these are authors that

15:34:26 are actually on the -- the current AHS publication;

right?

A. Yes. Yes, they are.

Q. All right. And then what we see here, if we go down -- I don't want to spend too much time on this, because we've got to get going.

But let's go to page 12. It's already highlighted. It looks like the author, whoever wrote this document, highlighted it. That was not me, Doctor. Okay?

And it says right here, "Our results are also aligned with findings from epidemiological studies of other populations that found an elevated risk of NHL for glyphosate exposure and with a greater number of days per year of glyphosate use. As well as a meta-analysis of glyphosate use and NHL risk. From an epidemiological perspective our results were supportive of the IARC evaluation of glyphosate as a probable Group 2A carcinogen for NHL."

Do you see that, Doctor?

A. Yes, I do.

Q. Remember earlier we are talking about whether or not you thought it was limited or association, and we had that big back and forth? Do you remember that?

A. Yes.

Q. You said, based on the new data, which included

NAPP, you no longer agreed with IARC's assessment of -- of the epidemiology. You thought, actually, it was now even worse.

A. I'm sorry, could you restate the question?

15:35:53 Q. Let me put it this -- simply: These authors seems to think their data supports IARC?

A. Well, actually, while they do say this here, actually, later on in this draft manuscript they highlight the confounding that they see in their data

15:36:08 when they adjust for other pesticides.

Q. Sure.

But they don't ever talk about IARC again in this draft, do they?

A. No, they don't.

15:36:19 Q. And the one time they do, they say this confirms it, don't they?

A. I -- it said -- what they say specifically were those results were supportive of the IARC evaluation of glyphosate as a probable carcinogen, yes.

15:36:42 Q. All right. Let's move on to AHS. Okay?

Oh, actually, if we put up the Elmo again.

MR. WISNER: Permission to publish the slide?

THE COURT: All right.

Q. BY MR. WISNER: Doctor, this is the

15:36:56 meta-analysis you presented to the jury; right?

A. Yes, it is.

Q. And this NAPP number right here (indicating), right, that number is not the numbers that we were talking about from June of 2015; right?

15:37:09 A. No. That particular number came from the August -- August 2015, which is also included in the draft manuscript. It is the number where they've adjusted for other pesticides and where they've limited the data to the -- only the self-respondents. They're

15:37:30 getting rid of the proxy data.

Q. Now, Doctor, they haven't published the manuscript, have they?

A. No, they have not.

Q. It's been, like, over three years; right?

15:37:39 A. Yes, it has.

Q. So don't you think it's a little weird to base your opinion on data that hasn't gone through peer review or been subjected to a finalization by their own authors?

A. Well, actually -- I mean, because it's been

15:37:53 presented at a public meeting, that is -- while it's not a peer-reviewed journal, it is going through a scientific review process. So I -- I think it's a valid set of data to present.

Q. You know Dr. Portier's a biostatistician; right?

15:38:08 A. Yes.

Q. And he -- he actually went through all the data for this and NAPP, and he said the numbers just don't add up. Did you know that?

A. No. I'm not sure what he means by that, but no, I did not know that.

Q. Well, he's counted the number of cases in all these underlying studies, and there were cases that could not be explained in the NAPP, data that was being presented. Do you know that?

A. I -- I did not know that, but I can understand where he's coming from.

Q. And you know Dr. Neugut. He's a pretty esteemed epidemiologist; right?

A. I'm not sure of Dr. Neugut. I don't really know him. I couldn't say.

Q. You cite him, like, seven times in your book, don't you?

A. Yes, I do. His work. But I don't know him personally or his work, really, to much extent.

Q. He's kind of like the grandfather of cancer epidemiology; right?

A. No, he's not.

Q. Okay. That's John Snow; right?

A. No, he's not. No. That's not --

Q. That was a joke. I was messing around. It's

funny because of, you know, Game of Thrones. All right.

You've read the deposition of Dr. Blair; right?

A. Yes.

Q. And Dr. Blair was deposed specifically about the new AHS data; right?

15:39:18

A. Yes. But I don't think I've read that part of it.

Q. Oh, you didn't read the part where he says his opinion doesn't change?

A. No, I did not.

15:39:27

Q. That's kind of an important part to read, don't you think?

A. Again, given how many documents I've read through, I think what I was most interested in was reviewing the actual individual epidemiology studies.

15:39:38

Q. Why did you read Dr. Blair's?

A. Again, I've read pieces. These documents are hundreds of pages long. This really -- I went through and reviewed part of the documents.

Q. Was it the pieces that your lawyers gave you?

15:39:55

A. No, it was not. Actually, they gave me the entire document.

Q. All right. Let's go through the AHS.

And the most recent version is in the Andreotti paper from 2017/18; right?

15:40:07

A. Yes.

Q. It was published online in 2017, but officially published in 2018?

A. Yes.

15:40:16 Q. And is it fair to say that this document was published because of the, sort of, publicity created around this lawsuit?

A. I have no reason to believe that's the case, no.

Q. I mean, there was, like, a strong push on MCI to

15:40:33 get the data out, wasn't there.

A. Again, I -- I don't know what the motivation for publishing the study was. And there's no indication on the manuscript that would be the case.

Q. Okay. Do you know if Monsanto was orchestrating the outcry?

MR. LOMBARDI: And, your Honor, I've let this go a couple questions, but there's no foundation for this. There's no proof in the record, and it's not true.

THE COURT: Objection. Sustained.

15:40:52 Q. BY MR. WISNER: Let's go to the study, Doctor. But before I do that, I want to show you something that's in evidence.

MR. WISNER: Permission to approach, your Honor?

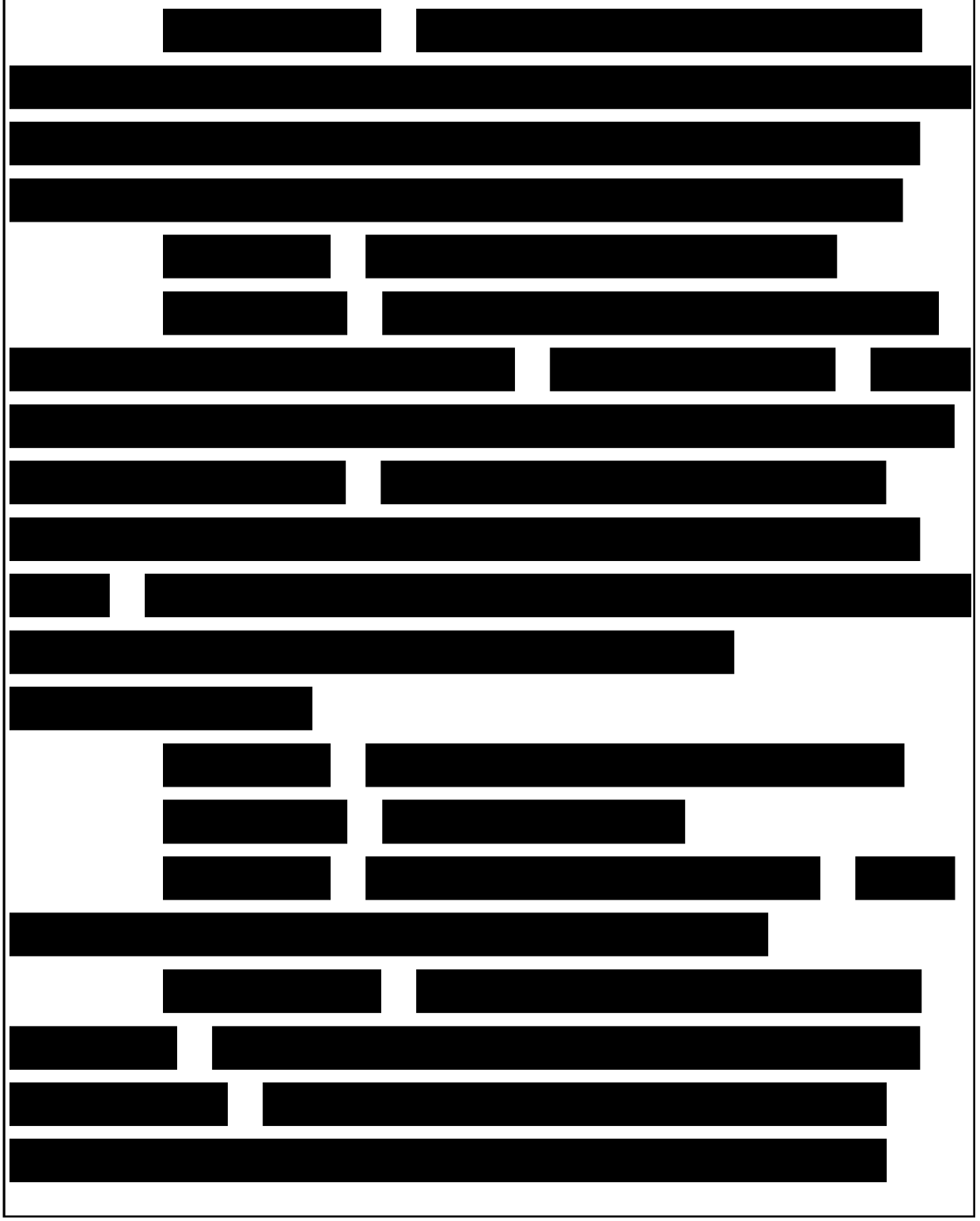
THE COURT: Yes.

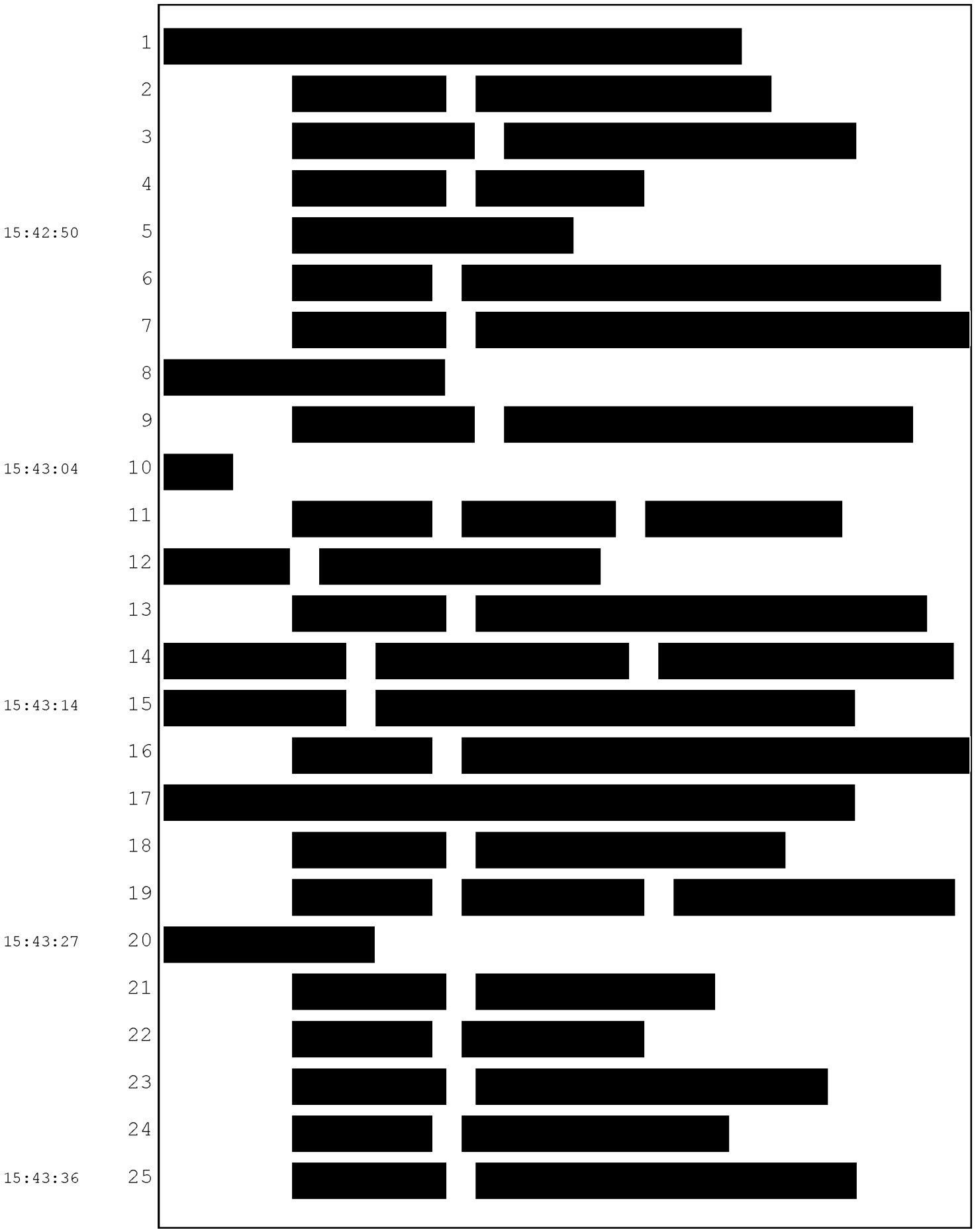
15:41:06 Q. BY MR. WISNER: Doctor, I'm handing you --

MR. LOMBARDI: I'll let him hand it, but, your Honor, we'll need a sidebar.

THE COURT: Okay.

(Sidebar.)

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[redacted]

(End sidebar.)

THE COURT: Please continue, Mr. Wisner.

Q. BY MR. WISNER: Do you know who John Acquavella is?

A. Yes, I do.

Q. Who he is?

A. He is a scientist who -- yes, he's a scientist who's been involved in a number of studies on pesticides.

15:44:58 Q. And he used to work for Monsanto?

A. Yes, he did.

Q. He used to be an epidemiologist for them; right?

A. Yes.

Q. The document that's in front of you, have you

15:45:19 seen it before?

A. Yes, I have.

Q. Great.

MR. WISNER: Can I use it, your Honor?

THE COURT: All right. Yes, if she's seen it

15:45:24 before.

MR. WISNER: Permission to publish, your Honor?

THE COURT: Just one moment.

All right. Very well.

Q. BY MR. WISNER: All right. Doctor, I'm showing

15:45:46 this on the screen. This is a document dated July 22nd, 1997.

Do you see that, Doctor?

A. Yes, I do.

Q. And this is written by John Acquavella.

15:45:55 Do you see that?

A. Yes.

Q. And this is specifically about the Agricultural Health Study; right?

A. Yes.

15:46:02 Q. All right. And he discusses the AHS rationale. Just to be clear, the time frame here -- this is before -- this is before any data has come out from the study; right?

A. Before any data on NHL and glyphosate.

15:46:18 Q. So before there's any good data from Monsanto; right?

A. It was before the AHS had published on glyphosate and NHL risk.

Q. "The rationale for the AHS derives from the

15:46:33 results of a number of poor studies which found associations between farming or pesticide exposure vaguely defined in various diseases. The AHS is intended to advance the science in this area by creating a human living laboratory from decades of research, thus the time

15:46:50 horizon for definitive research is long. In the short-term, the AHS investigators will work to confirm some existing theories, for example, 2, 4-D and lymphoma, but the viability and eventual impact of the AHS will depend on the investigators' ability to generate a new

15:47:10 class of scientific leads, most of which will be invalid.

"This has the potential to be disruptive for the agricultural chemical industry as new leads potentially take on a life of their own. Perhaps the best way to position AHS is as part of a learning process. The learning process will take years to be resolved and will need to incorporate information from other research, example, studies of manufacturing workers, before any conclusions can be established as valid."

Do you see that?

15:47:39 A. Yes, I do.

Q. Do you agree that that was a proper view of it in 1997?

A. There's a lot of text this, so I guess -- do you want me to comment on each of the sentences specifically

15:47:51 or --

Q. That's fine. So there are some things you agree with, some things you don't?

A. Correct.

Q. Okay. It says, "Studies of manufacturing

15:47:58 workers."

Do you see that?

A. Yes.

Q. Are you aware if Monsanto has ever conducted a study on manufacturing workers?

15:48:05 A. No, I'm not.

Q. Okay. All right. So it says, "The ideal studies. The limitations of the AHS can be illustrated by comparison with the hypothetical ideal study."

Do you see that?

15:48:23 A. Yes.

Q. It lists a bunch of different topics; right?

A. Yes.

Q. One of them is accurate exposure assessment --

A. Yes.

15:48:29 Q. -- right?

Now, when we talk about misclassification of exposure, what we're talking about is that in some studies, people who are actually exposed can be classified as unexposed and some people who are maybe

15:48:44 unexposed can be classified as exposed; right?

A. Yes.

Q. And if you have that problem, it creates a lot of noise in the study, it can obscure risks; right?

A. It can attenuate the results, yes.

15:48:59 Q. Now, in the study -- he goes, "Hypothesis: Most of the diseases to be studied in the AHS have scant reasons to link them putatively to pesticide exposure. Thus, much of the research can be termed 'exploratory.'"

Do you agree that the AHS study was exploratory?

15:49:20 A. No.

Q. Okay. So it was specifically designed for a specific pesticide?

A. So I think you need to -- I need clarify what I mean by that --

15:49:31 Q. Sure.

A. -- and specifically -- it's typical with many cancer epidemiology studies that we collect a large amount of data that, then, you know, an investigator many years in the future, you can come up with new hypotheses, 15:49:48 very specific hypotheses, to test for the new data.

So perhaps at the time when this was written -- and, again, I don't know exactly what was happening in 1997, but just because they didn't have a specific hypothetical about glyphosate and NHL risk doesn't mean 15:50:05 they can't have a well-founded hypothesis-driven analysis of the data. I mean, this is very typical of what we do with these cohort studies and really take into account the richness that these studies provide us.

Q. Okay. Let's move on to the next part. It says, 15:50:21 "Exposure assessment: The exposure assessment in the AHS will be inaccurate."

Do you see that?

A. Yes, I do.

Q. And it says, "Exposure assessment will be based 15:50:30 on historical usage as reported by the farmer or

applicator on the study questionnaires"; right?

A. That's what it says, yes.

Q. And he lists two problems. I don't really want to get into those yet. We'll get into them in a second.

15:50:46 Then he goes, "Inaccurate exposure classification can produce serious results. The conventional thinking in epidemiology is that exposure misclassification will most often obscure exposure disease relationships."

And by obscuring relationships, that's a false

15:51:03 negative; right?

A. It could be a false negative, yes.

Q. "More recent thinking has begun to recognize that it can also create spurious exposure disease associations. In a study of this size, there will be

15:51:16 some, perhaps many, spurious exposure disease findings due to exposure misclassification."

Do you see that?

A. Yes, I do.

Q. All right. Now, you understand, because you've

15:51:26 read our experts' reports, that our position is that the AHS had a lot of exposure misclassification; right?

A. That is your position, yes. However, actually, I think one of the strengths of the AHS cohort was they actually in multiple different studies assessed whether

15:51:45 exposure misclassification was there.

Q. You -- I'd like to show the jury the actual questionnaire for exposure. Okay? You've actually reviewed that for the AHS; right?

A. Yes, I have.

15:51:59 MR. WISNER: Permission to approach, your Honor?

THE COURT: Yes.

MR. LOMBARDI: Your Honor, just for my planning purchases, what's the timing?

THE COURT: Well, Mr. Wisner, you have ten more

15:52:09 minutes left, and then each of you, I think, agreed to divide the last half hour.

MR. WISNER: I've handed the witness Exhibit 1060.

Q. Doctor, this is the questionnaire; right?

15:52:27 A. This is the enrollment questionnaire, the based on questionnaire.

Q. And so let's set the scene; right? We've got people who have just taken their pesticide license testing; right?

15:52:38 A. Yes.

Q. And they're asked after the test, "Hey, will you participate in this cohort study?"

A. Yes.

Q. And some people said, "Yes," and some people

15:52:47 said, "Do I have to," and they said, "No," and then they

(inaudible) out; right?

A. A certain proportion of them agreed to be part of the study.

Q. Okay. And then they had to sit down and they fill out this thing right there on the spot; right?

15:52:55

A. Yes.

Q. And they were also given supplemental things to take home?

A. Yes.

15:53:03

Q. And after they filled it out, people went home with the supplemental things, and they reviewed it, and some of them sent them back.

A. Correct.

Q. About half?

15:53:13

A. Correct.

Q. So let's look at the actual questionnaire that they got.

MR. WISNER: Permission to publish, your Honor?

THE COURT: Any objection?

15:53:20

MR. LOMBARDI: No objection.

THE COURT: Very well.

Q. BY MR. WISNER: So this is the Agricultural Health Study questionnaire. "The questionnaire will take approximately 25 minutes to complete."

15:53:29

Do you see that?

A. Yes.

Q. And then if you turn the page, it has all of these questions, and you have to, like, fill in the bubbles and stuff; right?

15:53:34 A. Yes. This is a standard epidemiology questionnaire.

Q. Yeah. Okay. And then we get to the pesticide area, and this is Question 11, and it asks you to: "Please complete the following questions about your

15:53:50 personal use of the specific pesticides listed below"; right?

A. Yes.

Q. This is where we're getting the exposure data for the people in the cohort?

15:53:57 A. Correct.

Q. This is, like, between 1993 and 1997?

A. Yes, correct.

Q. Okay. And then for -- on this page, we actually have Roundup.

15:54:09 Do you see that?

A. I'm sorry, which page is it?

Q. This is page 10.

A. Yes.

Q. And this person who just took this test, right,

15:54:22 has to figure out on the spot if they've ever applied

Roundup; right?

A. Yes.

Q. How many years they'd personally done it?

A. Yes.

15:54:32 Q. They have to say on an average year how many days per year did you apply it?

A. Yes.

Q. And when did you first personally use this pesticide; right?

15:54:41 A. Yes.

Q. And actually, there's a before 60, so it -- you could actually pick the wrong one?

A. Yes. Although, there's a validation showing that was not the case for glyphosate.

15:54:51 Q. No, I know. I'm just saying it's possible.

So they have to fill this all out. They don't have access to any of their records; right?

A. No, they don't.

Q. They can't call up their wife and say, "Hey, 15:55:03 when did we start planting that crop that we used Roundup," or any of that?

A. No, they did not.

Q. And that's -- that's the Roundup exposure information?

15:55:10 A. That's correct, yes.

Q. And then the actual calculation in the AHS adjusted the amount of exposure based on protective equipment; right?

A. Yes.

15:55:21 Q. And this is the protective equipment question. It says, "What type of protective equipment do you generally wear when you personally handle pesticides"; right?

A. Yes.

15:55:29 Q. "Check all that apply."

A. Yes.

Q. And this isn't specific to a pesticide?

A. That's correct.

Q. So if someone -- you know, let's say they

15:55:37 treated glyphosate differently than some super toxic pesticide, and they just answered this with, you know, the cartridge respirator or gas mask.

Do you see that?

A. Yes.

15:55:50 Q. But they didn't apply glyphosate that way --

A. Huh-uh.

Q. -- that wouldn't be captured in here, would it?

A. It's -- I'm sorry, what is your question, specifically?

15:56:00 Q. Well, I'm trying to say that it didn't specify

the protective equipment to the specific pesticide?

A. That's correct.

Q. Because it wasn't about glyphosate, it was about, like, 50 pesticides?

15:56:10 A. That's correct.

Q. And it wasn't about NHL, it was about all disease outcomes?

A. With a focus on cancer, yes.

Q. Now, was that exploratory?

15:56:20 A. No, that is not a correct classification of this.

Q. Now, here's the last thing I want to ask you about, and I could go on the AHS for hours. They've already heard a lot about imputation, and I really don't

15:56:35 want to get into that fight with you, Doctor, but here's something no one's really mentioned, and I have a question about this, and this is a genuine question. When they filled out the pesticide information for glyphosate, they're discussing their use for, like, the

15:56:45 last 15, 16 years; right?

A. Yes.

Q. And when they fill it out, if they had cancer already, they couldn't enter the study; right?

A. Right.

15:56:56 Q. So anybody who had been exposed to glyphosate

and gotten cancer, they were weeded out of the study before they ever got in?

A. Well, the definition of a cohort study is you start following individuals when they're free of cancer.

15:57:13 Q. Yeah. And so what you have, then, is a cohort of pesticide applicators with a documented history of applying pesticides yet no cancer; right?

A. Yes. That's the definition of a cohort, yes.

Q. And so what we have, then, in this group are

15:57:31 people who are naturally resistant to pesticide cancer?

A. Actually, that's incorrect.

Q. Well, I mean, you screen out anybody who got NHL already from Roundup; right?

A. That is -- the number of cases that were

15:57:43 excluded is quite small, because this population was quite young, but it's a standard epidemiological practice of what we do with cohort studies, and it's the standard approach that you would take --

Q. Now, I --

15:57:55 A. -- and doesn't lead to any bias.

Q. Well, I mean, if people who would have been exposed to it and gotten cancer in a few years, they wouldn't have made it into the study; right?

A. That -- while that would be correct, it still

15:58:10 wouldn't be a biased analysis. There were a range of

individuals who had, you know, a small amount of exposure, large amount of exposure in the study.

Q. Now, I noticed during your direct examination you didn't mention the -- how glyphosate or Roundup changed over time, did you?

15:58:25

A. No, I did not.

Q. And it changed a lot, didn't it?

A. By changing you mean?

Q. Increased.

15:58:33

A. It has increased, yes.

Q. Dramatically; right?

A. It has increased, yes.

Q. I mean, between the first time they were surveyed and the second time they were surveyed, it was more than doubled; correct?

15:58:45

A. No, that's not correct. I mean, at the first survey, there were 75 percent of people using glyphosate, and in the second questionnaire, it was in the '80s, so it wasn't a tremendous increase.

Q. Okay. So it went from 70 percent of all the people who are using glyphosate to now 80 percent of them?

15:58:55

A. So 75 percent to 80 percent.

Q. Okay. I meant, though, nationwide, the volume and amount of glyphosate dramatically increased. You

15:59:05

understand that?

A. Yeah. At the national level, yes.

Q. Okay. And that was primarily agricultural; right?

15:59:14 A. Yes.

Q. It would be these exact people, wouldn't it?

A. Again, these individuals were already -- a high percentage had already used glyphosate at the start of the study.

15:59:24 Q. Yeah, but the exposure makes an assessment per individual, right, based on the amount they stated they were using?

A. Yes, it does.

Q. And it would be fair to say that what they were

15:59:33 doing for the last 15 years, in 1993 is very different from what they were doing in 2015?

A. While that may be the case, the information that they're reporting on is not how much they're using it, it's how many days per year they're using, how many years

15:59:50 they've used it, whether they're mixing the substance, so all of that information is there.

Q. And even in the follow-up survey, that was done by 2005; right?

A. Yes.

16:00:00 Q. But they were collecting cancers through 2014?

A. Yes.

Q. So if somebody started using Roundup much more in the late 2000s -- and we know that happened with the volume, right, they -- that change wouldn't be captured, would it?

16:00:18

A. Well, that's true. Actually, one of the analyses the investigators did was to end the follow-up is the sensitivity analysis in 2005 to see if that issue was present, and, actually, the results were exactly the same.

16:00:31

Q. And in tobacco epidemiology, one of the biggest problems that they ran into back in the '40s and '50s when they were trying to figure this stuff out, was that everyone smoked; right?

16:00:43

A. No, that's not true.

Q. Yeah. They had a hard time finding controls that didn't get exposed to secondhand smoke or direct smoke, because at that time, everyone was smoking?

A. No, that's not true.

16:00:55

Q. Okay. You would agree, though, that the responsibility of the AHS to properly assess the risk of NHL and Roundup exposure is hampered by the fact that the use of the product has changed so dramatically in this exact population?

16:01:11

A. No. Actually, I disagree, and it's actually one

of the strengths is the fact that you have so many people -- such a high proportion of people using glyphosate, because you can look, really, at people who were exposed to very high levels and still compare it to
16:01:25 people who were not using any glyphosate, so you're able to -- actually, it's a strength of the study, not a weakness.

Q. It doesn't create misclassification, Doctor?

A. No, it definitely does not. And again, as I
16:01:36 said, they tested that question. It's reasonable to be concerned about whether the changes in glyphosate over time have biased the results, but they actually tested that and found it did not bias the results, so I think all of these things you're saying are reasonable --

16:01:50 Q. What did they test? What are you talking about?

A. As I said, what they did was to truncate the follow-up in the sensitivity analysis to 2005, immediately after the last follow-up questionnaire was asked, so then they didn't consider that future exposure.
16:02:06 They were just looking at the associations between the current exposure, past exposure in 2005, so all of those changes after 2005 wouldn't have biased the results.

Q. So I just want to be clear, you've never studied pesticides before this case; right?

16:02:21 A. No, I have not.

Q. You've never studied pesticide applications and its relationship to NHL; right?

A. I have not studied it, no.

Q. You know Dr. Neugut has; right?

16:02:29 A. Yes, I do.

Q. You know Dr. Portier has; right?

A. Yes.

Q. And they all say that this change in the use of glyphosate causes real problems for the study --

16:02:40 MR. LOMBARDI: Object to the form --

Q. BY MR. WISNER: -- but you say they're wrong.

MR. LOMBARDI: Object to the form of the question.

THE WITNESS: Again, I don't know the context in

16:02:46 which --

THE COURT: Overruled. She can answer, but this is your last question.

MR. WISNER: Let me ask the question again so I can have a dramatic ending.

16:02:55 No further questions, your Honor.

THE COURT: All right. Thank you.

Mr. Lombardi.

MR. LOMBARDI: Thank you, your Honor.

REDIRECT EXAMINATION

BY MR. LOMBARDI:

Q. Hi, Dr. Mucci.

A. Hi.

Q. Let me start here. This is the Forest plot that Dr. Portier presented, and on here -- on here he shows the studies and whether they're adjusted for pesticides or not; is that right?

A. Yes.

Q. Every single time they have a study where there's no pesticide adjustment and a pesticide adjustment, what happens when you adjust for pesticides?

A. All of the relative risks are attenuated towards the null value.

Q. Now, that was epidemiology speak.

A. Yes.

Q. What do you mean by "attenuated towards the null value"?

A. Right. They become closer to the relative risk of 1, which suggests there's no association.

Q. So that's true for Hardell 2002; is that right?

A. Yes.

Q. Now, Counsel suggested that maybe you should have presented to the jury Hardell 1999, but Dr. Portier didn't either; right?

A. Correct.

Q. And that's because Hardell 2002 is a pooled study that includes Hardell 1999?

A. Correct.

Q. So Hardell, when you adjust for pesticides, the relative risk gets smaller and it becomes not statistically significant; is that correct?

16:04:13

A. Yes, correct.

Q. How about Eriksson, no pesticide adjustment. What happens when you adjust for pesticides?

16:04:22

A. Again, the value goes closer to 1, suggesting no association.

Q. What does your review of all of these case-control studies tell you about what happens when you adjust for pesticides?

16:04:36

A. All of these analyses in the case-control studies suggests there is confounding due to the use of other pesticides.

Q. Now, Doctor, there was some discussion about Eriksson and whether there was adjustment for other pesticides in Eriksson. That's one of the case-control studies that you talked about this morning; right?

16:04:59

A. Yes.

Q. And you mentioned -- and Counsel didn't show you this part, but you mentioned that Eriksson says you need to do an adjustment for other pesticides; is that right?

16:05:11

A. Yes, that's correct.

Q. All right. So let me show you page 1660, and up there at the top it says, "Multi-variate analysis"; right?

16:05:24 A. Yes.

Q. And can you read that to the jury, that first sentence?

A. Sure. "Since mixed exposure to several pesticides was more a rule than an exception and all

16:05:34 single agents were analyzed without adjusting for other exposure, a multi-variate analysis was made to elucidate the relative importance of different pesticides."

Q. What's that mean?

A. That is by definition the acknowledgment that

16:05:48 there was confounding in their results.

Q. Okay. And it says, "Refer to Table 7"?

A. Yes.

Q. And that's the table that you told the jury about; is that right?

16:05:56 A. Yes, it is.

Q. And what happens in Table 7 when you do -- multi-variate is the adjusted result; isn't that right?

A. Yes.

Q. And what happens when you adjust?

16:06:07 A. You can see that the relative risk goes closer

to the value of 1, suggesting no association.

Q. And what is -- what's the confidence interval on that?

A. It's confidence interval from 0.77 to 2.94.

16:06:22 Q. And what's that tell you about -- when you adjust for other pesticides, what's that tell you about the risk of glyphosate?

A. It's no longer statistically significant and -- yeah.

16:06:33 Q. Okay. And, actually, did the authors of the Eriksson study recognize that, Doctor?

A. Yes, they did.

Q. Okay. Let's go to the last page of the article, page 1662, and if you read -- would you read that second

16:06:47 full paragraph there for the jury, please?

A. Yes. "Glyphosate has succeeded MCPA as one of the most used herbicides in agriculture, and many individuals that used MCPA earlier are now also exposed to glyphosate. This probably explains why the

16:07:02 multi-variate analysis does not show any significant odds ratio for these compounds."

Q. And explain to the jury what this means?

A. Again, that is highlighting the role that confounding played in the estimate of glyphosate.

16:07:18 Q. Okay. I want to talk a little bit about

approximate bias, which came up in your cross for a bit. And you remember Counsel asked you about McDuffie, and said it doesn't say anywhere in McDuffie that there is -- there's a use of proxies; right?

16:07:31 A. That's correct.

Q. And what was the -- you -- what was your answer to that?

A. That there was another analysis using the same case-control study data from Hohenadel, which highlights

16:07:42 the use of proxies.

Q. Okay. And I just want to put in front of the jury the Hohenadel study. And unfortunately, I have some writing on the top which I'll try to cover. That wasn't so good. There we go.

16:08:01 Is that the Hohenadel study?

A. Yes, it is.

Q. Okay. And I just want to take you to a table inside Hohenadel, Table 1 on page 2324.

MR. LOMBARDI: Hohenadel is 2606, for the

16:08:11 record. Defendant's Exhibit 2606.

Q. And do you see Table 1?

A. Yes.

Q. And what does that tell you about whether there were proxy respondents in Hohenadel and, therefore, in

16:08:22 the McDuffie study?

A. It shows that there were -- between 15 and 21 percent of the data had proxy data.

Q. And what's that tell you about the reliability of the studies, both McDuffie and Hohenadel?

16:08:37 A. Right. It raises the concerns of validity, that there may be proxy bias present.

Q. Okay. Let's look at proxy bias in the context of De Roos 2003. You talked about De Roos 2003. Is there a proxy bias problem in De Roos 2003?

16:08:54 A. Yes, there is.

Q. I'm going the show you De Roos 2003, which is Defendant's Exhibit 2193, and I put a Post-it there to make this easier to read.

First of all, what is Table 2 -- this is page 4 of the article. What's Table 2 about, Doctor?

16:09:11 A. Yeah, so this is presenting the characteristics of the cases and controls from the three US case-control studies that were pooled here.

Q. Okay. And I've put the Post-It where the proxy respondent numbers are.

16:09:28 Do you see that?

A. Yes, I do.

Q. And what does that show about De Roos 2003?

A. First, it shows that there's a considerably high proportion, between 37 and 45 percent of the data was

from proxy. Secondly, that you have more proxy in the controls -- a higher proportion of proxies than controls in the cases.

Q. Let me just stop you there. So for the cases, you have 37.4 percent are proxies, and for the controls, you have 45.0 percent. What is the significance of that discrepancy in proxies between cases and controls to an epidemiologist?

A. Right. And so as I had mentioned earlier, if we're -- as Dr. Blair showed, that the proxies actually tended to underreport glyphosate exposure or pesticides, and since the prevalence of proxies is higher than the prevalence of exposure in the control, it's going to be lower than it should be, and so what that's going to do is inflate the relative risk and make it look larger than it actually is.

Q. Okay. Now, Dr. De Roos and company, in De Roos 2003 in their last line, urged the scientific community to do something; right?

A. Yes, they did.

Q. And what was that? I've highlighted there at the end of the article.

A. So what they've said in their discussion is, "A chemical-specific approach to evaluating pesticides as factors for NHL should facilitate interpretation of

epidemiological studies for regulatory purposes."

Q. What's it mean to say "a chemical-specific approach"?

A. It means taking a very -- a pesticide specific hypothesis-driven approach to analyzing the data.

Q. And did Dr. De Roos do that?

A. Yes, she did.

Q. So I'm going the show you De Roos 2005, which is Defendant's Exhibit 2191. You were shown this, but not this part. The discussion -- beginning of the discussion -- this is De Roos 2005, and it was a study specifically of glyphosate; is that right?

A. Yes.

Q. And a hypothesis-driven study?

A. Yes.

Q. Better than an exploratory study?

A. Yes.

Q. What did they conclude there in the first sentence of the discussion?

A. "There was no association between glyphosate exposure in all cancer incidents, or most of the specific cancer subtypes we evaluated, including NHL, whether the exposure metric was ever used, cumulative exposure days or intensity-weighted cumulative exposure days."

Q. So in Dr. De Roos' study -- and immediately

following De Roos 2003, at least for purposes of our case, the next study she did related to pesticides, what did it show about glyphosate and causation of non-Hodgkin's lymphoma?

16:12:13 A. It -- there was no evidence of an association between glyphosate and NHL risk.

Q. Okay. You were asked some questions about IARC and causation. Now, the truth is that IARC has its own special way of doing things; isn't that right?

16:12:27 A. Yes.

Q. It's a very structured way of analyzing causation; isn't that right?

A. Yes, it is.

Q. And that's so that their Working Groups will all

16:12:38 do the same kind of thing when they do things; correct?

A. Yes, that's correct.

Q. Not everybody does it that way; right?

A. Right.

Q. And, in fact, in your cancer epidemiology book,

16:12:48 right next to where Counsel was looking, this is page 129.

MR. LOMBARDI: This is getting tricky, Judge. I think I have to hold it.

Q. Can you read that while I hold it?

16:13:03 A. Yes. "Establishment of the etiologic role of a

particular exposure on the occurrence of a disease ideally requires strong epidemiologic evidence and appropriate and reproducible animal models and documentation at the molecular and cellular level of the morphologic or functional pathogenetic process."

16:13:19

Q. Okay. So there are people that don't require limited evidence of epidemiology in order to establish causation; isn't that true, Doctor?

A. Yes.

16:13:32

Q. Now, Doctor, you were asked some questions about NAPP. Do you remember that? The North American Pooled Project.

A. Yes.

Q. And the North American Pooled Project, you were

16:13:43

asked, "Well, gee. Why did you choose the version of the PowerPoint that you chose"; right?

A. Yes.

Q. And Counsel showed you a PowerPoint that was presented in June of 2015. Do you remember that?

16:13:57

A. Yes, I do.

Q. And he said, "Well, look, the numbers are different here. They're different from the ones that you presented"; isn't that right?

A. That's what he said, yes.

16:14:05

Q. And what was the date, do you recall, of the

PowerPoint that you presented?

A. It was from August 2015.

Q. So it was later?

A. Yes, it was.

16:14:13 Q. And in science, do you usually go with the most advanced numbers?

A. In terms of the dates, yes.

Q. Okay.

A. Yes, because you're usually incorporating

16:14:24 different suggestions into your analysis.

Q. Now, Counsel asked you if you had read Dr. Blair's deposition; is that right?

A. Yes, he did.

Q. And you know Dr. Blair's deposition was played

16:14:37 in court yesterday?

A. Yes, I knew that.

Q. And are you aware that the August PowerPoint that you showed is the one that Dr. Blair did not want Monsanto to see?

16:14:47 MR. WISNER: Objection. Speculation, misstates the record.

THE COURT: Sustained.

Q. BY MR. LOMBARDI: Well, are you aware -- well, let me ask you this: What's publication bias?

16:15:00 A. Publication bias occurs often in epidemiology,

particularly when studies are null. It can become quite challenging to get journals to publish null studies.

Q. Okay. And can you think -- they had this data on NAPP that shows no association between glyphosate use and non-Hodgkin's lymphoma; is that right?

16:15:21

A. Yes.

Q. And they still haven't published it today?

A. Correct.

Q. Okay. Having read Dr. Blair's deposition --

16:15:32

THE COURT: Mr. Lombardi, this is your last question.

MR. LOMBARDI: Oh, I'd better be judicious.

Q. Okay. My last question. I had more, Doctor, but I'm out of time, but let me just show you the -- the

16:15:47

questionnaire that was shown you from the JNCI 2018, from the Agricultural Health Study project. Okay?

A. Yes.

Q. All right. And here's the questionnaire, and let me just ask you: Do you see that when they ask how

16:16:03

you apply pesticides, one of the things they ask about is whether you use a backpack sprayer?

A. Yes.

Q. And do you see when they ask about personal protective equipment, they ask about whether you wear

16:16:17

face shields or goggles?

Do you see that?

A. Yes.

Q. Tyvek outer clothing?

A. Yes.

16:16:24 Q. Chemically-resistant gloves?

A. Yes.

Q. Other protective clothing?

A. Yes.

MR. WISNER: Your Honor, we had an agreement.

16:16:32 THE COURT: He may finish his question.

MR. WISNER: Okay.

Q. BY MR. LOMBARDI: Those are -- every one of those things are characteristic that Mr. Johnson in this case has; isn't that right?

16:16:40 MR. WISNER: Objection. Lack of foundation.

THE COURT: Overruled.

She may answer if she knows.

THE WITNESS: Yes.

MR. LOMBARDI: I think I'm out of time, your 16:16:46 Honor.

THE COURT: Thank you.

Mr. Wisner.

RECROSS-EXAMINATION

BY MR. WISNER:

Q. How do you know about Mr. Johnson?
A. I -- through the team -- the lawyer team.
Q. Oh, they told you about it?
A. Yes.
16:16:58 Q. So you actually haven't read anything?
A. I have not, no.
Q. You haven't actually talked to Mr. Johnson?
A. No, I have not.
Q. So you just gave an opinion based on what
16:17:07 Mr. Lombardi told you?
A. I -- I -- I gave the information that I was given, yes.
Q. You repeated what he said to you?
A. That is what I was told, yes.
16:17:19 Q. All right. You know, we talked about proxies, we talked about -- on recross -- redirect -- proxies and we talked about statistically significance. And I want to look at what you actually said about these things before you were ever hired by Monsanto. Okay? So let's
16:17:36 start off with proxies.
MR. WISNER: Your Honor, may I approach?
THE COURT: Yes.
Q. BY MR. WISNER: I'm handing you Exhibit 1061.
Dr. Mucci, this is one of your papers; right?
16:17:55 A. Yes, it is.

Q. Published 2001?

A. Yes.

MR. WISNER: And permission to publish, your Honor?

16:18:01 THE COURT: Very well.

Q. BY MR. WISNER: So this is the study we're talking about. The reliability of information collected by proxy in family studies of Alzheimer's disease; right?

A. Yes.

16:18:19 Q. And that's you, Lorelei Mucci?

A. Yes, it is.

Q. And there's a bunch of other -- looks like a bunch of authors with you on this as well; right?

A. Yes.

16:18:27 Q. And I just want to go to the conclusion. I just want to read the conclusion. It says, "This study supports the reliability of proxy responses for most categories of questions that are elicited in typical epidemiological studies, including the Mirage study." 16:18:43 That's what you wrote?

A. Yes, I did. Yes.

Q. Okay. Let's talk about what you wrote about statistical significance before you were hired by Monsanto.

16:18:51 MR. WISNER: Permission to approach, your Honor?

THE COURT: Yes.

Q. BY MR. WISNER: Handing you Exhibit 829.

Dr. Mucci, this is a one of your publications on lymphoma, isn't it?

16:19:09 A. Yes, it is.

Q. This was actually written back in 2001; isn't that true?

A. Yes, it is.

MR. WISNER: Permission to publish?

16:19:15 THE COURT: Very well.

Q. BY MR. WISNER: This one was looking -- sort of an interesting study, Doctor. So you were looking at the effects of smoking by mothers who were pregnant on various types of cancer; right?

16:19:27 A. Looking at childhood leukemia and lymphoma, yes.

Q. Yeah. So you're looking at NHL and leukemia in children?

A. Yes.

Q. And you looked at -- you actually used the

16:19:38 Swedish database, didn't you?

A. Yes, I did.

Q. It's a pretty good database?

A. This particular study leveraged national data, yes.

16:19:45 Q. Yeah. All right. And in your abstract here,

you report on non-Hodgkin's lymphoma, and you state: "The data also suggested a small excess risk of non-Hodgkin's lymphoma," and you give an odds ratio of 1.5 that is not statistically significant; correct?

16:20:07 A. Yes, that's correct. Yes.

Q. So in this study, a 1.25 risk ratio that was not statistically significant, you still reported that as a small excess risk; correct?

A. So if you --

16:20:22 Q. Is that what you wrote, Doctor? I don't have time.

A. -- what the data says is "suggested," which I think is an important caveat to saying there's a causal association.

16:20:32 I'm not saying there is a causal association. I think that's the first thing, and the second thing is as I said before, when you're looking at an association, you want to rule out not just chance, which is what the confidence interval tells you, but also bias and

16:20:51 confounding. And so in this situation, we considered many forms of bias and confounding. We then -- taken together, I was quite -- I didn't mention anything about a cause, but I'm saying there's a suggestion of a small excess risk.

16:21:14 Q. There is a suggestion of an excess risk in this

Forest plot; right?

A. This is -- in which result are you suggesting?

Q. They're almost all to the right of 1, Doctor; right?

16:21:25 A. Yeah, but there's a really different interpretation. For example, De Roos 2005, which has a relative risk of 1.0 and a confidence interval -- I'm not suggesting no association, and the difference there also with Hardell, given the width of the confidence interval.

16:21:43 So, again, when you're thinking about whether there is or is not a positive association, you not only want to look at the confidence interval to give up chance, but you want to think about bias and confounding.

Q. Here's what you wrote. You said, "Given the

16:22:00 inconclusiveness of earlier epidemiological studies, we can turn to biological plausibility to assess the study findings."

Do you see that?

A. Yes, I do.

16:22:13 Q. So when you were confronted in your research before being hired by Monsanto, when you had a small excess risk that wasn't statistically significant, you turned to biological plausibility to see if it could explain it, didn't you?

16:22:26 A. We comment on the biological plausibility, yes.

Q. You haven't in this case, have you?

A. I think the difference there is, again, we haven't talked about it being a cause. What we're talking about is in the context of these prior studies -- epidemiological studies, let's think about what the biology is, but nowhere in this report do I say that cigarette smoking is a cause of NHL in kids.

Q. Okay. Another difference between this study and what you've done here, is you weren't paid $100,000 by Monsanto, were you?

A. Well, I was not. This is still a standard approach that you take in epidemiology. When you look at this relative risk and confidence interval here and taking into account the fact that we think that there was no bias or confounding present, all of this together is different than the epidemiology studies that we've looked at today.

Q. So that's a "yes"?

A. I'm sorry, a "yes" to?

Q. To the question I asked you. I said another difference between this study and what you've presented here today is that here you've been paid 100 grand by Monsanto; correct?

A. I think that would -- that kind of comment suggests that I was bias in my review of the epidemiology

studies, which I don't think is a fair assessment at all.

MR. WISNER: Okay. No further questions, your Honor.

THE COURT: All right. Thank you, Dr. Mucci.

16:23:49 You may be excused.

THE WITNESS: Thank you.

THE COURT: All right. Ladies and Gentlemen, we're going to adjourn now for today. We will not be in session tomorrow. So we will resume again on Thursday

16:24:02 morning at 9:30. Please remember: Do not do any research. Please do not have any discussions about the case. I'll see you Thursday morning. Thank you.

And, Counsel, can you please remain?

(Jury leaves courtroom.)

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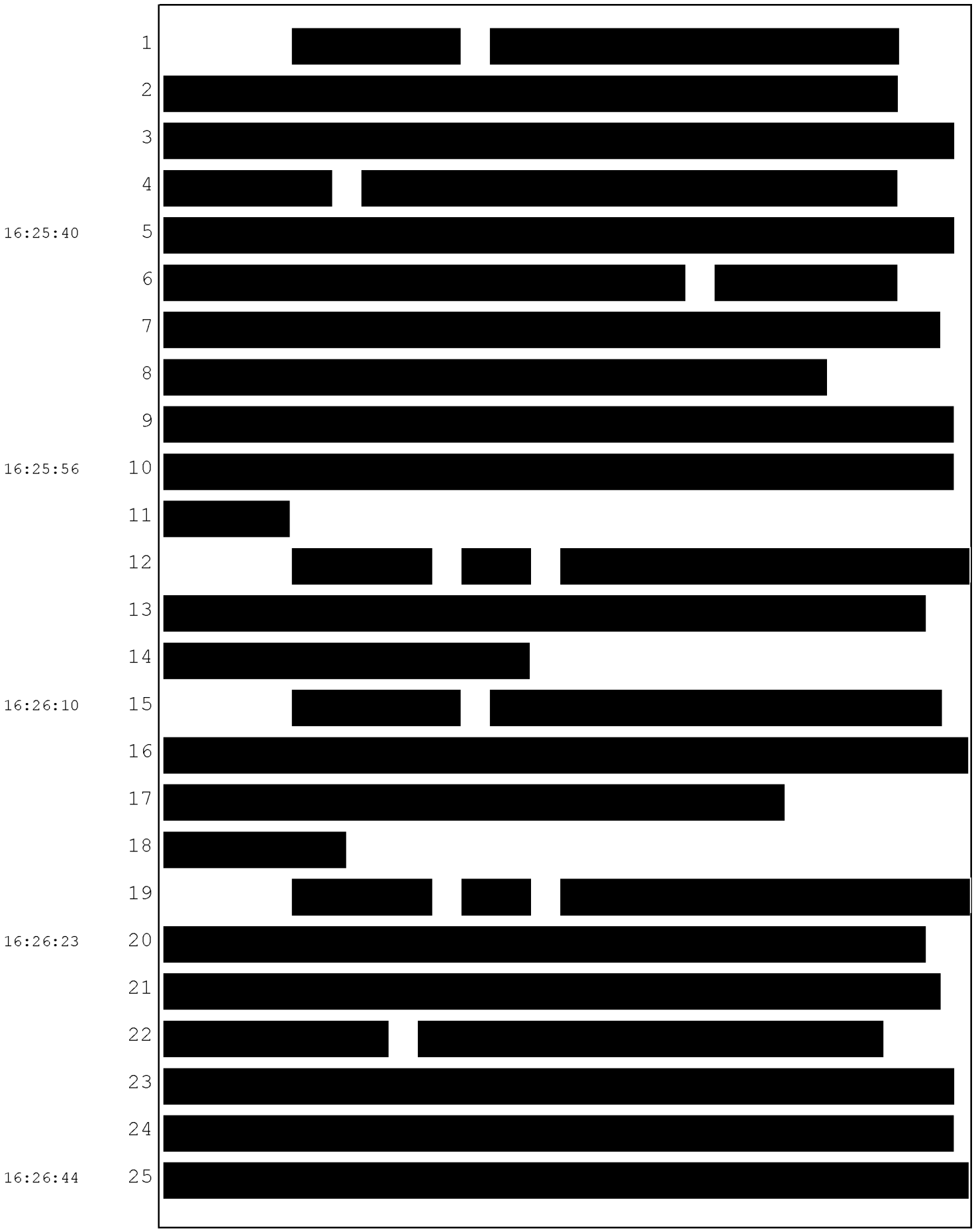
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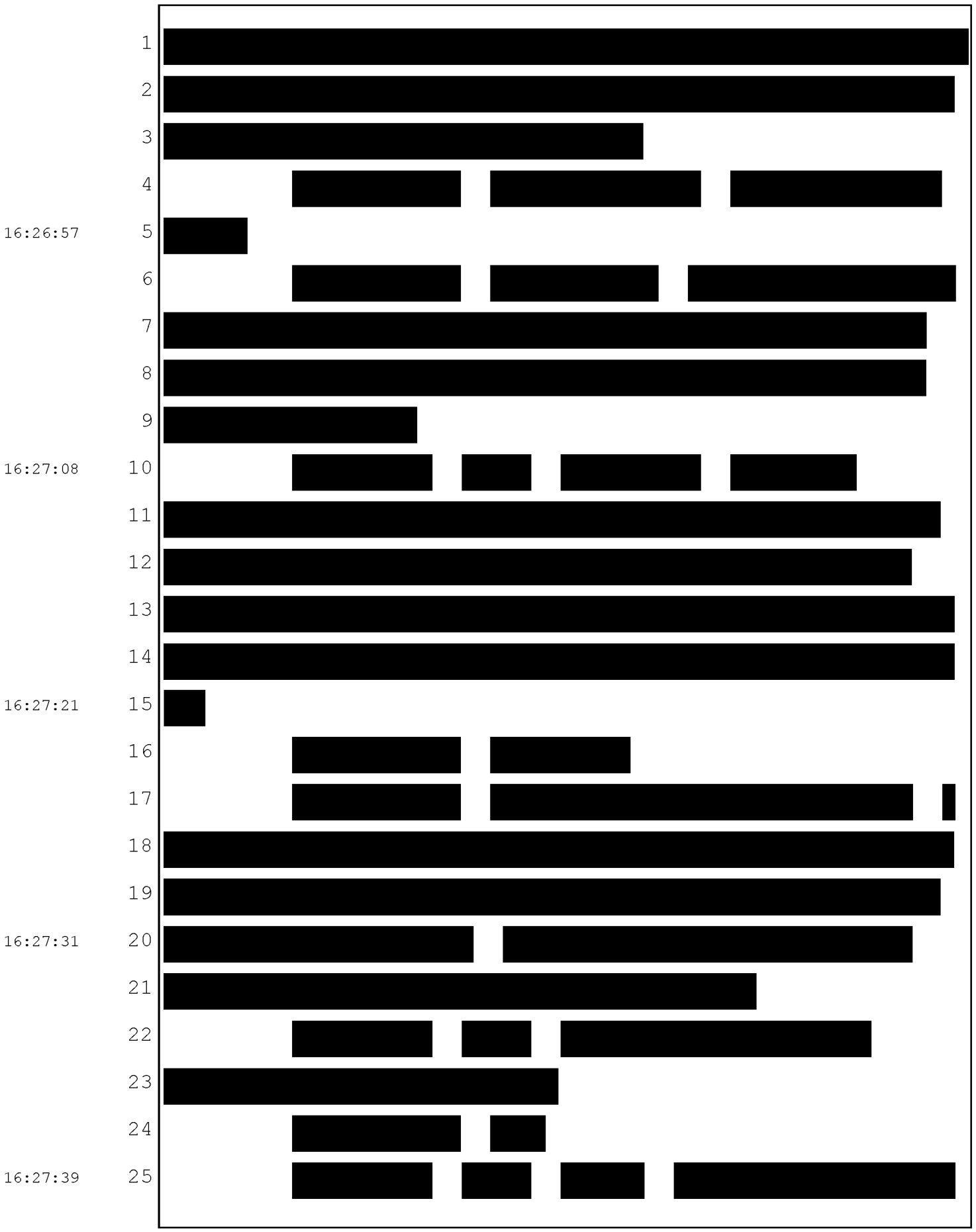
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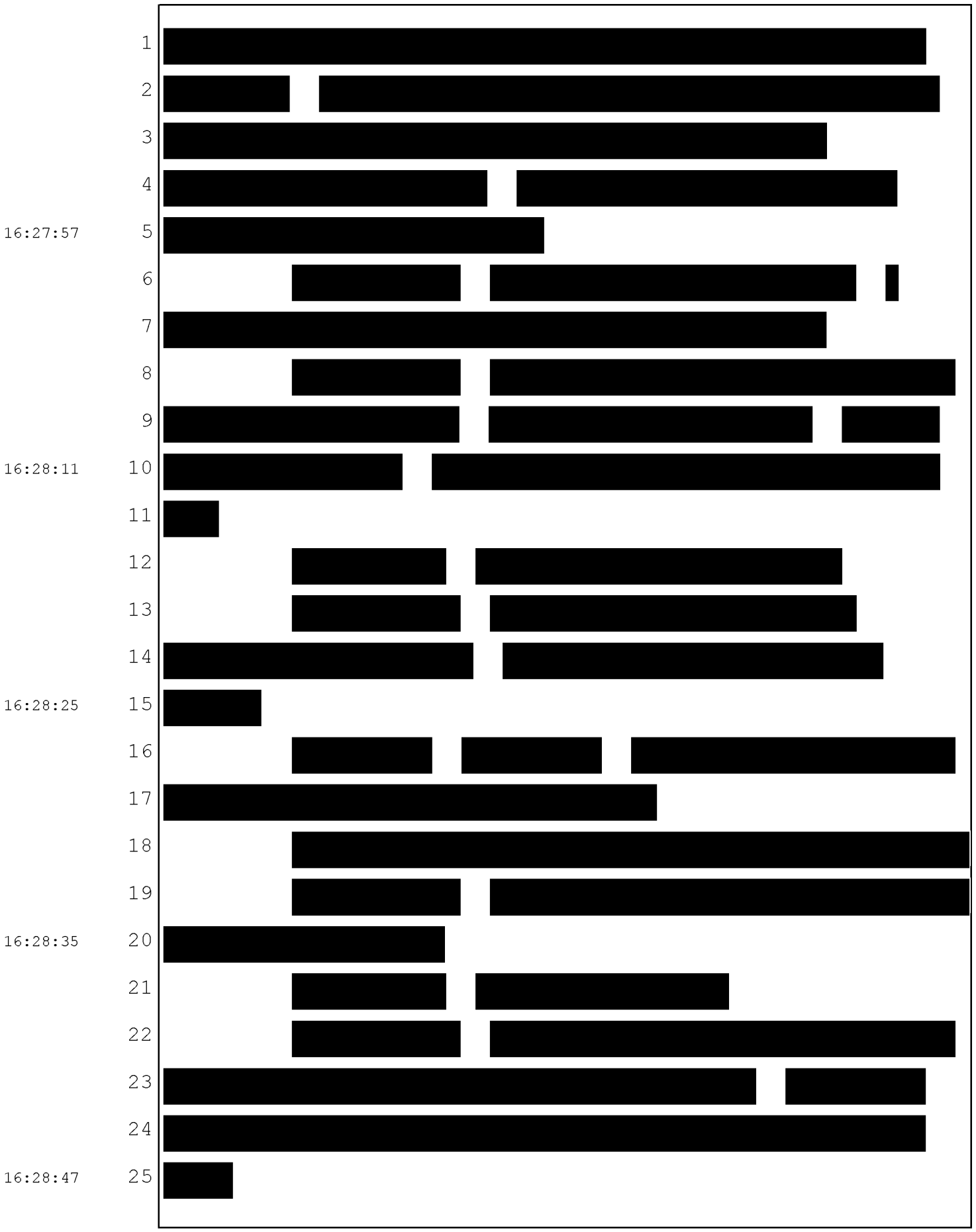
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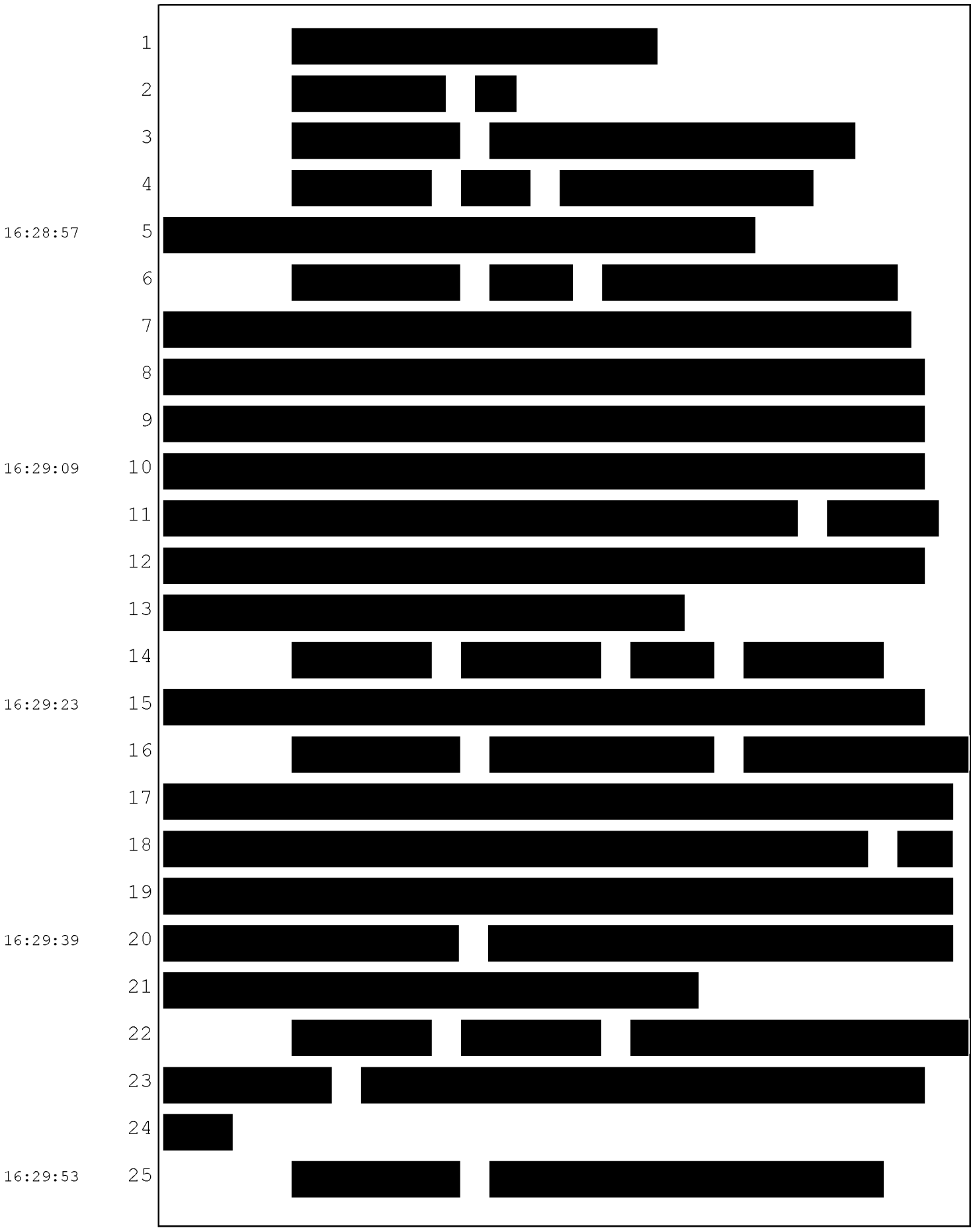
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(Time Noted: 4:29 p.m.)

REPORTER'S CERTIFICATE

I certify that the proceedings in the within-titled cause were taken at the time and place herein named; that the proceedings were reported by me, a duly Certified Shorthand Reporter of the State of California authorized to administer oaths and affirmations, and said proceedings were thereafter transcribed into typewriting.

I further certify that I am not of counsel or Attorney for either or any of the parties to said Proceedings, not in any way interested in the outcome of the cause named in said proceedings.

IN WITNESS WHEREOF, I have hereunto set my hand: July 31st, 2018.

<%signature%>
Leslie Rockwood Rosas
Certified Shorthand Reporter
State of California
Certificate No. 3462