EXHIBIT 50

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA

IN RE: ROUNDUP PRODUCTS LIABILITY LITIGATION	)	MDL No. 2741
THIS DOCUMENT RELATES TO ALL CASES	)	Case No. 16-md-02741-VC

FRIDAY, SEPTEMBER 22, 2017

CONFIDENTIAL - PURSUANT TO PROTECTIVE ORDER

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VIDEOTAPED DEPOSITION of LORELEI A. MUCCI, ScD, held at the offices of Cetrulo LLP, 2 Seaport Lane, Boston, Massachusetts, commencing at 8:05 a.m., on the above date, before Maureen O'Connor Pollard, Registered Merit Reporter, Realtime Systems Administrator, Certified Shorthand Reporter.

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PROCEEDINGS

THE VIDEOGRAPHER: We are now on record. My name is Chris Coughlin, and I'm a videographer at Golkow Technologies. Today's date is September 22, 2017, and the time is 8:05 a.m.

This video deposition is being held in Boston, Massachusetts, In Re: Roundup Products Liability Litigation, MDL No. 2741, for the U.S. District Court, Northern District of California.

The deponent is Dr. Lorelei Mucci.

Will counsel please identify yourselves and state whom you represent.

MR. MILLER: Good morning. It's Michael and Nancy Miller who represent the plaintiffs.

MR. COPLE: William Cople and Grant Hollingsworth, both of Hollingsworth LLP, for the Monsanto Company.

THE VIDEOGRAPHER: And appearing by phone?

MR. MILLER: Jeffrey?

MR. TRAVERSE: Jeffrey Traverse from the Miller Firm.

THE VIDEOGRAPHER: The court reporter is Maureen O'Connor, and she will now swear in the witness.

LORELEI A. MUCCI, ScD,
having been first duly identified and sworn, was examined and testified as follows:

EXAMINATION

BY MR. MILLER:

Q. Good morning.

A. Good morning.

MR. COPLE: I have a statement first.

Dr. Mucci is being produced today for deposition pursuant to Pretrial Order No. 7 on the deposition protocol as a general causation expert for Monsanto. Monsanto marks the entire deposition, videography, and exhibits on a provisional basis as confidential pursuant to the MDL court's protective and confidentiality order.

BY MR. MILLER:

Q. How are you doing today?

A. I'm fine, thank you.

Q. Great.

Please state your full name?

A. My name is Lorelei Ann Mucci.

Q. May I call you Dr. Mucci?

A. Yes.

Q. Okay. And you are a doctor, in fact, and you're a professor here at Harvard University?

A. I am.

Q. Now, you're not a medical doctor, but what kind of doctor?

A. I'm a -- I have a doctoral degree in epidemiology.

Q. Okay. Very well.

And have you testified as an expert before?

A. No, I have not.

Q. Okay. I'm going to ask you some questions today; all right?

A. Yes.

Q. Okay. And you've been named as an expert witness on behalf of Monsanto. You understand that; right?

A. Yes.

Q. So if you answer my questions, I'll assume you understood them and answered them truthfully and fully; is that fair?

A. Yes.
Q. Okay. Very good.
I will do my best to ask intellectual and honest questions, and I know you'll do your best to give me intellectual and honest answers. And I promise to do this, and I know we'll disagree, but without being disagreeable; all right? So -- and I promise not to interrupt you, and I know you'll extend me that courtesy. Is that fair?
A. Yes.
Q. Okay. And I just want to clear up, you never worked on, as an epidemiologist, on the issue of glyphosate and potential association with non-Hodgkin's lymphoma until you were retained as an expert by the Hollingsworth firm; true?
A. Yes, I've not previously worked on these studies.
Q. And it would also be true that you were -- or were not following the literature surrounding this issue -- when I say "this issue," I mean glyphosate non-Hodgkin's lymphoma -- that was occurring in the medical scientific literature until being asked to look

at this; is that fair?
A. Yes. Although while that's fair, I think I'm competent to be able to review the epidemiology studies of glyphosate and non-Hodgkin's lymphoma.
Q. Nor was I suggesting otherwise. I just wanted to get a time frame of when you first started doing that. And I'm not trying to put words in your mouth. I'm really just trying to get us, you know, down the road to where we can talk about specific issues.
But fair to say clearly you don't believe there is an association between Roundup and non-Hodgkin's lymphoma, is that true?
A. Based on my critical review of all of the epidemiology literature, I believe there's no causal association between glyphosate and NHL risk.
Q. Right.
But my understanding from your report, you did not do the Bradford Hill analysis; you looked at the studies, determined there was no real association, and that was the end of it?
MR. COPLE: Objection. Lacks foundation. Object to the form of the question.

BY MR. MILLER:
Q. You can answer.
A. So while I did not apply a Bradford Hill approach, I used a standard epidemiological approach for critically reviewing the epidemiology studies each on their own, and came to my conclusion based on this complete review.
Q. Sure.
In your report you say the strongest evidence on this issue is the Agricultural Health Study; right?
A. I agree, because the Agricultural Health Study is a prospective cohort study, and it avoids many of the biases inherent in case-control studies.
Q. And prior to your becoming involved as an expert for Monsanto and the Hollingsworth firm, were you aware that other scientists of Harvard had looked at the Agricultural Health Study and analyzed its strengths and weaknesses in a publication?
MR. COPLE: Objection. Vague, lacks foundation.
A. No, I was not aware of that.
BY MR. MILLER:

Q. And I'll hand it to you now.
You were not provided this prior review of the Agricultural Health Study which we're marking as Exhibit 24-1.
(Whereupon, Mucci Exhibit 24-1, Gray, et al article, The Federal Government's Agricultural Health Study, was marked for identification.)
BY MR. MILLER:
Q. I'd lose my head if it wasn't attached.
Here it is, Doctor. I'm handing you what is a review of the Agricultural Health Study.
MR. MILLER: I need that one back. Sorry.
MS. MILLER: Sorry.
BY MR. MILLER:
Q. I'll put that one right here. You have not seen Exhibit 24-1, this review of the Agricultural Health Study prepared by Harvard University School of Public Health before, right, Doctor?
MR. COPLE: Object to the form of the question.

A. I -- while I have not seen this report, I'd just like to clarify that there are actually multiple authors from many institutions in this study.
BY MR. MILLER:
Q. Yes, ma'am, that's absolutely true. Let's look at some of them.
One of them is George Gray who is from the Center for Risk Analysis, Harvard School of Public Health.
Do you see that?
A. Yes.
Q. And, of course, that is affiliated with Harvard University; right?
A. Yes.
Q. And do you know Dr. Gray?
A. I do not.
Q. And another scientist involved in this review is Elizabeth Delzell who is from the University of Alabama. She's an epidemiologist. Do you know her?
A. I do not.
Q. And Richard Monson, one of the authors of this scientific paper, is from the department of epidemiology, Harvard School of Public

Health. Do you know him?
A. I do know him.
Q. How do you know Dr. Monson?
A. Dr. Monson, I believe, actually is in the department of environmental health. He's a researcher and a professor at the university.
Q. These scientists in this published article -- this is called Human and Ecological Risk Assessment Journal. Are you aware of that journal?
A. No, I'm not.
Q. Is it peer-reviewed?
A. I don't -- I'm not sure. I'm not familiar with this journal --
Q. Do you see --
A. -- but I would assume it would be.
Q. It's in year 2000. Do you see that?
A. Yes.
Q. And to put it in context, that's three years after the questionnaires had been completed for the first round of the Agricultural Health Study; right?
A. On average, yes.
Q. Okay. And what -- and we'll go through some of this, but in the Abstract

section, these scientists from Harvard and other schools tell us that there are -- "Although the AHS was intended to be an integrated program of studies, some significant difficulties have emerged."
Did I read that correctly?
MR. COPLE: Objection. The document speaks for itself.
A. Yes, while that's what the abstract says, I actually have not had a chance to read through this myself.
BY MR. MILLER:
Q. And it wasn't provided to you by the lawyers for Monsanto; right?
A. It was not one of the ones that I remember reviewing.
Q. And it says here in this abstract that there have been 90,000 applicators and their spouses enrolled in a number of studies to determine whether exposure to specific pesticides are associated with various cancers and other adverse health outcomes.
Do you see that?
MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Yes, I see that, where it's written, yes.
BY MR. MILLER:
Q. In your --
A. But, again, I haven't had a chance to read through this.
Q. I understand. And it wasn't provided to you, ma'am. We'll go through it together. Here's my question.
In your report you talk about a health study, Agricultural Health Study, with about some 50-some thousand people in it; right?
A. Correct.
Q. What happened to the other 40,000 people?
MR. COPLE: Objection. Argumentative, lacks foundation.
BY MR. MILLER:
Q. Do you know?
A. As I said, I haven't had a chance to review through this, so I couldn't testify one way or the other what the difference is between the number presented here and the number in the report I reviewed.
Q. I want to go over the limitations to

the Agricultural Health Study that are articulated by the authors of this study from Harvard University. If you would go to Page 48, please. Do you see where it says "Important limitations"? That would be the first full paragraph. Do you see where I am, ma'am?

A. Yes, I do.

Q. It says, "low and variable rates of subject response to administrated surveys."

Do you see that?

MR. COPLE: Objection. The document speaks for itself.

A. Yes, I see where it says this in this report.

BY MR. MILLER:

Q. That's a serious problem, isn't it?

MR. COPLE: Objection. Argumentative, vague.

A. Well, as I stated, I haven't had a chance to review this particular report, so I wouldn't be able to specifically comment on what the authors have said here in the abstract.

BY MR. MILLER:

Q. Well, do you know what they mean by "low and variable rates of subject response to

administered surveys"?

MR. COPLE: Objection. Asked and answered.

A. Again, since I haven't had a chance to read through this particular document, I'm unable to comment on what they're referring to there.

BY MR. MILLER:

Q. As long as you don't comment at trial, that's fine.

MR. COPLE: Objection. Argumentative.

BY MR. MILLER:

Q. So the other criticism -- one more of the criticisms in the limitations of the Agricultural Health Study as articulated by these experts from Harvard is "concerns about the validity of some self-reported non-cancer health outcomes."

Do you see that, ma'am?

A. Well, that may be what is written here. I'd like to clarify, the study we looked at was using cancer outcomes, and relying on state registry data which have been shown to have very high quality data and complete follow-up.

Q. Ma'am, if -- in the study you looked at, they looked at potential confounders that were not cancer outcome; true?

MR. COPLE: Objection. Lacks foundation.

A. I'm sorry. I don't understand your question.

BY MR. MILLER:

Q. Were there potential confounders in the Agricultural Health Study?

A. There the Agricultural Health Study did look at a number of potential confounders of the association.

Q. Can you and I agree it would be important to have accurate information about those potential confounders?

MR. COPLE: Objection. Lacks foundation, argumentative.

A. While I would agree that it is, of course, important to have high quality data of confounders, I don't think that the discussion here about self-reported non-cancer health outcomes refers to that point of confounding.

BY MR. MILLER:

Q. But you don't know? You've not talked

to these authors about this paper?

A. I have not read through this paper. But having critically reviewed the Agricultural Health Study publications, I can say that the data that was included as potential confounders in a number of validation studies that have been performed by the Agricultural Health Study showed that the majority of factors were quite valid.

Q. Let's take a look at what these scientists said from Harvard.

So we've talked about the limitation of the Agricultural Health Study, number one, "low and variable rates of response"; two, "concerns about the validity of some self-reported non-cancer outcomes"; three, "limited understanding of the reliability and validity of self-reporting of chemical use."

That's a problem, isn't it, ma'am?

MR. COPLE: Objection. Argumentative, lacks foundation, asked and answered.

A. And so as I said previously, because I haven't read through this report, I'm not specifically sure what they are referring to. However, I do know that the Agricultural Health

Study has published some validation studies looking specifically at the quality of the pesticide data, including glyphosate, and showed high reliability of the self-reported data, including looking at biomarkers. So I'm not specifically sure what they're discussing here, because I have not read through this publication.

BY MR. MILLER:

Q. The fourth criticism on limitation by these Harvard authors was "an insufficient program of biological monitoring to validate the exposure surrogates employed in the AHS questionnaires."

Is that a criticism that you also observed, or do you not agree with these folks?

MR. COPLE: Objection. Argumentative, compound question, lacks foundation, and asked and answered.

A. As I said previously, since I haven't read through this report I can't address specifically what they're talking about. But as I've just mentioned, the Agricultural Health Study has reported a number of validation studies showing high quality of the

self-reported data on pesticides as it relates to biomarkers of exposure.

BY MR. MILLER:

Q. The fifth criticism of these Harvard authors of the Agricultural Health Study is "possible confounding by unmeasured, non-chemical risk factors for disease."

Is that a serious issue, ma'am?

MR. COPLE: Objection. Vague, argumentative, lacks foundation, asked and answered.

A. I mean, I think, again, it is challenging for me to comment specifically here since I have not read this particular manuscript. However, I think while we're often concerned about confounding, not only in the Agricultural Health Study but all of the case-control studies that were looked at as well, I think one important finding from several of the studies was the importance of adjusting for confounding by other pesticides which was done in the Agricultural Health Study.

BY MR. MILLER:

Q. Is it important to have a detailed plan for data analysis when you're doing a

study?

MR. COPLE: Objection. Vague.

A. I think I would want clarification specifically in what context you're asking that question.

BY MR. MILLER:

Q. You can't answer that without context?

MR. COPLE: Objection. Argumentative, vague.

A. As I said, I think in order to answer the question fully, I would need to understand the context in which you're asking it.

BY MR. MILLER:

Q. Let's look at it in the context of these Harvard professionals who are criticizing the limitations of the Agricultural Health Study. There are six --

MR. COPLE: Objection. Misstates the authorship of the manuscript.

BY MR. MILLER:

Q. Their sixth limitation is, "and the absence of a detailed plan for data analysis and interpretation that includes explicit, a priori hypothesis."

That's a pretty serious charge, isn't

it, ma'am?

MR. COPLE: Objection. Argumentative, vague, lacks foundation, asked and answered.

A. Again, as I said, I haven't read through this manuscript, so I couldn't comment specifically on that point. However, in the Agricultural Health Study publication of 2013, as well as 2005, there was a clear a priori specification of the hypothesis. So I'm not sure specifically what they're referring to here since I have not read this manuscript.

Q. It's your testimony, ma'am, under oath that there was an a priori hypothesis for the 2013 AHS study before the data was collected?

MR. COPLE: Objection. Misstates the witness's testimony.

A. That's not what I said actually.

BY MR. MILLER:

Q. Well, then let's clarify, because you and I are going to agree that there was -- first let's back up.

For laypeople, what is an a priori hypothesis? How would you explain that in lay terms?

A. I would say that an a priori

hypothesis is a hypothesis that's laid out at the initiation of a study or analysis within a project.
BY MR. MILLER:
Q. And that's important in epidemiology, isn't it?
MR. COPLE: Objection. Vague, argumentative.
A. I think it would be important to have some clarification about specifically what you're asking. Are you asking -- it would be helpful to have clarification on that.
BY MR. MILLER:
Q. Prior to me asking that question, have you written a textbook on epidemiology?
A. I have written a -- been part of a textbook of cancer epidemiology, yes.
Q. And did you write in that book how important it was to have an a priori hypothesis?
MR. COPLE: Objection. Lacks foundation.
A. I would -- I can't recall specifically one way or the other what was in a textbook of hundreds of pages.
BY MR. MILLER:

Q. Well, if I was one of your epide- -- right now do you teach epidemiology?
A. I teach cancer epidemiology.
Q. And if I was to raise my hand in your class -- as if Harvard would ever have me, but let's pretend I made it -- I'm in your class, I raise my hand, I say, "is it important, Dr. Mucci, to have an a priori hypothesis when I do a study," what would you tell me?
MR. COPLE: Objection. Vague.
A. As I stated previously, it actually depends on the study question. There are -- while there are some times where you would have an a priori hypothesis, there's other examples in epidemiology where you wouldn't necessarily have an a priori hypothesis.
BY MR. MILLER:
Q. All right. So I'm going to write these down, just give me one second here, the six limitations. I could do this without writing it down, I guess. Let's go back, because I don't want to take too much time.
So here's a question. Of these six important limitations as described by these authors, including these Harvard

epidemiologists, one -- I'm going to ask if you agree or disagree with each one.
One, "include low and variable rates of subject response to administered survey." Do you agree that's an important limitation, or not?
A. As I stated, since I haven't read the specific manuscript, I couldn't comment on that specific statement there.
Q. Okay. Two, do you agree, disagree, or have no comment about this limitation, "concerns about the validity of some self-reported non-cancer health outcomes"?
A. As I stated, I haven't read this manuscript. I couldn't refer to specifically what they're asking. However, important note here is that in the study of non-Hodgkin's lymphoma, which is a cancer outcome, it uses data from the state registries which has a very -- has been shown to have very high quality and high follow-up.
Q. Three, another limitation, "limited understanding of the reliability and validity of self-reporting of chemical use."
Do you agree or disagree?

A. As I stated, since I haven't read this manuscript, I'm unable to comment specifically. However, there have been validation studies performed by the Agricultural Health Study that have shown high reliability and validity of the self-reported data.
Q. Four, "an insufficient program of biological monitoring to validate the exposure surrogates employed in the AHS questionnaire." Do you agree with that limitation, or disagree?
A. Since I haven't read through this manuscript, I'm unable to specifically comment on what's written here. However, as I just stated, there have been biological validation studies, including for glyphosate, in the Agricultural Health Study to show high validity.
Q. The fifth limitation, do you agree or disagree, "possible confounding by unmeasured, non-chemical risk factors for disease"?
A. I have not read through this, so I'm not sure specifically what they're referring to here. However, in all epidemiology studies, including the case-control studies that have looked at NHL and glyphosate, a measure confounding is an important consideration that

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we evaluate in looking through the epidemiology literature.

Q. Six, the sixth limitation, the absence of a detailed plan for data analysis, an interpretation that included explicit a priori hypothesis. Do you agree or disagree there was no a priori hypothesis?

A. As I stated previously, since I haven't read through this manuscript, I can't say specifically what they were commenting on. However, there are examples where, in epidemiology, where you would want an a priori hypothesis, and there are other examples where you wouldn't necessarily have an a priori hypothesis stated.

Q. All right. Would you please turn with me to Page 52, this Harvard study. They talk about in the first full paragraph -- I want to ask you about it. "In the prospective cohort study, low response rates to questionnaires designed to obtain information on subject identifiers, exposures, and baseline disease status will clearly diminish statistical power and may create bias."

It's true, isn't it, ma'am?

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MR. COPLE: Objection. Argumentative, mischaracterizes the study authors, lacks foundation, asked and answered.

BY MR. MILLER:

Q. You can answer.

A. Since I haven't read through this manuscript, I'm not sure what they're referring to specifically, and would need greater context about this.

Q. They go on to warn in the next sentence, "The success of the cohort study also depends upon acceptable response rates to future follow-up surveys of the cohort."

That was a concern that Harvard expressed in two -- in year 2000. That's called loss to follow-up, isn't it?

MR. COPLE: Objection. Argumentative, mischaracterizes both the study authors, as well as that particular statement lacks foundation, asked and answered.

A. While that may be an issue one would want to be concerned about, I believe that the specifics in the Agricultural Health Study publication addresses issues around response rates in a number of different ways. So -- but

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I can't say specifically what they're commenting on here.

BY MR. MILLER:

Q. They're commenting on a concern about loss to follow-up in the future surveys, and that's what they're commenting on.

MR. COPLE: Objection. Argumentative, the document speaks for itself, asked and answered.

A. Yeah, it's challenging to really understand fully what they're referring to here since I have not had a chance to review this document yet. So it's hard for me, without specific context of what they were talking about, to fully answer your question.

BY MR. MILLER:

Q. Well, you were provided the Agricultural Health Study and call it the strongest evidence in the case. So let me ask you this.

Do you know what the loss of follow-up was in the Agricultural Health Study number two that you rely upon?

A. So I think what you're -- well, I'm not exactly sure what you mean by "loss to

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follow-up" here. Could you -- it would be helpful to have a clarification.

Q. Have you used the phrase "loss to follow-up" before?

A. When I talk about loss to follow-up, what I'm thinking about is not knowing what the outcomes of study are. And we know by using the state registry data that we have virtually complete follow-up for cancer outcomes, including non-Hodgkin lymphoma.

Q. Okay. So it's your testimony there is no low -- there is no loss to follow-up in Agricultural Health -- let me finish my question -- in the Agricultural Health Study number two, the unpublished study that you rely upon?

MR. COPLE: Objection. Misstates the prior testimony.

A. What I stated was when I, as an epidemiologist, think about the concept of loss to follow-up, we're concerned about whether or not we know somebody has the outcome of interest, which in this case would be non-Hodgkin's lymphoma. Since the Agricultural Health Study uses state registries to follow

individuals, that follow-up for the endpoint of non-Hodgkin's lymphoma was actually quite high. And so in terms of the outcome, the loss to follow-up in the Agricultural Health Study is very, very low.

BY MR. MILLER:

Q. Did the state registries tell the investigators whether these people were -- started using Roundup?

MR. COPLE: Objection. Vague, lacks foundation.

A. As I just mentioned, the use of the term "loss to follow-up" in epidemiology usually refers to the outcome, not to the exposure. That's a different issue.

BY MR. MILLER:

Q. Is it important that 37 percent of the participants in the first Agricultural Health Study did not fill out the questionnaire for the second Agricultural Health Study, or is that -- it doesn't mean anything to you?

MR. COPLE: Objection. Vague, lacks foundation, argumentative.

A. Could you clarify what you mean by that, please?

BY MR. MILLER:

Q. Let's read the question back and see what needs clarifying.

(Whereupon, the reporter read back the pending question.)

MR. COPLE: Same objections.

A. All right. So if you could clarify what you mean by "important."

BY MR. MILLER:

Q. Have you ever used the word "important" before?

MR. COPLE: Objection. Argumentative.

A. I can imagine many different interpretations of the word important here. So I guess if you could clarify specifically what you mean by important in this context, that would be helpful.

BY MR. MILLER:

Q. Tell me your interpretation of the word important, and we'll get back to work.

MR. COPLE: Objection. Vague.

A. It has many interpretations. That's why I'm asking for some clarification on this question.

BY MR. MILLER:

Q. You need clarification on the definition of the word "important"?

MR. COPLE: Objection. Argumentative.

A. If you could say specifically why -- what you'd like me to talk about in terms of the participation in the second wave of the questionnaire in terms of potential bias, I'd be -- if you could clarify that.

BY MR. MILLER:

Q. It may not have been important to you, but it was important to these Harvard scientists.

Let's look at --

MR. COPLE: Objection. Argumentative, mischaracterizes the study authors.

BY MR. MILLER:

Q. These scientists at Harvard not retained by Monsanto say, "If low response rates occur with follow-up questionnaires, the potential for bias will increase, partly from misclassification of subjects (and person-years) with regard to chemical exposure and partly from residual confounding stemming from inaccurate measurement of risk factors other than pesticides."

Did I read that correctly?

MR. COPLE: Objection. The document speaks for itself.

A. That is what is stated here in this document.

BY MR. MILLER:

Q. Tell the jury what the problem is in epidemiology with misclassification. What's that mean?

MR. COPLE: Objection. Vague.

A. I'd like to read this again, because, again, since I haven't had a chance to read this document, I'm seeing this for the first time here, so I'd just like to read it again.

(Witness reviewing document.)

A. I think what they're saying specifically is a concern of misclassifying the exposure which could result. However, I think what's been shown in the Agricultural Health Study publications is that although there was some missing data in the second phase of the questionnaire, they looked at this in many different ways, all of which said basically the same thing, that they were able to -- including in a validation study, they could use all this

data, and that the misclassification was likely to be low.

If I believe -- when this publication happened, it was well before the second wave or any validation studies that were done to assess the potential issues of misclassification, which do not seem to be apparent in the Agricultural Health Study.

BY MR. MILLER:

Q. What is the residual confounding? How would you explain to a lay -- a jury what residual confounding is?

MR. COPLE: Objection. Vague.

A. I would say that residual confounding occurs in -- when you haven't fully adjusted for factors that are both correlated with the exposure and also have an association with the outcome.

BY MR. MILLER:

Q. Please turn with me to Page 57. Before we talk about the particulars of Page 57, you understand that the Agricultural Health Study was done off of questionnaires that were filled out by people that were applying to become licensed pesticide commercial

applicators?

MR. COPLE: Objection. Lacks foundation.

BY MR. MILLER:

Q. You can answer.

A. Could you repeat the question? Sorry.

MR. MILLER: Ma'am, would you read that back?

(Whereupon, the reporter read back the pending question.)

MR. COPLE: Same objection.

A. I know that questionnaires were filled out by the participants in the Agricultural Health Study. But in addition to that, there were also subsequently validation studies on select participants as well.

BY MR. MILLER:

Q. Do you understand that they were applying for license, commercial pesticide applicator licenses?

A. I was not aware one way or the other if they were.

Q. I understand.

Let me look with you at Page 57. A concern raised by these scientists from Harvard

and other institutions is -- and we're at the middle of the page, I'll highlight it -- "It is possible that those farmers who apply pesticides frequently and have done so for many years do so with particular experience and care, which might suggest that their absorbed dose per application is less than the exposure of farmers who apply chemicals less frequently or have fewer years of experience in farming."

That's a fair concern, isn't it, ma'am?

MR. COPLE: Objection. Argumentative, vague, lacks foundation.

A. Again, since I'm just reading parts of this manuscript, now I'm not specifically sure what they're referring to. However, in the Agricultural Health Study publications, one way that they try to account for potential different use of protective gear, for example, was in their measure of one of their dose-response exposures to try to address and say what was the real dose-exposure.

So I'm not sure specifically what they're referring to here, but it is the case that their dose-response analyses in both of the

Agricultural Health Study publications did address this issue.

BY MR. MILLER:

Q. You said twice now "both of the Agricultural Health Study publications." But just to be clear, you and I agree the second Agricultural Health Study is not published?

A. Parts of the second updated analysis was actually published in a peer-reviewed journal using very similar methodology to what we saw in the 2013 manuscript.

Q. The part of the Agricultural Health Study that was done on glyphosate and its potential association with non-Hodgkin's lymphoma was not published, was it, ma'am?

A. Well, it was not published in a journal to date. A huge amount of that data that was in that same publication using the same methodology has been published in 2014.

Q. You're referring to the Alavanja paper on fungicide?

A. Well, included many different compounds including fungicides, yes.

Q. Okay. But we can agree that the second paper that you're referring to on

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glyphosate non-Hodgkin's lymphoma has not been published?
A. Correct. While it has not been published, however, they used a very similar methodology that I referred to that integrated information on potential use of protective equipment in order to try to get a true dose of exposure. That was published in the 2014 publication.
Q. These scientists from Harvard and other institutions raise another concern, "A particular task, such as mixing, may lead to much greater exposure than frequent application. If rare but serious mishaps or spills have a powerful influence on total lifetime exposure, number of applications may be a poor surrogate for total exposure."
That's an honest criticism and concern, isn't it, Doctor?
MR. COPLE: Objection. Vague.
A. I'm not sure specifically what they're referring to here. However, the validation study that was done within the Agricultural Health Study addresses some of the concerns about the use of the questionnaire data and how

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valid it was by looking at both the reliability study as well as the biomarker study that was done that both showed an association.
BY MR. MILLER:
Q. Are you aware, Dr. Mucci, that the questionnaires did not deal with the issue of whether or not the applicant had spills and exposure from spills?
MR. COPLE: Objection. Lacks foundation.
A. So I was not sure one way or the other about that. However, I think the validation study shows a high validity of the questionnaire data with the glyphosate biomarker data. And so, therefore, whether there were spills integrated, they're not -- still shows the questionnaire data are highly valid.
BY MR. MILLER:
Q. Is it your testimony the validation study addresses the issue of spills?
A. As I said, I'm not sure one way or the other how it integrated spills. However, it did take into account other components of protective gear and other factors.
Q. These scientists from Harvard and

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other institutions caution, "The United States EPA study may not be large enough to detect these rare yet serious incidents."
That's a legitimate concern, isn't it, Doctor?
MR. COPLE: Objection. Vague.
A. I'm sorry, I don't know under -- I don't know what the US EPA study is, and I don't know what the context of this statement is.
BY MR. MILLER:
Q. They go on to caution, "Errors due to misclassification can produce bias as towards the null."
What does "bias towards the null" mean?
A. In epidemiology, bias towards the null can happen when you have an exposure that's misclassified, and that misclassification is either a yes or no category, and it's similar in those who eventually get the disease and those who do not get the disease.
Q. What is non-differential exposure misclassification?
A. In epidemiology, non-differential exposure misclassification, as I said just in my

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last statement, refers to when the exposure is misclassified, and that misclassification is similar in terms of people who develop the disease versus people who do not develop the disease.
Q. Misclassification can reduce the power of a study to detect a general cause/effect; true?
A. Misclassification can result in bias. I would think it's an issue of bias rather than loss of power.
Q. You'll agree that it will affect the power of the study to determine a general cause and effect; true?
A. As I just said, my thought is it's really an issue of bias and not statistical power.
Q. Let's see what these scientists from Harvard said on Page 58, ma'am. They say, "Misclassification will reduce the power of the study to detect any genuine cause-effect relationship."
Did I read that correctly?
MR. COPLE: Objection. The document speaks for itself, mischaracterizes the study

authors.
A. While that's what it says specifically here, I'm not sure how they're using the term "power" in this statement here.
BY MR. MILLER:
Q. They also say it "will also reduce the validity of findings."
That's true, isn't it, Doctor?
A. If there is misclassification in the study and it biases to the null, that can influence validity. One important feature, however, is not only whether there's misclassification present, but how large the misclassification is, and validation studies can help address the amount of misclassification that exists in the study.
Q. There's a genuine and serious concern about recall bias in the Agricultural Health Study, isn't there, Doctor?
MR. COPLE: Objection. Lacks foundation, vague.
A. No, that is not correct. Recall bias does not occur in cohort studies like the Agricultural Health Study. Recall bias occurs, and I think there's many examples in several of

the case-control studies of glyphosate and NHL risk because you're asking about the exposure after the disease occurred.
BY MR. MILLER:
Q. Let's see what these scientists from Harvard say about whether the agricultural study is subject to recall bias. On Page 59, ma'am, at the bottom there, they say, "In order to answer these questions, respondents must remember with some accuracy when they first used products and their frequency...of each pesticide product, and they must be able to compute averages in their head involving multiple years of use. For older subjects who may have many years of farm experience, accurate responses will be difficult to supply. Moreover, some pesticides are sold and applied as mixtures and thus the exact ingredients may not be known to farmers. It can reasonably be expected there will be inaccuracies in these data."
That was the concern of these Harvard scientists, wasn't it, Doctor?
MR. COPLE: Objection. Mischaracterizes the study authors, lacks foundation, argumentative.

A. So I -- again, I have not read this particular manuscript, so I'm not sure what specifically they're referring to here.
But just to your comment earlier, there's no -- recall bias is a very specific form of misclassification. It's a differential misclassification. This statement does not talk at all about recall bias. And as I had said, the Agricultural Health Study performed a number of validation studies with respect to the exposure.
Q. These scientists from Harvard thought there was serious questions about the quality of the data being collected; true?
MR. COPLE: Objection. Vague, argumentative, mischaracterizes the study authors.
A. I couldn't say one way or the other specifically what these authors, which included some Harvard authors, but many other institutions as well, I can't say specifically what they were concerned about. But subsequent to this publication, a number of validation studies have been published on specifically glyphosate that showed high reliability of

reporting.
Q. I think we can clear that up. Let's see. This is on Page 58, from these authors, "However, there are still serious questions about the quality of the pesticide use data that are being collected in the Agricultural Health Study."
A. I'm sorry, was there a question?
Q. Did I read that correctly?
MR. COPLE: Objection. The document speaks for itself.
A. Those are the words that are written there.
However, as I mentioned, after this was published in 2000, since that time frame, there have been different settings that have addressed specifically the issue of the validity of the self-reported data.
BY MR. MILLER:
Q. Do you know who Aaron Blair is?
A. I know of Dr. Blair by name.
Q. And is he the author of any of these studies?
MR. COPLE: Objection. Vague.
A. I'm sorry, could you clarify, any of

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what studies?
BY MR. MILLER:
Q. Is he an author of the Agricultural Health Study?
A. Yes, he is an author in the Agricultural Health Study.
Q. Is he an author -- or do you know what the NAPP study is?
A. The North American Pooling Project.
Q. Is he an author of the NAPP?
A. I'd have to review the author list on that to make sure.
Q. Did he help with this Harvard study, do you know?
A. I don't know one way or the other.
Q. Let's take a look. Go with me, please, to Page 69. In the Acknowledgment section it tells us that "Preparation of this report was a collaborative effort involving Drs. John D. Graham and George M. Gray of Harvard Center for Risk Analysis."
Do you see that, ma'am?
A. Yes.
Q. And "We are particularly thankful for information and assistance provided by

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Agricultural Health Study team members," lists many of them, including Dr. Aaron Blair. Do you see that?
A. Yes, I do.
Q. It also lists and thanks a Dr. John Acquavella in helping with this report.
Do you know who Dr. John Acquavella is?
A. I know him by name, yes.
Q. He's an epidemiologist that was a full-time employee at one time for Monsanto. You're aware of that, aren't you?
A. Yes.
Q. And you knew Dr. Acquavella prior to being retained as an expert here by Hollingsworth, right?
A. Did I know -- I've never met Dr. Acquavella.
Q. You knew him by name and reputation prior to that?
A. I knew of his name, yes.
Q. Okay. I'm going to move on to something else.
Yes, ma'am. I think I'm going to leave it in a pile there. We might go back and

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forth between exhibits. Thank you.
You mention in your report the Exponent meta-analysis. Are you familiar with what I'm talking about there, ma'am?
A. Which specific report are you referring to?
Q. Dr. Chang and others did a meta-analysis of this issue. You mention it in your report. It's not published. I'm sorry, to be precise May 24, 2017.
A. May I look at my report to pull it up?
Q. Sure, I think you can find it on Page 59, if that helps.
A. Page 60 refers to the technical memorandum of 2017.
Q. Yes, ma'am. So I'll mark it as 24-2.
(Whereupon, Mucci Exhibit 24-2, 5/24/17 Exponent paper, Meta-Analysis of Glyphosate Use and risk of Non-Hodgkin Lymphoma, was marked for identification.)
BY MR. MILLER:
Q. And this is what we're referring to (handing).
MR. COPLE: Do you have a copy?

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MR. MILLER: I do, yes. I'm sorry (handing).
BY MR. MILLER:
Q. All right. Ma'am, so this is the Exponent report mentioned in your report?
A. Yes.
Q. And I want to get your understanding for the jury. This draft in Footnote 1 of an Agricultural Health Study 2013 article was sent by a lawyer for Hollingsworth, Mr. Lasker, to Exponent, and then they took it and did a meta-analysis; right?
MR. COPLE: Objection. The document speaks for itself.
A. Yeah, I'm not sure specifically. I couldn't comment specifically on what was sent to Exponent for this meta-analysis.
BY MR. MILLER:
Q. It says in footnote 1, ma'am, the Alavanja draft, Lymphoma risk and pesticide use in the Agricultural Health Study, March 15, 2013, and that was received by Exponent from Mr. Eric G. Lasker, Hollingsworth, LLP.
Do you see that?
MR. COPLE: Objection. The document

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speaks for itself.
A. Yes, I see where it says this, but I couldn't comment specifically what materials were sent to them or what materials were not sent to them.
BY MR. MILLER:
Q. Well, you don't challenge this footnote 1 where it says that the draft of the AHS manuscript was sent to Exponent by the lawyer at Hollingsworth?
A. I just couldn't comment one way or the other since I'm not familiar specifically what was sent to them for this meta-analysis.
Q. Well, you can comment that Hollingsworth is the same law firm that has hired you; right?
A. Correct.
Q. Yeah, okay. So Hollingsworth has been retained by Monsanto. You've been retained by Monsanto.
Are you aware that Exponent is being funded by Monsanto?
A. I'm sorry, could you clarify specifically what you mean by "funded by Monsanto"? Was that for this particular study

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or...
Q. Yes, for this particular study.
MR. COPLE: Objection. Lacks foundation.
A. I wasn't familiar one way or the other about who was funding this manuscript.
BY MR. MILLER:
Q. The other -- if you go, please, with me to footnote 7, here we have, "Other documents that we reviewed were unpublished draft manuscript," NAPP, received by Exponent from Mr. Lasker, Hollingsworth LLP.
Do you see that, ma'am?
MR. COPLE: Objection. The document speaks for itself.
A. Yes, I can see where it says that in the document.
BY MR. MILLER:
Q. Have you met Mr. Lasker?
A. Yes, I have.
Q. When was the last time you saw Mr. Lasker?
A. This week.
Q. Okay. One of things I want to ask you about in this unpublished manuscript written by

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Exponent is on Page 5. If you look at the top of the page. When Exponent looks at the De Roos 2003 article -- you've looked at the De Roos 2003 article; right?
A. Yes.
Q. And you remember there were two analyses; There was a logistical regression and a hierarchal regression model. Do you remember that?
A. Yes.
MR. COPLE: Objection. Lacks foundation.
Q. They prioritized the results using the logistical regression model in the present analysis.
Do you see that?
MR. COPLE: Objection. Lacks foundation, the document speaks for itself.
A. I can see -- I know from reading this technical memorandum that they actually considered multiple different models, as you can see in Table 1, one of which included using the logistic regression results.
BY MR. MILLER:
Q. And just one last thing before we

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leave this particular study. Page 7, they state they "cannot verify the accuracy of these results or the published results of any of the...studies included in this analysis," and it's signed by Dr. Chang; right?
MR. COPLE: Objection. The document speaks for itself.
A. That's what it says here, but I couldn't comment specifically about whether -- what they were thinking with regard to the accuracy of this.
BY MR. MILLER:
Q. You know Dr. Chang, don't you?
A. I do.
Q. She's a friend of yours; right?
A. She and I were doctoral students together.
Q. You're still friends; right?
A. Yes.
Q. Okay. All right. Is that how Hollingsworth found out about you, from Dr. Chang?
A. I'm not familiar with how they found out about me.
Q. Here's the Chang meta-analysis that

was published. I'd like to go over that with you. It's a 2016 document. We'll mark that as Exhibit 24-3.

(Whereupon, Mucci Exhibit 24-3, Chang and Delzell paper, Systematic review and meta-analysis of glyphosate exposure and risk of lymphohematopoietic cancers, was marked for identification.)

BY MR. MILLER:

Q. You reviewed this as well, ma'am; right?

A. Yes.

Q. And this is on the issue, "Systematic review and meta-analysis of glyphosate exposure and the risk of lymphohematopoietic cancers"; right?

A. Yes.

Q. And mouthful, but lymphohematopoietic cancers includes non-Hodgkin's lymphoma?

A. Yes.

Q. Systematic review means what?

A. In this context, a systematic review was done to review all of the studies included in this analysis. The meta-analysis refers to a

very quantitative assessment of the individual studies.

Q. Turn with me, please, to Page 416.

Before we go, you agree this was done by Exponent; right?

A. This study was done by Drs. Chang and Delzell, both of whom have an appointment at Exponent.

Q. And Page 416. On Page 416, Dr. Chang and Exponent have selected estimates included in meta-analysis and calculated meta-analysis risk for the association of glyphosate and the risk of LHC, including non-Hodgkin's lymphoma, non-Hodgkin's lymphoma subtypes, Hodgkin's lymphoma, multiple myeloma, and leukemia; right? That's what they're talking about here?

A. In Table 3 these are the selected estimates, yes.

Q. Okay. And so in the top here, block, they talk about the meta-analysis model, and Model 4 here, they're looking at non-Hodgkin's lymphoma, and Dr. Chang gets an increased risk of 40 percent; right?

MR. COPLE: Objection. The document speaks for itself.

A. So while that is the relative risk estimate that is presented here, you can also see that there are a number of different meta-analysis results that are published, and the findings are sensitive to the specific studies that are included or not included.

BY MR. MILLER:

Q. Sure. And that's fair. And let's look at some other models that Dr. Chang does.

She models in the next block a meta-analysis model for B-cell lymphoma, which I think you and I can agree is a form of non-Hodgkin's lymphoma; right?

A. Yes.

Q. Okay. And she shows a relative risk of 2, over a 100 increased risk, statistically significant; right?

A. So again, while she did perform this meta-analysis, I think one important thing to remember is that meta-analysis addresses issues of precision. But if studies are inherently flawed, which we know there were flaws in these two studies included in these two particular analysis of B-cell lymphoma, then the relative risk estimate would be biased.

Q. That's the proverbial, I like to call it the royal "we." I mean, I don't want to -- I don't think so. You think there's a problem here; is that right?

MR. COPLE: Objection. Argumentative.

A. The reason that I would and most epidemiologists would -- or as it follows, first, the -- one of the two studies that included was based only on four cases and two controls in total, and so it's quite limited.

Secondly, we know with the Eriksson study there's concerns of misclassification or confounding, actually, in the Eriksson study. So most epidemiologists would agree that while the meta-analysis relative risk, generated relative risk of 2, that should not be interpreted as a causal association. I think subsequently, as shown in the 2017 updated analysis, which was able to include data from the Agricultural Health Study, there was -- essentially this odds ratio was attenuated substantially.

MR. MILLER: Move to strike "most epidemiologists would agree."

BY MR. MILLER:

Q. We can only look at your opinions, and we can look at the opinions of Dr. Chang here who is also retained by Monsanto. And so let's look at that.

MR. COPLE: Object to counsel's statement. The witness's testimony will stand.

BY MR. MILLER:

Q. Let's go to models -- well, first of all, you'll agree that multiple myeloma is a form of non-Hodgkin's lymphoma; right?

A. In the updated definition, multiple myeloma is included in the definition.

Q. And so here we have Dr. Chang in Model 5 of her meta-analysis, multiple myeloma, showing a 50 percent increased risk of multiple myeloma with exposure to glyphosate; right?

A. I'm sorry, could --

MR. COPLE: Objection. The document speaks for itself.

A. I'm sorry, I'm not sure where you're looking at.

BY MR. MILLER:

Q. It's easier if you look up here, ma'am.

A. So my specific report focused

specifically on non-Hodgkin's lymphoma, which earlier on had not included this definition multiple myeloma. So I did not review in detail the study by Brown or Kachuri for this particular systematic review expert report that I put together of the epidemiology.

Q. So you have no opinion on that?

MR. COPLE: Objection. Misstates testimony of the witness.

A. I haven't had a chance to review thoroughly the studies by Brown and Kachuri which would allow me to understand specifically potential biases in these studies.

BY MR. MILLER:

Q. Let's go to Page 404. You know what a forest plot is, right, Doctor?

MR. COPLE: Objection. Lacks foundation.

A. I -- in -- I understand what a forest plot is, but it can have different definitions and different meaning in different settings.

BY MR. MILLER:

Q. What we're looking at here on Page 404 is a forest plot of relative risk; right?

A. These are relative risks that were

from specific studies of glyphosate and NHL risk.

Q. For the association between glyphosate exposure and the risk of non-Hodgkin's lymphoma; right?

A. Yes.

Q. Okay. And so for us lay folks, this line where there's a 1, that vertical line, any study that comes in on the right side of that line is showing a risk, and any study comes in on the left side is showing a protective effect; right?

MR. COPLE: Objection. Vague.

A. That's not exactly correct actually. Not only is it important to look at the relative risk estimate, but also the 95 percent confidence interval, because it gives a range of values consistent with the estimate. And so some of these estimates do -- while the point estimate may be larger than 1, do not support a positive association.

BY MR. MILLER:

Q. Which ones don't support it?

A. Well, it's really difficult to say one way or the other with the Hardell 2002 given the

large width of the 95 percent confidence intervals --

Q. Have you --

A. -- for example.

Q. I didn't mean to interrupt you. Sorry.

Have you written before that it's important to look at studies even if they don't have a 95 percent confidence interval?

MR. COPLE: Objection. Lacks foundation.

A. I'm sorry, I'm not sure what you're referring to specifically.

BY MR. MILLER:

Q. We'll take a look at it in a minute.

So you agree that on this vertical line, how many of the black boxes are on the left side of 1?

A. As I've mentioned, we -- epidemiologists wouldn't look at the data that way. They would look not only at the point estimate, which is the box, but also the 95 percent confidence interval, which is the line. So both -- all of that taken together is important.

And as I mentioned previously, also, it's really critical in looking at these data to say can we exclude bias and confounding from these individual studies, which you cannot actually. And I think that's clearly shown in the updated analysis of Chang and Delzell where, for example, they use the data from De Roos 2003 and McDuffie 2001 in the North American Pooling Project. If you take that data, appropriately adjusting for residual confounding due to concomitant use of other pesticides in dealing with the issue of recall bias introduced by proxies, actually the point estimate would be quite different for the meta-analysis and its 95 percent confidence interval.

MR. COPLE: Before you move to something else, we've been going for a little more than an hour. How long do you plan to go before the witness has a break?

THE WITNESS: Yeah, I was actually going to just ask if we could take a break.

MR. COPLE: Sure.

THE WITNESS: Okay. Great. Thank you.

THE VIDEOGRAPHER: Going off the

record. The time is 9:10.

(Whereupon, a recess was taken.)

THE VIDEOGRAPHER: Back on the record. The time is 9:25.

BY MR. MILLER:

Q. What's Dr. Chang's first name?

A. Ellen.

Q. And Dr. Delzell is Elizabeth?

A. I don't know Dr. Delzell. I would have to look it up.

Q. And you've not met a Dr. Acquavella but know of him, I think, is where we were?

A. Correct.

Q. Okay. I didn't want to restate.

All right. Do you know if Dr. Acquavella was involved in the search for you as an expert?

MR. COPLE: Objection. Vague, lacks foundation.

A. I don't know one way or the other.

BY MR. MILLER:

Q. Okay. I show you e-mail that we were produced by Monsanto.

(Whereupon, Mucci Exhibit 24-4, 6/2/15

e-mail, ACQUAVELLAPROD00010118 through 120, was marked for identification.)

MR. MILLER: We'll mark it as Exhibit 24-4. Copies for everyone (handing).

BY MR. MILLER:

Q. This is in June of 2015. Do you see the date there, ma'am?

A. June of 2015.

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Yes, I can see that's what it says here on this document.

BY MR. MILLER:

Q. From John Acquavella to Thomas Sorahan.

Do you know Dr. Sorahan?

A. No, I don't.

Q. Whether he attended IARC Volume 112 on behalf of Monsanto?

MR. COPLE: Objection. Lacks foundation.

A. I don't know one way or the other.

BY MR. MILLER:

Q. Let me stop there.

Have you read the IARC monograph for

Roundup, Volume 112?

A. I have reviewed it, yes.

Q. Reviewed it, or did you -- skim it, or did you read the entire thing?

A. It was one piece of many documents that I read in putting together my expert report.

Q. Read the entire thing?

A. I read the parts specifically related to the epidemiology, and then read through less diligently the other parts.

Q. Okay. Going back to her e-mail, John Acquavella, Tom Sorahan, it says "Tom, I have the highest regard for Elizabeth. She is" an expert -- "she is as expert as any occupational epidemiologist. Plus, she is a personal friend. The major con with Elizabeth is that she works for Exponent and would not be perceived as an academic with no direct conflict of interest."

Do you see where I'm reading?

A. I get --

MR. COPLE: Objection. The document speaks for itself.

A. Well, I can see where you're reading. I -- you know, again, I'm not familiar with

Dr. Acquavella or his relationship with Elizabeth.
BY MR. MILLER:
Q. They go on to write, "My sense is that you are right, that it may be impossible to find a prominent EU" -- I assume that's means European Union -- "epidemiologist who will want to get in the middle of this."
Do you know if Monsanto and Hollingsworth attempted to get other epidemiologists before you were retained?
A. I'm not --
MR. COPLE: Objection. Lacks foundation.
A. I'm not familiar one way or the other.
BY MR. MILLER:
Q. Is it appropriate before a meta-analysis is released on a subject of potential exposure and its association with cancer to allow the company funding the process to review and edit the manuscript before it's published?
MR. COPLE: Objection. Lacks foundation, vague.
A. While there may be some examples where

that might not be the case, I can think of other examples where there -- that would be appropriate.
BY MR. MILLER:
Q. Was that done with the Chang manuscript?
A. I couldn't tell you one way or the other who reviewed the document by Chang and Delzell.
Q. So you had not been made aware that Donna Farmer, lead toxicologist for Monsanto, reviewed and edited the Chang meta-analysis before it was published?
A. I --
MR. COPLE: Objection. Objection. Lacks foundation, argumentative, vague.
A. As I stated, I'm not sure one way or the other who reviewed this document.
BY MR. MILLER:
Q. I'm going to hand you what's been marked as 24-5, another series of e-mails provided to us by Monsanto.

(Whereupon, Mucci Exhibit 24-5, E-mail

chain, Bates ACQUAVELLAPROD02463444 through 446, was marked for identification.)
BY MR. MILLER:
Q. You've not seen this e-mail before?
MR. COPLE: Objection. Lacks foundation.
A. I have not seen this e-mail before.
BY MR. MILLER:
Q. This is from Donna Farmer at Monsanto to Elizabeth Delzell, a copy, Ellen Chang, both at Exponent.
Do you see that, ma'am?
A. I can see where it says this on this document.
Q. It's concerning a glyphosate draft, August 17, 2015.
Do you see that?
A. I can see where it says that in this document.
Q. And Donna Farmer writes to Dr. Delzell and Chang, "Thank you for the opportunity to review the draft of the paper and please see our suggested comments in the attachment."
Do you see that?

A. I can see where it says this on this.
Q. And is it appropriate for employees of the company to review and edit an epidemiological draft in this context?
MR. COPLE: Objection. Vague, lacks foundation, argumentative.
A. Since I don't know the context for this e-mail, and I also don't know the context for what was specifically commented on, I couldn't say one way or the other whether it was appropriate.
BY MR. MILLER:
Q. Do you know whether the Exponent meta-analysis was rejected the first time they attempted to have it published?
MR. COPLE: Objection. Lacks foundation.
A. I'm not familiar one way or the other.
BY MR. MILLER:
Q. All right. Let's look at it.
(Whereupon, Mucci Exhibit 24-6, E-mail chain with attachments, Bates ACQUAVELLAPROD00022326 through 334, was marked for identification.)
BY MR. MILLER:

Q. Here's what we've marked as Exhibit 24-6, a series of e-mails and attachments produced to us by Monsanto (handing). I just want to go over a few things here.

This is a series of e-mails between Donna Farmer from Monsanto, Dr. Chang and Dr. Delzell from Exponent.

Do you see that, ma'am?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. I can see where it says this on this document.

BY MR. MILLER:

Q. Let's go to Page 2. Ellen Chang is advising Monsanto employee Donna Farmer that "Dear Donna, Unfortunately, our manuscript on the meta-analysis and review of glyphosate and lymphohematopoietic cancers was rejected by the International Journal of Environmental Research and Public Health."

Do you see that, ma'am?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Again, I haven't read -- I'm not

familiar specifically with this set of e-mails, but I can see where it says this on this document here.

BY MR. MILLER:

Q. This e-mail chain was not provided to you by the lawyers for Monsanto; right?

A. No, it was not.

Q. And on the first page, Ellen Chang tells us that "They didn't explicitly state why, and one of the reviews was reasonably favorable. I suspect that the editors had concerns about bias and conflict of interest."

Do you see that?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Yes. While I can see it, I couldn't really comment one way or the other specifically about the content of this e-mail.

BY MR. MILLER:

Q. Have you been a reviewer of journals?

A. Yes, I have.

Q. And reviewers of journals write their comments and criticisms when they reject a particular piece for a journal?

MR. COPLE: Objection. Vague.

A. It would depend on the journal. There may be different requirements that different journals have.

BY MR. MILLER:

Q. Let's take a look at what is Bates stamped 022329, and it's a reviewer's comment about the Chang meta-analysis. The bottom of the page there, pull that up so you can read it, "This paper seems like it is agenda-driven from the outset."

Do you see that?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. I can see where this particular document says that, yes.

BY MR. MILLER:

Q. What does it mean to be agenda-driven from the outset?

MR. COPLE: Objection. Vague, argumentative.

A. I couldn't say specifically. I'm just seeing this now. I couldn't say specifically what this review is speaking to.

BY MR. MILLER:

Q. "The authors set out to redo the

meta-analysis of Schinasi and Leon" -- you've read that meta-analysis, haven't you, Doctor?

A. I have --

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

BY MR. MILLER:

Q. -- "using specific selection criteria for studies and by presenting multiple meta estimates for various combinations of risk from the studies."

Do you see that?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Well, I can see that. And again, since I'm not familiar with this document, I'm not sure specifically what they are referring to in this case here.

But I think one point that's important to make is that the Schinasi and Leon meta-analysis did not integrate the most fully adjusted estimates from some of the studies and, therefore, the Chang and Delzell analysis actually provided some additional information that was not available in Schinasi and Leon.

BY MR. MILLER:

Q. Let's see what this reviewer for this journal has to say. They have similar results as Schinasi and Leon (meta relative risk, 30 percent) versus 50 percent for the risk of NHL associated with ever versus never use of glyphosate." That's what this reviewer observed; right?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. I think one of -- again, I couldn't say specifically what this reviewer was commenting on. But I think one important finding is that by integrating the studies which had additional adjustment for confounders, you can see the attenuation of the odds ratio that was due, but still the meta-analysis in both of these cases relied on some of the studies that did not have fully adjusted odds ratio adjusting for other pesticides or dealt with the issue of recall bias from the proxy respondents.

BY MR. MILLER:

Q. In addition this reviewer says, "the authors find a relative risk of 1.4 for the association between multiple myeloma and the use of glyphosate (a cancer type that had not been

examined by Schinasi & Leon) and had a significantly increased meta relative risk for B-cell lymphoma."

That's what the Chang study found, isn't it?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. I couldn't comment again specifically on what this reviewer was commenting on in this review. And I've spoken previously about some of the limitations with the meta-analysis results for B-cell lymphoma, and more generally just the concerns with this meta-analysis because of the issues of bias and confounding that were not fully addressed because of the studies that went into the meta-analysis.

Q. This reviewer goes on to say, "Then, despite the fact that the authors deemed the meta-analysis worth conducting, the discussion devolves into a laundry list of every possible cause of bias and imprecision of estimates in epidemiologic studies, as well as a review of the Bradford Hill criteria to evaluate the weight of the evidence for the association, from which the authors conclude there is no basis for

causal association."

Do you see that, ma'am?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Yes. While I can see that, I think, as I've mentioned, the Chang and Delzell study was able to integrate more fully adjusted estimates into their meta-analysis, although still even some of those studies they had to rely on results that were not fully adjusted for other pesticide use, so...

BY MR. MILLER:

Q. Another concern that this reviewer has is that "The authors should clearly state (in the text) which of the studies they cite were funded (or partially funded) by Monsanto - such as Mink 2012 and Sorahan 2015."

Do you see that, ma'am?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Yes. While I can see what is written here, I couldn't comment one way or the other about what this reviewer was intending with this comment.

BY MR. MILLER:

Q. This reviewer says, "Relying on the Agricultural Health Study as a Tier 1 study in this setting is" dubious -- "is tenuous at best."

Do you see that?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Well, I can see what is written here. I'm not sure what they're referring to with the use of terminology of Tier 1.

BY MR. MILLER:

Q. Let's go to the Bates stamp 0022331, it's about two pages back -- one page back. This is more comments by the reviewer that's rejecting this paper. I want to ask you about his comment here. "The scientific review based on Bradford Hill guidelines is sparse, incomplete, and comes off as biased."

Pretty strong criticism, isn't it, ma'am?

MR. COPLE: Objection. Argumentative, vague, lacks foundation, the document speaks for itself.

A. I can't really comment specifically on what this reviewer is referring to one way or

the other.
BY MR. MILLER:
Q. On the so-called concern for recall bias, this reviewer says, "Even though subjects were interviewed in case-control studies after diagnosis, people can generally remember whether their pesticide use was before diagnosis or not."
That's true, isn't it?
MR. COPLE: Objection. Argumentative, lacks foundation, document speaks for itself.
A. Again, I couldn't specifically comment on what this reviewer was referring to. However, I think an important thing to remember actually is that we know from both the analysis of Pahwa, et al, as well as the Wadell publication that there is strong evidence of recall bias that was induced by the use of the high proportion of proxy respondents in several of the US, Canadian, and Swedish studies, and so that is an important feature there.
BY MR. MILLER:
Q. It's okay to use proxy responses in the Agricultural Health Study, but not okay to use proxy responses in the Hardell study?

MR. COPLE: Objection. Lacks foundation, misstates witness's testimony.
A. That statement regarding the Agricultural Health Study is not correct. They did not use proxy respondent data there.
BY MR. MILLER:
Q. They imputed the answers for 20,000 missing people?
A. That --
MR. COPLE: Objection. Vague, lacks foundation.
A. That is not proxy respondents that I'm referring to. That -- and actually I think the validation studies of the imputation method that was used in the Agricultural Health Study to address an issue of missing data done in many different ways showed that there was no bias that ensued because of any potential missing data.
The issue that I'm talking about here specifically with respect to recall bias has resulted in several of the US, Canadian, and Swedish studies because more than 30 -- as many as 40 percent of the respondents' datas were completed not by the respondents themselves, but

actually by proxy respondents. And in the analysis by Pahwa, as well as the analysis by Wadell, both of those showed the impact of the recall bias associated with the use of proxy respondents.
BY MR. MILLER:
Q. These case-control studies show dose-response; true?
MR. COPLE: Objection. Vague, lacks foundation.
A. I'm not sure what studies you're referring to specifically. If you'd like to look at a specific study about dose-response, I'm happy to take a look at it.
BY MR. MILLER:
Q. The case-control studies, do any of the case-control studies show dose-response?
A. I -- I --
MR. COPLE: Objection. Asked and answered, lacks foundation, vague.
A. If you'd like, we can walk through some specific studies and look through study by study and look at the association.
BY MR. MILLER:
Q. I'm entitled to do it my way. Can you

answer that question or not?
MR. COPLE: Objection. Asked and answered, argumentative.
BY MR. MILLER:
Q. If you can't, you can't.
MR. COPLE: Objection. Arguing with the witness.
A. If you'd like, I'd be happy to look at some of the specific studies, and we can walk through each of the studies here.
BY MR. MILLER:
Q. Well, although you can't answer that one, this reviewer did. Let's look at it, ma'am. He said that, "There is some evidence for dose-response from the studies of non-Hodgkin's lymphoma, and especially multiple myeloma."
Do you see where I'm reading?
MR. COPLE: Objection. Argumentative, misstates witness's testimony, lacks foundation, the document speaks for itself.
A. And, again, I'm not specifically sure what that reviewer was commenting on with respect to the meta-analysis. And if you'd like to talk -- comment on some specific studies and

evaluate them, I'm happy to look at those individual studies.
BY MR. MILLER:
Q. Let's look at another reviewer that rejected the study, and you can find that on Page 022333.
A. I'm sorry, I don't know where you're referring to in this.
Q. Page -- get to the page, and I will point it out.
A. Why -- I don't know which page to go to, actually, because I'm --
MR. HOLLINGSWORTH: She's not familiar with Bates numbers, I don't think.
MR. MILLER: Sure.
BY MR. MILLER:
Q. These long numbers on the bottom of the page, and I'm looking at the one that says 0022333.
A. Okay.
Q. Okay? And I'm looking at the reviewer's comment on the bottom half of the page, and I want to ask you about this. "The authors conclude that no valid association, much" --

A. I'm sorry, I don't see where --
Q. Yeah, it's up here, see, ma'am?
A. Yeah.
Q. Okay. "The authors conclude that no valid association, much less a causal relationship, has been established between glyphosate exposure and the risk of LHC. This is not supported by the results of the meta-analysis, and the weight of the evidence evaluation was not sufficient to make a conclusion about causality."
Do you see that, ma'am?
MR. COPLE: Objection. Lacks foundation, the document speaks for itself.
A. Yes, I can see specifically where this statement is made in this document. I'm not specifically sure what the reviewer is referring to.
However, in my review of the meta-analysis produced by Chang and Delzell, including the updated analysis, I think, and take -- in a systematic review of all of the epidemiology studies, there are concerns about bias and residual confounding in especially the case-control studies, and taken together do not

support a causal association between glyphosate and NHL risk.
BY MR. MILLER:
Q. Now, you know that -- have you ever done any work for Exponent?
MR. COPLE: Objection. Vague.
A. I have not worked for Exponent.
BY MR. MILLER:
Q. Would it change your opinion if there was a known proven mechanism of action for glyphosate and non-Hodgkin's lymphoma?
MR. COPLE: Objection. Vague.
A. Specifically whether or not there's a mechanism, I could comprehensively review the body of epidemiology evidence, and based on that analysis there's not sufficient evidence to support a causal association between NHL and glyphosate.
BY MR. MILLER:
Q. So it wouldn't change your mind?
MR. COPLE: Objection. Asked and answered.
A. Again, it -- I -- specifically what I did was to review the epidemiology evidence, and whether there's a mechanism or not a mechanism,

I came to my conclusion that there is no causal association.
BY MR. MILLER:
Q. So fair to say you did not look at the issue of whether there was a mechanism of action; that's right?
MR. COPLE: Objection. Misstates witness's testimony.
A. What I said specifically was that my task in reviewing the epidemiology literature was to assess each of the individual studies, to think through them critically, evaluate the strengths and weaknesses, and look at the body of evidence as a totality, and come to an assessment about whether the epidemiology evidence supports a causal association.
BY MR. MILLER:
Q. Any such thing as a perfect epidemiological study?
MR. COPLE: Objection. Vague.
A. I'm sorry, did -- could you repeat the question?
BY MR. MILLER:
Q. Sure.
MR. MILLER: It was too fast I bet,

but if you got it.
(Whereupon, the reporter read back the pending question.)
MR. COPLE: Same objection.
A. I'm sorry, that's a -- I'm sorry, that's a very general question. It would be difficult to answer.
BY MR. MILLER:
Q. You can't answer general questions?
MR. COPLE: Objection. Argumentative.
A. That specific question is quite general, so I'm not specifically sure what you're asking here.
BY MR. MILLER:
Q. All studies have bias?
MR. COPLE: Objection. Vague.
A. It's important to consider all epidemiological studies and look to evaluate whether any associations that are observed, whether there might be bias, confounding, or a role of chance in any findings that are made.
BY MR. MILLER:
Q. Now, you took into account, we have spoken about, the Exponent meta-analysis. Did you ever review the Exponent's criticisms of the

Agricultural Health Study that were prepared? I'll give you a date here in a second. January of 2016.
MR. COPLE: Objection. Vague, lacks foundation.
A. Could I take a look at the document you're referring to?
BY MR. MILLER:
Q. Sure.
(Whereupon, Mucci Exhibit 24-7, Exponent document, Design of Epidemiologic Studies for Human Health Risk Assessment of Pesticide Exposures, Bates MONGLY02314040 through 14079, was marked for identification.)
BY MR. MILLER:
Q. Monsanto's lawyers show you this document marked as Exhibit 24-7?
MR. COPLE: I'm going to object to the phrasing of that question, and instruct the witness not to answer.
MR. MILLER: Instruct the witness not to answer the question?
MR. COPLE: Yes.

MR. MILLER: On what grounds?
MR. COPLE: Communications, deposition protocol, Pretrial Order 7.
BY MR. MILLER:
Q. Have you been provided 24-7, the design of epidemiologic studies for health and human risk assessment of pesticide exposure from any source?
A. I don't believe so, no.
Q. Never reviewed it?
A. I don't believe so, no.
Q. Well, let's take a look at it. This is from Exponent. That's the same organization that did the meta-analysis that you looked at; right?
A. If it's from Exponent, then, yes, the two authors that were part of that Chang and Delzell study are employees of Exponent.
Q. And it was prepared by an organization called CropLife. Do you see that, ma'am, on Page 2?
MR. COPLE: Objection. Lacks foundation.
A. Yeah, I --
MR. COPLE: The document speaks for

itself.
A. I see that it says that in the document. I'm not familiar one way or the other who it was prepared for.
BY MR. MILLER:
Q. Go with me, please, to Page 15. And what Exponent says here in this 2016 report is that there are "Strengths and limitations of specific study design characteristics for" health -- "human health risk assessment of pesticide exposure can be illustrated through examination of actual epidemiologic studies described in detail in published papers."
Will you agree that there are strengths and limitations of specific study designs?
A. I -- there are strengths and limitations of different epidemiological approaches. Each study should be evaluated on its own to assess the actual strengths and limitations of that study.
Q. And what they talk about here is they're going to talk about two studies that are used as examples. In this section are a pair of prospective cohort studies, the Agricultural

Health Study and another study that's not at issue in our case. Do you see that, where I'm reading that?

MR. COPLE: Objection. The document speaks for itself.

A. I can see where the document says this, yes.

BY MR. MILLER:

Q. Okay. They go on to discuss the Agricultural Health Study questionnaire, and they say, "highly detailed, thorough, and thoughtfully designed. Few, if any, other epidemiologic studies have conducted more exhaustive questionnaire-based assessment of pesticide exposure."

Do you see that, ma'am?

A. I can see where it says this in the document.

Q. "Nevertheless, as discussed earlier, self-reported pesticide use data have substantial drawbacks."

That's true, isn't it?

A. While this is what it says in this report, what I commented on earlier was the specific validation studies and reliability

studies that have looked at this question specifically within the Agricultural Health Study.

Q. Well, in the study dated 2016, Exponent says these limited accuracy -- "These include limited accuracy and reliability of recollected detailed exposures, crude summary measures of exposure that fail to capture important heterogeneity, and only modest correspondence between self-reported exposures and measured biomarker levels, as demonstrated in validation studies conducted with this cohort."

Do you see that, ma'am?

MR. COPLE: Objection. The document speaks for itself.

A. While I can see what this is, what they're saying specifically in this document, I'm not sure specifically whether or not this refers to the glyphosate data collected in the Agricultural Health Study.

BY MR. MILLER:

Q. Ma'am, they're talking about the Agricultural Health Study in this paragraph, aren't they?

A. While that is correct, they don't specifically comment one way or the other about glyphosate.

Q. They do comment that there's limited accuracy and reliability of recollected detailed exposures in the Agricultural Health Study; true?

MR. COPLE: Objection. The document speaks for itself.

A. I haven't had a chance to review this entire document, so I'm not specifically sure the details are going to go into and specifically what pesticides they've looked at in this particular article.

BY MR. MILLER:

Q. They critique -- they criticize for having, "Crude summary measures of exposure that fail to capture important" heterogenicity -- "heterogeneity."

A. So since I haven't had a chance to read through this document, I'm not specifically sure what they're commenting on there.

What I can comment on, however, is that with respect to glyphosate, the way the Agricultural Health Study dealt with this in

terms of integrating both the intensity of exposure as well as the cumulative exposure had been shown in the reliability and validity studies to have good reliability.

Q. Dr. Mucci, the truth is there was a problem with selection bias in the Agricultural Health Study; true?

MR. COPLE: Objection. Lacks foundation, argumentative.

A. I would say that is not correct.

BY MR. MILLER:

Q. Let's see what Exponent says. Let's look at Page 19. I'm looking at the section that starts "Selection Bias."

Do you see where I am?

A. Yes.

Q. Okay. Over 80 percent of eligible pesticide applicators, 75 percent of spouses married to private applicators enrolled in the AHS study during the initial recruitment phase, which took place at licensing facilities for application of restricted use pesticides.

Do you see that, ma'am?

MR. COPLE: Objection. The document speaks for itself.

A. I can see where the document says this.
BY MR. MILLER:
Q. And under this section of "Selection Bias," they say, "However, only 44 percent of enrolled pesticide applicators completed the detailed take-home questionnaire shortly after enrollment."
That's a problem, isn't it?
MR. COPLE: Objection. Argumentative, the document speaks for itself.
A. Again, I haven't had a chance to thoroughly review this particular document or read specifically about what their concerns are regarding selection bias here.
BY MR. MILLER:
Q. Well, they go on to say that, "participation in follow-up questionnaires was highly incomplete."
Do you agree with that?
MR. COPLE: Objection. The document speaks for itself.
A. While this is what this document says, I believe I commented earlier specifically about the phase 2 questionnaire and the different

strategies the Agricultural Health Study evaluated to assess whether or not there might be any bias induced by the fact that the second phase of the questionnaire was not completed.
BY MR. MILLER:
Q. Only 64 percent of private applicators, 59 percent of commercial applicators, and 74 percent of spouses in phase 2. That's selection bias, isn't it?
MR. COPLE: Objection. Lacks foundation, the document speaks for itself.
A. And actually that is not selection bias. You can have examples where there is some data that is missing in a -- follow-up questionnaires. It doesn't -- some -- in some cases it might induce a selection bias. In other cases it may not. And I believe that I commented earlier that there were several approaches that were done to assess the potential for bias to be induced by the missing data issue.
BY MR. MILLER:
Q. Well, this -- Exponent authors said in 2016, "Thus, considerable selection bias could have occurred if non-participation was related

to exposure and health status."
And they go on to say, "A formal analysis of bias due to study dropout does not appear to have been conducted."
That's true, it isn't?
MR. COPLE: Objection. Lacks foundation, document speaks for itself.
A. Actually that may have been the case. I couldn't say one way or the other since I haven't reviewed this manuscript. However, actually there has now been a publication looking specifically at non-participation and looking at a range of exposures as well as health outcomes, and overall that -- that study that has been published has shown that the -- those who did participate in the second wave and those who did not are very, very similar with respect to a number of health outcomes, including cancer outcomes, as well as a number of the different demographic factors in the study.
BY MR. MILLER:
Q. What study, and when was it published?
A. I'd have to look back. It was a study actually I didn't refer to in my report. It's a

study that I found just recently, but I would have to go through my notes to call that study up.
Q. Well, let's do it now.
A. Okay. I would have to get my computer to get that -- to get that for --
Q. Well, if we're going to do it at trial or a Daubert hearing, we're going to have to do it now. So let's take a break and do it.
A. Okay.
THE VIDEOGRAPHER: Going off the record. The time is 10:04.
(Whereupon, a recess was taken.)
THE VIDEOGRAPHER: Back on the record. The time is 10:21.
MR. COPLE: We have a statement. Dr. Mucci has confirmed that since the time the supplementary materials considered list was provided to plaintiffs in the MDL that she has considered a further article. The article has been provided to counsel.
MR. MILLER: Let me be clear. We won't be waiving any objections to that late notice, but let's go on.
BY MR. MILLER:

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Q. All right, Doctor, we have in front of us, and I've marked my copy, you have a copy just handed to me by counsel, the Montgomery article, Characteristics of non-participation.

MR. COPLE: The witness does not --

A. I don't have a copy.

MR. MILLER: Oh, I'm sorry.

MR. COPLE: I gave two to you. All right. Well --

MS. MILLER: Was that at the same time? Unless you want to go ahead and mark it and we'll talk about it later.

MR. MILLER: Yeah. So let's hand it to the doctor.

MS. MILLER: Are you going to talk about it now? Can we read it? Thank you so much.

MR. MILLER: Well, I just want to talk about it a little bit.

BY MR. MILLER:

Q. We might talk about it more later, but here, Doctor, that's 24-8.

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(Whereupon, Mucci Exhibit 24-8, Montgomery, et al article, Characteristics of non-participation and potential for selection bias in a prospective cohort study, was marked for identification.)

BY MR. MILLER:

Q. This is the article that after the break counsel handed me. And I think to put it in context, before the break we were talking about this Exponent article and the subject and the section on selection bias in the Agricultural Health Study. You, I think, generally told me that there was a study that had recently explained that there was -- this problem did not exist generally. Is that what you're -- the general line of -- let's just -- you don't have to say yes or no. That's our general backdrop.

So question, is this study, 24-8, the study that you went to get in response to that line of questions?

A. I'm sorry, is this 24-8?

Q. It is.

A. Okay.

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Q. Okay.

A. This is the study I was thinking about, and I wanted to make sure I had the right author on.

Q. All right. I think we're back on track.

Now, just to be clear, though, 24-7, this study by Exponent that has the criticism that I was referencing on the selection bias section, was written in 2016. Do you remember that?

A. So I can see here where they comment on the topic of selection bias, and so what I was -- since I haven't read their manuscript in detail, what I was referring to was a study by Montgomery, et al, which shows in general differences between those who did and did not participate in the follow-up interview were generally very small differences.

In addition, there was the study by Rinsky in 2017 that was just published that actually carried this even further to evaluate potential selection bias, which seemed to be small.

Q. All right. I want to break that down.

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That's a mouthful.

You just mentioned another study from 2017, Winsky?

A. Rinsky.

Q. Spell, please.

A. R-I-N-S-K-Y.

Q. And was that in your materials that you -- list of materials that you provided?

A. Yes.

Q. Okay. It's a 2017 article. All right.

But the article that you provided me after the break, the Montgomery article, that was written in 2010; right?

A. Yes.

Q. Okay. And so let's go back and look at the 2016 criticisms. Can you assume that they would have been -- the 2010 article of Montgomery would have been available to Exponent in 2016?

A. Well, since I haven't reviewed this document by Exponent, I couldn't say one way or the other if they reviewed this, if they considered it. I couldn't say one way or the other what they considered in this description

of the selection bias.
Q. Well, they considered one Montgomery article from 2008. Do you see that on --
A. Well, I can see that on this document. It is not the article I was referring to.
Q. That is true. Let's go back and see what these authors from Exponent say about selection bias and follow that discussion.
We were talking about the, "Thus, considerable selection bias could have occurred if non-participation was related to exposure and health status. A formal analysis of bias due to study dropout does not appear to have been conducted."
And my question is, are you of the opinion that the Montgomery study is a formal analysis of bias due to study dropout?
A. It is one of the two -- at least two analyses that have been conducted within the Agricultural Health Study to evaluate potential for selection bias because of the proportion of people who did not respond to the second wave.
Q. Well, what they say in the Montgomery study is in the conclusion, they say, "Differences between non-participants and

participants in the follow-up interview were generally small, and we did not find significant evidence of selection bias. However, the extent of bias may depend on the specific exposure and outcome under study"; right?
MR. COPLE: For the record, plaintiffs' counsel is marking the exhibit. This highlighting was not previously there.
BY MR. MILLER:
Q. You can answer.
A. I'm sorry, could you repeat the question?
MR. MILLER: If you could read it back, please.
(Whereupon, the reporter read back the pending question.)
A. Well, that is what the last statement in the conclusions does say. In fact, they actually look specifically at the topic of cancer here and the -- those who did and did not respond to the second questionnaire, there was a similar incidence of cancer. Also, non-Hodgkin's lymphoma they looked at specifically. So I think they partially addressed that here.

In addition, the article by Rinsky, et al, specifically looks at several aspects of pesticide exposure and cancer risk. And, again, although there is some missing data, it does not appear to be leading to a selection bias.
BY MR. MILLER:
Q. Show me the page in the Montgomery article where they study the specific exposure and outcome of non-Hodgkin's lymphoma.
A. So if you look on Table 2, you can look at the --
Q. I haven't found Table 2 yet. All right. Here. Okay. Now I have Table 2. All right. Sure, go ahead.
A. So you can -- here is where they compare health conditions reported at enrollment and participation in follow-up questionnaires.
Q. And you're saying between participants and non-participants we have the same result?
A. I'm saying that based on this, they're quite similar, and it wouldn't lead you to concerns about differential misclassification.
Q. To put a sharper number on it there, .09 for non-participants and .2 for participants; right?

A. What we're talking about is a difference between -- on an absolute scale it's quite a small difference. And when we look at cancer incidence overall, there as well we're seeing very small differences in the percent of people who have cancer and those who did and did not respond. So it's very small.
Q. The adjusted odds ratio is 67 percent?
A. But actually if you look at the confidence intervals, because the numbers are quite small, you can see .1 percent versus .2 percent. Confidence intervals are quite wide. These are very similar numbers, not a big concern for bias.
Q. And Exponent would go on to say in 2016, "An analysis of bias due to missing data, another form of selection bias" -- well, let's stop there.
You can agree that missing data is another form of selection bias?
A. In some settings in the case of missing data, if the missing data is not random, there may be concerns that's selection bias. But it's not always the case if you have missing data that you can result in selection bias.

Q. And what they go on to say in this case that it revealed that, "subjects with complete covariate data were substantially different from those with missing data," and they cite the Lash study of 2007; right?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Well, that is exactly what that says. The Lash study was not a study per se, but rather a letter to the editor commenting on this as a potential issue.

BY MR. MILLER:

Q. And they conclude in their paragraph on selection bias, "Thus, an analysis relying on follow-up questionnaires or relying on covariates with a high degree of missing data, selection bias is a major concern in the Agricultural Health Study."

That's true, isn't it?

MR. COPLE: Objection. Vague, lacks foundation, document speaks for itself.

A. So as I stated, you know, if there is some missing data, there can be a concern of selection bias. But there was the publication by Rinsky, et al which actually showed that it

wasn't -- it didn't appear to be a huge issue of selection bias. It is a concern potentially, a small concern, and I think a large concern that Rinsky's study shows evidence not to be the case.

BY MR. MILLER:

Q. Turn with me to Page 20. This is Exponent 2016 on the Agricultural Health Study, and they go on to say about generalizability. And generalizability means can we take the study of findings for a particular group and generalize it to larger groups of population. Is that fair, or no?

A. Yes. It -- and just an added level of that, generalizability can be assessed only once we're sure that there's internal validity of the study.

Q. Yes, ma'am.

And here the Exponent experts say, "Results also cannot reliably be generalized to other subpopulations not represented by the study subjects."

Do you see that, ma'am?

A. While -- while I can see that they have stated this, I'm not -- since I haven't

read this document, I'm not sure what the basis is for that particular statement.

Q. Go if you would to Page 23, please.

A. May I add to that statement?

Q. Sure. What's that?

A. I just -- just to add to that, in -- in -- there are many, many examples where you can generalize studies from one population to the other. The question is, is any underlying biology of an association going to differ between populations.

In this case with respect to glyphosate and NHL risk, it would seem hard to think about why you couldn't generalize the findings from the Agricultural Health Study to another population.

Q. Let's take a look at Page 23. "The guidelines put forth by Sir Austin Bradford Hill in 1965 for evaluating the causality of exposure-outcome association are commonly cited and implemented in epidemiology."

That's true, isn't it?

A. That's what this particular report states. Bradford Hill is really more of a set of guidelines that is used, but the real

approach to evaluating causality is much more -- is not exactly only relying on Bradford Hill.

Q. What else is it relying on?

A. It relies on a systematic and thoughtful evaluation of each of the individual studies, and assessment of the role of potential bias or confounding or chance in the explanation of those findings. So I think the Bradford Hill criteria are a set of guidelines. They're not taken necessarily as fact per se.

Q. You have to look at the quality of the study; right?

A. It's important to look at the quality of all of the studies before making the assessment.

Q. As these authors say here, "For example, if a prospective cohort study has substantial loss to follow-up, the risk of selection bias will high" --

A. I'm sorry, I don't see where you're highlighting.

Q. I apologize. Let me move. See me now?

"For example, if a prospective cohort study has substantial loss to follow-up, the

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risk of selection bias" -- should be "will be high," but it says -- "will high regardless of whether the loss to follow-up is clearly described."

That's true, isn't it?

A. The -- I'm not specific -- since I haven't read this document, I'm not specifically sure what they're referring to. As I've mentioned earlier today, the main issue with loss to follow-up is whether or not you know the outcomes that have happened in the study.

In this particular literature on non-Hodgkin's lymphoma, the loss to follow-up for outcome is actually very, very low because the quality of the registry data, the cancer registry is quite high in capturing the outcome of these participants.

Q. Last point I'd like to go over with you on this study, ma'am, this Exponent study, 2016, it's a simple general statement, perhaps you agree. On Page 25, "In epidemiology, there is no universal ideal study design."

We can agree on that, can't we?

MR. COPLE: Objection. Vague.

A. In epidemiology, I think what we can

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agree on is that a cohort study is a higher level of validity than a case-control study.

BY MR. MILLER:

Q. Can you agree that there is no universal ideal study design?

MR. COPLE: Objection. Asked and answered.

A. I couldn't -- I -- again, as I said, you know, a cohort study is a higher level of evidence than the case-control study.

BY MR. MILLER:

Q. Okay. We're going to move off that document and on to something else.

Your job when hired by Monsanto's lawyers was to assist their lawyers in the case; right?

MR. COPLE: Objection. Vague.

A. No, that's not correct. My role was to critically review all of the epidemiology studies that have looked at the association between glyphosate and NHL risk and come to an assessment of whether they supported a causal association or not.

BY MR. MILLER:

Q. And let's look at the retention letter

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that -- between the Hollingsworth firm and you. This is marked 24-9. Okay?

(Whereupon, Mucci Exhibit 24-9, 1/28/16 retention letter, was marked for identification.)

MR. COPLE: Do you have a copy?

MR. MILLER: Yes, of course (handing).

BY MR. MILLER:

Q. You've seen this before; right?

A. Yes.

Q. Okay. This was sent to you January 28, 2016; right?

A. Yes.

Q. And had you worked with the firm before that?

A. No.

Q. Did any work for Monsanto before that?

A. No.

Q. And you have never been an expert before; right?

A. I've never served as an expert report -- expert before.

Q. This letter sent to you from the Hollingsworth firm, Mr. -- Ms., excuse me, Heather Pigman; right?

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A. Yes.

Q. Okay. It says that, "This letter confirms that Hollingsworth LLP, on behalf of Monsanto Company, has retained you to provide expert consulting services...for the purposes of assisting Hollingsworth in representing Monsanto in connection with potential or actual litigation against Monsanto involving injuries allegedly caused by Roundup or glyphosate"; right?

A. That is what the document says.

Q. Okay. Let's look at -- now, how many hours have you billed to date, ma'am?

A. I don't recall the specific total at this point.

Q. Can you give me an estimate?

MR. COPLE: Objection. Asked and answered.

A. I couldn't -- I know I provided that information. I just -- I'm not sure of the exact number of hours.

BY MR. MILLER:

Q. The last bill I have is June 21st, 2016. Have you submitted a bill since then?

A. You should have all the bills that

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were submitted to date.
Q. Okay. You don't think you submitted a bill since June?
MR. COPLE: Objection. Asked and answered.
BY MR. MILLER:
Q. You can answer.
A. Yeah, I just -- I can't -- I turned over all of my invoices to Hollingsworth.
Q. The money that is earned, does it go to you directly or to Harvard, or how does that work?
A. The money, it's for me for work as an independent outside my activities at Harvard.
Q. Do you know Dr. Dimitrios Trichopoulos?
A. Yes.
Q. And he was a mentor of yours?
A. Yes.
Q. And then you spent a year in Sweden working under the mentorship of Hans-Olov Adami?
A. Yes.
Q. Okay. And you still work closely with him now?
A. Yes.

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Q. Okay. Are you aware that they're both good friends of Dr. Acquavella, a full-time employee epidemiologist at Monsanto?
MR. COPLE: Objection. Lacks foundation, vague.
A. No, I was not aware.
BY MR. MILLER:
Q. This is a document produced to us by Monsanto, we've marked as Exhibit 24-10.
MR. MILLER: I have a copy for counsel.
(Whereupon, Mucci Exhibit 24-10, E-mail chain, Bates MONGLY01204377 and 4378, was marked for identification.)
BY MR. MILLER:
Q. I'm looking, ma'am, at the first page, an e-mail by Donna Farmer, employee of Monsanto, and she states in pertinent part here, "Hans-Olov and Dimitrios" -- these are the two gentlemen we were just talking about?
MR. COPLE: Objection. The document speaks for itself, lacks foundation.
A. It looks like from the document, that's what it says, yes.
BY MR. MILLER:

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Q. -- "were good friends with John Acquavella. We worked with them a lot when John was here."
When you took the assignment of assisting Hans with this case, did you know that Dr. Olav and Dr. Dimitrios had also worked with Monsanto?
MR. COPLE: Objection. Lacks foundation, document speaks for itself.
A. I'm sorry. Could you repeat what you just said?
BY MR. MILLER:
Q. When you agreed to assist Hollingsworth in this case, did you know that Dr. Olav and Dr. Dimitrios had worked for Monsanto?
MR. COPLE: Same objection.
A. No, I was not aware one way or the other.
BY MR. MILLER:
Q. Do you know if that's how Hollingsworth was able to contact you?
A. I don't know one way or the other.
Q. Fair to say you would have been the mentor of Dr. Rider?

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MR. COPLE: Objection. Lacks foundation.
A. I was a mentor to Dr. Rider. We are now colleagues.
BY MR. MILLER:
Q. Sure.
Were you able to listen in on Dr. Rider's deposition yesterday?
A. No, I did not.
Q. Did you talk to her about it?
A. No, I did not.
Q. Have a chance to read any of it?
A. No, I did not.
Q. Are you aware that Dr. Olov and Dr. Dimitrios have been helping Monsanto defend glyphosate since 1999?
MR. COPLE: Objection. Lacks foundation, vague.
A. I am not familiar with any relationship one way or the other with Dr. Trichopoulos or Dr. Adami.
BY MR. MILLER:
Q. This is an e-mail produced to us by Monsanto we've marked as 24-11, 1999.

(Whereupon, Mucci Exhibit 24-11, E-mail chain, Bates MONGLY00878065 through 67, was marked for identification.)

BY MR. MILLER:

Q. And I just want to draw your attention to the -- this is an e-mail chain in 1999 from, again, Donna Farmer. Do you see that on the first page, June, 1999? And it's -- if you go to Page 2, this is regarding what they call the Hardell situation.

Hardell, of course, is an author of an article on the association between glyphosate and Roundup, isn't he?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Yeah. I'm sorry, I was reading through this. Could you repeat the question?

BY MR. MILLER:

Q. Hardell is an author of a study on the association between glyphosate and non-Hodgkin's lymphoma, isn't he?

MR. COPLE: Same objections.

A. Dr. Hardell is a co-author on several publications that emanated from two case-control

studies.

BY MR. MILLER:

Q. And this is an update on the Hardell situation. Let me get up here so you can see that. Can you see that, ma'am?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself, vague.

A. I haven't had a chance to review this set of e-mails. I'm not sure what it's referring to.

BY MR. MILLER:

Q. Well, let's look at Page 2. Ms. Farmer goes on to say, "What have we done to defend glyphosate?" It says, "We are creating a scientific outreach network of prominent epidemiologists in Europe and in the US, including Dimitrios Trichopoulos" -- that's your mentor, right, that we talked about earlier?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself, asked and answered.

A. Dr. Trichopoulos was my mentor, yes.

BY MR. MILLER:

Q. -- "and Hans-Olov Adami, who will

assist us in defending glyphosate."

Do you see that?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Yeah, while I can see that's what it says, I have no information to share with you one way or the other regarding Dr. Adami or Dr. Trichopoulos on this.

BY MR. MILLER:

Q. How many years did you study under these gentlemen?

A. Dr. Trichopoulos, I was his doctoral student starting in 19 -- I can't remember exactly the start date, but it was in the late 1990s, early 2000s. I also started working around the same time with Dr. Adami.

Q. And you did not participate in helping him defend glyphosate at that time?

MR. COPLE: Objection. Asked and answered.

A. I don't recall any work that we did one way or the other.

BY MR. MILLER:

Q. The latency period for non-Hodgkin's lymphoma, you would agree, would be more

appropriately left for oncologists who study non-Hodgkin's lymphoma?

MR. COPLE: Objection. Vague, lacks foundation.

A. Could you clarify what you mean by that comment?

BY MR. MILLER:

Q. Let me see. What was the question? Let's see. It's marked here as an answer, not marked as a question. I'm not sure.

The latency period for non-Hodgkin's lymphoma, you would agree, would be more appropriately left for oncologists who study non-Hodgkin's lymphoma?

MR. COPLE: Same objection.

A. I would actually disagree. An oncologist's role is to treat non-Hodgkin's lymphoma. Indeed, oftentimes epidemiology studies are quite useful in defining a latency period for a specific exposure and the risk of a new disease.

BY MR. MILLER:

Q. Would epidemiologists who were also medical doctors and oncologists then be in the best spot to tell us about latency?

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MR. COPLE: Objection. Vague.
A. Not necessarily.
BY MR. MILLER:
Q. We can agree you're not an oncologist?
A. I'm an epidemiologist, a cancer epidemiologist.
Q. So we can agree you're not an oncologist?
MR. COPLE: Objection. Answered.
A. I'm a cancer epidemiologist. I'm not an oncologist.
BY MR. MILLER:
Q. You're not a medical doctor?
A. I'm a cancer --
MR. COPLE: Objection. Asked and answered.
A. I'm a cancer epidemiologist, and in many of my epidemiology studies we look at specific latency periods using lagged analysis and other approaches to understand the latency between a specific exposure and a specific disease.
BY MR. MILLER:
Q. How many papers have you written on the latency period for non-Hodgkin's lymphoma?

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A. I have published some studies on non-Hodgkin's lymphoma, although it is not my area currently of research. However, I'm still, given my skills as a cancer epidemiologist, able to not only review existing literature on this topic, but also to think about issues that may not be related to a disease I study often.
Q. So I'm clear then, you have written papers on the issue of latency for non-Hodgkin's lymphoma?
A. The studies, I would want to look back specifically on my studies of non-Hodgkin's lymphoma that I've performed, these were several years ago, before I said one way or the other.
Q. What is the latency period for non-Hodgkin's lymphoma?
A. That -- the issue of latency is actually more complicated. There's not necessarily one average time period for a disease. It may vary depending on specific risk factors. But generally for a disease like non-Hodgkin's lymphoma, and given epidemiological studies that have looked at a range of risk factors, it would be reasonable to think about in the order of several years, if

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not a decade, between when an exposure happens and when the actual outcome is diagnosed.
Q. Fair to say that that blood cancers develop quicker than solid tumors?
MR. COPLE: Objection. Vague.
A. That is -- may be the case in some circumstances, but is actually not always the case.
BY MR. MILLER:
Q. Have you done any work with the 9/11 program in New York for the injuries sustained from the destruction of the twin towers?
MR. COPLE: Objection. Vague.
A. I have not done any work with an organization such as that.
BY MR. MILLER:
Q. Are you aware that non-Hodgkin's lymphoma is a compensable injury under the 9/11 Fund?
A. I'm not --
MR. COPLE: Objection to the extent it calls for a legal opinion.
A. I'm not familiar with this program.
BY MR. MILLER:
Q. Do you know Dr. Chen at Harvard?

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A. What is Dr. Chen's first name?
Q. Mei, M-E-I.
A. No.
Q. Let's look at the study real quick. All right. 24-12. This is a study, "Residential Exposure to Pesticide During Childhood and Childhood Cancers: A Meta-Analysis" performed, I believe, at Harvard. Let's take a look.
(Whereupon, Mucci Exhibit 24-12, Chen, et al study, Residential Exposure to Pesticide During Childhood and Childhood Cancers: A Meta-Analysis, was marked for identification.)
BY MR. MILLER:
Q. Have you seen this before?
A. No, I have not.
Q. Looking at the names of the scientists involved, do you know any of them?
A. I do not.
Q. It says they are from the department of environmental health, Harvard. That's the same Harvard that you're at, right?
A. The Harvard T.H. Chen School of Public Health, yes.

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Q. Yes, ma'am. All right. And they say that "There is an increasing concern about chronic low-level pesticide exposure during childhood and its influence on childhood cancers." Right?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Yes. While that is what it says in the abstract, just to clarify, I have not reviewed any studies that relate to glyphosate and risk of cancer in children, just to clarify that.

BY MR. MILLER:

Q. Let's see what these authors conclude at Harvard, that "Conclusions: Results from this meta-analysis indicated that children exposed to indoor insecticides would have a higher risk of childhood hematopoietic cancers."

Do you see that, ma'am?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Yes, while I can see that the authors have written this, I haven't reviewed this article before, so I haven't reviewed the studies themselves.

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I think it's also important to note that the etiology of childhood cancers is quite different than the etiology of those same cancers in adults.

It's also important to note that for non-Hodgkin's lymphoma, 95 of the cases of non-Hodgkin's lymphoma occur in adults, and that the etiology of that disease can be quite different than that in children.

BY MR. MILLER:

Q. How is that? How is it different?

A. We could spend a long time discussing this, but the way in which cancer may be forming in the growth patterns of children, the types of hormones they're exposed to, the underlying genetic -- somatic genetics of these diseases can be quite different, and so it's almost impossible to extrapolate findings from studies within children, childhood cancers, to that of adults.

Q. Do you have a Ph.D in any -- I apologize, let me pull out -- we have your CV. Do you have a Ph.D, I guess I'm asking.

A. Do I have a Ph.D?

Q. Yes.

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A. I have a degree equivalent to a Ph.D. that's what Harvard confers.

Q. Oh, I don't doubt that. I'm not suggesting otherwise. Some people also have Ph.Ds who are epidemiologists, and I'm asking if you're one of them. That's all.

A. I'm sorry. I don't understand the question.

Q. A Ph.D. Do you know a Ph.D is?

MR. COPLE: Objection. Asked and answered, argumentative.

A. Yeah, I guess I don't understand what you're asking specifically with your question.

BY MR. MILLER:

Q. Well, let me be more specific.

Like Dr. Neugut, he's got -- he's an epidemiologist, but he also has a Ph.D in molecular biology and a medical degree.

A. I have a doctoral degree in epidemiology. I have a master's of public health.

Q. And I respect all that. I guess the answer is you don't have a Ph.D as well --

MR. COPLE: Objection.

BY MR. MILLER:

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Q. -- in addition thereto?

MR. COPLE: Objection. Asked and answered.

MR. MILLER: I'm just asking.

A. I just -- I'm --

MR. COPLE: Asked and answered, argumentative.

THE REPORTER: I'm sorry. One at a time, please.

MR. COPLE: Objection. Asked and answered, argumentative.

BY MR. MILLER:

Q. I wasn't trying to get anybody upset. I just asked.

A. Well, I've stated what's on my CV.

Q. Okay.

A. But I also have broader knowledge about biology and have been a cancer epidemiologist for a number of years, and I actually know a fair bit about childhood cancers in addition to adult cancers. I know a fair bit about the underlying somatic genetics of childhood cancers versus adult cancers.

So just to clarify, I think that I can say with high confidence that the etiology of

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non-Hodgkin's lymphoma in children is quite different than that in adults.

Q. Would it be fair to say that the predominant interest of yours is prostate cancer?

A. Prostate cancer, yes.

Q. Yes. How do you pronounce it?

A. Prostate.

Q. Prostate cancer. Excuse me.

What percentage of your professional time is within that sphere vis-à-vis other types of cancer?

A. Currently?

Q. Yes.

A. I work on many different studies in prostate cancer epidemiologically. I also have the cancer epidemiology program not only for the School of Public Health, but the Dana Farber Harvard Cancer Center, so in those capacities I'm involved in a range of activities related to a broad range of cancers actually.

Q. All right.

A. So it's hard to say specifically the amount of time in a week I spend on any one scope of my work.

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Q. Okay. Do you currently have any non-Hodgkin's lymphoma research ongoing?

A. Myself, I published something in the -- that's on my CV in the past year that did cover hematopoietic malignancies.

Q. Consider -- today do you have any ongoing research that's not published in non-Hodgkin's lymphoma?

A. No.

Q. Okay.

A. Although just because that's the case, that doesn't mean that I can't critically review the epidemiological studies on that.

Q. Do you know Dr. Marshall Kadin at Harvard?

A. No, I don't.

Q. I want to look at one of your studies that involved childhood leukemia and lymphoma and maternal smoking. Do you remember that study?

A. I do.

Q. Okay. I'll mark it as Exhibit 24-13.

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(Whereupon, Mucci Exhibit 24-13, Mucci, et al study, Maternal Smoking and Childhood Leukemia and Lymphoma Risk, was marked for identification.)

BY MR. MILLER:

Q. All right. Let me ask you, ma'am, in this study you found an excess risk of non-Hodgkin's lymphoma for smokers?

A. What we found was a suggestive small increased risk of non-Hodgkin's lymphoma associated with smoking. Although, you know, given the number of cases, the confidence intervals were fairly wide.

Q. And this was if the mother smoked was the child at increased risk of leukemia; is that it?

A. Correct. If the mother smoked during pregnancy.

Q. Yes, ma'am.

Let's look at Table 1 of your study.

As regards non-Hodgkin's lymphoma, you're showing mean age at diagnosis of what, ma'am? That's 5.7 years?

A. Correct.

Q. And 74 percent male?

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A. Yes, correct.

Q. Please turn with me, if you would, to Page 1531. Would you tell us here, and I'm on the right side, middle of the page, "Because such misclassification of exposure is non-differential, the true associations between maternal smoking and leukemia and lymphoma may be greater than reported"; right?

A. I can see where it says this in this document, yes.

Q. And it's true, misclassification of exposure is non-differential, it can reduce the true association?

A. Well, actually it's the issue of non-differential misclassification. In general when it's a yes/no variable, it will tend to bias a result toward the null. However, when there's more than two categories, it can actually bias away from the null as well.

Q. And let's go, then, to Page 1532 and your last paragraph there. "This study provides supportive evidence of a positive association" --

A. I'm sorry, where are you?

Q. Sure.

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A. Okay. Yeah.
Q. "This study provides supportive evidence of positive association with AML and NHL and an interesting protective effect with ALL, which needs to be explored further"; right?
Did I read that correctly?
A. That is what the manuscript says.
Q. And I want to point out that you saw supportive evidence of a positive association even though there was no statistical significance; right?
A. Right. And as I'd like to -- as this document said earlier, we use the word "suggestive" since the odds ratio, while it is above 1, the confidence intervals were somewhat wide because of the small numbers.
Q. And this was not a cohort study, but this is a case-control study; right?
A. No, that is not correct. This is actually a cohort study within 1.4 million Swedish children.
Q. You look back at a register; right? That's how it's worked out?
A. This was leveraging -- for this study we took advantage of a nationwide registry of a

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birth registry in Sweden that has information collected on smoking status, and that was then linked together with a cancer registry to look at cancer outcomes in children. We also have information from the death register as well.
Q. So even if the confidence interval or the p-value is greater than .05, you can get important information from the study, I think we can agree?
MR. COPLE: Objection. Vague.
A. In some cases. You know, again, you wouldn't want to take one study in isolation. It would be important not only to look at the role of chance, but before even doing that, it's important to look at the role of potential bias and confounding in explaining associations. So I think that you need to think about a lot of different factors in looking through taking a relative risk estimate in this 95 percent confidence interval.
BY MR. MILLER:
Q. Do you remember the study you did on trichomonas vaginalis infection and prostate cancer incidence?
A. Yes. Actually I was part of

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several -- a few different publications on that topic.
Q. This one is in the journal National Cancer Institute, 2009. I've got a copy for you here.
(Whereupon, Mucci Exhibit 24-14, Stark, et al article, Prospective Study of Trichomonas vaginalis Infection and Prostate Cancer Incidence and Mortality, was marked for identification.)
BY MR. MILLER:
Q. And I just want to go over a couple of things with you on this.
In your Results section, "Although not statistically significant, the magnitude of the association between T vaginal-seropositive status and overall prostate cancer risk (odds ratio 1.23) was similar to that reported previously."
You conclude, "This large prospective case-control study obtained further support for an association between a seropositive status for antibodies against T vaginalis and the risk of prostate cancer"; true?

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A. So this is what the document says.
To add some clarity on your comment regarding case-control study, this is actually a different approach to a case-control study than any of the case-control studies that were looked at for glyphosate and non-Hodgkin's lymphoma. What we did was perform a prospective analysis where the bloods were actually collected well before the cancer diagnosis. So that's very different than what we see in the glyphosate and NHL literature where the information on glyphosate is collected after the diagnosis. So I just wanted to clarify that point.
And I think that statement that we made in the conclusion really was in large part because of the strong positive associations that we observed for extraprostatic prostate cancer as well as metastatic disease. Prostate cancer is a disease that's quite biologically variable in its risk of metastatic disease, and what we're really interested in looking at are associations for risk of more advanced cancer. And so that in terms of our conclusion, I think the basis for that statement was given the strong evidence of extraprostatic prostate

cancer and clinically relevant lethal disease in this study.

Q. You say on the next page -- oops, I guess that's two pages -- on Page 3 in the Discussion section that, "In this large...case-control study, we provide further evidence to support the previously" associated -- I'm sorry, "previously reported association between a T vaginalis-seropositive status and prostate cancer risk."

You say that even though it's not statistically significant; right?

A. So just to clarify, again in the comment about the case-control study, this is a case-control study where the information on the exposure was collected prior to development of any disease. So, again, just to clarify that point. So these data, the relative risk estimate was not statistically significant. However, the confidence intervals were actually fairly narrow around that point estimate because we had such a large number of cases, and because the exposure was so common.

So, you know, again we're taking an odds ratio together with the size of the

confidence intervals, and then taking that in the context of other epidemiological studies.

Q. Which is what epidemiologists do; right?

A. What epidemiologists do is you want to review critically each individual epidemiology study and look at the strengths and weaknesses and assess whether there's potential bias or confounding or trends that might explain associations.

Q. And lots of epidemiologists use forest plots to make their points about association of exposures and outcomes; right?

MR. COPLE: Objection. Vague.

A. I wouldn't necessarily agree with that one way or another. There can be instances where in meta-analyses forest plots are used to present data, but there also could be other instances where it's not the case.

BY MR. MILLER:

Q. Let's look at an instance where you use forest plots as part of a presentation.

(Whereupon, Mucci Exhibit 24-15, PowerPoint, Epidemiology of Prostate Cancer Risk and Progression, was

marked for identification.)

BY MR. MILLER:

Q. 24.15, do you recognize that document?

A. Yes.

Q. And what is it?

A. Well, actually I have to remind myself. This likely would have been a presentation that was made at the University of Pennsylvania, potentially.

Q. And turning with me to --

A. Is that correct? I'm not sure.

Q. I know what it says. It says "Epidemiology of Prostate Cancer Risk and Progression, Prostate Cancer Evidence Academy."

A. But, again, I haven't seen this document for a little while. So I'm just -- I'm not sure specifically what this was from.

Q. Well, that's you, right, Lorelei --

A. No, I'm saying it is, but I'm just not sure what this is from, I -- you know, what the Prostate Cancer Evidence Academy is.

Do you know where this document came from? I'm sorry to ask. I just want to make sure that I'm -- I have the right information about what the document is.

Q. That wonderful thing they call the internet.

A. I understand that, but I'm just trying to understand, like, what this comes from actually.

Q. Let me know when you're ready. I have some more questions.

A. I'm sorry, just -- I just want to clarify what this actually is from. I've given a number of different talks in 2015. So I just want to make sure that I have the correct -- that this is -- what this is referred to, where these slides are from.

Q. Take your time and look at it as much as you want, and I have some questions.

A. Okay. Go ahead, please. I'm ready. Go ahead, please.

Q. Okay. So here we have Dr. Lorelei Mucci --

A. It's Lorelei.

Q. I'm sorry, excuse me. Lorelei Mucci at the Prostate Cancer Evidence Academy, and I want to go with you to --

A. And just to clarify, again I'm not sure what the Prostate Cancer Evidence Academy

is. I just -- that's my point that I'm trying to clarify with you. But I can look at my slides irrespective of that and just give you some information.

Q. Well, let's go to Page 13 of your PowerPoint here. You do a summary slide of "risk factors for advanced/lethal prostate cancer." And you say that there is a strong evidence of association with cigarette smoking.

Do you see that, Doctor?

A. Yes, I can see that in this presentation.

Q. Let's go to Page 9 where you use forest plots to make that point.

A. There's no forest plots here. These are results from a specific analysis. This is just one study. Actually, these are hazard ratios for different categories of exposure. This isn't a forest plot.

Q. I appreciate the clarification. This is one study, and it's "Smoking and snus use among 9,500 Swedish men with prostate cancer"; right?

A. It's snus, yes.

Q. I'm sorry?

A. Snus, that's how have you pronounce it, snus.

Q. Snus. Snus. What is snus?

A. It's a smokeless tobacco product.

Q. And so from this one study, smoking only, you show hazard ratio. You have a line for 1, and it's above 1; right? But the confidence interval crosses 1. Am I reading that right?

A. While that is what this particular study showed, this comment here about the strength of evidence is based on a report from the Surgeon General's Report, their fifth anniversary report looking at the evidence for the association between cigarette smoking and the risk of developing an advanced or lethal cancer. So that's where the strength of evidence being strong comes from.

Q. All right. We'll move on. Do you consider the NAPP study to be a published or unpublished? It was an abstract.

A. I'm not sure I would qualify it one way or the other. It was a -- it's a study that has been presented at international scientific meetings.

Q. Let's take a look at it. 24-16.

(Whereupon, Mucci Exhibit 24-16, 9/21/15 NAPP Study, was marked for identification.)

BY MR. MILLER:

Q. You reviewed this, "Evaluation of glyphosate use and the risk of non-Hodgkin lymphoma major histological sub-types in the North American Pooled Project" (handing)?

A. So what I reviewed with respect to North American Pooling Project is an abstract that was submitted to one of the scientific meetings, as well as three PowerPoint presentations. I have not seen this particular manuscript.

Q. Well, let's take a look at it. Did you -- let's just ask you first. All right.

23-16. One of the authors is Aaron Blair. Have you read Dr. Blair's deposition?

A. I believe that I did review parts of his deposition, yes.

Q. Did you review Dr. Weisenburger's deposition?

A. No, I did not.

Q. You and I can agree that's the same

Dr. Blair that was a co-author of the Agricultural Health Study; right?

A. I believe it is, yes.

Q. Let's look at this paper. What this paper adds on Page 2 -- if you look with me, please. So what this paper adds per these authors is that significant or nearly significant risk of non-Hodgkin's lymphoma overall were observed for greater than two days' use. Odds ratio of 2.42, statistically significant.

Do you see that?

MR. COPLE: Objection. The document speaks for itself.

A. Yes. While I can see that actually there are a couple of concerns specifically here with respect to both using greater than two days per year of use, as well as the fact that these odds ratio were not the odds ratio that they -- Pahwa presented in the PowerPoint presentation that mutually adjusted for use of 2,4-D, dicamba and malathion, which was shown there was confounding present because, in fact, the odds ratio was substantially attenuated.

Secondly, I think an important issue

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is around the issue of the recall bias by the large proportion of proxy respondents. Again, the analysis in the presentation presented by Pahwa shows clearly the effect of the recall bias due to the high proportion of proxies in the studies in the North American Pooling Project.

Q. What was the percentage of proxy respondents?

A. In the studies it ranged from 30 to 40 percent of the cases had proxy respondents.

Q. And proxy respondent means what?

A. Well, what happened was these studies recruited cases, and sometimes many years after when they were initially diagnosed, some of them had died or were too ill, so they had individuals, whether it would be a spouse, a child, or somebody else, fill out the information about the use of glyphosate or other pesticides in these studies.

Q. Is that more accurate than estimating what the respondents would be, or less accurate?

A. I'm sorry, I don't understand.

Q. I mean, it just seems like you're criticizing proxy respondents, but you don't

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criticize multiple imputation in the AHS study, and it seems to be intellectually inconsistent.

MR. COPLE: Objection. Argumentative.

A. I think we can take those two issues separately. They're very, very different issues to be concerned about. What you asked me specifically with respect to the North American Pooling Project, and that one large concern and, in fact, which was demonstrated by Pahwa in this report and was also demonstrated by Wadell in his analysis which showed that the -- when you looked at the data specifically on -- from the self-respondents versus the self-respondent proxies, you see attenuation of the odds ratios. And I think it's a pretty well -- there's other published epidemiological studies that have shown in multiple different studies of cancer the fact that when in -- a spouse or a child loses somebody to cancer, they'll often ruminate and tend to overreport on the range of exposures. It was actually demonstrated clearly the issue of the recall bias induced specifically by the proxy respondents in the North American Pooling Project studies.

Q. How was it demonstrated?

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A. If you -- if we could look at the slides that were presented by Pahwa, et al, they did an analysis where they looked specifically in those, where the data was based on the self-report versus the self-report plus the proxies together, and what you could see in those who just use the self-report there was an attenuation of the relative risk which shows that there was this issue of overreporting.

Also, you can see a similar issue -- let me just pull it up here so I make sure that I have the correct numbers.

(Witness reviewing document.)

A. So Wadell, et al, in 2001 looked specifically around the issue of proxy respondents looking at, not glyphosate per say, but specifically the organophosphate pesticides, and what they found was that when you looked at the association between pesticide -- this pesticide exposure and NHL risk, when you used the data from the proxies, it was a relative risk of 3.0, and those from the self-reports was 1.2. So it's a very good example showing the issue of recall bias that results from the use of our proxy respondents.

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Q. Okay. Let's look what the authors of the NAPP study have to say about what this paper adds. They go on to say that for greater than seven days lifetime, the odds ratio, 55 percent of glyphosate use, with some differences in risk by subtype.

Do you see that there?

MR. COPLE: Objection. Document speaks for itself.

A. Yes, while I can see that is the relative risk they chose to highlight, I think it's important to also note that is the relative risk that has not been mutually adjusted for other pesticides which was shown in the Pahwa presentation to -- there was confounding that was accounted for when you adjust for them. I think that's one important feature to consider. And then also the same issue of the proxy respondents is an issue there.

BY MR. MILLER:

Q. Let's look at the next page, Page 3. This is from the abstract, right?

A. Page 3 refers to the abstract, yes.

Q. And the Results, it said, "Cases who ever used glyphosate had a significantly

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elevated risk of non-Hodgkin's lymphoma overall."

That's true, isn't it?

A. While -- what the authors have decided to present in the abstract is a relative risk of 1.43. It's shown clearly in the PowerPoint presentation that this relative risk can be explained both by confounding due to use of these three pesticides, as well as the issue of bias because of the high proportion of cases and controls that used proxy data to report on exposure. So they selected to present the unadjusted estimate as well as the estimate that we know is biased because of the use of proxy respondents.

Q. You know it's biased. The authors do not conclude it was biased.

A. Well, actually since I haven't seen this manuscript before, I haven't looked through carefully to see what they talk about in their results section or their conclusions. So I couldn't say why they decided to particularly present this.

But what I do know is that Pahwa themselves shows the issue of residual

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confounding as well as the issue of bias to the proxy respondents in their presentation.

Q. What they say in their abstract is that those who handled the glyphosate for greater than two days per year had significantly elevated non-Hodgkin's lymphoma overall, odds ratio 2.42, statistically significant; right?

MR. COPLE: Objection. The document speaks for itself.

A. Right. So, again, kind of based on what I've said for some of the prior estimates, all of these estimates that they're presenting here are estimates that have not been fully adjusted for by the use of other pesticides, and there's a clear example both in these studies as well as some of the other studies as well that show the effect of confounding by other pesticide use. So that's an important fact when you look at the odds ratio for accounting for also the proxy respondents.

And then finally, we can talk at length the issue of using greater than two days per year or more is sort of suboptimal in terms of a dose-response, because you're comparing people who might have only used it for one year,

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or people who might have been using ten years.

So what really has been shown in a number of the studies, what you'd like to do is to be able to integrate information on more of a lifetime exposure to account for both the number of years as well as the number of days per year. That would be the ideal dose-response.

Q. What is DLBCL?

A. DLBCL is one of the subtypes of non-Hodgkin's lymphoma.

Q. And in the NAPP study, do you know what that acronym stands for?

A. I do not recall the specific. I could look it up if you'd like.

Q. That's all right. So that subtype of non-Hodgkin's lymphoma had an odds ratio of 2.83, which was statistically significant; right?

A. And as I said, this is the crudely adjusted odds ratio, and which was actually attenuated after additional adjustment by other pesticides. And also does not deal with the issue of the potential for recall bias using proxy respondents.

So I think taken together, the results

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that are presented here are not additionally adjusted for the known confounding that exists in this dataset by use of these other pesticides as well. It does not account for the bias that was induced by the 30 to 40 percent of cases that have proxy respondents.

Q. Turn to Page 12, ma'am. This is a Discussion section, the NAPP study. And what Dr. Blair and Dr. Pahwa and others confirm here, "This report confirms previous analyses indicating increased risks of non-Hodgkin's lymphoma in association with glyphosate exposure." Do you agree with that?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. So as I stated previously, I haven't had a chance to fully read the manuscript. However, what odds ratio they've selected to highlight here in this particular line is, as I said, not the fully adjusted estimate. So there is concern over residual confounding, and it is not the estimate that takes into account the issues of bias.

And you can actually see that later on in the paragraph when they talk about further

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adjusting the odds ratio for 2,4-D dicamba and malathion resulted in an attenuated risk of NHL in this study, showing no association between glyphosate use and NHL risk.

Q. What these scientists say in their discussion is "Our results are also aligned with findings from epidemiological studies of other populations that found an elevated risk for non-Hodgkin's lymphoma for glyphosate exposure and with greater number of days/years of glyphosate use, as well as a meta-analysis of glyphosate use and non-Hodgkin's lymphoma risk." That's true, isn't it?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Right. So, again, as I have not had a chance to review this, I'm not sure what meta-analysis they're referring to, because it looks like they're referring to De Roos 2003 as the meta-analysis. So again, I'm not really sure, I haven't had a chance to read this manuscript yet.

However, as I've said previously, I think one of the big concerns is the use of number of days per year as a measure of

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dose-response. I think it was discussed in a lot of detail in the Agricultural Health Study, for example, but other studies as well, where you'd really want to integrate not only the number of days per year, but also the number of years that somebody has been using it to really understand the full dose of exposure. And so they've selected one of the specific doses. But the other important feature is that when they looked at the more integrated measure of dose they actually find no association after they've adjusted for the residual confounding and dealt with the issue of proxy bias.

BY MR. MILLER:

Q. So these scientists in their Discussion section say "From an epidemiological perspective, our results were supportive of the IARC evaluation of glyphosate as a probable carcinogen for non-Hodgkin's lymphoma."

That's true, isn't it?

MR. COPLE: Objection. Lacks foundation, document speaks for itself.

A. So, again, I haven't had a chance to read through this publication, so I can't comment specifically on what they are referring

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to here.

All I can say is that given my review of the results from Pahwa, et al in the slide deck that was presented where they show the residual confounding that existed, as well as the issue of recall bias due to the proxy respondents, and again because I haven't read the whole discussion, I can't say one way or the other exactly how their results relate to really anything at all.

BY MR. MILLER:

Q. Dr. Mucci, you say there is recall bias here, but let's look and see what these scientists say. Let's turn to Page 14. "No similar analysis of recall bias has been conducted in the Canadian case-control studies, but the similarity of study designs between the US and Canada make it likely that recall bias is not a major concern in the Canadian study and NAPP as a whole."

That's true, isn't it?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. I'd like to take a look briefly at the Canadian study.

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Q. We're going to take a break. You can look at that during the break. He has to change the tape now, that's why we have to take a break?

A. Okay.

THE VIDEOGRAPHER: Going off the record. The time is 11:39.

(Whereupon, a recess was taken.)

THE VIDEOGRAPHER: Back on the record. The time is 11:56.

BY MR. MILLER:

Q. All right. Let's get some work done before lunch. Okey-dokey?

A. Sounds great.

Q. Okay. Great. You've heard of IARC?

A. I have.

Q. What is IARC?

A. IARC stands for the International Agency for Research on Cancer.

Q. Okay. Would you agree it's a prestigious organization?

MR. COPLE: Objection. Vague.

A. Could you clarify what you mean by "prestigious"?

BY MR. MILLER:

Q. I don't know how to clarify words that are in common usage in the English language.
A. Well, I guess what do you mean with respect to -- it's a very broad set of terms. Maybe you could just clarify what you mean.
Q. I don't have to. If you can't answer the question, you can't answer it.
Have you used the word "prestigious" before?
MR. COPLE: Objection. Argumentative.
A. I have used the word prestigious in many different contexts. That's why I would like some clarification on what you mean by prestigious in this setting.
BY MR. MILLER:
Q. Have you been asked to be on any IARC panels?
A. Yes, I have.
Q. And when was that?
A. It was about two years. I was unable, however, to be a part of it.
Q. Two years ago you were asked?
A. Yes.
Q. And what panel?
A. It was for reviewing the epidemiology

of coffee and cancer.
Q. And schedule didn't allow it?
A. Correct.
Q. Any other involvement with IARC?
A. No.
Q. You understand that other professors from Harvard have participated as members of IARC?
MR. COPLE: Objection. Lacks foundation.
A. Yeah, I'm not sure who or who hasn't participated on different IARC panels.
BY MR. MILLER:
Q. I didn't ask if you know who.
Do you know generally whether Harvard professors have participated in IARC?
A. Well, since I don't know of specific people, I'm not sure. People might have. They may not have. I don't know really one way or the other.
Q. Let's find out. 24-17.
(Whereupon, Mucci Exhibit 24-17, IARC Monograph, Volume 105 List of Participants, was marked for identification.)

BY MR. MILLER:
Q. List of IARC participants from IARC Volume 105, "Diesel and Gasoline Engine Exhaust," Thomas Smith, Harvard School of Public Health.
Do you see that?
A. I do. I don't know who Thomas Smith is.
Q. 24-18, list of participants, IARC, Volume 112.
(Whereupon, Mucci Exhibit 24-18, IARC Monograph, Volume 112 List of Participants, was marked for identification.)
BY MR. MILLER:
Q. Have you seen that document before?
MR. COPLE: Do you have a copy for us?
MR. MILLER: Of course (handing).
BY MR. MILLER:
Q. Have you seen that document before?
A. I'm not sure. It's possible I've seen this document as part of something else. I'm not sure.
Q. Dr. Aaron Blair, do you his name on there?

A. I do.
Q. The "National Cancer Institute, United States of America [retired] (Overall Chair)."
Did I read that correctly?
MR. COPLE: Objection. The document speaks for itself.
A. That's what it says on the document, yes.
BY MR. MILLER:
Q. Now, we've talked before Dr. Blair was an author of the Agricultural Health Study study that you relied upon; right?
A. Yes.
Q. And is an author of the NAPP study that you have been commenting on; right?
A. Yes.
Q. Okay. And is chair of the IARC monograph that spent from the 3rd of March to the 10th of March looking at these issues, and it's Lyon, France?
A. That's what the document says, yes.
Q. Is that where they meet in IARC? Are you --
A. I -- I'm not sure where they meet.
Q. Okay. Others at Harvard put on the

website the findings of this panel. Are you aware of that?
A. No, I was not.
Q. Let's take a look at Exhibit 24-19.
(Whereupon, Mucci Exhibit 24-19, Document from Harvard T.H. Chan website, The Nutrition Source, Research Roundup, was marked for identification.)
BY MR. MILLER:
Q. A document from the Harvard T.H. Chan School of Public Health.
MR. COPLE: Do you have a copy for counsel?
MR. MILLER: Yes, of course (handing).
BY MR. MILLER:
Q. Are you a member of the Harvard T.H. Chan School of Public Health?
A. I am a -- I am on the faculty of the Harvard T.H. Chan School of Public Health.
Q. And so let's look at this website publication. And it states in pertinent part that in this report -- excuse me. "In March of 2015, 17 experts from 11 countries assessed the carcinogenicity of five pesticides including

glyphosate at the International Agency for Research on Cancer."
Do you see that, ma'am?
MR. COPLE: Objection. Lacks foundation, the document speaks for itself.
A. I can see that on this website document.
BY MR. MILLER:
Q. "In this report, glyphosate was classified as 'probably carcinogenic to humans' (Group 2A)"; right?
MR. COPLE: Objection. Lacks foundation, the document speaks for itself.
A. Yeah, I'm just seeing this now. I haven't had a chance to look at the website directly, but I believe this is just simply stating what was reported in The Lancet Oncology.
BY MR. MILLER:
Q. Yes, ma'am, for non-Hodgkin's lymphoma; right?
MR. COPLE: Same objection.
A. Yeah, again, it's just simply restating what was stated as part of the IARC document.

BY MR. MILLER:
Q. Do you agree with the IARC scientists who concluded that glyphosate is probably carcinogenic to humans for non-Hodgkin's lymphoma?
A. That classification -- what I did in my expert report was specifically to review the epidemiology studies, whereas a classification would have much broader topics on it. So I specifically reviewed the epidemiology literature, and based on my review of the epidemiology, I don't believe the epidemiology support a causal association.
Q. This publication from Harvard's website goes on to explain the "Evidence suggested the potential mechanism for cancer were primarily through two pathways: First, the chemicals damaged DNA, which caused mutations or alterations in their gene code. Second, glyphosate could induce oxidative stress."
Do you see where I'm reading that, ma'am?
MR. COPLE: Objection. Lacks foundation, the document speaks for itself.
A. Yes. While I can see that's what this

states on the website, this is not a statement -- I really don't know. But specifically what I do know is this is highlighting what was in the IARC report rather than being a comment one way or the other from the Harvard School of Public Health.
BY MR. MILLER:
Q. And you're not opining in the area of DNA or oxidative stress, that's not part of your role here; right?
A. My role was to specifically review the epidemiology studies.
Q. You did review the deposition of Dr. Blair; right?
A. I did take a look at the deposition of Dr. Blair.
Q. And you have relied in part upon the AHS unpublished 2013 manuscript as part and parcel of your opinions; right?
A. That was one part of the epidemiology I reviewed to make my assessment of a causal association, and assuming there's not. But, actually, even without that publication, my review of the epidemiology supported no association between NHL and glyphosate.

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Q. You're aware that Dr. Blair said it's irresponsible to rush out an analysis that's not fully thought out when discussing the 2013 AHS manuscript?

MR. COPLE: Objection. Lacks foundation.

A. You know, I didn't review Dr. Blair's deposition at great length because it didn't weigh in one way or the other in my critical review of the epidemiology studies.

BY MR. MILLER:

Q. Are you aware that Dr. Blair still, in light of this draft manuscript of AHS 2013, still believes that glyphosate is a probable carcinogen for non-Hodgkin's lymphoma?

MR. COPLE: Objection. Lacks foundation.

A. Again, since I didn't really thoroughly review his deposition, I couldn't say one way or the other what his feelings are on this topic.

BY MR. MILLER:

Q. Given that he is an author of the Agricultural Health Study that you rely upon, he's the author of the draft manuscript that you

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rely upon, he was the chairman of IARC, he was an author in NAPP, wouldn't he know more about the potential association between glyphosate and non-Hodgkin's lymphoma than you would?

MR. COPLE: Objection. Vague.

A. I guess my comment to that is I don't know what is underlying since I haven't reviewed anything that he's written specifically that summarizes in great detail how he's coming to his assessment.

But in reviewing critically the epidemiology literature that I've reviewed and looking through each individual studies assessing potential bias, including the studies from Dr. Blair, the NAPP, as well the unpublished and published AHS studies, taken together, these epidemiology studies do not support a positive association. So I couldn't say one way or the other what respect Dr. Blair is coming to his own assessment about this.

However, in reviewing the studies that I did that included Dr. Blair as a co-author, those studies do not support a causal association.

BY MR. MILLER:

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Q. Let's look at Exhibit 24-20.

(Whereupon, Mucci Exhibit 24-20, Excerpt of the 3/20/17 deposition transcript of Aaron Blair, PhD, was marked for identification.)

BY MR. MILLER:

Q. Here's some excerpts from Dr. Blair's sworn testimony in this case (handing).

Look with me, please, on Page 204 -- and I'm looking at the page numbers on the top right -- concerning whether the AHS study findings of the 2013 draft should be made available. The question is at Line 7, "And would you agree with Dr. Alavanja that it would be irresponsible for AHS...investigators not to publish the updated findings on pesticides and NHL in time to influence IARC's decision?"

His answer, "No. I don't agree with that. And the reason is because the timetable about when you have to have it published is arbitrary. And doing analyses and writing papers is not wedded to a timetable. And what is irresponsible is to rush something out that's not fully analyzed and thought out. That's irresponsible."

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Do you see that, ma'am?

MR. COPLE: Objection. The document speaks for itself, lacks foundation. I object to the incomplete document, selectively using Pages 204, 206, 207, and 293 without any of the remaining pages of this document.

BY MR. MILLER:

Q. You can answer.

A. So, yes, I can see where they're saying that. However, I'm not going to comment one way or the other about whether it's responsible or irresponsible about the publication. But I will say a few things.

One is Dr. Blair himself, when he wrote a manuscript on the use of meta-analyses in pesticide epidemiology, stated that it is -- indeed, you should include unpublished studies in your meta-analyses, often because of the issue of publication bias. So he, himself, has actually commented specifically on the use of unpublished studies and meta-analyses.

Secondly, as I commented previously in this discussion, I, myself, was able to review both the manuscript from 2013 as well as what was published from 2014. The methodologies that

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were presented in the Methods section and the type of presentation of results were very, very similar. I can review -- given my role as a peer reviewer in multiple publications, I could review critically that unpublished document myself.

So all of this taken together, whether or not it was responsible or irresponsible doesn't really take away from the fact that the 2013 publication, actually, is quite useful in summing up the state of epidemiology of NHL and glyphosate at the same time. Even without that updated follow-up, the body of evidence taken together would suggest no causal association between the glyphosate and NHL risks.

Q. Turn to Page 293. After three hours and 40 minutes of questioning by Monsanto lawyers, you're aware that Dr. Blair still held the opinion that he had at IARC, that glyphosate is a probable human carcinogen for non-Hodgkin's lymphoma?

MR. COPLE: Objection. Lacks foundation. Object to the use of an incomplete document.

A. Again, I don't have the full document

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in front of me. I didn't review it carefully because -- and I didn't think it was important to do so because I -- it wasn't going to influence -- his comments or others wasn't going to influence one way or the other my independent review of all of the epidemiology studies.

BY MR. MILLER:

Q. Let's look at the independent review of the epidemiological studies performed by IARC, and we'll mark that as Exhibit 24-21.

(Whereupon, Mucci Exhibit 24-21, Paper titled Carcinogenicity of tetrachlorvinphos, parathion, malathion, diazinon and glyphosate, was marked for identification.)

BY MR. MILLER:

Q. You've seen this before, ma'am?

A. I -- this is a news piece I have not seen previously.

Q. This is the -- from the Lancet, May 2015.

Do you see that, ma'am?

A. I see that, where it says that on the document.

Q. And it says, "In March of 2015, 17

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experts from 11 countries met at IARC to assess the carcinogenicity of the organophosphate pesticides," names several of them, one of them glyphosate.

Do you see that?

MR. COPLE: Objection. Lacks foundation.

A. I can see where it says that in this news article.

BY MR. MILLER:

Q. What these experts tell us is that case-control studies of occupational exposure in US, Canada, and Sweden reported increased risks for non-Hodgkin's lymphoma that persisted after adjustment for other pesticides.

That's true, isn't it?

MR. COPLE: Objection. Lacks foundation, the document speaks for itself.

A. Well, that is what this particular news article states. Actually, it's not fully correct for a number of reasons.

First, we can see from the analysis that was done in Pahwa, et al that adjusting for 2,4-D dicamba and malathion actually led to a substantial attenuation of the odds ratio to the

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null value. So I think that is an important consideration.

Secondly, there was an analysis by Hohenadel using the Canadian dataset that looks specifically at whether the association between glyphosate and NHL risk may be confounded by use of malathion. And, in fact, when you looked at glyphosate alone in the absence of malathion, the odds ratio in that study in Canada was 0.92, again showing the issue of confounding.

So that is --

BY MR. MILLER:

Q. Do you hold an opinion to a reasonable degree of scientific certainty that 2,4-D causes non-Hodgkin's lymphoma?

A. I have not thoroughly looked at the epidemiology literature on 2,4-D and NHL risk. However, for something to be a confounder of an association, it does not necessarily have to be a cause of the disease itself. If it is associated with the outcome and it's correlated with the exposure and its prevalence is high enough, it can induce confounding even if, in fact, that factor is not truly causally linked to the outcome.

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So the definition of a confounder does not need to be -- need to be that it is a formal true cause of the disease.

Q. "And glyphosate formulations and AMPA" -- do you know what AMPA is?

A. I do not. It's aminomethyl phosphoric acid.

Q. -- "induced oxidative stress in rodents and in vitro."

What does in vitro mean?

A. It would be studies that are performed experimentally in cells.

Q. "The working group classified glyphosate as probably carcinogenic to humans in (Group 2A)."

Do you agree?

A. Yes. I know that the statement that came out from the IARC review was a classification of 2A. However, in reviewing all of the epidemiology studies, including studies that have been published subsequent to the publication, but even before that, the body of evidence could not rule out that the few studies that suggested a positive association -- association with glyphosate and NHL risk may be

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due to confounding or bias.

Q. Did the scientists of IARC that met in March of 2015 follow reliable scientific methodology in looking at this issue?

A. I couldn't say one way or the other what the methodology was that was used by them. I wasn't part of the IARC working group.

Q. Have other scientists at Harvard commented on whether the scientists at IARC used reliable scientific methodology?

A. I'm not aware one way or the other about that.

Q. Let's take a look at it. Exhibit 24-22, "IARC Monographs: 40 Years of Evaluating Carcinogenic Hazards to Humans."

(Whereupon, Mucci Exhibit 24-22, IARC Monographs: 40 Years of Evaluating Carcinogenic Hazards to Humans, was marked for identification.)

BY MR. MILLER: A copy for you, ma'am. Copy for counsel (handing).

BY MR. MILLER:

Q. So there are lots of scientists on here. Some of them are from Harvard, I think we can agree. Let's look. If the name is

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footnoted with 8, it's the Department of Environmental Health, the Department of Epidemiology, Harvard T.H. Chan School of Public Health.

Do you see that, ma'am?

A. Yes, I do.

Just to clarify, Dr. Baccarelli is no longer at Harvard.

Q. Okay. And we're going to go through. So Dr. Baccarelli was at Harvard; right?

A. Yes.

Q. And why did he leave?

A. I don't know.

Q. And Dr. David C. Christian -- or Christiani?

A. Christiani.

Q. Oh, I'm sorry. Christiani, he's at Harvard?

A. He is.

Q. And you know him?

A. I do.

Q. Well-respected scientist?

A. He is.

Q. Also Francis -- I'm sorry,

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Francine Laden?

A. Yes.

Q. Do you know her?

A. I do.

Q. Well-respected scientist?

A. Yes.

Q. Okay. Also Richard Monson?

A. Yes.

Q. At Harvard?

A. Yes.

Q. And a respected scientist?

A. Yes.

Q. Okay. Dr. Ritz is not at Harvard, but you've read her deposition; right?

A. Yes, I did.

Q. She's an expert for the plaintiff. And Dr. Eva Schernhammer?

A. Yes.

Q. At Harvard?

A. She is.

Q. And --

A. No. Actually, she's not really at Harvard any longer. She has an adjunct affiliation.

Q. I see. She was at Harvard full-time,

and now she's adjunct at Harvard?
A. She, actually, wasn't even at Harvard full-time. She was at Brigham & Women's Hospital.
Q. Which is affiliated in some fashion with Harvard?
A. Not exactly, but it's with Harvard University, not the School of Public Health.
Q. Yeah. All right. And you also -- have you read Dr. Weisenburger's deposition in this case?
MR. COPLE: Objection. Asked and answered.
A. I have not.
BY MR. MILLER:
Q. Okay. Let's look at what these scientists from Harvard and others said about IARC monographs in this commentary that was published in June of 2015, some three months after IARC concluded that glyphosate was a problem with human carcinogen for non-Hodgkin's lymphoma. Go to Page 2 and look at this.
A. I'm sorry. What is Page 2?
Q. That's Page 508.
A. Okay.

Q. The Objectives, make sure I have this right, "The authors of this Commentary are scientists from various disciplines relevant to the identification and hazard evaluation of human carcinogens. We examined criticisms of IARC classification process to determine the validity of these concerns. Here, we present the results of that examination, review the history of IARC evaluations, and describe how the IARC evaluations are performed."
Did I read that correctly?
MR. COPLE: Objection. The document speaks for itself.
A. Yes, that is what is stated here. I have not reviewed this document.
I also think it's important to note that I took my own independent review of the epidemiology studies.
BY MR. MILLER:
Q. And you understand that these 17 scientists performed their own independent review of the epidemiological studies without pay for a seven-day period in 2015; right?
MR. COPLE: Objection. Lacks foundation.

A. I'm sorry. Could you repeat your question?
BY MR. MILLER:
Q. Sure.
You understand these 17 scientists at IARC conducted their independent evaluation of these epidemiological studies; right?
MR. COPLE: Same objection.
A. That being they performed an independent epidemiology review. I don't know exactly -- I wasn't there. I don't know exactly what happened during this process, so I can't really comment specifically on that.
BY MR. MILLER:
Q. Well, let's see what these scientists have to say. "Discussion: We concluded that these recent criticisms are unconvincing. The procedures employed by IARC to assemble Working Groups of scientists from the various disciplines and the techniques followed to review the literature and perform hazard assessment of various agents provides a balanced evaluation and an appropriate indication of the weight of the evidence."
You don't have any comment on whether

that's true or not?
A. Well, so I haven't reviewed this particular document previously. I'm not aware specifically what the criticisms are that they were referring to. So I couldn't really comment on that.
And, also, I think it's important to state that I reviewed the epidemiology literature on glyphosate and NHL risk in addition to the studies that were -- have subsequently come out since that IARC review. and I think it's important to note that the IARC epidemiologists were concerned about potential residual confounding and bias explaining some of the positive associations.
And indeed, actually some of the studies that have come out since then actually document this -- that actually residual confounding and recall bias were actually a concern in several of the studies. I think that's an important comment. And then finally -- well, I think I'll stop there.
Q. Okay. Let's look at the document, and I have a few more questions.
So you're unaware of any criticisms of

IARC, is that what I should understand?
A. I'm not familiar with specifically what criticisms -- I have never seen this document before you handed it to me, So I'm unfamiliar with the specific critiques and concerns that were addressed in this manuscript.
Q. Have you reviewed the scientific advisory panel report that was prepared by the scientific advisory panel of the EPA?
MR. COPLE: Objection. Lacks foundation.
A. Have I -- for -- I'm sorry, for what topic?
BY MR. MILLER:
Q. For glyphosate and potential association with non-Hodgkin's lymphoma.
A. I believe I briefly looked at part of it. However, I did not read through the entire document, and it was not part of my evaluation one way or the other of the epidemiology studies.
Q. Okay. So let's go, then, back to the IARC paper we were looking at here, Exhibit 23-14, I believe -- or 24. I'm sorry, what's the exhibit number?

A. 24-21.
Q. Thank you. 24-21.
A. This is the news article you're talking about, or the --
MR. HOLLINGSWORTH: We are on 22.
A. -- the 40 years of --
MS. MILLER: That was 22.
MR. MILLER: 24-22. Thank you.
BY MR. MILLER:
Q. All right. Go back and look at 24-22. Have I got it? All right. And I'm now on Page 513. This group of scientists, including several from Harvard, conclude this article with this sentence, "as a group of international scientists, we have looked carefully at the recent charges of flaws and bias in the hazard evaluations by IARC Working Groups, and we have concluded that the recent criticisms are unfair and unconstructive."
Did I read that correctly?
MR. COPLE: Objection. The document speaks for itself.
A. Yes. While that is what is said in this article, I'm not really sure what specifically the concerns were that were raised

and evaluated by this set of authors. I'm also -- that's it.
BY MR. MILLER:
Q. All right. Let's move on.
Were you aware that Harvard T.H. Chan School of Public Health is currently working on a scientific project with IARC?
MR. COPLE: Objection. Lacks foundation.
A. Could you be more specific, please?
BY MR. MILLER:
Q. Let's look at the document. 24-23.
(Whereupon, Mucci Exhibit 24-23, Goldie, et al paper, Global Cervical Cancer: HPV Vaccination and Diagnostics, was marked for identification.)
BY MR. MILLER:
Q. Pulled off the Harvard website. Do you see it's from the Harvard T. Chan School of Public Health, ma'am?
A. I am just seeing this document now. So if you could give me a second --
Q. Sure.
A. -- to look it over.

Yes, it seems to be from the Harvard School of Public Health website.
Q. Center for Health Decision Science. And what is that?
A. It is -- kind of as the name implies, it's the use of decision and analysis tools in public health.
Q. And the only reason I'm going over it is to show that one of Harvard's partners in this project on cervical cancer is the IARC.
Do you see that, ma'am?
MR. COPLE: Objection. Lacks foundation, the document speaks for itself.
A. You know, I -- I can -- I'm not familiar with this particular campaign. IARC, or the International Agency for Research in Cancer, is a very broad research group. So I guess I'm not exactly sure what their role is with this specific campaign. I'm just not familiar with this specific project.
BY MR. MILLER:
Q. According to this Harvard document, "IARC, which coordinates and conducts epidemiological and laboratory research on the causes of cancer. In this partnership, IARC

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collates published data on HPV type distribution in cervical cancer."

And I'm not trying to get into cervical cancer. It's really not an issue here. But were you aware Harvard was partnered with IARC?

A. For this particular project --

MR. COPLE: Objection. It lacks foundation, the document speaks for itself.

A. Yeah, as I said, there's -- this particular project I was not aware of one way or the other.

BY MR. MILLER:

Q. Were you aware of any other projects that Harvard has partnered with IARC on?

A. I -- it wasn't something that I -- I'm not aware one way or the other of other collaborations going on. I think I -- I think whether or not, however, Harvard is collaborating with IARC, whether Harvard investigators have served on IARC panels, I think for me in reviewing the epidemiology studies, looking at the IARC report was one small piece of this entire process that I put forth together in looking through my expert

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report. I'm not trying to make -- comment one way or the other on IARC as an organization or review body, but what to say is to specifically talk to you about the process in which I put together my epidemiology studies.

Q. But you see, one of the things I'm here today to do is to inquire as to why you disagree with the 17 scientists at IARC on whether glyphosate is a probable cause of non-Hodgkin's lymphoma.

MR. COPLE: Objection. Argumentative.

A. I think, as I said previously, I think when you look at what IARC said specifically about the epidemiology studies was that they found the evidence to be limited, and that they couldn't rule out bias, confounding, and chance.

And, in fact, actually, as I've stated previously, now reanalyses of those same studies that IARC looked at actually demonstrate in the actual datasets that there was recall bias because of the proxy respondents, and there was residual confounding by the lack of adjustment.

So those -- so actually I'm not disagreeing, but -- with IARC, but, in fact, actually looking at the body of epidemiology

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evidence. And in light of the concerns that IARC themselves raised about these important issues, I think -- and seeing the fact that they played out in the analysis of Pahwa, et al, as well as others, I think you can see that these are real issues in these epidemiology studies, the case-control studies, these are real issues that the bias and confounding existed.

BY MR. MILLER:

Q. All right. So you don't agree with IARC and their findings?

A. As I said, what I -- what I said just briefly wasn't disagreeing one way or the other with IARC. What I looked at was the epidemiology evidence. And, indeed, IARC themselves, the epidemiology group, said specifically that they could not rule out bias, confounding, or chance in those epidemiology studies. So that part I actually agree with.

And not only that, now with the additional analyses that have taken place in those same datasets of the studies that IARC reviewed, those concerns play out with actual data from -- I think Pahwa is an excellent example that highlights the residual confounding

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that was present in the -- some of the US and Canadian studies, the issues of proxy respondents that were in those studies, as well as in the Swedish studies as well.

Q. So you agree with the IARC scientists that there's limited evidence, but you don't agree with them that glyphosate is a probable form -- cause of non-Hodgkin's lymphoma?

A. That's not actually what I said.

What I said was my goal of my expert report was specifically to look at the epidemiology literature on the association between glyphosate and NHL risk, which is what I did. And I looked at all of the evidence, including studies that have been conducted after IARC occurred. And when I look at that entire body of evidence and look at each of the individual studies critically and look at the strengths as well as the weaknesses and look at the totality of evidence, based on that, I come to my expert opinion that NHL and glyphosate are not causally linked.

Q. Is there a positive association in the case-control studies?

A. While some analyses -- it depend -- I

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don't think you could say across the board there is one way or the other of positive association. While some of the earlier studies -- for example, De Roos 2003 reported an odds ratio that suggested a positive association. However, reanalysis of that same data actually found no association.

Q. Reanalysis by whom?

A. Pahwa, et al.

Q. Would you defer to Pahwa, et al about whether there is an association between glyphosate and non-Hodgkin's lymphoma?

A. As I said previously, I wouldn't defer to just any one study. I think you have to take it in totality, and which is what I did.

Q. Do you know who Richard Clapp is?

A. I am familiar with Dr. Clapp.

Q. He's a professor emeritus at Boston University School of Public Health?

A. Yes, I'm familiar with his name.

Q. Well-respected scientist?

A. I don't know him very well, actually. I couldn't say one way or the other.

Q. Let's mark as Exhibit 24-24 off the Harvard T.H. Chan website a picture of

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Dr. Clapp.

(Whereupon, Mucci Exhibit 24-24, Harvard T.H. Chan website biography of Richard Clapp, D.Sc, was marked for identification.)

BY MR. MILLER:

Q. That's the -- a gentlemen we've been talking about?

A. I'm sorry, is that a question?

Q. Yes, it is. Is that the gentleman --

A. I'm sorry, what is the question?

Q. Is that the gentleman we've been talking about?

A. I've never seen his photo, so I couldn't say. But the Richard Clapp that I'm thinking about was at Boston University.

Q. Okay. Are you aware that Dr. Clapp signed a letter published in the Journal of Epidemiology and Community Health concerning the issue of glyphosate in non-Hodgkin's lymphoma?

MR. COPLE: Objection. Lacks foundation.

A. No, I wasn't aware one way or another.

BY MR. MILLER:

Q. Here's a copy of that letter signed by

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Dr. Clapp, Dr. Portier, and others, and ask if anyone has provided this letter to you before. It's Exhibit 24-25.

(Whereupon, Mucci Exhibit 24-25, Portier, et al paper, Differences in the carcinogenic evaluation of glyphosate between the IARC and EFSA, was marked for identification.)

A. I don't recall. It's possible that it was provided to me, but I don't recall this particular publication.

BY MR. MILLER:

Q. Let's look at it. Okay? "Differences in the carcinogenic evaluations of glyphosate" --

A. I'm sorry, where are you reading?

Q. I'm reading the title right now, ma'am.

A. Okay.

Q. Okay. The "Differences in carcinogenic evaluation of glyphosate between the IARC and the European Food Safety Authority."

You see Dr. Clapp is one of the authors here? Let me find his name. There he

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is. See that, ma'am?

A. Yes.

MR. COPLE: Objection. The document speaks for itself.

A. Yes, I can see that he's a co-author on this study.

BY MR. MILLER:

Q. So in this August of 2016 letter, Dr. Clapp and others write -- let's go to Page 2 of this document. What Dr. Clapp says is that, "The IARC Working Group carefully and thoroughly evaluated all available epidemiology data, considering the strengths and weaknesses of each study."

Do you disagree with that?

A. With what it says, this is specifically what it says, yes. I -- but, again, I wasn't part of the review process. So, you know, I can't comment one way or the other about the thoroughness of the review. But it is what it says here.

Q. Dr. Clapp goes on to say, "This is key to determining that the positive associations seen in case-control studies are a reliable indication of association and not simply due to

chance or methodological flaws."
That's true, isn't it?
MR. COPLE: Objection. The document speaks for itself.
A. That is what it specifically says here in this commentary.
BY MR. MILLER:
Q. Dr. Clapp goes on to say, "To provide a reasonable interpretation of the findings, an evaluation needs to properly weigh studies according to quality rather than simply count the number of positive and negative studies."
That's true as well, isn't it?
MR. COPLE: Objection. The document speaks for itself.
A. That's specifically what this document says.
BY MR. MILLER:
Q. He goes on to say, "The two meta-analyses cited in the IARC Monograph are excellent examples of objective evaluations and show a consistent positive association between glyphosate and non-Hodgkin's lymphoma."
That's true as well, isn't it, ma'am?
MR. COPLE: Objection. Lacks

foundation, the document speaks for itself.
A. So, while that is specifically what those words say in the commentary, I think I've talked about this issue in a greater detail earlier today specifically. And I'm not even sure which of the two meta-analyses they're referring to. It only cites one of the meta-analyses here.
But if you take the Schinasi meta-analysis, I think there were concerns that were -- that, indeed, actually IARC mentions, which are that the -- for some reason they didn't always use the most-adjusted estimates in their analysis.
Secondly, if we look at the Chang and Delzell meta-analysis of 2016, that also is important to note that those meta-analyses -- a meta-analysis is going to be biased if the individual studies going into it are biased. And if -- based on what we talked about earlier, we can see clearly that there was residual confounding present in some of the US studies. You can see that from the Pahwa analysis.
And so I think that is an important consideration when we're thinking about these

meta-analyses and the results that they had in their study.
BY MR. MILLER:
Q. Let's see what Dr. Clapp and others say in their summary on these issues. Going to the last page, this is Page 743, and, "The most appropriate and scientifically based evaluation of the cancers reported in humans and laboratory animals as well as supportive mechanistic data is that glyphosate is a probable human carcinogen."
That's true, isn't it? That's true what it says, and as a scientific opinion that is correct? Do you agree or not agree?
A. So as I stated previously, first of all, this is what the words here say. However, what I reviewed specifically was the epidemiology data in humans, and there, based on that evaluation of the studies, you cannot rule out confounding and bias. And, indeed, we see that when you account for confounding and bias, actually, and when you look at the best epidemiology evidence, the -- in its entirety, there actually -- it does not support a causal association based on the epidemiology data.

Q. Dr. Clapp and others go on to say, "On the basis of this conclusion and in the absence of evidence to the contrary, it is reasonable to conclude that glyphosate formulations should also be considered likely human carcinogens"; right?
MR. COPLE: Objection. The document speaks for itself.
A. That is what the -- this is what is written in this commentary. However, as I've stated previously, the body of epidemiology evidence actually does not support this.
BY MR. MILLER:
Q. They just got it wrong?
MR. COPLE: Objection. Argumentative.
A. Is that a question?
BY MR. MILLER:
Q. Yes.
A. So, again, when you look at what IARC specifically said based on the studies they had, they said the evidence was limited, and that confounding and bias could not be ruled out. And, indeed, given the subsequent analyses that we've looked at and talked about earlier today, we can see that, indeed, confounding due use of

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other pesticides, as well as the recall bias, because a very high proportion of proxy respondents really accounts for any small positive associations that might have been seen in the earlier studies.

When you look at the updated analysis and the highest level of evidence from Alavanja using the cohort study that's immune from the recall bias, and that also dealt with the issue of residual confounding by adjusting for multiple pesticides in the study, taken together this body of evidence does not support a positive association between NHL and glyphosate.

Q. We talked before about John Acquavella, the epidemiologist who at times had been a full-time employee of Monsanto. Are you aware that he was deposed, and he said that IARC's classification of glyphosate as a probable carcinogen was a correct finding?

MR. COPLE: Objection. Lacks foundation.

A. I have not -- could I, please, look at the report from Dr. Acquavella?

BY MR. MILLER:

Q. The testimony, sworn-under testimony,

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and I'm going to hand it to you now.

(Whereupon, Mucci Exhibit 24-26, Excerpt of 4/8/17 deposition transcript of John Acquavella, PhD, was marked for identification.)

BY MR. MILLER:

Q. 24-26 is portions of Dr. Acquavella's deposition.

Have you been provided Dr. Acquavella's deposition by anyone?

MR. COPLE: Object to the use of an incomplete document that provides only pages Pages 337, 472, 473.

A. I'm sorry. Could you repeat the question?

BY MR. MILLER:

Q. Yes, ma'am.

Have you been previously provided what I just handed you?

MR. COPLE: Same objection.

A. I don't believe I've seen this.

BY MR. MILLER:

Q. Let's look together at Page 472. Dr. Acquavella was asked, "Question: IARC determined, based upon hazard identification" --

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A. I'm sorry. What --

Q. Page 472, Line 22.

A. Mm-hm.

Q. Okay. "IARC determined, based on hazard identification, that glyphosate, in its view, is a probable carcinogen. Is that a correct finding?"

Let's see what the doctor's answer under oath is here.

"Right. So I say yes in the context that they don't consider, you know, feasibility, necessarily, or plausibility, first, based on the amount of likely exposure and the frequency of exposure that people who have contact with the chemical are likely to have. So that the shorthand for that is hazard identification, so, yes, in that context."

Do you see that, ma'am?

MR. COPLE: Same objection.

A. I find it difficult since I don't have access to this entire testimony. And, actually, frankly, just in reading through his answer, I'm, actually, not really sure one way or the other what he's trying to say. Whether Dr. Acquavella feels one way or the other about

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the IARC finding, it wouldn't have influenced one way or the other my own independent evaluation of the epidemiology studies on NHL and glyphosate.

BY MR. MILLER:

Q. Let's move on to look at some of those studies.

THE WITNESS: Might this be a good time to take a break? Or what's our plan --

MR. MILLER: Sure.

THE WITNESS: -- for taking a break?

MR. MILLER: If you want a break, we'll take a break.

THE WITNESS: Okay.

THE VIDEOGRAPHER: Going off the record. The time is 12:49.

(Whereupon, a luncheon recess was taken.)

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AFTERNOON SESSION

THE VIDEOGRAPHER: Back on the record. The time is 1:30.

MR. MILLER: I said that. Give me one second. Perfect.

BY MR. MILLER:

Q. All right. Doctor, how was lunch?

A. Fine. Thank you.

Q. Good.

A. How was your lunch?

Q. Perky and sassy. Thanks. Great.

Okay. You had mentioned before the Pahwa PowerPoint and how it helped you look at things, generally speaking. Do you generally remember that line of --

A. What I remember is the importance of the analysis by Pahwa, et al, in terms of showing the issues of recall bias and residual confounding.

Q. Is this 24-27 that PowerPoint?

A. There were three different PowerPoint presentations that I looked at by Pahwa, et al. I believe the one -- well, yeah, let me -- I can look through specifically my report and tell you

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which ones they are.

(Whereupon, Mucci Exhibit 24-27, 6/3/15 PowerPoint, A Detailed Evaluation of Glyphosate Use and the Risk of Non-Hodgkin Lymphoma in the NAPP, was marked for identification.)

A. So there were two PowerPoint versions for a meeting. One was dated June 3, which is this one, and there's a second one, August 31st, 2015.

BY MR. MILLER:

Q. Okay. How does this June 13, 2015 aid you in coming to your opinions in this case?

A. This printout is a little difficult to see with the sort of extra text here. And there's no page numbers. I'm not sure if I could refer you to a specific page in the presentation.

These data also look actually different from the presentation of August 31st. I don't know if you have that presentation available.

Q. I don't.

Does this exhibit help you form your opinions, inform you of your opinions?

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A. Well, it doesn't, because it's missing one of the key analyses. It seems like comparing -- it's also these results are slightly different than what's reported in the manuscript. So I think it would be the August, 2015 that would be useful to have.

Q. What is that key analysis that is missing?

A. As I said, it's comparing the -- showing the comparison of the crudely adjusted and the multivariable adjusted analyses together to show the issue of residual confounding. I think that was one important feature. And then, also, separately looking at the self-respondents only. So, again, it's just different. So it would be helpful to look at the August, 2015 presentation.

Q. Do you have a copy of that with you here today?

A. I have it on my computer, but I don't have a printout of the copy.

Q. Are your findings in that regard referenced in your report?

A. Yes.

Q. Which page?

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A. So if you look, for example, on the top of Page 47, this talks about the ever versus never exposure.

And so what we can see here, I present first the odds ratio that was in the abstract, conference abstract document. Secondly, looking at the odds ratio from the 2015 August presentation, looking at the crudely adjusted odds ratio, and then looking at the multivariable adjusted odds ratio, and then finally the odds ratio multivariable that was restricted to the self-reported data from self-respondents.

Q. So Exhibit 24-27 is one of the PowerPoints that we've been discussing; right?

A. As I'd mentioned, it's one of the presentations that I looked at. But in terms of what I looked at, present in the report, it's specifically the odds ratio from the 2015 August presentation.

Q. Let's look at the June presentation for a minute and see what these scientists find, and then we can move on.

A. Sorry, I just want to make sure that we have the -- you know, I don't know why the

data are different between the conference abstract and the August, 2015 presentation or the June, 2015 presentation. So I'm also looking at the manuscript from Pahwa. Are there data tables associated with this manuscript, do we know, by Pahwa, et al?

Q. You don't get to depose me now.

A. Oh, I'm sorry.

Q. I depose you.

A. Yes, I'm sorry about that. I just -- I was hoping to see the actual data.

Q. Let's look at this exhibit. If you'd please turn with me to "Selected Characteristics of Non-Hodgkin's Lymphoma Cases and Controls." Okay.

A. Okay. Selected characteristics, cases and controls.

Q. Yes, ma'am. And all I'm trying to do by looking at this is to get some of the acronyms down. These are different types of non-Hodgkin's lymphoma. I think we can agree FL is -- how do you pronounce that?

A. Follicular.

Q. Say again?

A. Follicular.

Q. Follicular. Okay. And DLBCL is the -- is diffuse; right?

A. Yes.

Q. All right. And small lymphocytic, SLL, also a form of non-Hodgkin's lymphoma; right?

A. Yes.

Q. So if we go two pages back, the authors tell us with overall non-Hodgkin's lymphoma risk, 22 percent increased risk; right?

A. So the odds ratio is 1.22. The confidence interval includes the null value. But just to clarify, that is -- that odds ratio that is there is different than the odds ratio that was presented in the August, 2015 publication, which was an odds ratio of 1.13 with a confidence interval of 0.84 to 1.51.

Q. All right. And for DLBCL, a subtype of non-Hodgkin's lymphoma, they showed a 32 percent increased risk, not statistically significant; right?

A. Again, the relative risk is 1.32. The 95 percent confidence interval is somewhat wide given the number of exposed cases. 0.87 includes the null value.

But, again, that differs from the August, 2015 publications with the relative risk of 1.23 and 95 percent confidence interval of 0.8 to 1.8, suggesting no association.

Q. And for the subtype SLL of non-Hodgkin's lymphoma, they show an 87 percent increased risk, again with -- not statistically significant finding; right?

A. And just to give you the data for August, 2015, the odds ratio is attenuated 1.51, 0.87 to 2.60, based on 15 exposed cases.

Q. Okay. So instead of an 87 percent increase, it shows a 51 percent increased risk in the August PowerPoint?

MR. COPLE: Objection. Mischaracterizes the witness's testimony.

A. I'm not talking about it being increased risk at all. What I was saying was what the reported odds ratio and 95 percent confidence intervals were. This -- in this analysis, that number that I'm giving you and this number here actually don't deal with the issue of proxy respondents. They have limited the analysis to the self-reported data.

So adjusting for the way that they

have, putting proxy respondent in the model, actually doesn't adjust for the recall bias that's inherent in these studies.

BY MR. MILLER:

Q. These authors have adjusted for age; right?

A. Correct.

Q. For sex?

A. Correct.

Q. For state/province?

A. Yes. Correct.

Q. For lymphatic and hemopoietic cancer in a first-degree relative?

A. Correct.

Q. And for use of proxy respondent?

A. As I said, while they put that in the model, it doesn't account for the recall bias that is present in these studies. That's not an appropriate way to deal with the recall bias.

Q. And they've adjusted for the use of any personal protective equipment; right?

A. Yes.

Q. For the use of 2,4-D?

A. Correct.

Q. And adjusted for the use of dicamba

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and malathion; right?
A. Correct.
Q. And for other types of non-Hodgkin's lymphoma, other than the three subtypes identified, they have a 75 percent, statistically significant; right?
A. Just to clarify, that does differ what was in the August, 2015 public -- presentation, which presented a non-statistically significant association. And, again, just to clarify, it's not appropriate, their approach to adjusting for the proxy respondents' recall bias by just putting it in the model.
Q. So, please, turn to "Frequency of Glyphosate Handling and Non-Hodgkin's Lymphoma Risks" from this PowerPoint. And for greater than two days they show a statistically significant 98 percent increased risk; right?
A. Yes. Well, that's what the data shows here.
What I'd like to do is look at -- just because I think it's important that there are differences between the August, 2015 publication and this June publication. So -- and just to clarify, it's a small difference, but the odds

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ratio was attenuated somewhat to 1.73.
I think one other important issue to raise, which we've discussed previously, is the concerns around using only frequency to measure an actual dose-response. I think there's -- it doesn't take into account the lifetime of exposures and the intensity. It's really only taking into account how many days per year someone is using it.
Q. You didn't tell me whether the 1.73 from the August PowerPoint was statistically significant. Is it?
A. The 95 percent confidence interval is 1.02 to 2.93.
Q. Statistically significant; right?
A. It is an association that is statistically significant. However, the interpretation of that odds ratio is somewhat challenging because the selection of number of days per year as a measure of dose.
Q. I'm going to hand you what's been marked as 24-28, the McDuffie study from 2001.

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(Whereupon, Mucci Exhibit 24-28, McDuffie, et al study, Non-Hodgkin's Lymphoma and Specific Pesticide Exposures in Men, was marked for identification.)
BY MR. MILLER:
Q. You've reviewed this?
A. Yes, I did.
Q. And let's go over it. This is a study about non-Hodgkin's Lymphoma and Specific Pesticide Exposures in Men; right?
A. Yes.
Q. Now, do you know any of these scientists?
A. I know the names, but I don't know these individuals.
Q. Okay. Now, this was published in Cancer Epidemiology, Biomarkers & Prevention. Do you see that?
A. Yes.
Q. It's a peer-reviewed journal; right?
A. It is, yes.
Q. So this article would have undergone a peer review process and then been accepted for publication; right?

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A. Yes.
Q. And this is a population-based case-control study, we can agree?
A. It is a population-based case-control study, yes.
Q. And what these -- one, two, three, four, five, six, seven, eight -- nine scientists concluded in this peer-reviewed case-control study, if we could look at Page 1161, was that for glyphosate greater than two days per year had over a doubling of the risk, statistically significant. That's what they concluded; right?
A. I'm not sure. Could you point to specifically in the discussion where they conclude that? Because I think they report on that as the relative risk. But I'm just trying to find where the -- where they make a specific conclusion about that relative risk.
Q. I'm looking at the table. Let me know if I'm reading the table wrong. They're talking about glyphosate.
Do you see where I read that?
A. Yes, I do see. But there's a difference between reporting a relative risk estimate and a conclusion about that relative

risk. And I think the reason that I say that that is important is a number of things.

One is that this study had kind of a couple of important issues to consider. One is the issue of the proxy respondents, which I've talked a lot about and which we show in the Pahwa analysis, is an important issue.

Secondly, the issue of residual confounding, I think, by other pesticides used, and they haven't adjusted for other pesticides in this analysis. And I think particularly so what's been seen in several of these studies, that individuals who are using glyphosate more regularly tend to also more regularly use other pesticides. And so this is an example where the unadjusted odds ratio can lead to a spurious association.

So that's why I was trying to find specifically what the authors conclude. They may -- they reported a number. The question is how did they interpret that number and what are the strengths and limitations that they thought about. And then secondly, what do we know from the Pahwa analysis of which a large proportion of the cases for this dose analysis came from

McDuffie.

Q. Well, that was a mouthful, but let me give you my question. It's a narrow one.

I'm looking at Page 1161. And did these authors, these nine scientists in this peer-reviewed journal, report an odds ratio of 2.12, statistically significant? Am I reading that wrong?

MR. COPLE: Objection. Asked and answered, argumentative.

A. As I -- as I said, while that is the odds ratio that is reported in this manuscript, the authors as well acknowledge the fact that there is potential issues with the recall bias because of the proxy respondents.

Another issue that I didn't mention already was that the response rates for both the cases and controls was fairly low.

And what you worry about here, particularly with the controls, the controls are meant to provide information about the experience in the population that gave rise to the cases. And so if you don't have a good response rate, then you can lead to a form of selection bias. So while the odds ratio that

they reported here is 2.12, I think we can see from the Pahwa analysis that we're concerned about unmeasured confounding, as well as the potential issue of the proxy respondents.

And then finally, it's, again, the issue of the days per year perhaps not being really the optimal way of looking at this response.

BY MR. MILLER:

Q. And that 2.12 they report is statistically significant?

A. The 2.12 for the unadjusted odds ratio, you know, again, when we think about -- we can't really think about statistical significance being important or not important if we're concerned about bias or confounding, which I think we are in this case. So the issue of statistical significance, we can't -- we can't talk -- comment about chance without if we think there's bias or confounding, which I think we are very concerned about here.

Q. I'm sure you are.

Let's see what the authors say. Let's go to Page 1162. We're already there. Let's see what they say.

These nine authors in this peer-reviewed journal on the association between non-Hodgkin's lymphoma say, "Our results support previous findings of association between non-Hodgkin's lymphoma and specific pesticide exposure."

Did I read that correctly?

MR. COPLE: Objection. Argumentative.

A. That is what it says, but I want -- I think an important thing also is that they looked at multiple pesticides in this study, not only glyphosate. So it's difficult to say one way or the other what they're referring to here.

I think it's also important to note that one can be concerned about potential systematic bias given the number of positive associations that are seen across the board in this study.

BY MR. MILLER:

Q. You've never written to an editor to criticize his study; true?

A. I'm sorry. For this particular study?

Q. Yes.

A. I have never written a letter to the editor for this particular study. However, in

looking through critically this study now, and also taken together with the analysis of Pahwa, et al, I can see very clearly the bias and confounding that exists in this study.

Q. Sure you can. All right. Let's move on.

Let's look at Hardell. Does this study have bias and confounding, Hardell?

MR. COPLE: Objection. Argumentative.

A. I'm sorry. Hardell is part of a number of publications. Which particular publication are you referring to?

BY MR. MILLER:

Q. One we're going to mark as 24-29.

(Whereupon, Mucci Exhibit 24-29, Hardell, et al article, Exposure to Pesticides as Risk Factor for Non-Hodgkin's Lymphoma and Hairy Cell Leukemia, was marked for identification.)

BY MR. MILLER:

Q. Is there bias and confounding in this Hardell study (handing)?

A. So for each of the studies that I looked at, I went through this as a similar

strategy, to look at the strengths and the limitations. In terms of the limitations specifically of this study, it's actually some of the same problems we're worried about with the earlier case-control studies from the US and Canada.

First, 43 percent of the cases were actually dead by the time the study was undertaken. So that's a large number of proxy respondents.

Secondly, the way that the issue -- what we're concerned about is also the issue of residual confounding. So, again, case-control studies are a lot more susceptible to the issues of bias that the cohort study is not an issue of.

Q. So this study is subject to bias and confounding, in the Hardell study?

A. This particular study, I think another key issue is the very small number of exposed cases and controls, which is -- can lead to a spurious association as well.

Q. Okay. And so just to be clear, this is a study by three scientists, Dr. Hardell, Eriksson, and Dr. Nordstrom; right?

A. Yes.

Q. And it's published in Leukemia & Lymphoma, a peer-reviewed journal; right?

A. Correct.

Q. So it's undergone scrutiny of peer review and been accepted for publication, and you've reviewed it; right?

A. I have reviewed this study. It was published in a peer-reviewed journal, studies -- yes.

Q. Okay. Let's look at what they concluded in this peer-reviewed journal, these three scientists. On -- in their abstract section, they show, "Increased risks in an univariate analysis were found for subjects exposed to herbicides. Among herbicides, significant associations were found for glyphosate, a tripling of the risk, statistically significant."

That's what they reported; right?

A. What they're reporting there is the odds ratio that is unadjusted. However, the association for glyphosate was considerably attenuated in the multivariable analysis with an odds ratio of 1.85 in very wide confidence

intervals of 0.5 to 6.20, which is kind of an issue in terms of being able to interpret such findings that include the null value as well as potential protective effects.

Q. So instead of a 300 increased risk when we use the multivariate analysis, it was an 85 percent increased risk?

MR. COPLE: Objection. Misstates the witness's testimony.

A. I think -- one of the critical issues in epidemiology and getting at a causal association is the issue of confounding. It's one of the -- our most important issues to address. Here, they actually address themselves is there evidence of confounding or not. And, indeed, they actually see that there's considerable confounding.

The main issue is given that there were only eight exposed cases and eight exposed controls, when they're adding different factors into the multivariate model, you get these extremely wide confidence intervals. I would say this is basically a very difficult odds ratio and confidence interval to interpret.

BY MR. MILLER:

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Q. Doesn't this study prove that glyphosate is a risk factor for non-Hodgkin's lymphoma?

A. No, this study does not prove that. It's -- as I said, it's actually a study difficult really to interpret given the very small number of exposed cases and small exposed controls.

There's also an issue of latency. When these cases were actually recruited, the amount of sufficient latency really isn't there. And the issue of the fact that you had 43 percent of your cases were dead and you're relying on proxy respondents, which we've seen in other settings, has induced a recall bias.

Q. Let's turn to Page 1047, and see what these scientists say about whether glyphosate is an increased risk of non-Hodgkin's lymphoma, and they state in pertinent part, "In this study, exposure to glyphosate was a risk factor for non-Hodgkin's lymphoma."

Do you disagree with them?

A. Yes, I do.

Q. Okay.

A. You can't -- given their own data, I

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disagree on that. It's not my own opinion about this. But just looking at the multivariable odds ratio, so accounting for these other herbicides in the multivariate model in Table 7, we can see that it's not really interpretable at all. You have an odds ratio of 1.85, but your confidence interval is so enormous. It's only based on eight exposed cases and eight exposed controls.

Q. Are you aware that IARC relied in part on the Hardell study in reaching their conclusion that glyphosate was a probable form -- cause of non-Hodgkin's lymphoma?

MR. COPLE: Objection. Lacks foundation.

A. Again, so I know that the Hardell -- this Hardell study was one of the epidemiology studies that was reviewed. However, the epidemiology panel for IARC came to the assessment that the epidemiologic evidence was actually limited because of issues of confounding and bias, and it's clear here on many levels concerns about bias.

BY MR. MILLER:

Q. Bias -- I understand. They also

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concluded that they, IARC, that glyphosate was a probable human carcinogen for non-Hodgkin's lymphoma. Can't we agree on that much?

A. Their statement was a classification of glyphosate as a Class 2A. However, what I was asked specifically to comment on was the epidemiology literature. And my assessment of the epidemiology is that there is no causal association of glyphosate and NHL risk, also IARC's assessment of the epidemiology literature. So I'm just talking about the epidemiology literature here, specifically that the epidemiology studies were limited because they couldn't rule out bias, confounding, or chance.

And this is a clear example where all three factors played a role here. We have chance findings because of the fact you only have eight exposed cases and eight exposed controls. You have the issue of confounding here, and then you also have the real concern about recall bias, particularly because of the high proportion of proxy respondents.

Q. Are high ejaculators at a decreased risk of prostate cancer?

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A. I -- that's -- in what context? I'm sorry.

Q. In the context of high ejaculators, are they at decreased risk of prostate cancer?

MR. COPLE: Objection. Lacks foundation.

A. If you'd like me to look at a specific set of studies, I'm happy to do that.

BY MR. MILLER:

Q. No. I'd ask if you can answer that question. If you can't answer it, you can't answer it. But if you can, answer it.

MR. COPLE: Objection. Lacks foundation, vague.

A. I'm, again, happy to look at some specific studies or a whole body of literature, but I'm not prepared to comment on that at the moment.

BY MR. MILLER:

Q. Okay. Now, let's go back to 24-28. We can at least agree that this peer-reviewed study by these nine scientists was considered by IARC and part of the evidence upon which they base their conclusion that glyphosate is a probable human carcinogen; right?

A. So as I mentioned, this is one of several epidemiology studies that IARC reviewed. However, when IARC was reviewing the epidemiology, the epidemiology panel said the data was limited because they couldn't rule out the issues of bias, confounding, or chance. And we actually know that both bias and confounding played a role in these results from two different analyses. One is the extra analysis by Pahwa, et al; and, secondly, when we look at the results from Hohenadel where they looked specifically among what's the association between glyphosate and NHL risk among those who are not using malathion, and I think that's a very clear example of the importance of confounding that particular study.

Q. You keep saying "we." Who is we? You and who else?

MR. COPLE: Objection. Objection. Argumentative.

MR. MILLER: I'm just asking.

MR. COPLE: Objection. Argumentative.

BY MR. MILLER:

Q. You can answer.

MR. COPLE: Objection. Argumentative.

MR. MILLER: Are you instructing her not to answer?

MR. COPLE: Did you hear that, Counselor? Objection. Argumentative.

MR. MILLER: I understand that.

BY MR. MILLER:

Q. You can answer.

A. So in epidemiology we tend to work collaboratively, so if I'm using the word "we," it's really "I."

Q. Okay. Fair enough. Let's look at -- we're going to try to treat this as agreeable as possible, even though we clearly disagree on much. So I wasn't trying to be offensive. I hope you didn't take any.

Let's look at the next study. The next study, I think, in the line of studies on this issue of association between glyphosate and non-Hodgkin's lymphoma is De Roos 2003.

Did you review that study, ma'am?

A. I did.

Q. Okay. And let me hand it to you. First let's talk about -- and I know you're going to disagree with what the authors concluded, but can we talk about for a minute

what they concluded, and then we can talk about why you disagree with it? Okay.

MR. COPLE: Do you have a copy for counsel?

(Whereupon, Mucci Exhibit 24-30, De Roos, et al paper, Integrative assessment of multiple pesticides as risk factors for non-Hodgkin's lymphoma among men, was marked for identification.)

MR. MILLER: I'm sorry, yes, excuse me. Here you are (handing).

BY MR. MILLER:

Q. And you have reviewed this study, right, ma'am?

A. I have.

Q. And it was in the -- published in the Occupational Environmental Medicine journal; right?

A. Yes.

Q. And that's a peer-reviewed journal?

A. Yes.

Q. And it's by -- one, two, three, four, five, six -- seven scientists, including Dr. Blair and Dr. Weisenburger; right?

A. Yes.

Q. Okay. And these scientists looked at the issue of the "assessment of multiple pesticides as risk factors for non-Hodgkin's lymphoma among men"; right?

A. That is the title of the paper.

Q. And what they're doing is they're looking at three case-control studies; is that right?

A. Correct.

Q. And as they integrate those three case-control studies, they reached some conclusions, and I'm certainly not going to try to stop you from giving me your critique of that. But let's look first at what they concluded, please, at Page 5.

On Table 3, they were providing us a table of effect estimates for use of specific pesticides in non-Hodgkin's lymphoma incidence, adjusting for use of other pesticides; right?

A. That is what Table 3 is -- includes, yes.

Q. And when we say "effect estimates," is that like relative risk? Is that what that means?

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A. Yes.
Q. Okay. And so they did two kinds of analysis, logistic regression and hierarchical regression; is that right?
A. Correct.
Q. Yes, ma'am.
And they looked at glyphosate, and they calculated a 2.1 percent odds ratio, statistically significant, under the logistic regression; right?
A. So the odds ratio is 2.1 percent, but odds ratio of 2.1 and then -- yes.
Q. Okay. And using the hierarchical regression, they came up with a 60 percent, but it was not statistically significant; right?
A. The odds ratio was 1.6.
Q. Okay. Now -- and I know that you disagree with that as being a real association, and now I'm going to ask you to explain why.
A. So actually I think -- just one thing I want to clarify. When we're looking at tables, we're not looking at conclusions. We're just looking at numbers that were generated from the analyses. While I would agree -- well, so a couple of things. While I would agree that

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these odds ratios are elevated, it's -- in a lot of ways this paper is -- it's a little challenging to understand a couple of things.
One is, it's not clear -- I reviewed the paper several times. It's not exactly clear to me what is or is not included in the logistic regression model. So I think that's one thing to take into account.
I think, secondly, what is a little bit challenging is the difference between the results that were seen in Cantor on its own and Cantor -- Cantor dataset, and that comprises the largest number of cases that are included in the study. And then also the Pahwa analysis. So I think it's interesting to see how this relative risk in the same study population seems to vary a lot.
So if the hierarchical regression model, if you believe that to be adjusted for confounding, and I think it seems like it was a reasonable approach, then you could say it was a relative risk of 1.6 and the odds ratio of 0.9 to -- or sorry, 1.6, 0.9 to 2.8. It seems to have dealt with the issue of confounding. We're still left here with the issue of recall bias,

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which we definitely see exists in the Pahwa, et al, analysis.
In some ways, though, when you look at the -- so when you look at this totality of evidence, and when -- I think one of the important ways in which the updated technical memorandum of Chang and Delzell does, it -- when it takes the Pahwa's analysis for -- which kind of deals with all these other issues we've been talking about, and puts that into a model, you kind of see that the odds ratio generally varies. When you look at the body of evidence of epidemiology, there's no positive association.
So I would agree with you that this -- the results from this one study with a multivariable adjusted odds ratio generated an odds ratio of 1.6 with confidence intervals close to 1. However, it doesn't deal with the issue of recall bias, which -- you know, it's interesting we keep talking about these as individual studies, but I think one thing to remember is that several of the -- so it's McDuffie and De Roos and Cantor and Pahwa are kind of -- there's a lot of overlap in what

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these studies are. So although it seems like I'm picking apart each individual study, these are all studies that have similar issues in common and, indeed, actually are relying on the same studies.
Q. So you think one of the problems with this paper is recall bias; right?
A. Well, they haven't accounted for recall bias. That is one issue.
The second issue could be is that because they're including adjustment for a large number of pesticides, and some of these had missing data, there's a concern about potentially how missing data might have influenced the result. But I think one of the big issues is around the recall bias that remains here.
Q. But you're aware these scientists considered and rejected recall bias as a problem later? Are you aware of that?
A. Well, I -- you know, in looking at the analysis from Pahwa, et al, you know, I don't -- I don't know how they made that assessment about recall bias specifically, if they -- how they looked at it in their own data. But I do know

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by the same -- many of the same authors looking at the same dataset through Pahwa clearly shows the effect of the proxy respondents as a recall bias.

So it was the same authors here now, I guess, 13 years later show, in fact, in their -- this original dataset that there was concerns about recall bias from the proxy respondents.

Q. And --

A. Finally just one final comment, I'm sorry to interrupt you, but we haven't addressed -- or I haven't addressed here, you know, these are all studies that were conducted in the 1980s. So really the maximum amount of latency from -- and this is the maximum, it's not necessarily what it was, but the maximum possibility is less than ten years. So we do have concerns about really their real interpretation of these studies.

Q. Let's see what these authors said about whether or not they had recall bias. Turn to Page 8, if you would. "Second, the fact that there were few associations suggests that the positive results we observed are not likely to be due to a systematic recall bias for pesticide

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exposures, or selection bias for subgroups included in the analyses of multiple pesticides."

So they didn't think they had a recall bias; right?

A. Yeah, I mean, I understand how they came to that assessment here. However, you know, several of these authors are authors on the Pahwa analysis where they looked at the issue of recall bias again in that analysis. So, in fact, they actually did, indeed, see the effect of the proxy respondents having in that same dataset. So several of the same authors on these two studies.

Q. Ma'am, are you aware that one of the authors in this study is, in fact, an expert for plaintiffs in this case, Dr. Weisenburger?

A. I am aware of that, yes.

Q. And he stated under oath and in a very detailed report that, in fact, glyphosate causes non-Hodgkin's lymphoma. Are you aware of that?

MR. COPLE: Objection. Lacks foundation.

A. I was not aware one way or the other of his statement about that.

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BY MR. MILLER:

Q. You haven't read his deposition, and you have not read his report?

A. I have not read his deposition. I read over his report briefly because it didn't cover -- it wasn't -- major focus wasn't on epidemiology. So I only reviewed a small part of it.

Q. We can agree that this De Roos 2003 article was one of the papers upon which the 17 members of IARC concluded that glyphosate was a probable human carcinogen; right?

A. The epidemiology group relied on the De Roos as one of the papers that looked at, in its conclusion, that the epidemiology actually was limited in that bias, confounding, and chance actually could not be ruled out. So it was one of the studies that they used and evaluated and came to their statement that the evidence was limited and that bias, confounding, and chance could not be ruled out.

Q. Is that all they ruled, or did they rule anything else?

MR. COPLE: Objection. Argumentative.

BY MR. MILLER:

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Q. You keep wanting to say that the evidence was limited, but you don't say that, in fact, they found that glyphosate was a probable human carcinogen. Can we agree that's what they found?

MR. COPLE: Objection. Asked and answered.

A. As I stated, what I'm referring to specifically is around the review of the epidemiology, which is actually the content of my specific expert report here. I reviewed all of the epidemiology evidence. And as I stated earlier, I think it was important to see that some of the concerns that IARC had in raising the issues of bias and confounding actually panned out in the future -- or the subsequent analyses that were performed in the same datasets that IARC made their review of.

BY MR. MILLER:

Q. And that's -- you're referring to the Pahwa article; right?

A. That -- the Pahwa is one of the studies that I'm referring to that exemplifies the issue of confounding and bias in these studies that had been part of previously.

Q. And the authors of the Pahwa article would be in a better position to understand that than you, or you cannot agree to that?

MR. COPLE: Objection. Argumentative.

A. I'm not sure I understand what your question is.

BY MR. MILLER:

Q. Well, who is more knowledgeable about this issue, you who has come in as an expert for Monsanto or the actual authors who wrote these articles over the last ten years?

A. I'm sorry, I don't understand specifically what you're asking.

Q. Who is more knowledgeable --

MR. MILLER: I can't read it while it keeps scrolling. Why don't you read it back. I try to read it, and it keeps moving.

(Whereupon, the reporter read back the pending question.)

A. Yeah, I know the question that you asked, but maybe you could clarify specifically what you're asking. I think, you know, in 2003 when De Roos, et al, published, they hadn't looked at the issue of proxy respondents the way that Pahwa, et al, did. So, you know, and

similarly -- so I guess I'm not -- I guess I'm trying to say the own authors looked at their own data in a different way, and actually you can see the issue of confounding and bias here.

BY MR. MILLER:

Q. Let's look at the Eriksson study from 2008. Have you reviewed that before?

A. Yes.

Q. Okay. Here's a copy. We've marked it 24-31.

(Whereupon, Mucci Exhibit 24-31, Eriksson, et al article, Pesticide exposure as risk factor for non-Hodgkin lymphoma including histopathological subgroup analysis, was marked for identification.)

BY MR. MILLER:

Q. Just a few preliminary matters.

You can agree that this is an article written by Dr. Eriksson, Hardell, Carlberg, and Akerman?

A. Correct.

Q. You were in Sweden for a while. Did you know any of these folks?

A. I did not.

Q. And this is in the International Journal of Cancer, correct?

A. Correct.

Q. Peer-reviewed journal?

A. Yes.

Q. So this underwent peer review, was accepted for publication, and published in 2008; right?

A. Correct.

Q. And it is on the issue of "Pesticide exposure as risk factor for non-Hodgkin lymphoma including histopathological subgroup analysis"; right?

A. Yes.

Q. And they tell us in their abstract their findings are, "Exposure to glyphosate gave an odds ratio of 2.02," statistically significant.

That's what they report; right?

A. So that is the unadjusted odds ratio. And the odds ratio that was adjusted for other pesticides was attenuated with an odds ratio of 1.51 and a confidence interval of 0.77 to 2.94.

Q. And their conclusion is, in part, "The association with glyphosate was considerably

strengthened."

That was their conclusion; right?

A. That is what was written here in this manuscript.

Q. And please go to Table 2, if you would. And regarding exposure to various herbicides, these scientists in this peer-reviewed journal conclude that if you've been exposed to glyphosate for more than ten days, you have a statistically significant, more than doubling of the risk; right?

A. So just again a statement that I made earlier which I think is important, the presentation of data in a table is not a conclusion. It's just some numbers. But the odds ratio they report, which is an unadjusted odds ratio, for more than ten days of use was an odds ratio of 2.36 with a confidence interval of 1.04 to 5.37.

However, we're particularly concerned with the issue of confounding here. The way that they classified the exposure -- or actually the unexposed group is actually -- not only raises concerns about confounding but, in fact, actually is more likely to result in

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confounding, because they defined unexposed not only people who were not using glyphosate, but people who are not using any form of pesticides.

So now you have people in more -- with more than ten days of use are those, also, who are using a number of other pesticides. So these pesticides we know tend to vary together. So now you're comparing a group that has many pesticides being used compared to no pesticides being used. So that's where the confounding issue is even stronger an issue here in Eriksson, et al.

Q. Let's look at Page 1662 and see what these scientists concluded in their paper. They concluded that, "Glyphosate was associated with a statistically significant increased odds ratio for lymphoma in our study, and that the result was strengthened by a tendency to dose-response effect as shown in Table 2."

That's what they concluded; right?

A. That is what they -- their statement is that they -- they were associated. But, again, you know, they -- what they're commenting on is not the fully adjusted odds ratio, but the odds ratio from the crude analysis. So they're

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making a statement about what odds ratio was statistically significant without actually referring to the odds ratio that is adjusted for other confounders.

And, again, with the dose-response -- confounding is such a key issue here in epidemiology. It's really important to understand the important confounding that can get induced due to the fact that people are using multiple pesticides at the same time.

In this analysis of dose-response, as I've mentioned, while it is true that they do find this number here, the question is can you exclude confounding as a reason for this number. And there's big concerns for confounding.

Q. Confounding is a well-known concept within epidemiology; fair?

A. Correct.

Q. You could, then, agree that the epidemiologists who are on the IARC panel looking at this issue knew about a confounding and knew how to consider it; fair?

A. You know, I don't know the individuals, but I'm sure if they're -- yeah, I'm sure given the importance of confounding.

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But I wouldn't want to say one way or the other given that I wasn't on the panel and didn't hear the discussions.

Q. You just don't know if those epidemiologists invited to sit on IARC knew about confounding or not; is that fair?

A. That's not what I said. What I said was I don't know how they approached the issue of confounding, but I do know in their summary statement what the epidemiology panel did say, that they couldn't exclude confounding as one of the forms of bias from the epidemiology studies.

Q. Yes, ma'am. They said that, and they also said that glyphosate was a probable human carcinogen for non-Hodgkin's lymphoma?

A. What I'm talking about, specifically about, is the epidemiology literature, not the overall assessment that was made by the entire panel. What I'm talking specifically about are the epidemiologists. And they couldn't say -- and also, you can see here the importance of confounding in the ever-never.

For some reason they -- these authors decided not to adjust for other confounders by other pesticides and present those results for

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the dose analysis. But you can see the important effect of confounding that existed in the analysis for ever-never.

Q. All right. Let's look at what these four scientists in Eriksson peer-reviewed journal concluded within this article.

They concluded that based on their research and based on this report, their earlier indication of an association between glyphosate and non-Hodgkin's lymphoma had been considerably strengthened.

Do you agree with that?

A. Well, sometimes you can get to the same numerical association because you have bias in both studies. And I think -- well, actually, I would agree that this study has some additional strengths that the prior study did not have. For example, they didn't use proxy respondents. However, confounding, given what we can see in Table 3, there's odds ratios in -- or Table 2, the odds ratios are elevated for a number of the different compounds presented, raising the concern about confounding in the dose-response analyses.

So there was confounding in this

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analysis. There was a confounding in the other analysis. Confounding tends to bias in the sense that things are positively associated with glyphosate use and NHL risk. And it makes -- it makes sense while you see numerically similar findings, but it doesn't add to -- or doesn't make the suggestion that there's a causal association.

Q. IARC used Eriksson 2008 as one of the pieces of evidence upon which it based its conclusion that glyphosate was a probable human carcinogen for non-Hodgkin's lymphoma. We can agree with that, can't we?

A. What I said previously is that it was one of the epidemiology studies the epidemiology panel looked at, and in their assessment of the epidemiology they came to the assessment that there was limited evidence because they could not rule out bias, confounding, or chance. And we see here themselves, these authors show the important effect of confounding just looking at the ever-never exposure. So I think that's an important feature.

Q. Did you review the Cocco study of 2013?

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A. I briefly reviewed the Cocco -- let me see. Could you -- could you provide me the Cocco study just so I can make sure --

Q. Yes.

A. -- I'm talking about the right study?

Q. I will.

Did you -- do you know if you reviewed it?

A. Cocco was one of the studies I reviewed. I just want to make sure I'm thinking about the right study.

Q. Marked as Exhibit 23-32.

(Whereupon, Mucci Exhibit 24-32, Cocco, et al article, Lymphoma risk and occupational exposure to pesticides, was marked for identification.)

A. Yes, I did, but it wasn't a study I decided to comment on because it only had such a small number of exposed cases and small number of exposed controls.

BY MR. MILLER:

Q. Let's take a brief look at the study. Okay? This is a study on "Lymphoma risk and occupational exposures to pesticides; right?

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A. Yeah, that's the title.

Q. And it's published in British Medical Journal.

OEM, what does that mean? Do you know?

A. It may be occupational environmental medicine.

Q. A peer-reviewed journal?

A. Yes.

Q. And it's got -- one, two -- 18 authors; right?

A. I'll take your word for it.

Q. Do you know who Paola Boffetta is?

A. I do.

Q. Epidemiologist?

A. Yes.

Q. Used to be with IARC?

A. Yes.

Q. Do you know where he is now?

A. He is in New York, and he's also an adjunct faculty member at the Harvard School of Public Health.

Q. How long has he been there?

A. At Harvard?

Q. Yeah.

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A. I couldn't say.

Q. Let's look, Conclusions, they conclude that, "Our results provide limited support to the hypothesis of an increase in risk of specific lymphoma subtypes associated with exposure to pesticides"; right?

A. That's what that statement says. But I would want to look, as I didn't read through this in great detail because I was -- felt that it was not an informative study given the limited number of cases exposed -- cases and controls to glyphosate. You know, I'm not exactly sure what they're referring to in terms of that specific concluding statement.

Q. Let's look at Table 4 in the study, peer-reviewed, 18 scientists. They list in Table 4 the risk of B-cell lymphoma, which is a type of non-Hodgkin's lymphoma; right?

A. It's the most common subtype, yes.

Q. Yes, ma'am. The risk of B-cell lymphoma and occupational exposure to selected specific active ingredients of pesticides, one of them, glyphosate, and they show an odds ratio of 3.1 with a confidence interval from .6 to 17.1; right?

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A. Those are the numbers, yes. However, you know, as you can assess, that is not consistent. It's really a non-informative study to base an analysis on four exposed cases and two exposed controls.

The reason I didn't include it in my assessment is that it's -- if you have one case or one control that goes from exposed to unexposed, your odds ratios are going to really sort of blow up. And it's really not an informative study for glyphosate and NHL risk.

Q. Did IARC reference this study in their paper where they concluded glyphosate is a probable carcinogen for non-Hodgkin's lymphoma?

A. As I said previously, I'm looking specifically at the epidemiology literature. The epidemiology panel found the evidence limited, but I'm not sure if this was or was not included in the IARC review.

Q. Did you review of the Schinasi meta-analysis on this issue?

A. Yes, I did.

Q. Let's take a look at it.

Do you know Dr. Schinasi?

A. No, I don't.

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(Whereupon, Mucci Exhibit 24-33, Document, Non-Hodgkin Lymphoma and Occupational Exposure to Agricultural Pesticide Chemical Groups and Active Ingredients, was marked for identification.)

MR. MILLER: All right. A slight technical difficulty. We'll be right back with you.

There you go. All right. Thank you, Counselor.

BY MR. MILLER:

Q. Doctor, here's what we've marked as 24-33. Here you go. Sorry. Counsel, 24-33 (handing).

All right. And you reviewed this; right?

A. Yes. Although this is the supplemental table. So I'm not sure that -- whether or not I looked specifically at the supplemental information or not.

Q. Okay. Well, let's look at the supplemental information from Schinasi.

And just to clarify a point or two, published in 2014 in the Journal -- I'm sorry,

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International Journal of Environmental Res Public Health; right?

A. Yes.

Q. And that's a peer-reviewed journal?

A. I'm not familiar with this journal.

Q. Okay. Let's look, if we can, at supplement Page 4. The bottom half of the page, forest plot, can we agree that's what that is?

A. Yes.

Q. Okay. And so we understand, vertical line 1, what does that mean, vertical line 1? What does that signify?

A. I'm sorry, what -- oh, which --

Q. I'm on supplemental --

A. The yellow line?

Q. Yes, ma'am.

A. That is referring to the value of 1.0 for an odds ratio, which would suggest no association.

Q. And so anything to the left of that line would be protective; right?

A. You wouldn't only want to look specifically at the point estimate, but also the 95 percent confidence intervals.

Q. True.

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A. So that would be -- those numbers would be suggestive of an inverse association.

Q. If they were on the left side of 1.0?

A. If they were on the left side.

Q. And if they're on the right side of 1.0, they are suggestive of an association?

A. Of a positive association, yes. One of the challenges, you can see here already, is that Schinasi relies on the unadjusted estimates, even though for some the adjusted estimates were available.

Q. And this is hard to read. I'm going to zoom it in a little bit.

What she does, then, she takes a De Roos 2003, which we looked at, she takes De Roos 2005, the Agricultural Health Study, Eriksson '08, Hardell 2002, McDuffie 2001, and Orsi 2009; right?

A. Yes.

Q. And she comes up with a meta-analysis with a 1.46, statistically significant; right?

A. Well, that is the number that she came up with. I think the problem with her approach was that she -- even when there is the more fully adjusted odds ratios available from the

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studies, for some reason she selected to provide the unadjusted estimate. So the important feature of interpretation of a meta-analysis is that the individual studies should be devoid of bias or confounding. And so, you know, while she calculates a number of 1.46, I think there's a lot of problems with the approach that she took here.

Q. And IARC took this study, the Schinasi meta-analysis, into consideration as one of the studies upon which it based its conclusion that glyphosate was a probable human carcinogen for non-Hodgkin's lymphoma; true?

A. I'm actually not familiar one way or the other whether they -- how they reviewed Schinasi versus the individual studies. But, again, the summary of the epidemiology by IARC was that the evidence was limited in terms of the epidemiology studies because bias, confounding, and chance could not be ruled out.

Q. What's a sensitivity analysis?

A. Could you clarify a specific example what you mean by that question? I mean, a sensitivity analysis could mean many things in different contexts.

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Q. Generally speaking, there's no way to define it in general?

A. Well, a sensitivity analysis, as I said, could mean different things in different settings. So that's -- I don't want to give you the wrong answer, depend -- I just would want to know the context in what you're asking.

Q. If you can't answer, you can't answer.

MR. COPLE: Objection. Argumentative.

BY MR. MILLER:

Q. The textbook you're involved in, did you put a definition of sensitivity analysis in there?

A. I can't recall one way of the other if I did. And, again, I'm not trying to avoid your answer, but a sensitivity analysis can mean many different things in epidemiology. So that's why I can't answer such a general question.

Q. What I do have is Dr. Schinasi's full --

THE WITNESS: Would it be possible to take a quick break?

MR. MILLER: Sure.

THE VIDEOGRAPHER: Going off the record. The time is 2:39.

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(Whereupon, a recess was taken.)

THE VIDEOGRAPHER: Back on the record. The time is 2:51.

(Whereupon, Mucci Exhibit 24-34, Schinasi and Leon article, Non-Hodgkin Lymphoma and Occupational Exposure to Agricultural Pesticide Chemical Groups and Active Ingredients, was marked for identification.)

BY MR. MILLER:

Q. Making this easy for you, Doc. This is Exhibit 24-34, the Schinasi non-Hodgkin's lymphoma paper, and I've tabbed the only page I want to talk about.

But you have reviewed this document; right?

A. Yes, I have.

Q. Okay. I'll hand you my tabbed copy, and I'm not sure I can find it.

A. Do you want --

Q. What page is tabbed? That's what I want to know.

A. 4513.

Q. 4513. Thank you so much.

All right. So Schinasi paper --

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MR. COPLE: For the record, the document marked as Exhibit 24-34 on Page 4513 has highlighting which was not in the -- in any original copy. So counsel made that highlight.

MR. MILLER: That is true. That is absolutely true.

BY MR. MILLER:

Q. All right. Now, let's look at this exhibit.

It is by Dr. Schinasi and Leon; right?

A. Yes.

Q. And it's published in the International Journal of Environmental Research and Public Health; right?

A. Yes.

Q. And that was in 2014; right?

A. Yes.

Q. And if we look, then, to page -- can you remind mean again the page -- what, again, page am I'm looking at?

A. 4513.

Q. 4513. Thank you, Doctor.

And this is a page where they give the meta-analytic summary estimates of association between herbicides and insecticides with

non-Hodgkin's lymphoma; right?
A. Yes.
Q. And I'm looking now for glyphosate, and they've shown the meta risk ratio at 50 percent, statistically significant; right?
A. So this is the relative risk that they have found in their meta-analysis which relied on taking some of the odds ratios from individual studies that were not mutually adjusted for other confounders. And this meta-analysis also doesn't account for the recall bias that was induced by the use of proxy respondents.
Q. Right. I understand those are your criticisms of the study.
But what they did find was a 50 percent increase, statistically significant. I respect you have your criticisms, but that's what they found; right?
A. The relative -- the meta relative risks that they calculated based on these unadjusted odds ratios ended up with a relative risk of 1.5. That is true. It's in contrast from the meta-analysis done most recently by Chang and Delzell which actually tries to deal

with some of the issues of confounding and recall bias from the proxy respondents.
Q. And in this meta-analysis by Schinasi and Leon, they also list on Table 5 here the estimation risk of B-cell lymphoma, the most common type of non-Hodgkin's lymphoma, right?
A. They do provide a summary meta risk ratio estimate, but it's only based on two studies.
Q. And it's a doubling of the risk, statistically significant, is what they report? And I know you have your criticisms; right?
A. And they're not just my criticisms. So the relative risks that they calculated in this meta risk ratio was a relative risk of 2.0. The criticisms that are inherent in meta-analysis is that they rely on the fact that the individual studies are not biased and that there's no confounding. And we know that the estimates they've taken in the Schinasi meta-analysis for some reason are the unadjusted and not the fully adjusted estimates. And that the estimation of the meta summary risk estimate is different than what was seen when we account for the most fully adjusted odds ratios.

Q. And the Schinasi and Leon study was one of the studies that IARC used to conclude that glyphosate was a probable human carcinogen for non-Hodgkin's lymphoma; true?
A. Well, the overall statement from IARC was a Class 2A assignment. The epidemiology studies, which I'm not sure how much they did or did not rely on Schinasi in their review of the epidemiology studies, but taken together, the IARC panel for the epidemiology found there was only limited evidence because they couldn't rule out the confounding and bias were present.
Q. Is that yes, they considered Schinasi, or no, they didn't?
A. I couldn't say one way or the other the extent to which they integrated the results from Schinasi versus the results of the individual studies that went into Schinasi. I couldn't say one way or the other.
Q. Okay. You rely upon Agricultural Health Study unpublished manuscript as part of your opinions; right?
A. The unpublished manuscript, yes, was one of all of the epidemiological studies that I looked at in my -- in putting together my expert

report.
Q. And are you -- you are aware that Dr. Alavanja is one of the authors of the AHS manuscript?
A. Yes.
Q. Let's look at just one or two of his papers real quick.
(Whereupon, Mucci Exhibit 24-35, Alavanja, et al paper, Increased Cancer Burden Among Pesticide Applicators and Others Due to Pesticide Exposure, was marked for identification.)
BY MR. MILLER:
Q. We're going to mark as 24-35 Dr. Alavanja and Dr. Ross and Dr. Bonner's Increased Cancer Burden Among Pesticide Applicators and Others Due to Pesticide Exposure.
Ma'am, have you seen this paper before (handing)?
A. While I've seen the paper before, I didn't review it in detail.
Q. This is a paper published in Pesticide Exposure and Cancer. Do you see that, ma'am?

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A. I believe actually the journal was Cancer Journal for Clinicians. That may have been a running title or something.
Q. I think you're right. Excuse me. Yes, A Cancer Journal for Clinicians.
Is that a peer-reviewed journal?
A. Yes, it is.
Q. So here we have three scientists, Dr. Alavanja, one of the authors of the AHS draft manuscript that you rely upon.
Dr. Ross, are you aware he was on the IARC panel for IARC and glyphosate?
A. I'm sorry, was there a question?
Q. Yes. There was.
A. Sorry.
Q. Are you aware that Dr. Ross, Dr. Alavanja's co-author, was a member of the panel that voted glyphosate for IARC?
A. I was not aware that Dr. Ross was on the panel.
Q. And then a third scientist, a Matthew Bonner; right? These are the three authors; right?
A. Correct.
Q. And what they tell us is "A growing

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number of well-designed epidemiological and molecular studies provide substantial evidence that the pesticides used in agricultural, commercial, and home and garden applications are associated with excess cancer risk."
Has that been your observation from studying the literature?
MR. COPLE: Objection. Lacks foundation, the document speaks for itself.
A. I have -- my -- in putting together my expert report, I specifically focused on glyphosate and NHL risk. I have not done a thorough systematic evaluation of epidemiology studies more broadly, so I wouldn't be able to comment one way or the other.
Q. Dr. Alavanja says that "The literature does strongly suggest that the public health problem is real." And is that something that you can comment on?
MR. COPLE: Objection. Lacks foundation, the document speaks for itself.
A. As I've stated, I specifically for this expert report looked at the epidemiology of NHL and glyphosate, and wouldn't be able to comment specifically on -- beyond that scope.

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BY MR. MILLER:
Q. Dr. Alavanja in his paper, if you please turn with me to Table 5, indicates that glyphosate is positively associated with non-Hodgkin's lymphoma.
Do you see that, ma'am?
A. I'm sorry, I don't see it on Table 5.
Q. Page 2 of Table 5. There are actually two pages to Table 5.
A. I see.
Q. In the middle of the page there.
A. I -- you know, I can see where in this table he comments on this. I didn't thoroughly review this as in assessing the epidemiology. I felt what was important to do was to review the individual assessment and come up with the strengths and limitations. So I couldn't comment specifically what is -- what that -- what the basis of that statement is coming from.
Q. Well, he's -- Dr. Alavanja is one of the authors of the AHS study; right?
A. He is one of the authors from the AHS study. However, I'm not exactly sure what this line here is referred to, you know, specifically, what each of these columns are

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referred to.
Q. And he's one of the authors of the AHS manuscript, draft manuscript upon which you rely, right?
A. Well, he is one of the authors; that is true. What I'm saying here is that I'm not sure what information went into this table that he put together. So I couldn't comment specifically on what he's getting at here.
Q. Let's see what he's getting at.
He's saying glyphosate is positively associated with non-Hodgkin's lymphoma. Do you disagree with him?
MR. COPLE: Objection. Asked and answered.
A. Again, so I haven't looked at this. Clearly he's listing one reference in this, which is the study by Eriksson, et al. I'm not sure where he's coming up with this. Again, I can't really interpret this table because I haven't looked through it carefully. I haven't looked to see how he's assembled all of this information together, but looking at all of the epidemiology evidence together, there is no supportive evidence of a causal association

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between glyphosate and NHL risk. Like, I couldn't comment specifically on what this table is referring to.
BY MR. MILLER:
Q. So let's go now from Dr. Alavanja where he says -- what's the name of that last article? Anyway, let's move on.
(Whereupon, Mucci Exhibit 24-36, Alavanja, et al, Draft, Lymphoma risk and pesticide use in the Agricultural Health Study, was marked for identification.)
BY MR. MILLER:
Q. He's also the author of this draft that you rely upon; right?
A. It was one of the reports I relied upon. I looked at all of the epidemiology literature.
Q. All right. So -- I'm thinking out -- the last Alavanja article we looked at was 2013 where he said in the Table 5 that there was a positive association. I want to go now down to the article that you looked at which was a draft, and here is Exhibit 24-36. Is this -- and there have been several iterations of that.

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Is that the iteration that you looked at?
A. I couldn't say specifically if it was or was not. I believe that the March 15, 2013 was the date that I looked at.
Q. And I'm not trying to pull any punches on you here. We looked at a couple versions yesterday with Dr. Rider. This one looks like it was redrafted 2000 -- several times. It looks like March 18th, March 21st, July 10th, July 19th, and then September 19th. And do you remember which of these iterations you might have looked at?
A. Well, I'm not sure what this footnote is referring to. It may be, in fact, when it was printed, but I think by looking at the draft date that's here underneath the author's name, I believe that is the draft version that I looked at.
Q. Okay. And this is by that same Dr. Alavanja; right?
A. Correct.
Q. Okay. And this is draft, meaning this hasn't gone through peer review, right?
A. No. Although it has not gone through peer review, however, I think there's a number

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of reasons to think that the data are valid. Just because something hasn't gone through yet a peer review process, it doesn't mean it's not valid. And I think we can say because part of the data presented here using the same methodology actually had been published in a 2014 manuscript using the same methodology.
Q. If I was a student in your epidemiology class and I asked you whether I should give equal strength of evidence to unpublished data as to peer-reviewed published data, what would you tell me?
MR. COPLE: Objection. Incomplete hypothetical.
A. I think it would really depend on the situation. But as I stated, you know, as somebody who has reviewed hundreds of articles for medical journals, and given the fact these methods have been actually peer-reviewed and published subsequently on non-Hodgkin's lymphoma and other pesticides using the same methodology, and even given a comment by Dr. Blair himself in the importance of including unpublished studies in meta-analyses, but one should be cautious, he says in his manuscript on meta-analyses,

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however, it's important to include unpublished data because of the issue of publication bias.
Q. Dr. Blair also said glyphosate is a probable cause of non-Hodgkin's lymphoma. Is that important to you?
A. What was important to me was to have all of the epidemiology evidence available that covered the topic of glyphosate and NHL risk, and to review each of these studies, to review their strengths, their limitations, their finding, and come to an assessment based on the totality of evidence.
Q. Dr. Blair also --
(Videographer interruption.)
BY MR. MILLER:
Q. Dr. Blair also says it would be irresponsible to look at draft data to come to conclusions. Do you agree with that?
MR. COPLE: Objection. Lacks foundation.
A. I haven't seen specifically where or what context Dr. Blair said something like that. So I wouldn't be able to comment on that specifically.
BY MR. MILLER:

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Q. Does this draft report say there's missing data?
A. This report discusses some of the missing data related to the phase 2 of the collection of data on pesticides.
Q. So it admits there's missing data; right?
A. It discusses it. It also discusses the potential for bias in this study, and then also it's addressed in subsequent studies following that have examined whether this type of missing data could lead to a bias in the study, and have come to the conclusion that the effect is likely to be limited on the association of glyphosate and NHL risk.
Q. The study had 37 percent loss to follow-up?
A. As I mentioned earlier, the term loss to follow-up we tend to refer specifically to outcome assessment. Here what you're talking about specifically is whether or not the data on the questionnaire for exposure is available.
And while -- and another important thing is that while they -- what the authors did to address this is to use a well established

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epidemiological approach, which is to use a method of imputation, which we know is reliable in this setting, because the data that is missing on the people who didn't fill out the second questionnaire, those people are similar to the people who actually did report the information, and therefore, that data are not -- are missing at random, which means that the imputation is a valid methodology for dealing with this issue of missing data.
Q. Are you aware that IARC will not consider unpublished data?
A. I know that IARC has as part of its review panel, that is what they do in that situation. However, other agencies and review panels take a different approach. I believe actually given the -- I agree with Dr. Blair and what he said of the importance in doing a complete assessment, and if there are unpublished data available, too, that it could be part of the review process as long as you can critically review the methodology that's being used in the study.
Q. So tell me when the first questionnaires were handed out for the first AHS

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study, please.
A. So the first set of questionnaires were -- the first wave was in 1993 to 1997, and it asked not only about current exposure, but also past exposure as well.
Q. And when were the second questionnaires handed out, or filled out?
A. I just have to refer to this. So the -- sorry, I just want to review before so I can give you the exact dates. The follow-up questionnaire was 1998 to 2003.
Q. How many people were participants in the study in the 1993, 1997 process?
A. So it states that over 57,000 individuals were included in this particular analysis, and included the phase 1 data.
Q. And how many people filled out the second questionnaire?
A. Of these, 63 percent, which translates into 36,300 participants.
Q. Fair to say over 20,000 people did not fill out the second questionnaire?
A. Yes, while that is true, we can see from a number of evidence that the people who did report were very similar on a number of --

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based on demographic factors, as well as cancer outcomes, and those who did and did not participate. So actually while the actual number may seem large, the actual potential for bias is somewhat minimized. And actually, the authors in a number of subsequent studies have addressed this issue of whether there's potential bias.
Q. When did they close the analysis for the second study?
A. The follow-up was through December 31, 2008.
Q. So that -- let me understand.
If I filled out the questionnaire in -- I'm sorry, in 1993, and I said I was a never user of glyphosate, and I failed to fill out the second questionnaire, and I die in 2007 from non-Hodgkin's lymphoma, but I used Roundup from 1994 through 19 -- through 2007, I'm going to show up as a never user of glyphosate; right?
A. No, that's actually not correct. The method they used of imputation was to look at the pattern of pesticide use in the individuals for whom there was the baseline and follow-up data, and then based on those patterns, apply it

to the people who did not have that second wave data. And, in fact, actually the Agricultural Health Study authors assess the validity of this approach in a number of ways. There was a -- the validation study that looked at this imputation method and showed actually that for glyphosate specifically that -- what they did was to look at the people they actually had both data on and take it as a random sample, and then impute what those values would be, and then they could compare it to what they actually did do. What they saw was this imputation method actually worked quite well.

So, no, it's not correct that they necessarily would or would not have been, and actually given the imputation, most likely they would have been assigned as a glyphosate user in that second wave.

Q. So of the 20,000 people that didn't fill out the second questionnaire, how many of those did they impute used glyphosate?

A. I couldn't tell you specifically at this point.

Q. Let's go back to my example.

If I filled out the questionnaire in

'93, then used glyphosate in '94 through '98, in the first study I'm put down as a never user of glyphosate; true?

A. I'm sorry, could you repeat the statement?

Q. Sure.

If I filled out my questionnaire in '93 and say I've never used glyphosate, then I go out the next spring and start spraying glyphosate, and spray it every year from '94 through '98, I'm going to show in that study as a never user of glyphosate; right?

A. I'm not sure how that person would be or wouldn't be coded for that second questionnaire.

Q. For the first study?

A. For the first they would have been classified as an unexposed, yes, correct. And that is, you know, a valid concern to think about and worry about.

However, in this particular case, I think there was the validation study that was done with actual biomarker data where they compared the -- first of all, they looked at the reliability and looked at one questionnaire time

point one year apart, and they looked at reliability of information collected in one year and then the next year, and actually for glyphosate showed a very high reliability of reporting. So I think if it is an issue, there might be some small misclassification. But it seemed like given the high reliability, that that amount of misclassification would probably be pretty small.

Then, secondly, with the validation they did with the self-reported data and the biomarker studies, I think that also supports that if there's misclassification which you're referring to, it's actually pretty small.

Q. From '94 to '98, was there an increase in Roundup use in America?

A. Well, there appears to have been perhaps an increase in intake. It's unclear specifically in this population of pesticide users what the uptake and the increase would have been if they were already using glyphosate. And part of that would be captured actually in the second wave in the questionnaire.

And I think what's important to see is that the findings with this updated follow-up

are actually really similar to the baseline analysis of 2005, suggesting that no matter how you look at the data, they're pretty internally consistent with each other and support no association.

MR. MILLER: I have no further questions. Thank you for your time.

A. Okay. Thank you so much.

MR. COPLE: Take a short break.

THE VIDEOGRAPHER: Going off the record. The time is 3:20.

(Whereupon, a recess was taken.)

THE VIDEOGRAPHER: Back on the record. The time is 3:24.

MR. COPLE: We have no questions for Dr. Mucci.

MR. MILLER: I don't have any follow-up, then, obviously.

I do strongly urge counsel to not attempt to designate this entire deposition as confidential. There were short spots where we used documents under seal. The Court has cautioned parties not to needlessly designate as confidential, and so we'll ask counsel to look hard at the Rider deposition and Dr. Mucci

deposition and follow the Court's instructions.

MR. COPLE: We understand the Court's instructions, and we, as always, intend to follow the Court's instructions.

The designation provisionally stands as confidential. We, of course, will endeavor to completely review Dr. Rider and Dr. Mucci's deposition and ensure we are in compliance with Judge Chhabria's order.

MR. MILLER: Have a good evening.

THE WITNESS: Thank you so much.

MS. MILLER: Thank you.

THE VIDEOGRAPHER: This concludes the September 22, 2017 deposition of Dr. Lorelei Mucci. Going off the record. The time is 3:25.

(Whereupon, the deposition was concluded.)

COMMONWEALTH OF MASSACHUSETTS)
SUFFOLK, SS.)

I, MAUREEN O'CONNOR POLLARD, RMR, CLR, and Notary Public in and for the Commonwealth of Massachusetts, do certify that on the 22nd day of September, 2017, at 8:05 o'clock, the person above-named was duly sworn to testify to the truth of their knowledge, and examined, and such examination reduced to typewriting under my direction, and is a true record of the testimony given by the witness. I further certify that I am neither attorney, related or employed by any of the parties to this action, and that I am not a relative or employee of any attorney employed by the parties hereto, or financially interested in the action.

In witness whereof, I have hereunto set my hand this 23rd day of September, 2017.

____

MAUREEN O'CONNOR POLLARD, NOTARY PUBLIC
Realtime Systems Administrator
CSR #149108

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ACKNOWLEDGMENT OF DEPONENT

I, __________________________, do Hereby certify that I have read the foregoing pages, and that the same is a correct transcription of the answers given by me to the questions therein propounded, except for the corrections or changes in form or substance, if any, noted in the attached Errata Sheet.

____
LORELEI A. MUCCI, ScD DATE

Subscribed and sworn
To before me this
______ day of _________________, 20____.
My commission expires: ________________

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Notary Public

LAWYER'S NOTES

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