Exhibit 5

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA

IN RE: ROUNDUP PRODUCTS LIABILITY LITIGATION	MDL No. 2741 Case No. 16-md-02741-VC
This document relates to: ALL ACTIONS	

VIDEOTAPED DEPOSITION OF DR. CHADI NABHAN
Rosemont, Illinois
Monday, January 15, 2018

Reported by:
PAULA CAMPBELL, CSR, RDR, CRR, CRC
JOB NO. 136021

January 15, 2018
8:53 A.M.

Videotaped discovery deposition of DR. CHADI NABHAN, held at CROWNE PLAZA CHICAGO O'HARE, 5440 North River Road, Rosemont, Illinois, pursuant to notice before Paula Campbell, CSR, RDR, CRR, CRC.

A P P E A R A N C E S:

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ALSO PRESENT:
Robert Zellner, Videographer

---------- I N D E X ----------

----------EXHIBITS----------

VIDEOGRAPHER: And good morning. This is the start of tape labeled number one of the videotaped deposition of Dr. Chadi Nabhan taken in the matter of In re: Roundup Products Liability Litigation in the United States District Court for the Northern District of California, bearing Case Number 16-MD-02741-VC.

This deposition is being held at the Crowne Plaza Chicago O'Hare Hotel, at 5440 North River Road in Rosemont, Illinois, 60018, on Monday, January 15th, 2018, at approximately 8:53 A.M.

My name is Robert Zellner from TSG Reporting, Inc., and I am the legal video specialist. And the court reporter is Paula Campbell, also in association with TSG Reporting.

And will counsel please introduce yourselves for the record.

MR. LITZENBURG: Tim Litzenburg for the plaintiff and the witness.

MR. GRIFFIS: Kirby Griffis of Hollingsworth, LLP, for Monsanto.

MS. SALEK: Stephanie Salek from Hollingsworth, LLP for Monsanto.

VIDEOGRAPHER: Thank you.

And will the court reporter please swear in the witness.

REPORTER: Would you please raise your right hand.

C H A D I N A B H A N,

called as a witness, having been duly sworn, was examined and testified as follows:

EXAMINATION

BY MR. GRIFFIS:

Q. Good morning, sir.

A. Good morning.

Q. We've met one time, and that was at your previous deposition; is that right?

A. Correct.

(Exhibit 29-1 marked for identification.)

Q. I have marked as Exhibit 1 -- and these exhibits that I'm about to describe are in front of you, sir -- Exhibit 1 your supplemental expert report; correct?

A. Correct.

(Exhibit 29-2 marked for identification.)

Q. As Exhibit 2, an article by Andreotti and others appearing in the Journal of the National Cancer Institute in 2018 entitled "Glyphosate Use and Cancer Incidence in the Agricultural Health

Study"; correct?

A. Correct.

(Exhibit 29-3 marked for identification.)

Q. And as Exhibit 3, the notice of this deposition; correct?

A. Correct.

Q. Have you seen the notice of deposition before, sir?

A. I have.

Q. It asks you to provide us with documents that you have reviewed regarding glyphosate and non-Hodgkin lymphoma, or either of those, since our last deposition.

What have you brought in response to that, sir?

A. Actually, I don't have anything in print. I've reviewed the paper, the -- that you have, which is Exhibit 2. I reviewed the editorial comment that was written in the journal at the same time, written by Elizabeth Ward, and I've refreshed my mind with the previous papers that we discussed at the previous deposition, specifically the DeRoos study from 2005. That's about it.

I have read some of the other depositions that were done. Dr. Neugut's deposition, I had a

chance to read that. I read Dr. Jamison's deposition as well, and I read two documents, one by Dr. Ritz and one by Dr. Mucci that was provided to me by counsel.

Q. Those were expert reports?

A. Yes.

Q. Anything else, sir?

A. No.

Q. So you mentioned some previous papers, such as DeRoos 2005, which we discussed at your prior deposition. Other than that, the only new things that you have reviewed since your last deposition concerning glyphosate and non-Hodgkin lymphoma or glyphosate alone or non-Hodgkin lymphoma alone are the Journal of National Cancer Institute's study 2018, the editorial comment by Elizabeth Ford [sic], and depositions of Drs. Neugut and Jamison and expert reports of Dr. Ritz and Mucci; is that correct?

A. Correct.

Q. The publication that is Exhibit 2, sir, the Journal of the National Cancer Institute 2018 publication, how did that come to your attention?

A. I actually do get a table of contents for a lot of the oncology-specific journals that I --

through my e-mail, and then it was also provided to me by counsel. But I have learned about it because I have -- I get table of contents for about 20 journals that -- whenever something is -- is out oncology related, I get notified.

Q. When you received the table of contents mentioning this article, did you retrieve it and read it then?

A. Not all of the journals I can get the actual full article. I get the abstracts usually, so I wasn't able to immediately retrieve it, but then subsequently I did.

Q. How long did you spend reviewing this article?

A. I did not keep track of the number of hours. I would say maybe about two hours, give and take.

Q. And did you -- you know, we discussed at your last deposition at some length your methodology and your process for evaluating scientific literature.

Did you apply the same process and methodology in reviewing this article that you applied previously in reviewing scientific literature about glyphosate and non-Hodgkin

lymphoma?
A. Of course.
Q. And how would you describe the process that you used to weigh this new study in forming opinions about glyphosate causation?
A. I'm not sure I understand the question. How do I describe the process?
Q. Yes.
A. It's similar to the process I apply to any scientific article with -- that I have an interest in. I read the paper. I try to understand the conclusions, and try to understand what methodologies were applied to each of these conclusions, and I form an opinion.
Q. How informative do you consider the 2018 National Cancer Institute study to be with regard to the issue of whether glyphosate-containing substances can cause non-Hodgkin lymphoma?
A. Well, I always applaud any study that provides long-term follow-ups. I mean, I think this is really critical in oncology and in the literature. There are many studies that usually are done, and you actually don't get any updated literature and so forth. But it did not add anything that -- rather unusual or did not really

change anything pertaining to the body of literature, but it's good that there is a longer follow-up. I applaud the authors for doing so.
Q. So there was a previous article that we talked about, the DeRoos 2005 study --
A. Correct.
Q. -- which reflected the early report of data from the same set of data; correct?
A. Correct.
Q. And this is the follow-up that you were just referring to; correct?
A. Yeah. This is the follow-up, and as I said, I always applaud and I enjoy the fact that authors and scientists look at follow-up data because there is much in the literature where you don't see a lot of follow-up. And I believe there would be additional papers, follow-up on the AHS. It is ongoing, so I don't believe this would be the last paper coming out.
Q. You know that the -- there are multiple publications from this same set of data on issues other than glyphosate and non-Hodgkin lymphoma; correct?
A. Yes, I'm aware of that.
Q. Do you consider the National Cancer

Institute 2018 study to be an improvement and an expansion on the DeRoos 2005 data?
A. It's an expansion because it reports on longer follow-up and additional cases that have been reported, as you are -- well know. You can't really improve on it because the study is what the study is. It's been designed in the '90s, and you can't improve on a study design. I have a lot of reservations about the study design that was done. So you can't improve on that. It's already done.
Q. In -- as a piece of evidence that you are weighing in deciding whether glyphosate-containing substances can cause non-Hodgkin lymphoma, do you give more weight to the NCI 2018 study or to the DeRoos 2005 study?
A. I would give more weight to the NC -- the JNCI article, because it is obviously longer follow-up and there are more cases, so I think it makes sense to take the data that is coming in this article as an update, and it has more weight because there are more cases.
Q. And in what ways does the 2018 NCI data improve on the data from 2005?
A. Longer follow-up. The longer follow-up and the additional cases that have been reported.

That's pretty much it.
Q. You would agree that this is a piece of evidence that weighs against causation; correct?
A. It is a piece of evidence that suggests no causation between glyphosate and non-Hodgkin lymphoma, which I don't agree with.
Q. So you agree that it is a piece of evidence against causation, but you disagree overall with that conclusion that there is no causation; is that accurate?
A. I do disagree with the conclusion, yes.
Q. And the rest of what I said is accurate as well; correct?
A. Yes.
Q. As a piece of evidence against a causal connection between glyphosate-containing substances and non-Hodgkin lymphoma, how much does this weaken your original opinion stated in your original expert report that glyphosate causes non-Hodgkin lymphoma?
A. It does not weaken it at all.
Q. Why doesn't it weaken it at all?
A. It doesn't add any information. It just adds longer follow-up to a previously done study. It provides no additional scientific information of substance.

Q. Okay. Could you explain, please, what you mean by "adding no additional scientific information" between the DeRoos 2005 data and the NCI 2018 data?

A. So the JNCI paper basically adds longer follow-up. So the follow-up now is through 2012 for North Carolina and 2013 for Iowa. So that's really what it adds. And it is rather predictable and expected with longer follow-up you will have more cases reported of cancer in general, non-Hodgkin lymphoma.

That's really all what this study adds. It doesn't change the way the study was designed, it doesn't change the drop of follow-up questionnaires, it doesn't change the fundamental flaws that exist in the Agricultural Health Study that were present previously in the DeRoos study.

Q. I'm just trying to understand fully the difference between your statement that this -- this has more weight than DeRoos 2005, given the additional follow-up, but adds nothing of scientific value. Could you explain what you mean, please?

A. What I mean by "more weight" is when you have a longer follow-up study or you have additional study that reports on the actual trial itself, you

will take the output or you would take the results of the latest follow-up, and it -- basically, you don't need to go back and take a look at DeRoos any longer.

In other words, in the future, as we continue to evaluate the Agricultural Health Study, nobody's going, in my opinion, to go back and take a look at DeRoos study any more in 2005. Why would they? We have now an update in 2018, so that becomes the benchmark at which you compare future updates against. That's what I mean.

Q. Okay. In your opinion, is this study so flawed -- I know we'll be talking about some of the flaws that you believe exist in the study later -- is it so flawed that it isn't of any value in assessing whether glyphosate-containing substances can cause non-Hodgkin lymphoma?

A. Well, it really depends how you define "value." I believe anything in the literature does bring some kind of value, and I think we -- we just have to take this in the context of other epidemiologic evidence and other body of literature that exists. I don't dismiss anything that is published that is being peer reviewed and out in the literature. I may not agree with all the

conclusions, but I don't dismiss it.

Q. What information, data, or conclusions in the NCI 2018 study do you consider to be reliable?

A. As I said, the -- the way the Agricultural Health Study has been set to look at the incidence of cancer and pesticides, including glyphosate, and from these cancers, non-Hodgkin lymphoma, has been established several decades ago. So that's not going to change, the way the study is designed and the way the study is conducted. All what we are going to see is additional follow-up and additional cases and additional things that are reported with longer follow-up.

So what the JNCI paper adds is that, with longer follow-up, this is what we have seen in terms of additional cases, and the conclusions of this particular paper mirrors the conclusions of the DeRoos paper. There are no really differences in conclusions, the way I read this paper. Basically, the conclusions of this paper are rather similar to the conclusions of the 2005 paper.

Q. What size epidemiological study would it take to shake your conviction that glyphosate-containing substances cause non-Hodgkin lymphoma?

MR. LITZENBURG: Objection to form.

A. So there is no such a thing. You actually have to define this a priori. Prior to designing the study, you have to decide, what -- what am I looking for, how do I design the study, what are the number of subjects I'm actually looking at, what's the power of the study, et cetera, and you make that decision.

I'm not an epidemiologist or a statistician, but you don't make these decisions actually after the fact. You actually make these decisions in the process when you design a study.

BY MR. GRIFFIS:

Q. Well, you came to this after the fact.

A. Right.

Q. You are not an epidemiologist. You weren't designing a study. You were looking at studies that had been published, and you came to a conclusion, without knowing about this because it didn't exist yet, that glyphosate caused non-Hodgkin lymphoma; correct?

A. Correct.

Q. What size new epidemiology study would it take to shake your conviction?

A. Well, at this point, nothing would shake my

conviction because, you know, short of doing the randomized control trials where you expose some subjects to glyphosate and others to no glyphosate and demonstrate that the subjects who received glyphosate do not have non-Hodgkin lymphoma, similar to the folks who don't receive glyphosate, and that's obviously a trial that cannot and should not be performed.

So the body of evidence so far that I have reviewed is convincing that there is a causation and an association between glyphosate and non-Hodgkin lymphoma. This is an update of a previously published trial in 2005 that I have took under full consideration when I reviewed the body of literature before.

Q. So it's your view that this is something that you have previously -- essentially this is something that you have previously considered since it's an expansion of data from an article that you previously considered; is that fair?

A. That is correct.

Q. Turn to Exhibit 2, sir, which is the National Cancer Institute 2018 study. I want to ask you about some specific things therein.

First, I'm in the abstract, the

conclusions. Do you see that?

A. I do.

Q. "In this large, prospective cohort study, no association was apparent between glyphosate and any solid tumors or lymphoid malignancies overall, including NHL and its subtypes."

Did I read that right?

A. You did.

Q. And that was -- that accurately reports what they found in the NCI 2018 study; correct?

A. That reports their conclusions, correct.

Q. Page 5, sir, first sentence under the "Discussion" section: "In this updated evaluation of glyphosate use and cancer risk in a large prospective study of pesticide applicators, we observed no associations between glyphosate use and overall cancer risk or with total lymphohematopoietic cancers, including NHL and multiple myeloma."

I read that correctly?

A. You read it correctly.

Q. And that accurately describes the findings of the NCI 2018 study; correct?

A. Of the authors who published in the JNCI paper.

Q. On Page 7, sir.

A. Okay.

Q. Let's go to the last paragraph, "In conclusion, we found no evidence of an association between glyphosate use and risk of any solid tumors or lymphoid malignancies, including NHL and its subtypes."

As we discussed, that accurately describes the conclusions of the NCI 2018 study; correct?

A. That accurately describes the conclusions that you just read, yes.

Q. You read the deposition of Dr. Neugut, you said?

A. I did.

Q. Do you agree with Dr. Neugut that -- and Dr. Neugut is an epidemiology expert that has been named by the plaintiffs; correct?

A. Yes, he is.

Q. You agree with him that the Journal of the National Cancer Institute is one of the most highly respected journals in the world?

MR. LITZENBURG: Object to form.

A. I -- I actually don't think that JNC -- I mean, it's a good journal. I don't think it's one of the most highly respected journals in the world.

I think there are a lot of papers that get published there that I have problems with, but it does have a high impact factor, and it's definitely one of the very good oncology journals that we view highly. I think "in the world" is stretching it.

BY MR. GRIFFIS:

Q. You do -- do you agree with Dr. Neugut that the Journal of the National Cancer Institute's impact factor is routinely among the top 5 percent of all oncology journals in the world?

MR. LITZENBURG: Object to form.

A. In oncology.

BY MR. GRIFFIS:

Q. You agree with that?

A. It is in the top -- I actually don't have the actual -- I will have to look it up. I'm not sure top 5 percent, top 10 percent, but it has a high impact factor. I don't want to state mistakenly what it is. I would need to search and see what the top 5 percent. I'm sure it's in the public domain.

Q. The peer reviewers of the JNCI apply a rigorous peer review; correct?

A. I think peer reviewers for every journal should apply rigorous peer review, whether it's JNCI

or other papers.
Q. And JNCI has a reputation for rigorous peer review like other top journals; right?
A. I don't know what peer review process they have. I don't peer review for them. I peer review for other journals, but I'm not sure what the peer review process that exists at the JNCI.
Q. You haven't been asked to peer review for JNCI?
A. I'm not a peer reviewer for JNCI, no.
Q. Take a look at the authors for Exhibit 2, sir.
A. Sure.
Q. And you see that under the listing of authors there is "Affiliation of authors"?
A. I see that, yes.
Q. And by using their -- by designating them with initials, they show which branches and subbranches of the National Cancer Institute a number of the authors belong to.
Do you see that?
A. I see that.
Q. And do you see that one, two, three, four, five, six, seven, eight of the authors work at the National Cancer Institute?

A. I haven't counted. I'll take your word for it. I'm -- I'm sure you did, one, two, three, four, five, six at the Occupational and Environmental Epidemiology Branch, and that's six, and then seven is the Division of Statistics at the NCI. I think seven, as you said -- you said seven?
Q. And then formerly of Occupational and Environmental Epidemiology Branch, over on the next line, Michael Alavanjas, who is deceased, which is why is formerly.
A. Okay.
Q. Division of Cancer Epidemiology and Genetics, National Cancer Institute, so those eight are National Cancer Institute employees or former employees due to deceased?
A. Okay. I mean, do you want me to count them? I'm fine. It could be seven, it could be eight. I see the majority of the authors are affiliated with the National Cancer Institute.
Q. And then two more are with the National Institutes of Health, a epidemiology branch, National Institute of Environmental Health Sciences at the National Institutes of Health?
A. I see that, yes, DPS and CGP.
Q. And then the remaining two with the

Department of Epidemiology at the University of Iowa.
A. And Public Health in Philadelphia.
Q. And Public Health in Philadelphia respectively; correct?
A. Correct.
Q. The bottom line of the first page, sir, says, "Published by Oxford University Press 2017. This work is written by U.S. Government employees and is in the public domain in the U.S." Correct?
A. Yes, correct.
Q. There are no industry authors or affiliations for this study; correct?
A. There are no industry authors or affiliations. I have not looked at any conflict of interest of these authors, but I'm not aware of any.
Q. At the end, sir, there is a statement about funding; correct?
A. What page?
Q. It's Page 7.
A. Yeah, I see that.
Q. "This work was supported by the Intramural Research Program of the National Institutes of Health, National Cancer Institute, Division of Cancer Epidemiology and Genetics, National Institute

of Environmental Health Science, the Iowa Cancer Registry, and Iowa's Holden Comprehensive Cancer Center, as well as the NIEHS-funded Environmental Health Sciences Research Center at the University of Iowa." Correct?
A. Correct.
Q. So it's all government funding, mostly federal government funding, to the National Institutes of Health; correct?
A. Yes, this information is not new. I mean, this has been the case since the inception of the Agricultural Health Study. There's nothing new here.
Q. Do you agree that National Institutes of Health funding means that high standards and best practices are used to ensure that the data is accurate?
A. It doesn't ensure the data is accurate. It just basically -- all what it does, it provides funding for a study that the NIH views important. You don't know what data you will generate from the funding, because when you fund a study, you don't really know what you are going to come with the study. You just decide on funding the study upon its inception, because you view it important in the

public domain.

And that's what the NCI and the NIH did. They funded the study and -- because of interests, obviously, to the general public.

Q. Have you had an NIH-funded study before?

A. No, I'm not a basic scientist. They do more for basic science.

Q. I'm going to ask the question again, because I think you focused on the conclusions and whether the conclusions are accurate.

A. Sure.

Q. My question is this, sir: Do you agree that NIH funding -- and perhaps you don't know, but do you agree that NIH funding means that high standards and best practices are used to ensure that data is accurate?

A. Yes.

Q. We talked -- the -- let's talk for a moment about peer review with regard to this study, sir.

Peer review -- this went through a peer review process, which means that it has been reviewed by experts in the field in order to be accepted for publication; correct?

A. Yes.

Q. The authors that we just reviewed are

themselves epidemiology experts, and this would have been reviewed by peers who understand epidemiology as well; correct?

A. I presume so. I'm not really sure who reviewed the paper. I think it's -- again, we just don't know who reviewed it, but your presumption is probably accurate, that it will be sent to folks who understand the field, but we just don't know really who peer reviewed it.

Q. The body of evidence was robust enough that it was accepted by the peer reviewers, whoever they were; correct?

A. So acceptance of papers in the literature does not always necessarily reflect that the paper has no flaws or has -- or the body of evidence is irrefutable. There are many journals and many articles.

So what this means, when a paper like this is accepted in the JNCI, it means that the reviewers that reviewed this paper found merit that it -- it is worthy of publication in the JNCI. That's really all that means.

Q. You would agree that the body of evidence was robust enough that the peer reviewers accepted it for publication?

A. It was compelling to the peers that reviewed this paper that they wanted this to be published. That's what you can tell from a peer review process.

Q. By the way, do you know -- we had some discussion at your prior deposition about the IARC Monograph being published in the Lancet. Do you know if IARC Monographs, when they're published in Lancet are published there just by arrangement automatically or if there is actually a peer reviewed process first?

A. I don't know, but I believe there is actually a peer review.

Q. Based on --

A. I don't -- I don't think there is any paper that gets into Lancet without peer review.

Q. And what --

A. I review for Lancet Haematology, and I'm not aware -- I mean, the Lancet -- there's no -- to my knowledge, there is no paper that gets published in any of these journals without a review, JNCI or Lancet or Lancet Oncology or whatever it is. All of these are peer review. And I'm a peer reviewer for Lancet Haematology, so I know for a fact that all of these things get reviewed.

Whether there's an arrangement between -- you know, you could say the same for this, whether there's an arrangement between these authors and the JNCI where you expedite things and just get published and just do a peer review, which is not the same peer review that you would do for other papers, I'm not aware. I don't think we need to speculate that.

Q. Okay.

A. We don't know.

Q. So just to be clear, you don't know whether IARC has an arrangement with Lancet that their publications are deemed peer reviewed internally and don't go through an additional Lancet peer review?

A. What I have said is I don't believe any paper gets published in Lancet without being subjected to a peer review. That's what I' said.

Q. But the basis -- okay. But the basis for that is not inside knowledge about the Lancet's peer review process or their arrangements with IARC?

A. The basis of that, that any journal out there usually have this as a particular standard. There's no reason to believe that the Lancet would deviate from the standard.

You know, when you look at the JNCI paper,

for example, just to give you just an example, the paper was received for the first time on August 22nd, 2017, when you look at the bottom. It was revised less than four weeks later. And as a peer reviewer for over 12 journals, for a journal like the JNCI to have this reviewed and peer reviewed and submitted back in less than four weeks is rather unusual for a rigorous peer review, and then it was accepted within two weeks on October 6th, 2017.

So I don't know how rigorous the peer review was here, but I can tell from you a Lancet perspective, it's very rigorous, and it's very difficult to get a paper in Lancet. The same should apply for JNCI, but I don't know what kind of arrangement was here for a paper to be published in less than four weeks that has thousands of cases and so forth. So I don't know.

Q. You would be equally skeptical if the Lancet publication was that fast or faster; right?

A. I think if I'm going to put my skepticism hat, I could be skeptical about any paper, when I usually look at the received and revised. But I would maintain the hope that all of these journals, JNCI, Lancet, and all of them, maintain the peer

review process, the rigorous process, because if I'm going to wear my skepticism hat, I would be skeptic about this one as well, in terms of peer review, and I'm -- I'm not going to go there, because I believe this was peer reviewed and the other one was peer reviewed.

Q. So you're not going to wear your skeptic hat for either one of them?

A. No, I won't.

Q. When they did the peer review of the NCI 2018 paper, the peer reviewers would have actually looked at the hypothesis being explored; correct?

A. Yes, of course.

Q. And they would have looked at whether the authors were free of bias; correct?

A. Well, that's actually a tough thing, to be honest. And, again, as -- as somebody who does a lot of peer reviews, you know, all what you can look at is the declared conflict of interest, and, you know, oftentimes, you know, it's really tough to know all of these conflicts. But we try not to take it into consideration when we review the papers.

And I can tell you, I've advocated for years that peer review should be blinded to the reviewers and the authors. I actually think that

any paper that gets submitted for peer review, you should not know who wrote it or the affiliations of the authors. So as a peer then, when you look at the paper, you don't get biased by, oh, this person is from a prestigious place and this name is great, so it must be a good paper.

But this is not the way things are going, so right now you get access for the most part to the authors' names and affiliations and so forth.

So whatever these authors declared in their conflict of interest is usually available for the peers to look at and make their own decision.

Q. Do they -- do peer reviewers look at whether the authors are free of bias?

A. When I peer review, I usually do. I'm not sure -- I don't know whether the peers that reviewed this paper did. I don't know. I don't know who reviewed it.

Q. Do peer review -- do the peer -- would the peer reviewers of JNCI have looked at whether the conclusions were actually supported by the evidence that was provided?

A. Again, I don't know what they looked at. It's hard for me to speculate what the peer -- what the peers that reviewed this paper, who I don't know

who they are, what they looked at and how they reached the conclusion of publishing or rejecting or revising it and so forth. I don't know who they are. I don't know what the process that they implemented. I did not review the paper, and I don't know who reviewed it.

Q. Okay. Let me read you your testimony regarding the Lancet peer review of the IARC Monograph.

A. Sure.

Q. And tell me if you think that it applies to this peer review as well.

A. Go ahead.

Q. "So when you do a peer review, you actually have to look at the hypothesis, whether the methodology is sound, whether the authors were free of bias, and whether their conclusions actually were supported by the evidence that they provide."

That's your testimony regarding the Lancet peer review of the IARC Monograph. Does that apply just as well?

A. That should be the case for any peer review for any journal, whether it's Lancet, JNCI, JCO. What -- what --

Q. That should you apply just as well to

Exhibit 2, the JNCI 2018 study; correct?

A. It should apply, yes, but what you asked me, did it apply, and I said I don't know. But it should apply for any peer review process. I agree with that hundred percent.

Q. So it should apply, but you don't know if it did apply to JNCI. You also don't know if it did apply to Lancet; right?

A. Absolutely. But, I mean, again, like I said, I'm trying not to wear my skepticism hat here, and I would believe that, for the most part, these papers get reviewed, and the reviewers, if they find merit to the publication, they will accept. If they don't, they will reject. And that's really all what we can say. We just don't know who they are and how rigorous their review process was.

Q. Had you been asked to peer review this paper, would you have passed it for publication?

A. Yes. It would be a conflict of interest. Yes, I would have not reviewed.

Q. Let's say you had no conflict of interest. Would you have approved it for publication?

A. I mean, I think this would be published somewhere. Every paper has a journal, and every journal has to have papers. It's a matter whether

you think this is a JNCI or a JCO or some other less specialized type of paper, because to me this is a follow-up data on a previous study.

So, yes, I think the follow-up should be published. I'm -- I would be very supportive -- I would have approved it for publication.

The question that I usually look at, whether this type of paper should be published in a journal like the JNCI, because the JNCI has a little broader spectrum in terms of the audience, or maybe a more specialized journal, like more of a specific epidemiology journal, specific environmental type of journal. That would be the thing I would have had to think about when deciding, but I do believe it should be published, absolutely. With this long follow-up, I think it should be published.

Q. Would you have approved it for publication in JNCI?

A. The thing that -- the reason I don't know how to answer this because I -- you know, for the journals that I review for, I know exactly a priori the type of papers that they want, so I think the JNCI would tell usually the reviewers that we want papers that are in the top 25 percent or top 20 percent or top 10 percent. So they usually let

us know how -- how powerful the paper they want in order for us to approve it.

They also -- most journals will tell you what the audience that they want. So for some of the journals I review for, they say, we want this to apply for the general medical audience, not just oncologists, not just epidemiologists. So if you are a primary care physician you would be interested. And other journals say, we want something that is practice changing, something fundamental.

So you will have to know, you know, from the editor in chief usually and the editorial board what they are looking for, and if that's what they are looking for, I see no reason for it not to be published in the JNCI. I would have approved it.

Q. Okay. So I'm just going back to the standards for peer review. You were talking about you being a peer reviewer at your last deposition and the standards that should be applied, you don't know if they were applied by particular peer reviews, but presumably you follow your own standards in peer review?

A. Yeah, sure.

Q. So in saying that this should be approved

for publication, you actually looked at the hypothesis, at whether the authors were free of bias, and whether their conclusions actually were supported by the evidence that they provide; correct?

A. Yes, I would look at that. I mean, just because the study is negative, it doesn't -- and I disagree with the conclusion, it doesn't mean I'm going to say it can't be published. I -- I think it's a very good to have a healthy debate. It's fine.

Q. Yes, sir. And you have reviewed it, and you agree that the hypothesis is sound, the authors are free of bias, and the conclusions are supported by the evidence provided; correct?

A. I never said the hypothesis is sound. In fact, I said there are so many flaws in this study that did not really change just because you have a longer follow-up. But all I said is, with longer follow-up, it is appropriate to report on additional public and additional data and so forth.

The hypothesis, as it was present in the DeRoos study, remains the same hypothesis in the -- all what this is is just an update. I mean, all what this is is an update of a previously flawed

study. That's what you did.
Q. Do you --
A. Just --
Q. Do you agree or disagree, sir, that the conclusions given in the NCI 2018 study are supported by the evidence provided?
A. The authors' conclusions are supported by the evidence that they actually showed. The evidence has a lot of flaws, and subsequently the conclusions will have a lot of problems. But, yes, their conclusions is supported by the evidence that they evaluated.
Q. Looking at Exhibit 1, sir, your supplemental expert report.
A. Okay.
Q. In the first sentence of the analysis -- you have an introductory paragraph, which I'm omitting -- the first sentence of your analysis, you write, "I have read and analyzed this publication, and my overall opinion remains unchanged." Correct?
A. Correct.
Q. Did your reading an analysis of this publication, was that as in depth as it would be for a peer review?
A. Of course. I don't have to make the

decision whether it's accepted or rejected. It's already published.
Q. But the process that you went through in reading and analyzing it was as thorough as the process that you would go through in reviewing a draft for a publication; is that right?
A. Yes, similar and similar to the body of literature I reviewed that we discussed in my previous deposition.
Q. You say, "There are several flaws in this study that challenges the recent conclusions stated by Andreotti, et al." Correct?
A. It should have been "challenge," but, yes, that is it.
Q. And this is the complete list of flaws that you believe exist in this study; correct?
A. As I was able to discern.
Q. You don't have any other in mind right now; right?
A. Not at this point.
Q. Okay. We'll run through them, and then we will talk about them.
The first one was that the study was restricted to two states, North Carolina and Iowa, not representing other states; correct?

A. That's correct.
Q. "Second, the study essentially ended in 2001, not accounting for the more expanded and increased use of glyphosate after that year." correct?
A. Correct.
Q. "Third, and most importantly," you write, "significant dropout rate in study participants where follow-up and full interviews were completed for only 63 percent of individuals." Correct?
A. Correct.
Q. "Additionally, the AHS study relied on self-reporting, which certainly resulted in some additional misclassification of exposure/use." Correct?
A. Correct.
Q. And "Lastly, in the authors' own admission, there was an increased risk of multiple myeloma with glyphosate exposure." Correct?
A. Correct, and acute leukemia as well.
Q. And the last one isn't a flaw in the study; correct?
A. Say again? I'm sorry.
Q. You don't consider the last one to be a methodological flaw in the study; correct?

A. It's not a methodological flaw, no.
Q. It is instead a point in favor of glyphosate-containing substances causing some type of cancer; right?
A. Correct.
Q. As far as the one that you have identified as most important, the significant dropout rate, would you please explain why you consider that to be a flaw?
A. You basically have missing data for 40 percent -- almost 40 percent of individuals. I mean, so -- I mean, it's very difficult, rather impossible, to make a sound conclusion on a study that was powered with the assumption that you need to have all of these patients enrolled and reporting, and then 40 percent you don't have enough information on.
So it's very difficult for me, as I sit here, to figure out, how would you actually reach a conclusion when you don't have information -- proper information for -- for that many patients.
Q. Do you know the process that was used to address that issue?
A. When I looked at the paper, they talked about, you know, imputation of data, which, again,

I'm not an epidemiologist, but I don't believe that this is an appropriate way of -- you're simply guessing, I mean, pretty much. Imputation, to me, is you're trying to guess the data on 40 percent, almost 40 percent of folks we don't have information on. That's really what it is. It's just a fancier word for statistics -- statisticians to use who are doing imputation of data.

But at the end of the day, you're really guessing, and you're trying to fill in the blanks. And maybe if you're filling the blanks for 5 percent, 7 percent of the folks that you did not have a follow-up, I would be tolerant of that. But when you're close to 40 percent, that's really stretching it.

So whatever methodology, imputation, not imputation, it doesn't matter to me. If you have 40 percent that you are missing, and you are trying to fill in the blanks, it's just not going to resonate with me as a scientist and as a lymphoma specialist.

Q. And you believe that the conclusions of the NCI 2018 study irrevocably depend upon the imputations of that missing data; correct?

A. Well, I think a lot of the conclusion is

dependable on that, yes.

Q. And if there was a portion that didn't depend on that, you would have no objection to that conclusion; right?

A. I would -- again, I would look at it. I mean, I realize that they did a lot of analysis for folks who had the follow-up and other individuals who did not have the follow-up, and they tried to do the imputation and they did the analysis only for patients who they had the information on. So I'm fully aware of all of the analysis that they did.

And, again, it's -- what I said is that the missing data and the -- is not going to be, in my mind, remedied by the imputation of data. You probably have to ask a lot of statisticians and epidemiologists of this. But as a clinician, when you tell me you have 40 percent missing and you did whatever you did to fill in the blanks, you've lost me as a clinician.

Q. Okay. So analyzing imputation and whether it can accurately fill gaps in data is beyond you?

A. It's like funny accounting. You can always make the spreadsheet look nice. So, again, statisticians will have ways to try to figure out, how can we actually remedy a flaw in a particular

study design. That's fine. It's great. But as a clinician, when I have to take this into account, it's very difficult to take it into account because you have a lot of missing information.

If you take any type of trial in the oncology literature and you say, we've lost data on 40 percent of patients, and these are the results, you will have a lot of eyebrows raised trying to figure out how you can reach a conclusion with that many dropout rate.

Again, I recognize there are other statistical methods to remedy all of these things. What I'm saying is, I don't agree with them because somehow the authors or the scientists or the folks who are in charge of the AHS should have figured out a way to assure low dropout rate, more follow-up, more rigorous follow-up. That's really where the rigor is, in the design of the study and how you conduct the study, not after the fact.

Q. So do you believe that imputation makes studies invalid for your consideration, regardless of how rigorous or reliable epidemiologists believe imputation to be?

A. I may not agree with what epidemiologists come up with because I'm a clinician ultimately, and

I will have to figure out how to counsel patients based on the available body of the literature.

What I said -- I didn't say it would be invalid. I would say it makes any study significantly less powerful. I am fully aware that imputation is actually a statistical methodology and it does exist and people do it, so I can't dismiss a particular methodology that is being done by my colleagues, whether they are statisticians or epidemiologists.

What I said is when I see that process being applied to 40 percent, then I have issues with that, and I question the significance of it. And I don't know what the threshold where I don't have a significance, but, you know, 5 to 10 percent, maybe I have some tolerance to that. But 40 percent is too much for me to accept any type of a statistical method that tries to guess data because similar -- I mean, again, you are guessing data and trying to fill in the blanks.

Q. So at 40 percent -- it's actually --

A. 37 percent.

Q. -- 37 percent.

A. We are just saying 40 percent.

Q. At 37 percent, you don't care what the

epidemiologists have to say about the reliability of imputation or what the studies say about the reliability of the AHS imputation process. It's not good enough for you; is that what -- is that a fair description?

A. I didn't say I don't care. I said I don't -- I believe the clinical significance of any type of a study that has missing data of 37 percent or 40 percent is very questionable, and whatever process you try to do as a statistician or as an epidemiologist to remedy that is going to be questionable for me as a clinician because you are ultimately guessing the data based on data of others.

I mean, if you try to simplify to a layman person, what is imputation? It's guessing. I mean, at the end of the day, I'm not an epidemiologist or a statistician, so I have to explain things to myself to understand them. Imputation of data is you take the data that's available for other folks that you have data on and you try to guess data for people you don't have data on. How rigorous is that? It's not rigorous.

So, again, for somebody who treats patients and who have treated patients, that's really where I

question the type of methodology that's being done to remedy the information.

Q. You understand that there's a mathematical formula which is adjusted and tweaked based on --

A. I'm pretty -- I'm pretty sure.

Q. -- based on empirical sampling of the data?

A. Pretty sure, a lot of math and a lot of squares and roots and all of these things. Like I said, like funny accounting.

Q. And you understand that nobody guesses anything?

A. There's a lot --

Q. They apply a mathematical formula?

A. There's a lot of guessing.

Q. How do you know?

A. In imputation, there's a lot of guessing. I mean --

Q. Sir, you just explained you don't know how to evaluate imputation as an epidemiologist. How do you know there is --

A. I can evaluate as a clinician, okay? I'm not an epidemiologist, nor am I a statistician. But as a clinician, as I told you, if you need to explain what imputation to a patient or a family member or a colleague, so you can say all of this

buzz word, it's a math formula and all of these things.

But at the end of the day, you are trying to basically guess. It's trying to guess to try to fill in the blanks of information that is missing. Maybe there's a math formula and all of this, but -- but, ultimately, it is guessing.

You don't have the primary data. That's what I'm trying to say. You actually do not have the data. So you try to figure out how to fill in the blanks, so whatever method you do, it does not take away from the fact that you didn't have the data. Do you have the data on these 37 percent? No.

Q. Do you agree with Dr. Neugut? You read his deposition. Do you agree with Dr. Neugut that imputation is a standard and valuable method for dealing with unreported data in epidemiology studies?

A. I agree with that definition because that's what they try to do in epidemiology study, but just recall, we are talking 37 percent that is missing here.

Q. Do you agree with Dr. Neugut that that level of unreported data is comparable to very

reliable studies that have been done and relied on by clinicians in the field?

A. I can't comment on that, because I have not reviewed all of that.

Q. Have you started seeing patients since our last deposition, sir?

A. I'm not seeing patients now because of my travel schedule, but I have a couple of things that I'm exploring.

Q. How long has it been since you've seen patients?

A. Sixteen months.

Q. In Exhibit 2, sir, the NCI 2018 report --

A. Okay.

Q. -- on Page 2, I'm in the second column --

A. Okay.

Q. -- and I'm about three quarters of the way down the top paragraph.

A. Under "Statistical Analysis"?

Q. No, above that one.

A. Okay.

Q. "For participants who did not complete the follow-up questionnaire, 37 percent," do you see that?

A. Yeah, I see that.

Q. Okay. "For participants who did not complete the follow-up questionnaire, 37 percent, a data-driven multiple imputation procedure was used to impute pesticide use since enrollment."

Did I read that correctly?

A. You read it correctly.

Q. Do you know what "multiple imputation" is?

A. I presume it's several formulas that, you know, you use the second formula based on the output of the first formula, and so forth.

Q. I presume you've never done imputation yourself or reviewed or assessed imputation yourself; is that right?

A. That's right, I have not.

Q. Under "Statistical Analysis," I'm about nine or ten lines down, "We use Poisson regression."

Do you see that sentence?

A. I see that, yes.

Q. "We use Poisson regression to calculate incidence rate ratios and 95 percent confidence intervals and Proc Mianalyze," that's a computer program, "to obtain the appropriate variants for the imputed data."

And then there's a Statistics Institute citation for Proc Mianalyze.

Are you able to explain that description of the imputation procedure, sir?

A. I'm unable to explain that -- that particular procedure, no.

Q. I assume you don't have a criticism of that particular procedure because you don't understand it; is that fair?

A. So my criticism -- let me rephrase -- which was very, very clear. My criticisms are the dropout and the loss of follow-up. That's -- that's what I was critiquing.

In any study, when you don't have data on 37 percent primary data, on 37 percent of study participants, that's the biggest critique. And what I said, whatever process you do to remedy this, whether imputation or something else, I have a problem with as a clinician. I may not know exactly what the procedure is or the process you're doing, but you've lost me when you say 37 to 40 percent of folks you lost the primary data on.

So, yes, I applaud you for trying to remedy this, and there's probably a lot of methodology to do so. It does not take away from the fact that this becomes a very weak evidence when you don't have that primary data. I don't need to know what

the process is. All what I need to know is you lost data on 37 to 40 percent of folks.

Q. Okay. So just once you hear that the data has been lost on 37 to 40 percent, that's enough for you?

A. That's more than enough, yes.

Q. And is that enough for you to discount a study entirely and not give it any weight, sir?

A. As I said, the study is published. It's been published before, several other manuscripts from the AHS have been published, as you said in the beginning. So it doesn't mean -- again, it becomes -- it's a weakness of the study, it's a flaw of a study.

Sadly, every study has strengths and weaknesses, and so we can't -- we can't dismiss the fact that this is a major weakness of this study. I don't dismiss it, because I don't dismiss anything in the body of literature, but I may -- it will make me question and have issues with the conclusions of this particular study.

Q. It causes -- let's put it this way, sir, I understand you said that you would approve it for publication --

A. Uh-hum.

Q. -- and that the conclusions of the authors were supported by the evidence that they provided, and so on, you approve -- you approve of its existence. But I'm asking you something else. I'm asking you about your own personal analysis that you made as to whether the evidence supports the conclusion that glyphosate-containing substances cause non-Hodgkin lymphoma.

And as to that analysis, your own analysis of the weight of the evidence, you've given no weight to this study; is that right?

A. I've given it weight that it exists, but it didn't change my opinion, because all what this did is it's reported an additional ten years of follow-up for an already flawed study.

Q. It didn't change your opinion at all; right?

A. Of course not.

Q. Page 3 of 8, and I'm looking at the first full paragraph on this page, the full paragraph above "Results, and here they're discussing some of the procedures that they used to assess whether imputation changed or didn't change the outcome of their -- of the results that they reported; right?

A. Yes.

Q. It says, "In addition, we conducted sensitivity analyses to evaluate the impact of including additional exposure information," i.e., imputation; right?
A. Yes.
Q. "First, we calculated risk estimates including cancer incidence data for the complete follow-up period with only exposure information collected at enrollment." Right?
A. I see that, yes.
Q. So what that means, sir, is that they -- there were two questionnaires that were done in this study, and the dropout that you are criticizing happened between the first questionnaire and the second questionnaire; right?
A. Yes, the first questionnaire was done at enrollment.
Q. And 37 percent of people who answered the first questionnaire did not answer the second; correct?
A. Correct.
Q. So the first thing that they did to check -- as a check on the imputation procedure was to run all the numbers and the data just with the people who completed both questionnaires; correct?

A. I see that.
Q. The second thing that they did is, "We examined associations excluding imputed exposure data, thereby limiting analyses to participants who completed both the enrollment and follow-up questionnaires."
That's the one I just described; right?
A. I think that's the one you just mentioned, they actually calculated the data based on the folks who answered both.
Q. And, "Finally, because the last exposure information was collected between 1999 and 2005, we truncated follow-up at 2005 to coincide with this exposure period." Correct?
A. Correct.
Q. So what they did in the last one is shortened the follow-up period to match with the questionnaire data that had been collected; correct?
A. Yes.
Q. If you turn to Page 4, sir. I'm in Column 1.
A. Okay.
Q. In the long paragraph starting "in primary analyses," they describe all three of these procedures that they followed; right?

A. You -- "in primary analyses, we include exposure" -- that's what you're talking about?
Q. Yeah, in that paragraph.
A. Yes, I see the paragraph.
Q. And in that paragraph they describe, again, all three of the sensitivity checks that they used to assess the imputation procedure; right?
A. I think they just repeat the same. I'm not sure how -- I'm not sure how much in depth they describe it. They talk about conducting several sensitivity analyses, evaluating the impact of including exposure data, et cetera. So they did repeat what they said to conclude the results. I see that.
Q. Well, they assessed the data for -- based just on information collected from the first questionnaire. They assessed the data for people who answered -- just for people who answered both questionnaires, and they truncated the follow-up period to 2005. Three different checks on the data; correct?
A. I see that, yes.
Q. And what they reported for all three is that they still found no association between glyphosate-containing substances and non-Hodgkin

lymphoma; correct?
A. That's what they found.
Q. And all three of those sensitivity checks involved more data and more exposed cases than exist in the rest of the case control epidemiology, correct, put together?
A. It's more than the DeRoos trial, the update, yes. This is more of the update.
Q. I'm not talking about the DeRoos. I'm talking about the case control studies like Eriksson that you rely on for your conclusion that glyphosate-containing substances cause non-Hodgkin lymphoma?
A. I rely on more than just Eriksson. I rely on other things. I rely on Eriksson and other epidemiology data and the IARC and so forth. It's not just Eriksson.
Q. If you put all the epidemiology data that you rely on together, there are fewer exposed cases than for any of these sensitivity checks alone; correct?
A. I really have to do the math. Honestly, I don't know. But if somebody has done the math and this is what you came up with, there is no reason for me to doubt the information. But I haven't done

that math. I haven't -- I haven't done and looked at all of the cases that were reported in all of the papers I looked and compared the number of cases here. It's not difficult to do, but I haven't done it.

Q. Now, in doing an imputation -- in applying an imputation formula, sir, an imputation formula would only bias results if the nonresponders, the people who didn't respond to the second questionnaire who did respond to the first, if their exposure to glyphosate was systematically different than the responders' exposure to glyphosate; correct?

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

Q. Yes. When -- when there's a piece of missing data in an epidemiology study -- I will start out more generally. When there is a piece of missing data in a epidemiology study and that piece is filled in somehow, it's only going to bias the results in a particular direction if the filling in isn't random, doesn't contain random error.

Like, if you say, this person had one more exposure day than he really had, and this person had one less exposure day than he really had and you make little mistakes that cancel out, it doesn't

affect your final result. But if you tend to make mistakes all in the same direction, then it would tend to affect your final result; right?

A. Oh, I see -- I see what you're saying. I think if the -- I see what you're saying. I think if the -- if the remedy, whatever that remedy which I think we -- I already said I'm not a big fan of any type of remedy when you have that high of a dropout. But if the remedy is random, as you are mentioning, it hopefully should even out that you don't have one bias towards one direction or another.

Q. And in order to -- that's the difference between differential and nondifferential --

A. Yes.

Q. -- bias; right?

To have differential bias, the probability of someone responding to the second questionnaire would have to be associated with their glyphosate exposure and their health outcome; right?

A. Yes.

Q. And there's no reason to suppose that someone's likelihood of responding to the second questionnaire is related to their exposure to glyphosate and their health outcome; correct?

A. We don't -- we don't know. There's no reason. We don't know one way or the other. That's my point about the guessing part. I mean, we are already -- just the line of questioning back and forth, it just tells us we are trying to guess what happened.

Q. All three of the sensitivity analyses that were performed in the JNCI 2018 article could themselves be published as a set of data that is more powerful and robust and larger in volume than the entire body of case control studies that you rely on; correct?

A. I think you -- this is -- you asked me this question before. I said I haven't done the count. There's no reason for me to think it's not. If you've done the count and you're accurate, then it's probably right. I just have not counted this myself.

Q. So they looked at the data three different ways without imputation, and looking at that data all three of those ways without imputation yielded the same overall result, no association between glyphosate-containing substances and non-Hodgkin lymphoma; correct?

A. That's what they found, yes.

Q. So with regard to those sensitivity analyses and those conclusions that there was no association between glyphosate-containing substances and non-Hodgkin lymphoma, your imputation criticism doesn't apply; right?

A. How so? I'm confused how my -- again, let me just repeat. I never critiqued any of the processes that the epidemiologists or statisticians do, whether it's imputation or some other fancy terminology.

What I critiqued was specifically the high dropout rate in a study that is prospective, and I said, rigorous ways of assuring proper follow-up of these folks that were enrolled should have been applied if you want to reach the proper answer. There is no reason to wait years until you get questionnaires. It could be ways of having more rigorous follow-up.

I don't critique particular processes that I'm not fully familiar with or I don't apply as a clinician, but a dropout rate of that high is what I critiqued.

Q. Take a look, sir, at Page 4 of 8.

A. Yes.

Q. The first column.

A. Yes.
Q. And I am -- let's go to the second batch of numbers, just to orient yourself.
A. Table 2?
Q. No, sir. There are some numbers in that paragraph.
A. Okay. Sure, no problem.
Q. Confidence interval and so on. And above that they describe their first sensitivity analysis. They say, "We conducted several sensitivity analyses," and then the first one they describe is, "When restricted to exposure reported at enrollment," i.e., to just the data collected in the first questionnaire, "the rate ratio and the highest exposure quartile was 0.82."
A. Sorry, I don't know where he's reading. Where are you reading? Oh, the second paragraph, okay. I thought it's the first paragraph, okay.
Q. Yes, sir. I will start over. "We conducted several sensitivity analyses." That's what we've been talking about --
A. Yes, yes.
Q. -- for a little while now. And the first one they describe is, "When restricted to exposure reported at enrollment" -- in other words, the data

reported in the first questionnaire; correct?
A. Yes.
Q. -- "the patterns of risk were the same as analyses that considered glyphosate use reported at enrollment and follow-up."
So they found the same patterns without imputation restricting to the first questionnaire as with imputation; correct?
A. Yes.
Q. And then they gave the data for that, which is a confidence interval straddling one and a point estimate of below one for non-Hodgkin lymphoma; correct?
A. Yes.
Q. And that reported data does not involve imputation; right?
A. I don't think it does, no.
Q. So your criticism of imputation doesn't apply to that piece of data; right?
A. For this particular one, there was no imputation of the data, that's correct.
Q. And, similarly, their second sensitivity analysis, sir, where they limited the analysis to the 34,698 participants who completed both questionnaires, again found glyphosate use to be not

associated with non-Hodgkin lymphoma, point estimate below 1.0; correct?
A. The confidence interval of 0.63 to 1.27. That's where you're reading?
Q. Yes.
A. Yes, I see that.
Q. So, again, they found the same overall result of no association between glyphosate-containing substances and non-Hodgkin lymphoma and, again, without imputation; right?
A. I see that.
Q. So your imputation criticism doesn't apply to that point estimate either; right?
A. Not for this one, no.
Q. And for the third, when they truncated the follow-up period to 2005 to be concurrent with the latest exposure information, again, removing the need to do imputation, they found a relative risk again spanning one with a point estimate of 1.04; correct?
A. 1.04, yes, I see that.
Q. And the confidence interval was -- it was not significant; correct, sir?
A. Crosses the one, yes.
Q. Yes.

So, again, we have the same overall outcome of no association between glyphosate-containing substances and non-Hodgkin lymphoma in this third way of looking at the data without imputation; right?
A. As I said, this study has shown no association mirroring the conclusions from the DeRoos study in '05. I am --
Q. So both with and without imputation, the NCI 2018 study shows no association between glyphosate-containing substances and non-Hodgkin lymphoma; right?
A. The NCI study shows no association, correct.
Q. That's with and without imputation; right?
A. With and without amputation -- imputation, sorry.
Q. Your expert -- I'm going to go back to your expert report, sir, and the first of your criticisms. We just talked at some length about the third of your criticisms, imputation.
But the first criticism that you had of the study was that the study at its core was restricted to two states, North Carolina and Iowa; right?
A. Yes.

Q. Do you believe that whether glyphosate-containing substances caused NHL, non-Hodgkin lymphoma, varies by region?

A. We don't know the answer to that.

Q. You think that it might vary by region?

A. We don't know the answer to that. What I said is that, you know, you have a study that is done at two states out of so many other states. So it's -- I recognize the -- probably the prevalence of farmers and so forth, and that's why probably North Carolina and Iowa were selected. But it begs the question, does this really represent everything else across the U.S., and I don't believe we have an answer to that.

Q. The criticism that it only -- that it's restricted to two states, North Carolina and Iowa, is a valid criticism only if, whether Roundup causes non-Hodgkin lymphoma varies by region; is that fair?

A. It's fair. And I said I don't -- we don't know the answer to that.

Q. Okay.

A. But I think it's -- it's, obviously, when you have something that is very restricted to two locations, you'll have to ask the question given the ubiquitous use of glyphosate across the U.S., so

that's really why you have to ask that question.

Q. Okay. I just --

A. It's not --

(Unreportable cross-talk.)

A. Glyphosate is -- glyphosate is not used only in North Carolina and Iowa. So if you are doing really a prospective study and you are looking prospectively as to whether substance A causes disease X, unless you have a reason that substance A is only used in this particular location, why are we restricting only in -- only in those two areas.

So, again, as somebody who is trying to look at the entire body of evidence, I'm seeing here that there is a substance that's being used across all 50 states, but the study is only restricted to two. So I need an explanation why only these two and not others.

Q. The -- have you heard anyone suggest that whether glyphosate causes non-Hodgkin lymphoma varies by region?

A. Have I heard anyone say that?

Q. Yes.

A. No, I personally have not heard anyone say that.

Q. Do you know of any reason why it might be

that whether glyphosate causes non-Hodgkin's lymphoma varies by region?

A. It's not necessarily the region. It's really the practice patterns and how people utilize the compound that may vary by region. I think you are mixing things.

So I don't know how farmers in Iowa are using glyphosate compared to farmers in South Carolina or in Florida or in Arkansas. So I think the region is not necessarily just the fact, you have a lot of issues that may vary by region. It could be the training. It could be how people use PPEs, could be how folks understand the compound. That you can -- you don't know. And we really can't control for.

So practice patterns of farmers and folks and people who apply pesticides in North Carolina and Iowa may not apply to what people do at other states. And, hence, I don't know, you know, how would you really make a conclusion based on the study that just looks only at two states.

Q. Might the data from the Eriksson study in Scandinavia be valid only in Scandinavia?

A. I think you always have to look and ask yourself whether certain things that are done

outside the U.S. apply to the U.S., if something done in the U.S. that is applied to Europe. So you look at the entire body of literature. And you don't -- you can't take one study and just be blinded to everything else. So I -- again, it's a matter of looking at the entire body of literature, not being selective at what type of literature we look at.

Q. Do you know of anything about the population that was being studied in North Carolina and Iowa that would differ from other exposures in a way that would invalidate the results of this study as a general -- as reaching general conclusions about glyphosate and non-Hodgkin's lymphoma?

A. I don't know anything specific for the farmers in North Carolina and Iowa. I explained to you, hopefully, what my issue is. It's not necessarily geography and so forth. It's what others do there that may not apply to folks that do at other states, because some of this may -- again, related to training, to how you apply the pesticide, to the PPEs, et cetera, but I don't know off firsthand anything specific for the folks in those two states that may be different or similar to other states. I don't know.

Q. And you know that the AHS -- AHS refers to a large group of studies that has been generated by an ongoing research project? You understand that, sir?

A. I do.

Q. And you know that there are multiple publications from that group about the characteristics of people in North Carolina and people in Iowa and about how they controlled for their exposures, their practices, their exposures to other substances, their time spent on the farm, their exposure to other animals, PPE, their exposure to drift, et cetera, et cetera? Have you read those papers, sir?

A. I have not seen all of these, no.

Q. Do you know whether the large body of literature that's been generated about the AHS pool of data suggests any flaws in relying on data from two states, North Carolina and Iowa?

A. Not firsthand. I tried to explain, again, you know, the issue that I have with this particular comment. I think it's pretty clear --

Q. Okay.

A. -- what I said.

Q. So you're flagging it as a possible

weakness in the study without knowing of anything specific that bears out those concerns; is that fair?

A. Of course, I don't have anything specific --

MR. LITZENBURG: Object to form.

A. -- but this is something that you -- it's -- it's glaring at you as a peer reviewer, as somebody who is looking at this, and it's hard to dismiss without trying to ask these questions.

BY MR. GRIFFIS:

Q. You don't know if it's been addressed by, for example, the statistical controls that were applied to other factors and other exposures?

A. I have not seen --

MR. LITZENBURG: Object to form.

A. -- the particular remedy to these issues.

BY MR. GRIFFIS:

Q. Now, you said second, the second flaw that you identified in the study is that you said the study essentially ended in 2001, not accounting for the more expanded and increased use of glyphosate after that year; correct?

A. Yes.

Q. So would you -- would you elaborate on

that, please? What is the problem with the study ending in 2001?

A. Well, if you look at the way the study is designed, it's really designed based on questionnaires with the first question -- with the first questionnaire done when you actually enrolled patients in ninety -- between '93 and '97, I believe, and the first questionnaire looked at prior exposure from decades before. These -- again, something that you've been exposed to 20 years or 30 years ago and forth.

The subsequent questionnaire was done in 1999 to 2005, and if I read correctly, they actually asked specifically at exposure the year before, not necessarily for many times or 10 years or 15 years prior to that.

So the -- the pattern, you know, how can you control to how folks were exposed prospectively to this substance? It's not really a constant. The use of glyphosate has changed over the years. It has increased significantly in the late '90s and early 2000 and so forth. So there's really incremental use of the compound over these years, and this incremental use and changes in the way people have been exposed to it is actually not

factored in how the questionnaire is addressing this.

So it's not constant. Everything is actually changing, but you're really asking question only for the year before -- and you are doing this before the incremental -- the significant increase in use of glyphosate.

Q. What's your understanding of when that significant bulge in use occurred?

A. A lot has happened in the early 2000s in terms of the increase in use.

Q. Okay. So your understanding --

A. So basically you're stopping -- you know, you're stopping to look at what happened in terms of exposure literally around almost the same time where people are using -- are using it more.

Q. So 2000 -- the 2001 cutoff is right when the bulge began; is that your view?

A. Well, there is no such a thing as right where the bulge began. I think the early 2000s is as accurate as you can get.

Q. Okay.

A. I mean, you can't say May 2000 versus July 2001. Early 2000s where you -- late '90s and early 2000s are where you really have seen

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significant increase in the use of glyphosate across the country and in the world, and somehow you really -- your follow-up falls short of that in 2001. And even the questionnaire is actually asking only exposure just one year before.

So if you had -- if you had a lot of exposure -- if you are asking somebody, you know, at a particular year, what was the exposure the year before, and they answer no, it doesn't account for the exposure from three years before. It's -- it's -- the way the questions are being asked is -- completely would miss the point of significant high exposure for some patients -- for some individuals, not patients.

Q. So I understand that there's not a particular month that you point to as suddenly a bulge occurs, but 2001, that was an important year. 2002 was an important year, 2003? Is that what you're telling us?

A. I said the early 2000s.

Q. Okay. And what's your basis for that, sir?

A. It's my research. When you look -- I mean, again, a lot of this information, when you look to when the use of glyphosate and take a look on the worldwide web and try to understand when it's being

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used, it's -- lots of this is public information.

Q. What resource did you rely on for this?

A. The worldwide web and what's going on in the literature and -- and the information that's been there in terms of when the use of glyphosate-containing compounds have increased.

Q. So you did a Google search and looked at one of the --

A. One of the searches --

Q. -- links?

A. One of the searches was Google searches, and there is also some literature that I looked at. And the previous deposition, but I wasn't sure -- I didn't bring it with me. I didn't think we were going to discuss that today.

Q. This is literature that you have provided to us, sir?

A. That is something that you have asked me about in the deposition that we had before.

Q. Is it literature that you have provided to us, sir?

A. I provide you with everything that I looked at, yes.

THE WITNESS: Can I take, like, a five-minute break in about ten minutes?

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MR. GRIFFIS: Let's take it now.

THE WITNESS: I'm okay. I'm just trying to base my --

MR. GRIFFIS: Remind in ten minutes. We'll do it.

THE WITNESS: -- need for the bathroom. That's all.

BY MR. GRIFFIS:

Q. Take Exhibit 2, sir, the 2018 NCI study, and tell me where it says that the study essentially ended in 2001.

A. It's not the -- it's not ended. It's the -- the follow-up continues.

Q. Okay. I'm -- when I said "essentially ended," I'm just quoting you from your --

A. Yeah.

Q. -- supplemental expert report.

A. No, I think the follow-up -- the follow-up continues. And, again, I believe there would be additional follow-ups and future publications from the AHS study. This is not going to be the last one.

Q. Okay.

A. The follow -- I mean, you know --

Q. Show me -- show me what you see in this

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study that made you say, "Second, the study essentially ended in 2001," in your supplemental expert report.

A. Yeah, I'll have to go in the -- I think on the NIH website and look at the AHS.

Can I take a look at that? Can I look at the -- that's where I found it.

Q. You may. I don't know how exactly.

A. That's fine. That's fine. I'll look at it.

Q. You didn't get that from this -- I mean, you told me what you looked at to get ready to generate your expert report.

A. I understand.

Q. And it didn't include that website. It was this paper. So I presumed you got it from this paper.

A. I'll get back to this. I'll look at it at the break, if that's okay. It's -- I don't want to read the entire paper right now and take about 10 or 15 minutes.

Q. Is it -- is it the statement in the background, follow-up through 2001 in the abstract?

A. Follow-up through 2001. No, I think this was probably the older follow-up. This one is 2005.

I'll have to make sure that this was -- was it a typo I said 2005 or 2001? Is it okay if I table this and just get back to you after the break?

Q. Okay.

A. I want to make sure I answer it for you.

MR. GRIFFIS: Okay. Why don't we take a break then.

THE WITNESS: Okay.

VIDEOGRAPHER: Ending disc number one of the deposition of Dr. Chadi Nabhan. We are off the record at 10:17 A.M.

(Recess taken from 10:17 A.M. to 10:26 A.M.)

VIDEOGRAPHER: And beginning disc number two of the deposition of Dr. Chadi Nabhan. We are back on the record at 10:26 A.M.

BY MR. GRIFFIS:

Q. Okay. Sir, you were going to look something up for me, the basis for your opinion that -- let me quote it correctly -- the basis for your opinion that the study, the NCI 2018 study essential ended in 2001.

A. So, again, I didn't -- when I say "ended," as I clarified earlier, the study is continuing, and as I said, you will have additional publications

coming out, and the JNCI paper will not, in my opinion, be the last paper that comes from the AHS, because it is ongoing.

I think what I meant by "ended" is that the -- when you look at the original paper, the DeRoos paper, when it's -- when it was originally published, they looked at -- I think the follow-up at that time was until 2001.

The follow-up of this study is until 2005 and the original questionnaire between 1993 to 1997 was probably the only questionnaire that was filled by most -- by most participants.

The 2001 here would more accurately reflected as 2005, because that's really the follow-up of this particular study, as opposed to 2001.

Q. And 2001 is incorrect, it reflects the --

A. The DeRoos paper.

Q. -- the follow-up date from the DeRoos 2005 paper and not the NCI 2018 paper?

A. That's correct.

Q. The NCI 2018 paper, second questionnaire, went through 2005; right?

A. Yes.

Q. So they were collecting data well into the

glyphosate bulge in the early 2000s that you were describing; right?

A. They have collected data during some of this bulge, yes.

Q. And do you know what impact it would have on the data to misallocate people's exposures based on increased glyphosate use later when you don't know whether someone is going to end up in the group of people who develop non-Hodgkin's lymphoma or not?

A. I'm not sure I understand the question. If you don't mind just --

Q. Yes, sir. It's an epidemio- --

A. -- simplifying it or --

Q. It's an epidemiology question.

A. Okay. Go ahead.

Q. You have a questionnaire that runs through 2005, collecting data on exposures through 2005, and you're suggesting the possibility that people's exposures could shift after that date because of changes in glyphosate use.

A. I mean, it always could shift throughout, right, yes.

Q. But if it shifts in a way that's the same for the group of people who end up developing non-Hodgkin's lymphoma, as it does for the group of

people who don't end of developing non-Hodgkin's lymphoma, then it would not alter the epidemiological results; correct?

A. If the shift is similar, it probably would have less likelihood to alter the epidemiology results.

Q. Do you know of any reason that the likelihood of someone using glyphosate in the future but not during the time of questionnaire two would be associated with whether or not they develop non-Hodgkin's lymphoma later?

A. Well, it's a matter -- it's -- the fundamental issue here is how you are going to answer the questionnaire between 1999 and 2005. That's really the fundamental question.

And I think, given the fact that you can't control how people are answering the questions, there's a lot of recall bias in answering these questions, and you're really answering the questions only for just the immediate past before answering. You're not answering for several years prior to that.

So it's just how you answer the questions. It's very possible that some folks might answer differently based on what they are doing, if they

have been -- if somebody is using a lot of other pesticides, not necessarily glyphosate, they may assume that they are using also glyphosate versus somebody who is not using anything.

So I think that's really the issue. It's not about -- the follow-up is one possibility, but also the way folks answer the questions is inherently depending on some other biases that are present in them. So it's answering the questions that's really fundamentally issue -- fundamental issue here.

Q. It sounds like you have identified a new potential flaw in this NCI 2018 study that isn't in your expert report, that people might fill out the questionnaires inconsistently?

A. It's the recall bias, which is something we discussed about with the DeRoos study. It's -- it's inherent in -- in most of these trial -- most of these type of studies. It's difficult to -- to remedy, except, frankly, the only way to remedy something like this is by having more frequent questionnaires and just trying to either just have -- it requires a lot of resources to ask people to fill a lot of these questionnaires more consistently. But that's -- that's something that

was present in DeRoos, still present here, because it's the same study. We talked about it before.

Q. Can you explain what "recall bias" means to an epidemiologist?

A. You mean to a layman person?

Q. Tell me your definition of "recall bias."

A. Well, you know, if you are being asked to -- to answer a question that -- about something that happened in the past, you may not have the most robust memory to remember all of the details of what happened a year before or even ten years before to provide the proper answers.

If I asked you what you had for dinner ten days ago, you may not be able to answer that accurately, but your answer might be dependent on what you had dinner yesterday, and you may assume that this is very similar.

So recall bias is basically not having the precise answer. You're dependent on your memory to answer a question, and you may be correct some of the times, and you may be wrong other times.

Q. Okay. I'm going to suggest to you, sir, that that's wrong. Tell me if this rings a bell.

A. Go ahead.

Q. Recall bias is a differential bias in a

study caused by the fact that people who are recalling -- one group of people who are recalling are in a different situation than another group of people who are recalling, the classic example of which is that when you are in a case-control study, people who have an illness that they believe may be associated with an exposure are much more likely to recall those exposures --

A. That's correct.

Q. -- than people who are just going about their lives without suffering from any particular malady.

A. That is one way of recall bias, absolutely. So if you have a disease -- you know, if you have a disease in 2010 and you're being asked to remember if you got exposed to something, you are more likely to remember that versus somebody who did not have the disease. That is one way.

And another way, in my opinion, is also trying to recall everything that actually has -- have happened in the past that you may not remember.

Q. The type of recall bias that I described is inherent to the same case-control studies that you rely on --

A. Yes.

Q. -- for your conclusions; right?

A. I understand that.

Q. In those case-control studies, like Eriksson, et cetera --

A. Uh-hum.

Q. -- in those case-control studies, people were asked about their exposures after they already had non-Hodgkin's lymphoma, and they would have been incentivized to remember better than the healthy people, the healthy controls who were asked to recall their exposure?

A. In any case -- I think in any case-control studies, you will always have that possibility. I think we know that people who have a disease are more likely to remember something that has happened to them versus healthy volunteers. I think that's an inherent limitation to case-control studies.

Q. Yes, sir.

And cohort studies, like the NCI 2018 and the DeRoos 2005, don't have that particular problem because people are asked about their exposures before they develop any illness; correct?

A. In the beginning, yes, but, again, in subsequent -- in this cohort study, you have subsequent questionnaires to see what happens in

that duration. And you're not accounting for that gap between questionnaire A and questionnaire B as to what happened in terms of pattern of exposure to these individuals.

So, yes, in a cohort study that you are looking at prospectively, you ask the individuals who are participating a priori, you ask them before it, what happened, and then you follow them prospectively. But in order for you to get proper conclusion, all of other factors for these individuals have to be stable and constant. So nothing really is changing to get these meaningful conclusions.

And that's a big problem for epidemiology study where you have a lot of exposures and external factors because you can't really account for these additional factors that folks are exposed to. And in this situation you can't really tell somebody that, now we ask you this question, no more exposure to glyphosate whatsoever until we talk to you in ten years from now. You can't control to that, especially in pesticide applicators and farmers.

That's the big limitation when you are talking to this cohort study, because you are unable to tell these cohort of individuals that you are

studying that, from now on, after you've answered this question, no incremental exposure is allowed, and I'm going to follow you and see whether your prior exposure has led to disease or not.

And that's not what happened in the AHS. I'm not sure how you can do it, frankly. It's not really an issue that you can do practically. It requires a lot of money and resources. So it's really very difficult.

But if you want to talk science, that's the only way in a cohort study that you do it. At some point in time, so in 1997 after you ask the first questionnaire, these individuals that answered the 1993 to 1997 questionnaire, that's it, no more exposure to anything after 1997. And now in 2018, 20 years later, you go and see, based on your prior exposure, prior to 1997, what happened to you.

But we all know in this room between 1997 and 2005 a lot of things changed for these individuals, and that's the problem.

Q. I want to get back to recall bias, because that wasn't about recall bias.

A. But that answer --

Q. The other thing with recall bias --

A. -- I was answering your comment about the

AHS that doesn't have that limitation. So I was describing to you the issue with the AHS that is different -- it's not a case control, but it has a different limitation as a cohort study.

Q. That's a totally different issue than recall bias; right?

MR. LITZENBURG: Object to form.

A. Okay. Well, we can talk about recall bias if you want.

BY MR. GRIFFIS:

Q. Let's finish talking about recall bias. The other thing that you called "recall bias" --

A. You are the one who moved to the other one.

Q. The other thing that you called "recall bias," sir, was people not remembering correctly when they are given a questionnaire; right?

A. Well, I think that's important when I talk to a layman -- when I talk to a patient and I talk to -- and I asked you, actually, whether we are describing to this a layman term. When I talk to a patient and I see a patient and I say, you know, have you been exposed to X, Y, and Z, from a patient perspective, they need to tell me based on their memory and their recollection.

When they fill a questionnaire, when they

come to the clinic and they are trying to fill a questionnaire about their past history or past occupational hazard or past exposure, they rely on their memory. From a patient perspective, that's actually a recall. And if they don't really remember appropriately, then it might be an issue.

Q. Just not remembering well is an issue for questionnaires asked in case-control and cohort studies; right?

A. Absolutely.

Q. Have you read the literature in which the AHS questionnaires were validated against objective data to test how accurate the recall of those pesticide applicators was about the pesticides that they applied?

A. I have not seen that literature. I would probably look it up.

Q. Now, on the new issue that I believe you were identifying a moment ago that people's exposures will not be -- remain fixed in between questionnaires and so could vary from what they reported at the time of the questionnaires, do you understand that the authors of the NCI 2018 paper took steps to adjust for and correct for that, sir?

A. I think we -- together we read a lot of the

statistical and sensitivity analysis that they did and so forth, and I think you have to try to adjust for it. It just doesn't take away from the limitation of it. I mean, and, again, this is not just an AHS specific limitation. This is really any prospective cohort limitation.

Q. And like some of the other biases that we've been discussing today, it would only affect the results if people's exposures after filling out the questionnaire were correlated with the particular -- a particular health outcome and not a different particular health outcome?

A. Yes, of course. I mean, if it changed in a way that affects the health outcome and so forth, but -- but, again, as I said, this is not a limitation just for the AHS study. This is a limitation for a lot of these epidemiologic prospective cohort studies because you follow these individuals prospectively asking one question, but you are unable to stop that additional exposure from happening moving forward. It's impossible, given the fact that these are farmers and pesticide applicators. That's what they do.

Q. Do you know -- never mind that question.

Do you know the difference between

differential bias and nondifferential bias, sir?

A. I think you just described it to me. The nondifferential, again, is if you -- if it's not going to affect the health outcome and the bias is almost equally distributed, then that's nondifferential bias.

Q. And people who are doing cohort studies have ways to assess whether they have differential biases and control for those; correct?

A. I think there are lots of statistical methods in an attempt to control for some of these things, yes.

Q. And do you know which ones were used in the NCI 2018 study?

A. They --

Q. How effective they were?

A. They did the sensitivity analysis that we talked about. They also looked at some of the patients that answered only both questionnaires in an attempt to get the information only from the folks who answered the questions.

Q. The fourth weakness that you -- the flaw you identified in the NCI 2018 study is that it relied on self-reporting; correct?

A. Yes.

Q. Now, I take it that at least part of the reason that you think that's a problem is because of, people might not recall correctly?

A. Yes. That's what we talked about.

Q. Is that right?

Okay. Is there anything else about it other than that people might not recall correctly?

A. No.

Q. And all of the epidemiology studies that you rely on for your opinion that glyphosate-containing substances can cause non-Hodgkin's lymphoma, involved self-reporting; right?

A. Yes.

Q. So to the extent that that's a flaw in the NCI 2018 study, it's also a flaw in those studies; right?

A. I think it's a flaw for most of the epidemiology studies. It's very difficult to have an epidemiologic study without problems with self-reporting. That's the field of epidemiology.

MR. GRIFFIS: Exhibit 4.

(Exhibit 29-4 marked for identification.)

BY MR. GRIFFIS:

Q. Sir, I've marked as Exhibit 4 the IARC

Working Group 122 -- 112, rather, Monograph on Malathion.

MR. LITZENBURG: He's not answering any questions about that.

A. Why are we talking about malathion?

BY MR. GRIFFIS:

Q. Sir, you understand that the IARC Working Group 112, when it did its analysis of glyphosate that you relied on in part for your conclusions, also did analyses of some other pesticides, including malathion?

A. I understand that they looked at other compounds as well as glyphosate, yes.

Q. And did you understand that they put some of their global analyses into the malathion monograph and said so in their overview publications rather than repeating them over and over again in each monograph?

MR. LITZENBURG: You don't have to answer any questions about this, especially if you haven't read it.

A. I really don't remember.

BY MR. GRIFFIS:

Q. Turn to Page 9, sir.

A. This is a 124-page document I haven't read

before.
Q. Yes, sir.
Turn to Page 9 where they discuss the Agricultural Health Study.
A. Sure.
Q. Do you see that they said, "Great efforts were made in the Agricultural Health Study to assess exposure among agricultural pesticide applicators and their spouses. These questionnaires and algorithms have been extensively described and have undergone several tests for reliability and accuracy that have provided considerable insight into the quality of this exposure assessment"?
A. I read that.
Q. Do you disagree with IARC's assessment there, sir?
MR. LITZENBURG: Object to form.
THE WITNESS: Sorry.
MR. LITZENBURG: I was just objecting again to a document that had nothing to do with the topic at hand.
A. I don't necessarily disagree, but I have not seen what type of these tests that were -- that were applied, and that particular paragraph is not referenced. There is no reference. But I'm

assuming they are going to expand on this in subsequent paragraphs.
BY MR. GRIFFIS:
Q. Yes --
A. So I have no reason to doubt this statement.
Q. Okay. Well, you do know, because we discussed it, that there are -- there were internal checks, the sensitivity analyses that were described within the NCI 2018 paper; correct?
A. Yes.
Q. And you also know that there are a large body, or a body anyway, of separate articles testing various aspects of the AHS model, their algorithms, their exposure assessments, et cetera, and that's a body of literature that you have seen referenced from time to time but haven't yourself read; is that right?
A. I have not read, yes, correct.
Q. Okay.
A. But I have seen it referenced.
Q. On Page 11, sir, do you see at the bottom of the first column, this is a section entitled "Other Epidemiologic Studies," B, "Other Epidemiological Studies." A was "The AHS

Epidemiological Body of Data."
A. Okay. I see that.
Q. "All of the studies" -- I'm in the second paragraph, "All of the studies addressed historical exposure to pesticides. Therefore, the use of biomarkers or monitoring data was not feasible at the individual subject level. Almost all of the studies relied on self-reported data which, as discussed above, is reasonably reliable and valid when applicators were reporting their own use, but may not be suitable for spouses or other farm workers, particularly those exposed by reentry."
Do you see that, sir?
A. I see that.
Q. And you agree with me that pretty much all of the epidemiology studies that we have discussed together at any time concerning glyphosate and non-Hodgkin's lymphoma rely on self-reported data; right?
A. Yes, it does.
Q. Do you agree with the IARC that such data is reasonably reliable and valid when applicators were reporting their own use but might not be suitable for others, as described here?
A. I mean, for the most part, yeah. I mean,

to the extent possible, you probably would remember more than the spouses would remember, but I think there were still some limitations that we talked about.
Q. Okay. In the case of the NCI 2018 data, that would be applicators reporting their own use; right?
A. That's correct.
Q. The next -- the top of the next column, it says, "Apart from the AHS," that's the dataset from which NCI 2018 is drawn, "Apart from the AHS, few of the studies included expert review of the data or performed validity or reliability studies." Right?
A. I read that.
Q. Do you know if any of the epidemiology studies that you rely on that included expert review of the data were validity or reliability studies?
A. I think the IARC, the IARC has done an extensive work and they had working groups and they looked at the body of literature and genotoxicity and everything to come up with the conclusion.
Q. Okay. What they are talking about -- what the IARC is talking about here is not themselves, because this was something that hadn't been published yet, but the epidemiology studies; right?

That's what the header says there.
MR. LITZENBURG: You are not suggesting this is about glyphosate; right? We are still looking at the malathion document.
MR. GRIFFIS: Sir, this is about everything.
MR. LITZENBURG: You are suggesting this is about glyphosate?
MR. GRIFFIS: Yes. The malathion was where they collected general conclusions and general analyses information.
MR. LITZENBURG: So your suggestion when it says "other epidemiological studies," that's referring to glyphosate? In this Exhibit 4?
MR. GRIFFIS: I've given you my answer. I'm not going to discuss it further with you.
MR. LITZENBURG: Okay. Again, object, and you don't have to answer any questions about malathion or IARC's assessment of it.
BY MR. GRIFFIS:
Q. I won't ask you a single question about malathion, apart from the AHS. So do you know if any of the epidemiology studies that you relied on, sir, any of the epidemiology studies that included expert review of the data or included validity or

reliability studies in support of themselves?
A. I am not aware of -- of the expert's review or reliability studies, but have not looked specifically at that. And, again, this document that you provided looks like it's discussing specifically malathion, to my -- at least that's what it says, unless I'm confused. The entire document is malathion.
MR. LITZENBURG: Do you have any more questions about Andreotti? Otherwise, I would say we ought to just shut it down.
MR. GRIFFIS: These are questions about Andreotti.
BY MR. GRIFFIS:
Q. On Page 21, sir -- this is the last page I'm going to direct you to in this document -- in the left-hand column, the first column, in the middle, I'm at a sentence starting "methodological studies were completed."
Do you see that?
A. One second.
Q. Sure.
A. In the left column, you said?
Q. Left column, that -- in the first paragraph there, in the first -- well, not the -- not the

paragraph stub, but the first full paragraph there, about right in the middle of it, there's a sentence that says "methodological studies."
A. Yep, I see it.
Q. Okay. "Methodological studies were completed to assess the reliability and validity of the pesticide information provided by the applicators." Again, we are talking about the AHS data, and they cite a couple of them there. Do you see that, sir?
A. I see that.
Q. So these are some of the outside studies, not contained internally to NCI 2018, but some of the outside studies that supported the data analyses; right?
A. I -- you know, I have to read the entire 124 -- I can't -- you can't just give me one small, little three lines in one page in a document I haven't read and expect me to comment. I have no comment on that.
Q. The imputation method for the AHS is discussed at the bottom of Page 21; right?
A. I see the word "imputation method," yes.
Q. And at the very end of this section, sir, it says, "The working group considered the AHS to be

a highly informative study." Right?
A. Yes, it's highly informative.
Q. And you agree with them?
A. It is informative, yes.
Q. Do you agree with them that it's highly informative?
A. It is informative. I've answered that.
Q. Okay. Do you disagree that it's highly informative?
A. It is informative.
Q. Is it not highly informative?
A. Define "highly informative" to me.
Q. You have --
A. What's the difference between informative and highly informative?
Q. Well, you wouldn't go along with "highly informative," sir, so what is the difference to you?
A. Just -- to me, informative is the proper way of saying something informative. I don't like using superlatives.
Q. Do you understand, sir, that IARC classifies the evidence that they rely on, including into the category of highly informative?
A. I do.
Q. Did you review the IARC -- the preamble to

the IARC Monograph, sir?
A. You are talking the monograph that we discussed last deposition?
Q. Yeah, and I'm not talking about the one labeled "Glyphosate," but the preamble that applies to every monograph that they do.
A. I have reviewed the one that we discussed at the last deposition. I didn't review it for today, but I reviewed it for the last deposition.
Q. Okay. Do you recall classification of --
A. It was classified --
Q. -- things into various -- no. Do you recall classification of pieces of evidence into categories --
A. Yes.
Q. -- as to informativeness?
A. Yes.
Q. And that highly informative is their top category?
A. I -- I -- you asked me. I said I don't usually -- I mean, we have a lot -- in the literature, sometimes you have to divide the evidence based on certain categories based on highly, less, and so forth. You asked my opinion, did I -- personally, Chadi Nabhan does not like to

use superlatives. That's all.
Q. Right. So --
A. That's all I said.
Q. And I'm trying to help you not need to. I'm just reminding you about this fact about IARC, that they do use that superlative for their highest level of evidence that they rely on.
A. I'm aware.
Q. So would you -- without using the word "highly," would you put the NCI 2018 study into your top category, your most influential category, as a piece of evidence like IARC did?
A. So, personally, I would not, because it's a follow-up study to a previously reported study. I mean, I think I've said that probably about ten times so far. This is a follow-up study with longer follow-up on a previously reported study.
So it's hard for me to put this at the highest evidence. It's not reporting any new evidence. It's not a new study. It doesn't really add anything except giving me additional years of follow-up and additional cases. So I'm not really sure why I would give it the highest category possible.
Q. What about DeRoos 2005? Would you put that

in the highest category?
A. I think that, frankly, would have more weight in my mind just -- well, more weight, in essence, that it was the first time it was reported in a peer-reviewed literature. This one has the more weight, it has more cases, and it's longer follow-up. But the first time you report ever on a particular study is really when people are more interested in trying to understand what's the output of that -- of that particular research.
Q. So DeRoos 2005 would be in your top category because it's first?
A. Because it's the first time, but this one has, again, longer follow-up as well as more cases, so you can't really dismiss that. It's very important.
Q. The last flaw that you identified in your supplemental expert report is -- and we agreed that it wasn't a flaw so much as a point that you were making.
A. Yes.
Q. -- that there was an increased risk of multiple myeloma with glyphosate exposure?
A. And acute leukemia that the authors talk about.

Q. Would you show me where the increased risk of multiple myeloma in that statement is?
A. I think the authors talked about two diseases. One is acute myeloid leukemia, and one is multiple myeloma. I will try to research that for you.
So I think under -- in Page 3/8 under the results, they go over the various type of diseases that they actually have, and they talk about -- let me just read that for you. One second. Where is the -- I think they add -- they add non-Hodgkin lymphoma -- there was also no evidence for association with NHL or any NHL subtypes, the rate ratio in the top exposure quartile was 0.87 for NHL and 0.87 for myeloma.
And then the association for NHL was not meaningfully changed where multiple myeloma was excluded, and then they talk about acute myeloid leukemia. They do acknowledge it was not statistically significant, but they observed an increased risk of acute myeloid leukemia among applicators in the highest quartile of intensity-weighted glyphosate use compared to never users.
Q. So there was not an increased risk of

multiple myeloma with glyphosate --
A. It's acute myeloid leukemia.
Q. Okay. You were wrong about the multiple myeloma in the NCI 2018?
A. I think I meant to said "acute myeloid leukemia." I'm sorry.
Q. Okay. Do you claim that glyphosate causes acute myeloid leukemia?
A. No, I don't think you can claim that. I think you could say -- you could say that there was a trend for increased acute myeloid leukemia, although that trend was not statistically significant. So it's -- I think additional studies might be needed just to better understand whether there is really increases for acute myeloid leukemia, but this -- the NCI study is not conclusive about the association between glyphosate and acute myeloid leukemia.
Q. On Table 2, sir --
A. Of -- of the study?
Q. Of Exhibit 2, yes, the NCI 2018.
A. Okay.
Q. Table 2 is one of the tables giving the results in numerical form; correct?
A. I see that, yeah.

Q. For all cancers, there was no association, P values were just above and just below 1.0 for all quartiles, and the P trend was .91; correct?
A. Yes, the risk ratio was -- yeah, I see that.
Q. Okay. So it showed no association -- the NCI 2018 showed no association for all cancers grouped together; right?
A. Yes.
Q. And what is a P trend?
A. It's just how the P is changing compared to the quartiles.
Q. And it's a way of measuring multiple confidence intervals at once, to put it in simple terms; right?
A. Sure, right.
Q. And it needs to be .05 to be considered statistically significant; right?
A. Yes.
Q. Okay. Let's skip over a bunch of solid tumors here and go to lymphohematopoietic cancer. It's on the next page.
A. Okay.
Q. So the lymphohematopoietic groups together the subgroups that appear below it; correct?

A. Yes.
Q. And for four quartiles it shows the point estimates and confidence intervals, for quartiles 1 through 3, their point estimates are below 1, and it's exactly 1 for the fourth quartile, and all of it is not significant; right?
A. That's correct.
Q. And the similar pattern of spanning the confidence interval and showing no significant association with most of the point estimates being below 1.0 applies to Hodgkin lymphoma, non-Hodgkin lymphoma in general, B-cell non-Hodgkin lymphoma, chronic lymphocytic lymphoma, diffuse large B-cell lymphoma, marginal-zone lymphoma, follicular lymphoma, and multiple myeloma; right?
A. Yes.
Q. The non-Hodgkin lymphoma T-cell is also not significant with a P trend of .31, although there the point estimates are -- vary from the previous set, they are above 1; right?
A. Say again the last.
Q. Yes.
The non-Hodgkin lymphoma T-cell --
A. Uh-huh.
Q. First of all, there is not very many cases

for non-Hodgkin lymphoma T-cell compared to some of these others; right?
A. Right, there is nothing.
Q. And the P trend is .31, showing no significant trend; correct?
A. Correct.
Q. And the confidence -- the point estimates here are 1 for no exposure for the first M, which is the first half of the data -- they had to use halves because there was so little data -- the point estimate is 4.25, the confidence interval spans 1, and the point estimate goes down for the higher exposed group to 1.53, and, again, the confidence interval spans 1. That's a nonsignificant finding; right?
A. Correct.
Q. And that one is not broken down further into further subtypes of T-cell lymphomas; right?
A. There's not enough cases.
Q. Yeah.
Acute myeloid leukemia, as we discussed, is not a significant finding, but they suggested that it was a possible trend to be looked at in future studies, and you agreed with that; is that correct?
A. I agree.

Q. You have claimed, sir, that -- since we're looking at this subtype breakdown here on Table 2, and you, of course, are claiming to be an expert on non-Hodgkin lymphoma, you've even been designated in a letter naming your area of expertise as non-Hodgkin lymphoma in this case. Do you claim to be an expert on any particular subtype of non-Hodgkin lymphoma?

A. All of them.

Q. And you know that there are people -- there are oncologists who treat non-Hodgkin lymphoma who specialize in particular subtypes; correct?

A. Very rare. Very rare. Some folks just do T-cells, some folks do B-cells. But for the most part, if you are going to do non-Hodgkin lymphoma, you do non-Hodgkin and Hodgkin, otherwise you can't have a practice.

Q. Okay. So your practice is non-Hodgkin plus Hodgkin?

A. Lymphoma.

Q. And all subtypes?

A. Both of them are lymphomas.

Q. And there are people who specialize in just marginal-zone lymphoma or something, but they would --

A. Very, very, very rare.

Q. You would find them at a major university or referral center?

A. Extremely -- I mean, and they will have to have a lot of funding to be able to do that, because there's not enough cases to have a practice.

MR. GRIFFIS: Okay. Give me two minutes to see if that's it. I'm either done or almost done.

VIDEOGRAPHER: Going off the record at 11:04 A.M.

(Recess taken from 11:04 P.M. to 11:05 P.M.)

VIDEOGRAPHER: We are -- we are back on the record at 11:05 A.M.

MR. GRIFFIS: All right. Thank you for your time, Dr. Nabhan. I pass the witness.

EXAMINATION

BY MR. LITZENBURG:

Q. I just have a couple questions about this monograph about malathion.

Have you ever seen this before today?

A. No, I have not.

Q. Okay. Nonetheless, would you turn to Page 107 of the packet.

A. Page 7?

Q. 107.

A. Oh, 107.

Q. Sorry.

A. Okay.

Q. And can you tell us what IARC's assessment overall of malathion was in Section 6.3?

A. "Malathion is probably carcinogenic to humans (Group 2A)."

Q. Okay. And that is the assessment that glyphosate received as well; is that correct?

A. It is.

Q. Okay. And then if you look a couple pages back, let's start on Page 103.

A. Okay.

Q. Now, this document was given to you today, and counsel for Monsanto showed you some -- showed you some positive comments about the AHS; would you say that's fair?

A. Yes.

Q. Okay. And then Page 103, it says that the AHS did not find an increase in the relative risk of non-Hodgkin lymphoma forever versus never use of malathion, the second-to-last paragraph.

Do you see that?

A. I see that.

Q. Flipping it over to Page 104, the last sentence before Section 5.2.2, it says, no excess occurred in the Agricultural Health Study cohort; is that right?

A. Yes.

Q. And, nonetheless, IARC saw fit to call this pesticide a probable human carcinogen; right?

A. Yes.

MR. LITZENBURG: Okay. Nothing further, thanks.

MR. GRIFFIS: Okay.

FURTHER EXAMINATION

BY MR. GRIFFIS:

Q. Malathion, Page 7, sir.

A. Okay.

Q. Do you see that's headed Section 1.4.2, "Exposure Assessment"?

A. Yes, I see that.

Q. And it reads, "This section summarizes the exposure assessment and assignment for epidemiological studies of cancer and exposure to the pesticides considered in the present volume (diazinon, malathion, glyphosate, tetrachlorvinphos and parathion)"?

A. I see that.

MR. GRIFFIS: No further questions.

MR. LITZENBURG: Okay. None.

VIDEOGRAPHER: This concludes the deposition of Dr. Chadi Nabhan. We are off the record at 11:08 A.M.

(Time noted: 11:08 A.M.)

_____

DR. CHADI NABHAN

SUBSCRIBED TO AND SWORN BEFORE ME
THIS _____ DAY OF _____, 20__.

_____

(Notary Public) MY COMMISSION EXPIRES:_____

C E R T I F I C A T E

I, Paula Campbell, CSR, RDR, CRR, CRC, do hereby certify that on Monday, January 15, 2018 appeared before me, DR. CHADI NABHAN.

I further certify that the said witness was first duly sworn to testify to the truth in the cause aforesaid.

I further certify that the signature of the witness to the foregoing deposition was not specified by counsel.

I further certify that I am not counsel for nor in any way related to any of the parties to this suit, nor financially interested in the action.

IN TESTIMONY WHEREOF, I have hereunto set my hand on this 15th day of January, 2018.

_____

Paula Campbell, CSR, RDR, CRR, CRC
Certified Shorthand Reporter
Registered Diplomate Reporter
Certified Realtime Reporter
Certified Realtime Captioner
Illinois C.S.R. No. 084-003481

ERRATA SHEET FOR THE TRANSCRIPT OF:

CASE NAME: In re: Roundup Products Liability
DEPOSITION DATE: January 15, 2018
WITNESS NAME: Dr. Chadi Nabhan

Reason codes:

1. To clarify the record.
2. To conform to the facts.
3. To correct transcription errors.

Page _____ Line _____ Reason _____
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DR. CHADI NABHAN

SUBSCRIBED TO AND SWORN BEFORE ME
THIS _____ DAY OF _____, 20__.

_____

(Notary Public) MY COMMISSION EXPIRES:_____

D