SUPERIOR COURT OF CALIFORNIA

COUNTY OF ALAMEDA

BEFORE THE HONORABLE WINIFRED Y. SMITH, JUDGE PRESIDING

DEPARTMENT NUMBER 21

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COORDINATION PROCEEDING SPECIAL TITLE (RULE 3.550) ROUNDUP PRODUCTS CASE THIS TRANSCRIPT RELATES TO: Pilliod, et al. vs. Monsanto Company, et al.	**JCCP No. 4953** **Case No. RG17862702** **Pages 3075 - 3301** **Volume 19**

Reporter's Transcript of Proceedings

Thursday, April 11, 2019

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I N D E X

Thursday, April 11, 2019

Thursday, April 11, 2019 8:53 a.m.

(Proceedings commenced in open court out of the presence of the jury:)

THE COURT: Good morning, Counsel.

ALL: Good morning, Your Honor.

THE COURT: What's happening?

MR. BROWN: Initially, Your Honor, I, out of an abundance of caution, shared our expert disclosures with plaintiffs and with other members of my firm. We have offices in New York and Chicago and Miami and of course in San Francisco. And this morning I got a message back from one of the partners indicating that he may -- he had hired an expert from Florida who is a witness in this case, Dr. Sawyer.

THE COURT: I'm sorry, I didn't hear that.

MR. BROWN: Dr. Sawyer. In a case he had that involved a death, and I think it was Italy and the case was venued, I believe, in Wisconsin.

THE COURT: Okay.

MR. BROWN: In any case, I asked Mr. Wisner and Mr. Miller, I told them about that. And I indicated that I would like for their witness to be instructed not to blurt out or to testify that he been retained by another partner in my firm involving a case of a drowning of a college student who got drunk and went off

and got in a fight with some Italian folks over there.

And they indicated that we should bring that up with the Court. And I'm asking the Court to exclude that testimony under 352. And simply because Dr. Sawyer was retained by someone else in a completely unrelated matter has no relevance here, and it's just unduly prejudicial.

THE COURT: Okay. So --

MR. WISNER: So, Your Honor, the only way that would come up is if on cross-examination they try to establish or suggest that Dr. Sawyer is a hired gun for plaintiffs' lawyers. And then I think he would probably say, "Well, no, I do a lot of work for defense lawyers. In fact I've done work for that man's firm right there."

That's the only way it would come up. If they don't want to go there, then it's no problem. We have no problem. We're not going to solicit it in direct, for what it's worth. But it is a fact. I mean, for what it's worth, the partner who's actually --

THE COURT: Well, let me just say this. If it's established that he works for both sides, that's sufficient because that often comes up: Do you work for plaintiffs' firms? Or do you work for plaintiffs and defendants or one or the other?

So if it's established that, in fact, he has

been retained by both plaintiffs and defendants, why would it need to go beyond, "Yes, I work for both sides"? And so there's no prejudice here. There would be no bias --

MR. WISNER: Sure.

THE COURT: -- in my judgment or in my opinion.

MR. WISNER: Here's the concern. Unlike our other experts, I think they're actually going to try to challenge his qualifications on cross and suggest that he's not qualified to be offering the opinions he's offering.

THE COURT: Okay.

MR. WISNER: If they go down that road, the fact that the very attorney's law firm in San Francisco, on toxicological issues hired him and had glowing things to say about him I think sort of erodes the credibility that he's not in fact a qualified expert.

So if they're not going to attack his qualifications, we have no interest in bringing it up at all. I agree it's a 352 issue.

THE COURT: So what I'm hearing is that they shouldn't attack his qualifications because then you would elicit that their firm had hired him. It depends, I guess, a little bit on the basis on which his

qualifications would be attacked, that is to say, is he not qualified as a toxicologist at all? Is he not qualified to address these issues regarding glyphosate?

You know, I'm not sure exactly what his opinions are going to be. I can't recall. I read his expert report a long time ago. But I guess it depends a little bit on, you know, did he not publish enough to be considered an expert, did he not publish in this field to be considered an expert? All of those things matter in terms of whether or not it's relevant that he has worked for this firm versus his work for plaintiffs and defendants.

I mean, there's a lot of nuance in there, I'm sure you would agree.

MR. WISNER: Can I make a suggestion? We won't bring it up in direct. I will instruct Dr. Sawyer to not mention it on cross. We'll see how the cross unfolds. And then after, before redirect, we can see if the door was opened.

THE COURT: All right. We can have that conversation. But I think -- I mean, I don't think that -- if you didn't know this -- I assume you learned this today.

MR. WISNER: I learned about it yesterday.

THE COURT: Or yesterday. I just have some

doubt that the fact that this attorney's firm actually hired -- so this attorney works for a firm who has been hired by Monsanto in this case. But if his firm in another office in an unrelated matter hired Dr. Sawyer, that's a stretch for me.

MR. WISNER: Let me tell you the facts. So --

THE COURT: If Monsanto had hired him, I could completely understand. But because they chose to ask Mr. Brown to represent them in this case, the fact that Mr. Brown's firm, in a completely unrelated matter, hired Dr. Sawyer really doesn't have anything to do with Monsanto, it has to do with Mr. Brown's firm.

So I'm just telling you my thinking. I mean, you can certainly raise with me at any point you feel a door has been opened, but I just don't see that as a stretch. If it doesn't more directly relate to Monsanto and Monsanto's retention versus an attorney and that attorney's firm and another client hiring, that's like four degrees removed from the controversy we're talking about in this courtroom.

MR. WISNER: I'll do a quick proffer of what -- what I understand the facts are.

Dr. Sawyer was hired by Mr. Brown's partner, specifically in San Francisco so it's not some other office.

THE COURT: The geography doesn't matter so much.

MR. WISNER: I'm just giving you the facts.

THE COURT: Sure.

MR. WISNER: So he's the managing partner in San Francisco. He gave toxicological opinions specifically about --

(Pause in the proceedings.)

MR. EVANS: Candidly I think I'm not going to go there on cross, and if I do, then we can address it.

MR. WISNER: Right.

MR. EVANS: I mean, I don't think we need to have some big --

THE COURT: So I'm just telling you it would have to be a rational relationship that would suggest to me that that's somehow relevant. But let's cross that bridge if and when we ever get there.

MR. WISNER: Sounds good.

MR. EVANS: That's actually not the issue that we needed to talk to you about.

THE COURT: Oh, there's more.

MR. WISNER: So, remember, we talked about that screenshot?

THE COURT: Right.

MR. WISNER: I'll put it on the screen right

now, Your Honor. This is the screenshot that we would like to use with Dr. Sawyer.

THE COURT: Okay.

MR. WISNER: And this is a screenshot from an ad that the Pilliods did see. I believe it's from the mid 2000s.

THE COURT: Okay.

MR. WISNER: The way this is going to come up is I'm not going to say whether or not this ad -- I'm not going to have him testify about whether or not the ad is appropriate or misleading or any of that. I'm just simply going to talk about the lack of protective gear on the individual and whether or not that's consistent with what he understands Mrs. Pilliod was doing.

And then talk about -- that would directly relate to his opinions about exposure. Because the lack of protection, there's no pants, no gloves, affects his actual exposure calculations and analyses. So that's how it's going to be used.

THE COURT: Didn't I see a picture of Mrs. Pilliod on a tractor or something in the very beginning? So there's a picture of -- I don't know if she was spraying Roundup at the time.

MR. WISNER: She wasn't spraying Roundup on

the tractor.

THE COURT: I just saw a picture of her -- it looked like how she maybe had been dressed when she was doing gardening or something. So a picture of Mrs. Pilliod gardening might be more relevant if you have one.

MR. WISNER: We don't unfortunately. That was just her using the tractor. This -- the use of spraying Roundup is done differently. And Dr. Sawyer will talk about --

THE COURT: As I told you yesterday, I don't know anything about spraying Roundup.

MR. WISNER: So anyway that's why it's going to be used.

I understand the limits of Dr. Sawyer's testimony is that he's not allowed to say what Monsanto's obligations were regarding warnings or any of that.

But I do intend to show, for example, the label and ask him: Okay, what are the protective gear statements here? How does that relate to exposure in the lawn and garden context? Because he's done all that, it's all in his report and analysis.

We are not going to offer an opinion about what Monsanto should or should not have done on the

labeling. That is something I would do in argument. And it might come up -- no, it won't come up -- so that's going to be something to be done in argument.

But we are going to lay the factual foundations for what's in the labels, what's not, go through a sort of history of what's been in the label since the 1970s and talk about what the studies show about absorption.

MR. EVANS: So specific to this, Your Honor, I don't know -- I asked Mr. Wisner when this was actually used. I don't have an ability of confirming it. I don't -- I mean, there's no evidence this was actually used during the relevant time period with the Pilliods. So that's one problem.

The second problem is with this witness he's, by your *Sargon* order, limited to not talking about wordings and the appropriateness of the label, et cetera. And I think it's just completely inappropriate. This is a backdoor way for them to come into that labeling opinion and the warning opinion, which I think is not appropriate.

So he's here to talk about the exposure and the calculation of absorption. And these are all issues that are bordering up on and I think crossing the line into those labeling warning issues which I just don't

think this witness is appropriate to address.

If they want to say, Mr. and Mrs. Pilliod, these are the clothes they wore when they were spraying, and if he wants to say, you know, they didn't have any reason -- I don't know what he's going to say, but I just have a problem with them using this particular thing.

I also have a problem with him walking through the label with this witness and he says laying a factual predicate for the warning. If he's going to be saying the warning says this at this point in time and the science says this, how is that not a backdoor way of establishing the industry standard about what the warning should have been? That's completely connecting those dots and it's inappropriate given your *Sargon* order.

THE COURT: So your objection is going to be substantively to his testimony, the parts of his testimony regarding whether or not -- depending on what the label says what the exposure, his calculations?

MR. EVANS: His exposure calculations are based upon the clothing worn as testified by Mr. and Mrs. Pilliod.

THE COURT: Right. How exposed they were to Roundup.

MR. EVANS: Exactly. So connecting that to, well, they did what the labels said or didn't say, is again -- it's again a labeling warning opinion.

THE COURT: So what does that have to do with what -- so if the evidence is that Mr. and Mrs. Pilliod wore shorts, short-sleeved clothing, which we don't know what that is because there's no -- you know, they haven't laid that foundation yet. But let's assume that there is some hypothetical posed to him based on what they will say as to what they wore over time. I mean, I'm assuming that they wore different things at different times; right?

MR. WISNER: That's right.

THE COURT: What does the label have to do with that?

MR. WISNER: Well, that's not --

THE COURT: No, I'm just asking: What does the label have to do with what they wore, how exposed they were which would lead to his calculation of how much they absorbed in their skin? And then again as it relates to whether or not it may have led to the cause of their NHL?

MR. WISNER: So the basis of his exposure calculation is the POEM modeling which is a model that Monsanto uses to model exposure for people and

individuals. That modeling has different ratios and numbers if you're using it in a lawn and garden context than if you're using it in sort of an industrial or occupational context. And those numbers reflect the lack of protective gear that are warning.

For example, the warning labels for occupational use require use of gloves, chemical aprons, things of that sort. The ones used for lawn and gardens don't have any of that. So it goes into that issue.

But for what it's worth, that's -- he's not just here to offer a calculation opinion. He has a lot of opinions. He has a 115-page report.

And the Court excluded this, and this is -- we're not going to do this. This is the exact wording. It says:

> Sawyer may not provide testimony on the industry standard of care on warnings and may not testify on whether Monsanto complied with the substantive standard of care on warnings.

He's not going to offer those opinions. But it doesn't mean he can't mention what the warning label says and mention what the science is. That's all within his expertise without question. He's also a personal user of Roundup as well which goes to his credibility.

But those two issues are, I think, something within his ambit of expertise.

Now, when we connect the dots, he won't. That's the ultimate question. Right? And that's something we'll do in closing. And there's a jury instruction talking about Monsanto's obligations of what was known or reasonably knowable within the scientific community at the time.

And in closing argument, I'm going to argue to the jury and say: They knew it. Here's their study. And they didn't put it on the label. Here's the label. And that's me arguing obviously, not the witness saying that. But the witness won't do the very thing he said he can't do, but he will offer the foundational factual predicates for us to prove our case.

THE COURT: Okay.

MR. EVANS: So what he's just said is they're not going to have expert opinion on the industry standard and whether there should have been a warning. And you can't backdoor it by simply saying here's a study which, wink-wink, nod-nod, that is the industry standard, that's the state of knowledge that the company should have known. That's exactly going to be an argument about warnings. And it's completely inappropriate given your order.

If they have a warnings expert who is going to come in and say here's what they knew or should have known and therefore they should have warned about this, that's a completely different opinion. But you can't just lay a factual predicate to say, okay, here's a scientific study, Monsanto knew about that, and yet look at their warning, there's not a warning there. That's connecting the dots in an inappropriate way given this --

THE COURT: Why would he testify about that regarding the warning at all, whether there is or isn't a warning as it relates to a study? Which -- yeah. So he has knowledge about toxicological studies, and what does that have to do with the label?

MR. WISNER: Okay. Well --

THE COURT: I'm just asking.

MR. WISNER: Sure.

THE COURT: So how do you -- why is he talking about that if what he's talking about is the absorption and exposure?

MR. WISNER: Sure.

THE COURT: So I just need to understand that.

MR. WISNER: Because that's not what he's just talking about. And I keep saying that. He keeps putting him in this little box. His report is much more

expansive. They didn't move to exclude him talking about the label. That's not correct. They actually did move to exclude that, but you didn't exclude that. You excluded the ultimate question, which we understand.

In fact, they've moved repeatedly and said: Hey, no one can offer the opinion about what Monsanto knew and what Monsanto should have done. That is ultimately the question for the jury. And so of course we're not going to have an expert say that. But we have every right to lay the foundations of what the Monsanto studies said, how you interpret them, what they mean, how they relate to exposure.

THE COURT: Okay.

MR. MILLER: And then so here's the Monsanto label that Mr. and Mrs. Pilliod had access to, and what does it say about protective gear? And, yeah, sure, the dots are easy to connect between what they knew, as we can establish in the facts, and what the label says, absolutely. But he's not going to offer the opinion that Monsanto should have warned. He's not going to say that.

THE COURT: So to the extent that the label is an issue, it's that it did not tell them to wear protective gear and they didn't wear protective gear.

MR. WISNER: Precisely.

THE COURT: And therefore they were exposed to the Roundup when they were spraying and they absorbed here, there, and other --

MR. WISNER: And it gets more involved because part of his assessment is whether or not he believes in fact -- thinks that in fact they didn't wear protective gear for his calculations. The fact that the label didn't say that lends support to that assumption that in fact this is their actual exposure. So it's part of his calculation. I mean, if the label had said wear protective gear, he would have had a different calculation.

THE COURT: The label, whether it said protective gear wouldn't have had anything to do with their exposure because what they wore had to do with their exposure. Right?

MR. WISNER: Well, no, because --

THE COURT: But if the label didn't tell them to wear anything, then that's one thing, which I think is a fair point to make. But I guess I'm saying that if they -- whatever they did or didn't have on is going to be the factual predicate for what their exposure was. And I don't know how this is going to come out. I don't know if he's going to talk about what they wore over time or whether or not there's some assumption -- basic

assumption in his calculation that a certain percentage of their skin was exposed.

MR. WISNER: Well, the entire model that it's built on --

THE COURT: Right.

MR. WISNER: -- assumes compliance with the labeling. And that model assigns different levels of exposure based upon the fact that lawn and garden users don't wear protective gear where occupational users do. This is Monsanto's model. And it's in his report at length.

So that's why it's really relevant to why it's part of his opinion. And all of these are obviously on his reliance list. It's not like these are undisclosed ideas. They've cross-examined him about it repeatedly.

So this is all within the ambit of what I understand the Court has allowed Dr. Sawyer to testify about.

THE COURT: Okay. All right. So we're going to go ahead and start with Dr. Sawyer. And I'm going to go back and look at my *Sargon* order, but I don't think that based on what you're telling me, if it's just a correlation of what they wore with respect to what the label suggested they wore, I mean, the label is going to be coming -- an issue. What they thought they were

supposed to do and what they did is clearly going to be an issue. So...

MR. EVANS: But here's the other -- here's the other factual predicate issue. The Pilliods both testified that they read the label early on in like the early '80s and didn't go back and revisit it going forward.

So the concept that, gee, the label said, or this has this at points in time over 35 years, what's the relevance?

The exposure calculation that this witness did, he does an exposure calculation based upon the POEM formula, whatever you want to call it. But then he ultimately says: I just have to look at the days that these folks are exposed to, and that's where I compare it to the epidemiology and that's how I get to an increased risk, et cetera.

THE COURT: Right.

MR. EVANS: But all of that is not based upon: The label said X at some point in time. Because the Pilliods didn't testify that in, you know, the year 1995 -- I'm sorry, go ahead.

THE COURT: If the label -- if it's established that the label never, over the 35-year period, warned to wear protective gear, then isn't that

kind of just it?

MR. WISNER: Yeah. That's literally it.

And I just want to -- I mean, if you don't want me to publish them, that's fine. It seems kind of silly. It's clearly an admission it's Monsanto's label. But I just have four labels that span different time periods starting in 1978 moving through the present.

THE COURT: Right.

MR. WISNER: And I'm going to quickly go through them, very quickly, and say:

Does it make any mention of protective gear here?

No, it doesn't.

Once that foundation is laid, we'll come back to that later as part of his modeling, but that's it. I mean, it's not: Should they have put that warning on there? I'm not going to ask that question.

THE COURT: All right. Well, stay away from warnings. That -- get into my *Sargon* order.

But you know what, the issue of whether or not Monsanto warned or when they warned is kind of a non-issue because they never warned. So I don't think that's an issue -- I don't think that's a fact that's going to not be disclosed to the jury.

I mean, I'm not sure what you're concerned

about in the sense that if they didn't in '78 or '85 or '92 or whatever point they did, it's pretty much the same label.

MR. EVANS: Well, that issue -- I'm not saying there was a warning at X point in time.

THE COURT: Sure.

MR. EVANS: What I am saying, though, is that for him to say, okay, here's a label in '78, that's what they used when they started using it. And here's one in '95, and here's one -- again, the Pilliods testified they didn't look at the label after they initially started using it, period. So what's the relevance to it?

They dressed the way they dressed going forward for 30 years because that's what they did. That's the factual predicate for the exposure opinion which is at the core of this expert's opinion.

So if he wants to use a calculation based upon the POEM model and come up with that, that's what his testimony is going to be. Okay. But you can't -- you can't base that upon here's what Monsanto told them because, again, they weren't relying upon what Monsanto told them over the course of 30 years.

THE COURT: Well, that sounds like cross-examination or your own expert. I mean, I think

that's really the issue here. Because I don't think that there's really any prejudice to them -- to the jury seeing four labels, none of which has a warning because they're -- what they will know and that they already seem to know is that Monsanto didn't warn. I mean, for whatever that means in the case --

MR. EVANS: But not from this witness because of your *Sargon* order. I think this is a backdoor way of labeling.

(Simultaneous colloquy.)

THE COURT: I'm not sure that I feel there's, A, prejudice, and, 2, let's just see. If he says -- you can interpose an objection at any time if you feel that it crosses *Sargon*. But from what I'm hearing, if Mr. Wisner's representation about where he's going is correct that this an issue of disclosing or just publishing four labels and you say he's basing his opinion on that, then you can attack the credibility of his opinion because he may not -- he may know that he's doing that knowing that the Pilliods didn't read the label after '85 or whenever they did. But that's one thing.

But I'm not sure that just the publication itself is prejudicial, to be honest with you.

MR. EVANS: I understand your ruling,

Your Honor.

What about this screenshot?

Well, and again --

THE COURT: Mr. Wisner, are you posing a hypothetical based on the Pilliods' actual testimony about what they wore?

MR. WISNER: Yeah. She wore flip-flops, shorts, and tank tops.

THE COURT: So why don't we stick with that in terms of him basing on his opinion on the fact of what they wore.

MR. WISNER: That's fine.

THE COURT: I mean, I don't -- honestly I'm not sure that that in and of itself is helpful one way or the other just because that's not Mrs. Pilliod. I don't know if Mr. Pilliod dressed like that. No, I mean, you understand what I'm saying.

MR. WISNER: That's fine.

THE COURT: I honestly think that basing it on a hypothetical more closely related to what they actually did or didn't wear makes sense to me. I'm not sure that's prejudicial, but at the same time I don't think it's relevant either.

MR. WISNER: We can deal with it next week when we get to the Pilliods and actually show what they

actually saw.

THE COURT: But you understand what I'm saying --

MR. WISNER: Sure.

THE COURT: -- the basis of his opinion, if it's based on what they did --

MR. WISNER: Yeah.

THE COURT: -- and based on what they actually did and what they wore. But it sounds like they may be similarly dressed, but I'm not sure that this image would clearly -- would represent either of the Pilliods is necessarily relevant to that.

MR. WISNER: All right.

THE COURT: I mean, you can certainly get in what you need to get in.

MR. WISNER: That's fine, Your Honor. We won't use it. No problem.

I'm going to read two admissions prior to Dr. Sawyer, but he's ready to go and we're ready to go.

MR. EVANS: Just to be clear, the label -- it's to the time they stopped using, not to the present?

THE COURT: Right.

MR. EVANS: Right?

MR. WISNER: The label that existed today is the same label that existed in 2015, '16, and '17.

THE COURT: So whatever you're showing, make sure it was the label at the time. Whether it's the same label or not, make sure it's a label that was published before they stopped using. Even if it's the same, it's the same, but you need to assure me that that's what it is.

MR. EVANS: I'm sorry. I'm just -- again, the post-usage period is not relevant. So to say it's the same relevant -- same label today, I don't think is relevant.

THE COURT: No. What I'm saying is that the label that he uses should be a label in time, and it's not relevant to say that it's the label they use today because that's post-usage. And I think Mr. Wisner understands.

MR. WISNER: I just want to make sure Dr. Sawyer knows the contours of the rulings.

THE COURT: Well, you can have a chat with him because we have to get the jurors. So we'll be about another five minutes before we get them out.

Thank you.

(Recess taken at 9:17 a.m.)

(Proceedings resumed in the presence of the jury at 9:24 a.m.)

THE COURT: Good morning, everybody.

ALL: Good morning, Your Honor.

THE COURT: Welcome back.

We're going to continue with the plaintiffs' case. And Mr. Wisner is going to call the plaintiffs' next witness.

MR. WISNER: Your Honor, before we call the witness, we're going to read one admission into the record.

THE COURT: Yes.

MR. WISNER: Admission number 30.

Request: Admit that POEA is now banned in Europe.

Response: Monsanto admits that the European Commission recommended that member states ban a co-formulant called POEA-Tallowamine from glyphosate-based products. And there's a URL. Accessed December 12th, 2018.

The European Commission noted that "It is primarily the responsibility of member states to decide upon and enforce such measures."

And with that, Your Honor, we call Dr. William Sawyer to the stand.

THE COURT: Dr. Sawyer. Could you stand and be sworn.

///

WILLIAM SAWYER,

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

THE WITNESS: Yes, I do.

THE CLERK: Thank you. Please be seated.

And would you please state and spell your name for the record.

THE WITNESS: William Robert Sawyer, S-A-W-Y-E-R.

THE COURT: Let me just grab these things from yesterday.

MR. WISNER: Your Honor, I have binders for the witness and yourself.

THE COURT: Thank you.

MR. WISNER: May I proceed?

THE COURT: Yes, you may.

MR. WISNER: Thank you.

DIRECT EXAMINATION

BY MR. WISNER:

Q. Good morning, sir. How are you?

A. Very good.

Q. Could you please introduce yourself to the jury by telling them your name, where you're from, and where you currently live.

A. Certainly. I live -- well, my name is

Dr. Sawyer. I live in Sanibel, Florida. I still maintain an office in Skaneateles, New York. It's one of the finger lakes.

Q. Is that where you're from?

A. Yes.

Q. Okay. I called you Dr. Sawyer when you got here. Are you, in fact, someone who has a Ph.D.?

A. Yes. I have a Ph.D.

Q. And I want to hand you a copy of your CV.

MR. WISNER: Your Honor, permission to approach?

THE COURT: Yes.

THE WITNESS: Thank you.

BY MR. WISNER:

Q. Is this a current copy of your CV?

A. Yes, it is.

MR. WISNER: Your Honor, permission to publish?

MR. EVANS: No objection.

THE COURT: Granted.

(Document published.)

BY MR. WISNER:

Q. All right. So I want to do this pretty quickly because I want to get to the sort of meat of things. But let's start off with your educational

background.

If you look down here, we have that you have a bachelor's degree in biology in 1978; is that right?

A. That's right.

Q. Why did you choose to study biology when you were in college?

A. I wanted to go into a professional program, primarily veterinary medicine, which ultimately I did apply to along with toxicology programs and was accepted in both but chose toxicology. And I always had an interest in it, even when I was very young. I used to wonder why crayons said "nontoxic" when I was little.

Q. And if we turn to the next page, we have here that you received a master's degree in cellular and molecular biology. Do you see that?

A. Yes, State University of New York in Geneseo. Right.

Q. What is a master's degree in cellular and molecular biology?

A. Well, it's a very specific field and it has several branches, but primarily the understanding of the genome. And my area of training in cellular and molecular biology was what impacts genome, in other words, what damages DNA and how is DNA repaired, primarily molecular biology from that sense, as opposed

to recombinant DNA research and preparing GMOs, that's not what I was trained in. I was trained really in other -- simply the aspects of damage and repair of the genome.

Q. And this master's program, it looks like it lasted three years; is that right?

A. That's right.

Q. And after you spent three years studying the human genome, it looks like you went to the Indiana University School of Medicine; is that right?

A. Yeah. And actually during my work on master's, I had submitted a publication on a new drug that dissolves cheno -- gallstones. And it's called chenodeoxycholic acid. And I published a study on its adverse effects on the mucosa and how it works at the cellular level.

And during that time, I then applied to the various universities and decided to go to Indiana University School of Medicine in 1988.

Q. I see here that you received your Ph.D. in toxicology; is that right?

A. Yes. We're one of the few -- I don't want to say few but a small number of universities in the United States that have a specific department of toxicology and where the students are trained and

required to go through the medical school curriculum.

Q. And I understand, if you look at the top of your CV here, it says that you are a forensic toxicologist. Do you see that?

A. Yes.

Q. We're going to get to what that is in a second. My first question is generally what is toxicology?

A. Well, toxicology is the -- really the study of the effects of any adverse agents on the body, whether it be radionuclides, chemicals, drugs of abuse, pesticides, herbicides, any adverse effect on a chemical from an exogenous agent is the field of toxicology.

And toxicologists are the ones who determine what chemicals cause adverse effects, how and why.

Q. What work -- did you do a dissertation for your Ph.D.?

A. I did, yes.

Q. What did you look at?

A. It came to my attention and I also as part of my training worked in the state toxicology department. We handled all the deaths for the State of Indiana, any death that was of uncertain cause.

And I noted -- and my mentor, Dr. Forney, a very famous toxicologist, noted that we were seeing

tricyclic antidepressant deaths in people who were taking their drugs regularly, not overdosing, but they were coming out of the fatal zone. And we had already theorized that a phenomenon was occurring called postmortem drug redistribution, that is, after you die the distribution of the drugs in the body changes.

And I ran controlled human studies using animal studies, rat studies, various groups, dose groups at different postmortem intervals, as well as unfortunate human subjects, heroin user deaths. I used to get excited when there was a heroin death because it would give me a new subject, but that's not -- I know that's not right.

But, yes, so my thesis was on postmortem drug distribution. I published several papers on it. It was the first controlled animal study published, I believe.

And now currently all forensic toxicologists recognize postmortem drug redistribution for certain agents and use certain caution with respect to that postmortem change that can occur after death.

Q. So my understanding of it is the amount of drug, for example, that a person takes before they die and how it's circulating in their body, it changes after they die; is that right?

A. Right, yeah. It was -- ADME, okay. We have

absorption of a drug, distribution of a drug, excretion of a drug. We also have metabolism of the drug usually before it's excreted. ADME.

And that's a principle in toxicology that is very important in understanding the fate of a exogenous substance, whether it be morphine or whether it be glyphosate.

Q. We're going to talk about ADME a little bit, but I want to finish going through your credentials.

Now, up here it says "forensic toxicologist." Do you see that?

A. Yes.

Q. What does that mean? And is that different than general toxicology?

A. Yeah. My training was in the state toxicology department. A hundred percent of our work was forensic. My research was forensic-related. My work for the last 30 years is forensic. That's what I do. I'm a forensic toxicologist. I'm not a research toxicologist.

Q. What does it mean that you're forensic? What does that mean?

A. Well, forensic stems from the Latin root word of determining -- for debate, to debate. To debate the science.

Q. And what do you do as a forensic toxicologist?

What is your job?

A. I have a consulting operation, which I established in about 1990 while I was working for the government. And I expanded that over five years, as I had previously worked as a government toxicologist, and I've been working full-time in that capacity.

I assess cases of accidental deaths, suicide, homicides, poisonings, mass poisonings. I have a case right now in Thailand including over a thousand people exposed to arsenic poison.

So a variety of things, many different areas.

Q. And when you say "forensic," what sort of pieces of information do you look at to sort of kind of find out what's going on?

A. Well, that's a really interesting question. What forensic toxicologists do is they rely on objective evidence. When I say objective evidence, scientific studies that show a significant change, that show mechanistic changes. Objective evidence from the exposure, in this case, how the individuals were dressed to calculate their exposure.

Any type of objective evidence is what I assemble after a very thorough review and then make determinations from that.

Q. Now if we go through your CV very quickly, you

mentioned this already, you said you have this consulting company where you're the chief toxicologist. Is that what you're referring to?

A. Yes.

Q. All right. And then I see that there's some other stuff on here. I'll ask you quickly about it.

A peer reviewer for the Editorial Advisory Board for *The Forensic Examiner*; what is that?

A. Yes. For many years there was a journal called *The Forensic Examiner* and I was a member of the peer-review committee. So when a toxicology-related paper was submitted, it would be sent to usually three blind reviewers, in other words, blind meaning that the person who wrote the study doesn't know who reviewed it. And when I receive it, the information of who that person is and what university is redacted.

And then I review that study, look up each reference in the study, trace it backwards and review the study that was referenced and make sure that everything is correct, that they're -- not just spelling errors, but rather the content, and either reject or accept, or accept with revisions, which is usually the case.

I had one I rejected because it was simply too long. It was ridiculous.

Q. Well, Doctor, as part of this process of peer review, did you sort of learn to study literature and understand and consider it?

A. Yes.

Q. Is that part of what you do here as a forensic toxicologist?

A. Yes. Yes. I also rely on statistical relevance. I have taught -- sub-taught, I should say, shared in the teaching at medical school epidemiology. And I use epidemiology and statistics in every day of my work in reviewing studies.

And I review probably on the average 50 to 100 studies a week. I do a lot of reading.

Q. Do you have any experience doing lab work?

A. Yes.

Q. And if you see up here on your CV, we have laboratory director at EXPRESSLAB. Do you see that?

A. Yes.

Q. Explain to the jury what lab work is and what you did there, to get a sense of your background.

A. Well, I'll step back. In 1988, I took a position with the Department of Health, Syracuse, New York as toxicologist. I answered to two bosses: The commissioner of health and the chief medical examiner. And in that capacity, I had to set up a

laboratory, public health laboratory, and get it licensed. And that was from 1988 to '93.

And then following that, during that time I started my consulting business. And I also took on a laboratory called EXPRESSLAB as laboratory director. And that was from '93 to 2002.

And EXPRESSLAB -- and I also developed -- or not developed. I actually took over another laboratory as director.

Q. Is that --

A. Lozier Lab.

Q. Is that the licensed laboratory director down here?

A. Yeah, but if you keep going down, there's other laboratories that I directed.

Q. Okay. Well, I just want to know what does it mean to be -- what does a lab do? And why is that relevant to what you do?

A. Yeah. Laboratory director is the person who oversees all of the technical operations and does the final quality control/quality assurance to make sure the lab report is correct. And it's a horribly time-consuming job. And there's some -- well, at Lozier we actually ran 24/7 on our instruments and caused constant problems.

Q. Are you familiar with something called good laboratory practices?

A. Yeah, GLP, yeah. And GLP was developed as a methodology to ensure that primarily the animal studies in the laboratory are carried out in a consistent and reliable manner, that there are certain rules that you have to follow.

And there's also OECD rules and regulations which again direct how an animal study is to be conducted. And they're very strict rules with various recommendations.

Q. All right. Have you published peer-review journal articles yourself about toxicology?

A. Yes, I have.

Q. And why have you done that, sir?

A. I started with my original paper on the chenodeoxycholic acid dissolves gallstones and damages the gastric mucosa.

And that was a very useful paper because I also pointed out a counter drug, a very similar drug that didn't damage the mucosa, which ultimately was accepted by FDA and is now in use.

So publishing things can be very useful. And I published a lot on my postmortem drug redistribution findings which, you know, helped -- you know, this case

has had a major impact on making sure the right forensic decisions were made based on drug levels at the time of death.

Q. And there's a discussion on your résumé, on your CV here, that I think is probably the most impressive one. Apparently you are a four-time Ironman; is that true?

A. Yeah. My wife would not approve of that.

Q. All right, sir.

MR. WISNER: At this time, Your Honor, I would tender Dr. Sawyer as an expert in forensic toxicology.

THE COURT: Voir dire?

MR. EVANS: Subject to prior motions and orders and we'll reserve for cross, Your Honor.

THE COURT: You may proceed.

BY MR. WISNER:

Q. All right, Doctor, during your -- a second ago you used the word "exogenous." Am I saying that right?

A. Exogenous. That means from the outer environment, not from within.

Q. All right. You also mentioned something called ADME. Do you recall that?

A. Yeah.

MR. WISNER: Your Honor, permission to set up the courtroom. I forgot to set up the chart.

THE COURT: Sure.

(Pause in the proceedings.)

BY MR. WISNER:

Q. All right. ADME. Let's start off with "A." What's that stand for?

A. That's the absorption of the substance into the systemic circulation. In other words, how a substance gets into the bloodstream.

Q. And why is that relevant to what you do?

A. Well, in toxicology, the dose makes a difference. And one has to determine whether the substance in question is of sufficient dosage to be relevant.

Q. And when we talk about absorption, are there different types of absorption that you can look at?

A. Yes.

Q. What are some of those types?

A. Primarily we look at dermal absorption, inhalation absorption, oral ingestion from what we eat or drink, and there are a couple of other minor routes, but those are the three primary.

Q. So oral, does that mean by food?

A. By food or drink, or by incidental dust ingestion as well.

Q. And then inhalation, is that somewhat

different?

A. Yes, very different.

Q. What is that?

A. The percent absorption via inhalation, depending on the substance, can be 100 percent. It could be very efficient. Although some types of water-soluble droplets or aerosol are also efficiently absorbed but rather deep lung, water-soluble substances are caught in the upper respiratory mucosal and upper respiratory tract and never make it to the deep lung but are still absorbed very efficiently.

Q. And then obviously dermal absorption, what's that?

A. Dermal absorption is what is able to pass through our skin. And that's an important area of study for many different chemicals.

Q. And so the first step is to look at absorption.

What does the D stand for?

A. Distribution, and that's also critical. Every substance has its own characteristic distribution profile. Alcohol, if I were to drink a Long Island iced tea right now, that would distribute into my water-containing organs. Okay. It's very hydrophilic, very soluble in water, and instead of distributing into

the fat, it would tend to go and follow the body of water. And that's how we're able to calculate blood alcohol levels, depending on how much a person drank and what they weigh, because we know what the volume of distribution of water in the body is.

Where if we take a fat-soluble drug, such as fentanyl anesthesia, it's extremely fat-soluble. And it wears off quick, not because the body metabolizes it, but because it distributes so quickly in the fat that it's no longer in the blood.

So distribution is a variable that one must understand.

Q. I'm going to have to define some words. You said "hydrophilic"?

A. Yes.

Q. What does that mean?

A. "Hydrophilic" means water-loving. Okay, it's very soluble in water. You put it in water, bang, it dissolves into a clear fluid. Where if it's hydrophobic, it's going to either float on top, or if it's trichlorethylene it's going to sink to the bottom and it's going to phase, it's not going to go into that water very well.

Q. Like oil in water?

A. Yes.

Q. You also said "fat-soluble." What does that mean?

A. Fat-soluble is -- fat is a lipid, it's oily, it's not miscible with water. And there are many drugs and substances that love to go into fat.

Q. Okay. So that's distribution.

What is the M?

A. That is what we call metabolism. Metabolism is where the substance or the drug or the herbicide is actually broken into subunits, it's modified. Or it can be bound with what we call a glucuronide. A glucuronide will make a substance that is fat-soluble more water-soluble so then it can go out via the kidney.

So there's, you know, many different avenues of metabolism. And it's a critical metabolism in understanding the mechanisms of toxicological effects in terms of identifying the metabolism, identifying what that metabolite is and testing it. So it's very important to understand -- fully understand how a substance is metabolized in the body.

Q. You said "metabolite." What is that?

A. Metabolite is what happens to the parent compound after it's altered, after it's either cleaved, after the hydroxy is removed or added, or after it's bound to glucuronide. That's the metabolite, the new

substance that's formed from the original substance. And most components will produce numerous metabolites, not just one.

Q. And then the last one is "E." What's that for?

A. Excretion. That means how the drug or the metabolite is removed from the body, whether it's removed in the sweat, whether it comes back off in the breath as freon gas might, or whether it comes out in the feces.

And when it comes out in the feces, that means it's usually processed by the liver or handled by the liver and goes through the bile duct into the feces. Or if the drug is not absorbed, it can go out in the feces. Or the other route generally is if it's water-soluble, it can go out in the kidney. So there's different modes.

There's also some minor routes as well. But those are the three primary.

Q. And when you look at a chemical, whether it be glyphosate or a drug, do you have to look at all four of these things to really understand how it affects our bodies?

A. Absolutely.

Q. And did you do that for Roundup and

glyphosate?

A. Yes.

Q. Now, excuse the context, Doctor. They've heard testimony quite a bit from a few doctors about generally does it cause -- does Roundup cause cancer. And they've heard testimony about whether or not it caused Mr. or Mrs. Pilliod's cancer.

What I want to focus on with you today is this (indicating). Okay?

A. Yes.

Q. But before I do that, I just want to quickly ask you: Did you review the epidemiology, animal data, and genotox and cell data for Roundup and glyphosate?

A. Yes.

Q. And did you come to an opinion about whether you believe it actually can cause non-Hodgkin's lymphoma in humans?

A. I've been studying glyphosate since approximately 1990 -- somewhere in 1996, 1999.

Q. Why were you studying it in 1996?

A. Two reasons. I had an interest in it as a toxicologist. But I also was asked to consult on a hairy cell leukemia case back somewhere in the late 1990s.

Q. Involving Roundup?

A. Yeah. Yeah.

Q. Did you work for them?

A. No. It was a plaintiff firm.

Q. I was about to say, oh, boy.

A. But I turned it down. I didn't feel at that point there was sufficient evidence, and I advised them not to move forward.

Q. Oh, okay.

So do you believe, sir, based on your review of all the science starting in the 1990s that Roundup is something that can cause non-Hodgkin's lymphoma?

A. Absolutely.

Q. And specifically with regards to Mrs. Pilliod, do you believe that Roundup was a substantial factor in causing Mrs. Pilliod's cancer?

A. Absolutely.

Q. And Mr. Pilliod as well, do you believe it was a substantial factor in causing his?

A. Yes.

Q. All right.

With that out of the way, let's talk about ADME. All right?

A. Okay.

Q. All right. The first thing I want to start off with is sort of a basic question, and that is what

is in Roundup? All right?

A. Okay.

Q. Sir, what is in Roundup?

A. Well, do you want the short list or the long list?

Q. The short list, and then we'll break it down.

A. The long list in my report is a full page.

Roundup, I must say, is very tremendously, since its inception, in terms of its formulation -- and that's why I say there's a lot of ingredients. But primarily what we have in Roundup is glyphosate, generally in the 40 to 60 percent range. And also surfactant, which we, in general, call POEA. That's polyoxyethylated -- or polyoxyethylene alkylamine. Okay, that's kind of a long name to remember.

But it's actually an important set of symbols because it's polyoxylate -- polyoxylated ethylene, and you're going to learn that that process, which is a very common industrial process, does create some unwanted side reactants.

Q. Is that the third one, contaminants?

A. Contaminants, yes.

And surfactants, by the way, generally run in the range of -- it's highly variable, but typically you see 10 to 15 percent surfactants in the Roundup mixture.

Q. All right. And then finally, what else is in there?

A. Well, there's some wetting agents. There's very often propylene glycol or other -- or other --

Q. How do you spell that?

A. P-R-O-P-Y-L-E-N-E, glycol. Propylene glycol is harmless, but it does have an impact on absorption.

Q. Okay. And is there water in there as well?

A. Yes.

Q. Okay.

A. And there are also some silicate compounds. And I could go on and fill the chart with other ones, but those are the primary things.

Q. Okay. I probably didn't spell any of that right, I apologize, but I think we get the concept.

Let's start off with the first one, glyphosate. What is glyphosate?

A. Well, glyphosate is what we call an organophosphorus compound. It's closely related to what we call organophosphates which there's a number of organophosphates that are of concern. Sarin is a war gas. It can penetrate right through clothing. It's lethal within a matter of a minute. There's other organophosphates that are used in farming that are tightly regulated because of neurotoxicity.

Glyphosate is closely related, but it's not an organophosphate. It's an organophosphorus compound. And its chemical characteristic from a toxicological standpoint is that it likes to what we call phosphorylate. You don't want to be phosphorylated. Okay. You would look like a twisted hot dog.

Phosphorylating a protein or DNA results in damage. And that is the characteristic of glyphosate that causes more harm than just knocking out the shikimate pathway in the plant. That is one thing it can do. It can bind specifically to a plant enzymatic pathway that shuts down the life of that plant. And that is a, you know, an excellent characteristic of glyphosate. But what's not talked about is phosphorylation and the damage it causes.

Q. Have you heard of the concept called chelation or chelating?

A. Yes.

Q. What is that?

A. Chelating.

Q. Chelating?

A. Yeah. Chelating is where a -- and we should probably put this on your chalkboard there.

But chelating is where glyphosate can be bound to minerals in the water. Okay. So if you're using tap

water and it's high in calcium and high in certain minerals, it can bind the glyphosate, rendering it not as useful and knocking out that enzymatic pathway in the plant leaf.

So ammonium sulfate is often added to prevent that chelation and make the product work better. Especially with farmers, they will pour literally bags of it into their tank, and in fact sometimes the -- splash back of the stuff on their hands.

But that's what chelation is.

Q. And when glyphosate was original -- well, when was glyphosate first actually used on the market? Was it in the 1950s?

A. Well, originally for a different purpose, yeah.

Q. What was that purpose originally?

A. Well, it was for cleaning boiler tanks, chelating and helping remove the mineral and lime and so forth out of the tanks that needed to be cleaned.

Q. When was it discovered that it could be used to block this enzyme as well?

A. It was -- I don't remember if it was the 1970s, early '70s, somewhere in there.

Q. And so that's glyphosate. How would you characterize glyphosate's complexity as a molecule?

A. Medium.

Q. Okay. All right. Let's move on to surfactant. And we're going to get more into detail about each one of these later on today, but I just want a sort of quick overview.

What is a surfactant in Roundup?

A. Oh, that's a critical principle of Roundup. Surfactants are necessary in the Roundup product to allow it to penetrate into the leaf. The leaf typically has sort of a waxy surface and if you spray just direct water glyphosate on that leaf and look at it under a stereo microscope viewer, you're going to see droplets and it could run off the leaf.

So a surfactant is sort of like adding Dove dishwasher soap to a dishpan with greasy stuff in it. It allows the emulsion to occur. And it allows the oily, waxy leaf surface to accept water so the water lays smoothly on that leaf and allows for absorption.

Q. Now you compare a surfactant to Dove soap. Are the surfactants we're talking about here in Roundup the equivalent of Dove soap?

A. No. No.

Q. Okay. We'll talk later about the toxicity of POEA, but I just wanted to clarify.

All right. Contaminants. Are there

contaminants in the Roundup formulation?

A. Yeah, unfortunately there are unwanted contaminants that are reactive products in the formulation of glyphosate.

Q. All right. What's the first one?

A. Well, the primary one at the highest level is formaldehyde.

Q. I can't spell that. How do you spell that?

A. F-O-R-M --

Q. F-O-R?

A. F-O-R-M-A-L-D-E-H-Y-D-E.

Q. All right. What is formaldehyde?

A. Well, it's a confirmed human carcinogen. And it is found in, for example, in the Monsanto centrifuge feed production at 1.3 percent, which is 13,000 ppm which is extraordinarily high.

Q. Is formaldehyde a carcinogen?

A. Yeah, human carcinogen.

Q. Now, you said it's found in the centrifuge?

A. Centrifuge feed line. In other words --

Q. What is that?

A. Well, I have a document on it. It's where the production line spins and removes solids and the liquid comes through.

Q. And in that machine that produces Roundup,

there's high levels of formaldehyde; is that right?

A. Yes, in the liquid itself, in the glyphosate.

Q. That was going to be my question. Does that mean the formaldehyde actually gets into the product that people use?

A. Yes, it does.

Q. We actually have here --

MR. WISNER: Permission to publish the bottle, Your Honor?

MR. EVANS: No objection.

THE COURT: Granted.

(Published.)

BY MR. WISNER:

Q. All right. So we actually have some Roundup bottle.

A. You don't want to touch that. You really should be wearing gloves.

Q. Yes. I just thought the same thing.

MR. EVANS: Your Honor, Your Honor, I move to strike all of that.

THE COURT: Okay. Stricken.

MR. WISNER: Sorry.

Q. So the actual Roundup product -- well, this is a -- and the jury will hear about this. This is actually from the Pilliods' shed.

Is the actual stuff that's in this bottle, does that actually contain formaldehyde?

A. Yes.

Q. Okay. All right. So what's the other contaminant?

A. The next one in terms of significance is ethylene oxide.

Q. How do you spell that out?

A. E-T-H-Y-L-E-N-E oxide.

Q. What is ethylene oxide, sir?

A. It's a sterilization gas. It kills every type of biological life on earth. It is an extremely powerful sterilizing gas. But it's also extremely mutagenic and a class A human carcinogen.

It's also very volatile. It boils at a subzero boiling point. So when it's in a solution, it has a tremendous tendency to come out of that solution into what we call the head space of a container.

So if I had this zero head space bottle of water, it wouldn't be a problem. But if I had a little air in the bottle, as one of our jurors has sitting there, that over time that air in the bottle, the ethylene oxide would accumulate in that air space.

Q. So this bottle here has been sealed for a couple of years. In your opinion -- well, let me back

up.

Is this stuff in the Roundup?

A. Yes.

Q. And you said it accumulates in the head space. So this actually has Roundup that's been sitting in here for a while. If I were to open up this cap, what would happen?

A. There would be ethylene oxide escaping from that head space.

Now I want to point out the ethylene oxide in Roundup presents no harm, no problem when you're out spraying. It's too dilute. The only problem is what can accumulate in that head space in the bottle.

Q. So if it's been stored for a while, that's when it becomes dangerous?

A. Yes.

Q. Okay. All right. What's the other contaminant?

A. Well, probably in terms of significance, 1,4-dioxane. It's "1 comma 4 hyphen dioxane," D-I-O-X-A-N-E.

And, again, all of these are reactants. They're not in any way deliberately put into the product. They form when the product is made, in crude form, so it's part of the production process.

Q. All right.

A. And that's been measured at I think 73 part per billion. It's not, in my opinion, high enough that when you're actually using the product to cause harm. However, the rule is in toxicology and even under EPA policy, that regardless of the concentration of the carcinogen, they are all additive in terms of their effect.

Q. So these are piling on top of the potential carcinogenic effect of glyphosate?

A. Yes.

Q. The potential carcinogenic effect of the POEA?

A. Right.

Q. Okay. And I guess my question is 1,4-dioxane, is that actually a carcinogen, a known carcinogen?

A. Yes. Yeah, that's rated as a probable human carcinogen.

Q. Okay. And is there any more?

A. Wait a minute. Let me think.

No. Dioxane may be a -- I think is actually regulated as a -- it could be either -- it could be a possible carcinogen classification. I don't remember if it's probable or possible.

Q. Okay. Is there any more contaminants that I should put on this board or --

A. Yeah. Yeah, there's one more.

Q. Okay.

A. And that is n-nitrosoglyphosate. N-nitrosoglyphosate. And again that's formed in very minor quantity. It's not volatile. It's additive to the mix. But when you're out in the field using the product, it's a minimal concentration.

Q. And n-nitroso, is that something that's known to be a carcinogen?

A. Oh, yeah, very powerful carcinogen in humans.

Q. Okay. All right. Well, we talked briefly about the glyphosate, surfactants, contaminants.

Propylene, do you see that? Glycol?

A. Yeah.

Q. All right. And I want to actually transition from this point into sort of one of the first issues, absorption.

A. Okay.

Q. Now I understand that there's a diagram that you put together of human skin; is that right?

A. Yes.

Q. All right. Let's have you take a look in your binder. And it's Exhibit 3079.

Is that a fair and accurate copy of that skin diagram?

A. It is.

MR. EVANS: What's the number again?

MR. WISNER: 3079.

THE WITNESS: Yeah.

BY MR. WISNER:

Q. Is that from your report, sir?

A. It is.

MR. WISNER: Permission to publish?

MR. EVANS: Hold on a second.

MR. WISNER: Sure.

(Pause in the proceedings.)

MR. EVANS: Yeah, no objection.

(Exhibit published.)

BY MR. WISNER:

Q. All right, sir. We actually have a screen up here. And if you need to step off to point to anything, let me know.

But what are we looking at here?

A. We're looking at the full thickness of the skin from the dermis all the way up to the stratum corneum.

Q. Dermis and what?

A. Is it okay if I --

MR. WISNER: Your Honor, may he stand up and just point to the screen as he talks?

THE COURT: Sure.

MR. WISNER: Thank you.

THE WITNESS: Okay. We have different layers in our skin. Some of our skin is living. Some is dead. And this is very important to understand how the skin is formed because glyphosate and some of the chemicals in glyphosate alter the skin in such a way that it's more permeable.

Starting with the stratum spinosum, these are living cells which we call keratinocytes. And these keratinocytes ultimately move upward to the outer layer of the skin up here. And these are dead cells filled with keratin. So the keratinocyte ultimately becomes the dead cells filled with keratin which is our protective layer.

Once you get past that protective layer, chemicals migrate through the lamellar granules and the keratinocytes very, very rapidly. And I'll show you on another slide with the capillaries.

So these cells, and what we have with the studies that have been performed in glyphosate is keratinocytes undergo some modifications with repeated exposures to glyphosate. The cells become stiffer, they become less -- they become more of what we call pointy. And thus when they make their way up to the keratin

layer, the what we call the mortar and brick formation does not fit as well. Imagine instead of using nicely fit stones, building a rock wall out of different shaped stones, they're not going to fit too nicely.

But this is our protective layer.

And I will also explain to you how a water-soluble chemical like glyphosate can make it through this keratin layer, which is what we call a fairly hydrophobic layer.

Okay. These cells are filled with cholesterol and other types of fatty acids and tend to repel water. They don't like to let water-soluble compounds in.

And in a healthy skin, glyphosate still makes its way in. But the point is that glyphosate does do damage in the formation of keratinocytes as they move upward and turn into keratin cells.

I think that's probably all I have on that slide.

BY MR. WISNER:

Q. Doctor, quick follow-up on some stuff.

First you mentioned it sort of changes the shape. Would it be fair to say that repeated exposure to an herbicide like Roundup actually changes the architecture of the skin cells?

A. It does. That's been in generally accepted

peer-reviewed studies.

Q. And does that change in the architecture affect this issue, absorption?

A. Yes, it does.

Q. Why is that?

A. The ultimate keratin layer becomes poorly formed and in some cases even thinner.

Q. You mentioned earlier this thing called propylene glycol?

A. Yes.

Q. How does that relate to the change in skin architecture?

A. Yeah. The propylene glycol and other related glycols used in the product tend to defat the keratin layer. In other words, remember I pointed out that the keratinocytes are formed of hydrophobic things such as cholesterol and other types of lipids. And just like ethanol can remove the fat and remove that and allow the skin to become drier.

And many of you may have experienced this if you use a detergent, especially a strong detergent, you can end up with cracked skin. And that's because that skin has been defatted. And propylene glycol can do that.

Q. Let me ask you a quick question. What are

some common sort of things that we're familiar with that might explain this experience? Like, for example, skin sanitizers, how does that work?

A. That's a very good point. Skin sanitizers, and they're commonly used, contain ethanol which defats the skin. It does sterilize, but chronic use of hand sanitizers can dry the skin.

Now that's counteracted by a lot of people will use a hand lotion. But believe it or not, the studies on four different pesticides in generally accepted peer-review studies show that the hand lotions, because of the lipid nature of that lotion, can enhance dermal absorption.

Q. Oh, wow.

All right. What are some biological human body mechanisms that might affect whether or not something can get through the skin?

A. Well, I probably should go to the next slide to explain that.

Q. You want to go to the next part?

A. Yeah.

MR. WISNER: Your Honor, permission to publish Exhibit 135?

It's this blowup.

MR. EVANS: No objection.

BY MR. WISNER:

Q. I actually have a blowup of it, sir.

A. Okay.

Q. I'm going to put it up on the screen too just so we can all see it.

(Exhibit published.)

BY MR. WISNER:

Q. All right. Sir, do you see it on the screen there?

A. Yes.

Q. So the first thing I want to ask you about with regards to this is, is this a diagram that you use in explaining dermal absorption?

A. Yes.

Q. All right. I understand we've also prepared an animation to sort of illustrate Roundup or glyphosate absorption; is that right?

A. Yes.

Q. Okay. We're going to get to that in one second, but I want to start off with just getting some basic facts here. Okay?

A. All right.

Q. So what is this top part up here that we're looking at? Is this what you were talking about earlier?

A. Yeah --

MR. WISNER: Your Honor, can he stand up?

THE COURT: Yes.

THE WITNESS: Yeah. What we're looking at in the highlighted area is the stratum corneum. These are the mortar and brick cell layers of dead cells, which is known as the keratin, the keratin layer, that protects us from the invasion of chemicals, viruses, and bacteria.

And there are several things that -- reasons and routes of exposure.

One is if you apply a surfactant to this material along with propylene glycol or other glycols or even alcohol, we can erode, remove some of the lipid from these cells making it more conducive for a hydrophobic watery substance to make its way through.

Also, we have sweat glands that are deep down in the dermal layer, in the hypodermis, which when we sweat release primarily water but some salts for cooling. And that is also a conduit that chemicals use to make its way through the keratin.

Once it's through the keratin, in this region just below the keratin, the very serious problem occurs. We have a highly enriched, very fine capillary network which becomes activated when exercising or especially

when warm. And that's designed for cooling. The design of this sub -- really this in the viable epidermis layer, the very outermost part of that layer is designed primarily for cooling.

So in studying the dermal absorption of a substance, if we run the study, say, in an in vivo study in a rat that's sleeping in a cage, that capillary loop may be constricted and not doing much, as opposed to somebody out cutting brush and spraying and walking in the warm weather, this could be greatly engorged with blood flowing, and so any chemical that gets through has a higher likelihood of being absorbed.

We also have different parts of the body with hair shafts. This is pretty common on the arms to have a fair amount of hair as opposed to the hands which are less hair. There's some on the back of the hand but not much.

But the hair shaft is also an excellent route for water soluble substances to make it into the viable epidermis and dermis layer to be absorbed.

BY MR. WISNER:

Q. All right. Well, let's break it down a little bit. So let's see if I can do this on both.

So we mentioned earlier how surfactants affect how it spreads on the skin; is that right?

A. Yes.

Q. So, for example, if there was a bead of water, it might look something like that; is that right?

A. That's correct. And even if you spray more on it, it's going to run off.

Q. Okay. And then when you have a surfactant, it allows it to sort of spread out; is that right?

A. Yes.

Q. Okay. All right. Now you mentioned --

A. And also and I should say that in the design and in the Monsanto documents, the surfactant has also been shown to increase what we call the residency time of the material, the water and the glyphosate chemicals on the skin.

So not only are we spreading it out and covering the complete surface area, but we're allowing a little thicker amount of water to remain and stay put --

Q. I got you.

A. -- for longer duration.

Q. All right. So you said one of the ways it gets through this method is through the sweat glands; is that right?

A. Yes.

Q. Okay. And have I kind of drawn that in there?

A. Yes.

Q. All right. So it can come in through the sweat glands.

And I guess my first question is -- my first question, sir, is when you're sweating, like if you're outside in the sun spraying Roundup, that activity of sweating, does that increase the ability for the product to get through that pathway?

A. Yeah. That's been studied in actual human applicator studies.

There's two part points. One is capillary engorgement during sweating when one gets warm. And some people may even notice that when they exercise heavy, playing a sport, you know, legs might even look a little red, that's the capillary engorgement trying to cool the body.

But the other point is with sweating, what the applicator studies have shown is that when the material is sprayed onto the clothing, onto a long-sleeved shirt or jeans, if a person is sweating and those pants are moist, it then gives a kind of a conduit for the material sprayed on the clothing to flow through the wet garment onto the wet skin. And it increases the what we call the dermal exposure quantity to the actual dermal absorption quantity. So sweating is important for that reason as well.

Q. All right. You also mentioned there was this avenue in through the hair follicles; right?

A. Yes.

Q. And why is that important in understanding absorption of something like glyphosate or Roundup?

A. Simply because that is a well-documented input for water-soluble substances, that keratin layer.

Q. Now I notice in this diagram here, after you get through the hair, you get in something called the lymphatic vessels; do you see that?

A. That's right. The lymphatics are in the hypodermis, yeah.

Q. And so if glyphosate is able to get through these portions, is it able to then circulate within the lymphatic system?

A. Absolutely.

Q. And is that what you've seen in the studies that looked at this very issue?

A. Yes.

Q. You mentioned also increased blood flow helps increase absorption; is that right?

A. Very much.

Q. Why is that?

A. Simply because the capillaries are engorged, they're larger, the flow of quantity is higher. And

there is just a lot more area for the glyphosate in the epidermis to enter the blood through the very thin-walled capillary.

Q. Now POEA, the surfactant within Roundup, is it a skin irritant?

A. Yes.

Q. And what does that mean?

A. When the skin is irritated by any substance, the first thing that happens from the histamine reaction and other signals is dilation of the capillary bed. And that's why, you know, if you have an irritated skin, you notice it's red. And it's engorgement and activation of the capillary bed.

Q. So in addition to some physical activity that causes the blood flow to get going, the actual irritant within surfactant, does that also increase blood flow?

A. Yeah, yeah. Glyphosate is well-known as an irritant and even labeled as such.

Q. And does that then further increase the absorption rate?

A. Yes.

Q. All right. I want to talk a little bit about --

Is this better? Oh, look at that. It is better.

I want to talk a little bit about, let's say this actually happens. So it gets into the system, it goes through the hair follicle, the sweat glands, or just even through the cells themselves.

A. Okay.

Q. Is there any evidence that you're aware of about whether or not glyphosate or Roundup remains under the skin even after it washes off?

A. Yes.

Q. And what is that? What is your understanding of that?

A. The dermal absorption studies have shown that a reservoir of glyphosate is formed in the epidermis that is not immediately absorbed.

Q. And so I want to walk through what that means. So we have a reservoir that gets created under the skin; is that right?

A. That's right.

Q. And then after you wash off the glyphosate, let's say, does that reservoir stay?

A. Yes.

Q. And can that reservoir then continue to deliver doses to the capillaries as well as ultimately the lymphatic system?

A. Yeah. Studies even such as Wester have shown

continual absorption for seven days as excretion in the urine.

Q. I want to talk a little about what the studies show in a second. I just want to get a sort of general understanding.

I understand an animation has been created that sort of illustrates this whole point; is that right?

A. Yes.

Q. Let's go through that animation very quickly.

All right. Doctor, since we've covered a lot of the big concepts here, right, I'm hoping --

MR. EVANS: Your Honor, I thought we were starting later with this.

THE COURT: I did too.

MR. WISNER: I can start it right here.

MR. EVANS: Take it down, please.

THE COURT: Yes, take it down and approach.

(Sidebar held but not reported.)

MR. WISNER: All right. Your Honor, one second.

THE COURT: That's all right.

(Pause in the proceedings.)

BY MR. WISNER:

Q. All right, Dr. Sawyer, I'm sorry. My computer

suddenly froze up on us. It's never happened before actually.

So we have this animation --

One second.

THE COURT: We can take our break.

MR. WISNER: We're good to go. If you want to take a break, Your Honor, we can, but we're good to go.

THE COURT: I was going to take a break in the next 10 minutes anyway so either way.

MR. WISNER: Why don't we do it right now. I can get my computer working.

THE COURT: We're going to take a 10-minute break. A fairly short break this morning.

(Recess taken at 10:31 a.m.)

(Proceedings resumed in open court in the presence of the jury at 10:48 a.m.)

THE COURT: Mr. Wisner.

MR. WISNER: Thank you, Your Honor.

Q. All right. Computer is up and running, sir.

A. Yes.

Q. So here's how I want to do this. I'm going to run it once through just so we see how long it goes. It's about 40 seconds. And then I'm going to go back to it, and I want to stop and talk about how it relates to what we've been covering all morning.

A. Okay.

(Animation played.)

BY MR. WISNER:

Q. All right. So that's -- let's go back to the beginning.

All right. Let's start off with this part, sir, very beginning of the animation.

Actually, let's go back a little bit earlier.

Okay. The first question is we have here a sort of aerosolization of the Roundup. Based on your review of the scientific literature and your understanding of the chemistry of this product, does in fact Roundup become airborne into a sort of fume?

A. Yeah, this has been extensively studied. And I have at least a dozen publications that I've reviewed in terms of the measurement of aerosol.

I should point out there are two types of what we call hydraulic sprayers. The home use hydraulic sprayer is simply the fluid is pressurized and comes out a nozzle, and it presents a very wide distribution of particle size ranging from only as low as 50 or 100 micron on up to 1000 micron, a very wide variety of particle size.

Professional applicators often use what's called a CDA, a controlled droplet atomizer. Instead of

pressuring the fluid through a nozzle, there's virtually no pressure, it's a mechanical spinning device and it releases primarily just a narrow band of droplets that are a little larger and they tend to settle out quicker. Where the home user is using a device that creates a mess basically, an aerosol that becomes airborne and the slightest amount of wind or moving the body allows that mist to make contact with the body, the clothing, and the skin.

And that's what's shown here is just simply that there is aerosol contact.

Q. Now, one of the things that --

A. We call that drift, by the way, in the scientific community. Drift.

Q. So one of the things --

A. You'll probably hear that term again.

Q. One of the things I noticed in here was you pointed out the hair; right?

A. Yes.

Q. And is there hair on the arms and legs of most people?

A. Yeah. Usually starting at the wrist. And in this diagram, you can see some hair beginning in the wrist area, not much, but there's hair follicles. Even if the hair is not long, the follicles are still

present.

Q. And so we have this sort of spray wand here. Do you see that?

A. Yes.

Q. Is that what you're talking about?

A. Yes. And, again, the professional applicator generally has a long wand to hold it away from the body, where the home garden user doesn't have that ability, and when that's sprayed it's very close to the legs. And depending on the wind, it can actually affect beyond the body, beyond just the legs.

Q. Sir, would you please estimate how long is the nozzle on this?

A. Around the length of the hand, maybe 5 inches.

Q. Okay. So you get about 5 inches away, you're spraying. I assume if you spray from up here, I mean, it has to drop a lot; is that right?

A. I'm sorry, I didn't hear you.

Q. If I spray from up here, right, just standing --

A. Right.

Q. -- it has to drop from the tip of the sprayer down to the ground; is that right?

A. That's right.

Q. And so if I'm walking around spraying, how

does that affect whether I'm in contact with, for example, my leg?

A. Well, there's a known amount of contact that's been studied and published.

Q. Okay. And we talked a little bit about contacting your leg, and so you're saying, for example, the hair follicle on the skin; is that right?

A. Yes.

Q. And all these little hair follicles, does that allow increased absorption on the dermis?

A. It does.

Q. And that goes into the body then?

A. Yes.

Q. Yeah. I need to get out in the sun more, I know. We all thought it. It's okay.

Okay. So we have this aerosol sort of around the skin. And it makes contact on the skin. And I know we haven't -- I'll stop right here.

We haven't -- do you see the white stuff on there; do you see that?

A. Yes.

Q. What is that illustrating relative to the spreading of the product on the skin?

A. Just differences in the area. The diagram also again showing the back of the hand with hair

follicles. Even though many of us have, if you look at your hand closely, very minimal hair, the follicles are still there.

Q. Okay. So you're talking about, like, hair on your palm, that kind of thing?

A. On the back of the hand primarily, yeah.

Q. And if we keep going, we now have a sort of cross-section here. What does this reflect?

A. Well, the upper layer is showing the keratin layer, the most protective layer of the skin. And as we go below that, we have an area which contains capillaries. And they're really not very apparent in this second layer.

Q. And if we see here, we have this white stuff accumulating under the skin. Do you see that?

A. Yeah. Over time there is accumulation of deposited glyphosate within the epidermis, known as a reservoir, chemical reservoir.

Q. That's the stuff right here?

A. Yeah.

Q. Okay. And so even after you wash, say, take a shower, that chemical reservoir stays?

A. That's right. It doesn't wash off.

Q. And based on the literature you've seen, how long does that continue to release a dose of glyphosate

into your blood system?

A. Seven days.

Q. And you say seven days. Is that because they haven't measured it past seven days or because that's the cutoff?

A. No, that's just the cutoff of the studies I've seen.

Q. Okay. And then these white arrows and this white stuff, what does that represent, sir?

A. This continual absorption into the deeper tissue.

Q. Okay. Now, one of the things we talked about was the effect of surfactant on the skin irritation; right?

A. Right. Right.

Q. And so here, what is this reflecting?

A. Well, we're beginning -- as we move forward, we're seeing capillary engorgement and we're seeing heat being liberated, sweat being liberated, and increasing amounts of absorption occurring during that time.

Q. And when experiments have been done to sort of look at the absorption of an aerosolized Roundup on the body, have they been done in sort of hot environments?

A. No. Generally most of the studies have been done by putting 4-by-4 cotton patches throughout the

body and then having the applicator do the actual work and then removing those cotton squares, sending them to a laboratory. It's called passive monitoring.

And then you can measure from those 4-by-4 cotton squares how much impact is getting onto the skin or clothing.

Q. And because it's sort of a passive monitoring, does it underestimate or overestimate absorption?

A. Well, it's based upon generally 3 percent dermal absorption. However, as you're going to learn, that's a somewhat variable number.

Q. Okay. All right. So we spent some time on absorption and we're going to come back to that.

I want to talk about -- I want to talk about one of the components here of Roundup. I want to talk about the surfactant. Okay?

A. Yes.

Q. Specifically I want to talk about the toxicity of the surfactant that's found in Roundup. All right?

A. Yes.

Q. Now, the Roundup that I can buy in the hardware store -- let me get to a more specific question.

The hardware (sic) that Mr. and Mrs. Pilliod bought in the hardware store, is that the same Roundup

you buy in Europe?

A. No, not at all.

Q. What's the primary difference?

A. Well, starting back in the 1970s and even up through more recent years, Roundup in the U.S. has the polyoxyethylene amine known as tallowamine. Okay. Tallowamine is a POEA. TALLOW, T-A-L-L-O-W, amine.

And what it is, is in the production process, ethylene undergoes what we call ethoxylation reaction.

So you take ethylene and animal fat and you ethoxylate it, and it forms tallowamine. And tallowamine is a -- usually a 16-carbon-long chain of fat that is bound on one end with this ethoxyamine which is water-soluble, and then that unsaturated 18-carbon tail is highly fat-soluble. And this is your detergent.

Q. Can I actually -- let's actually show the jury.

MR. MILLER: Your Honor --

Q. Doctor, can you look at Exhibit 3074. Is that a journal article that you reviewed that specifically deals with POEA in Roundup?

A. Yes, it is.

MR. WISNER: Your Honor, permission to publish?

MR. EVANS: No objection.

THE COURT: Granted.

(Exhibit published.)

BY MR. WISNER:

Q. All right. So this is an article, it was published fairly recently. Let's go into the diagram. This is what you're talking about?

A. That's correct.

Q. All right. So we have here on the left side -- well, on the left side it says ethylene oxide. Is that the -- is that that?

A. Yes.

Q. The stuff that's mutogenic?

A. Extremely.

Q. Okay. Well, walk us through how POEA is created, using this diagram?

A. Well, as I say, the ethoxylation reaction occurs between the animal fat, which we call tallow, with ammonia added, and in that reaction process starting from the ethylene oxide, the fatty acid ammonia and heat, it forms polyoxyethylene tallowamine.

And that is what's primarily been used in the U.S. since its inception. It is out of the -- I should explain there are many different types of POEAs. I can name about 15 of them. There's different types.

The most harmless type is called

polyoxyethylene ether amine. Instead of having this long tail, it has -- it's based off an ether molecule.

Q. Now if we look in this document, there's a portion that kind of -- that kind of goes over this.

The first generation of glyphosate-based herbicide sold in the 1970s and 1980s predominantly contained the polyoxyethylene tallowamine surfactants. Is that POEA?

A. Yeah.

Q. Typically derived from animal fat?

A. That's right.

Q. (Reading from document:)

> The tallow sources range from fat products destined for human consumption to industry intermediates used in the manufacturing of surfactants.

Is that what you were talking about, sir?

A. Exactly.

Q. Okay. Do you know approximately when Mr. and Mrs. Pilliod actually began using Roundup?

A. Yes. In the 1970s.

Q. Okay. I think it's early 1980s, but we can hear it from them directly.

But regardless your understanding --

MR. EVANS: Your Honor, can we just watch the

leading, please?

THE COURT: Okay. Go ahead.

BY MR. WISNER:

Q. Based on what you understand -- I mean, do you want to look at your report, sir?

A. Yeah, so I'm in error. Early 1980s.

Q. So in the early 1980s when Mr. and Mrs. Pilliod began spraying and purchasing Roundup, is it your understanding that the POEA surfactant was in there?

A. Yeah, I confirmed that. I actually have received confidential documents from Monsanto that lists the tallowamine during that era and beyond that era as well.

Q. All right. I want to talk a little bit about this sort of toxicity of the surfactant POEA.

Let's just cut straight to the chase. What is the toxicity of POEA relative to glyphosate?

A. It's approximately 40 times stronger.

Q. And --

A. And that's based on animal studies as well as aquatic studies.

Q. When you say 40 percent stronger --

A. No, not 40 percent, 40 times stronger.

Q. Oh, so that would be 40,000 percent?

A. Yeah.

Q. Okay. Well, what is -- whatever. What is -- what do you mean by it's more than 40 times toxic, what does that actually mean?

A. Well, when the studies are run on animals to determine what the threshold dose is, that is, the lowest observable effect level, LOEL, or an LD50, the measurement of the amount of glyphosate compared to that, of the amount of surfactant POEA, tallowamine, specifically is 40 times different. In other words, the surfactant is 40 times more potent than the glyphosate itself.

Q. All right. So we can actually look at a chart here in this article. There's a chart that says Table 1. It says:

> The surfactant POE15 tallowamine is more toxic than glyphosate. Data extracted from material safety data sheets, regulatory evaluations, and from experimental investigations.

Do you see that?

A. Yes.

Q. And we see this sort of -- you know, the differences in these various sort of toxicity analyses. And is this where you talking about approximately

40 times greater?

A. That's right.

Q. All right. Now, something mentioned here, it says material safety data sheets. So what is that?

A. A material safety data sheet is written under specific guidelines to warn the user of the hazards of the chemical involved, as well as safety precautions, disposal, recommendations, special handling, and it outlines the various adverse health effects.

I've written some myself years ago.

Q. And when we look at -- I'm sorry.

Okay. We're going to get back to the MSDS later. I just wanted to sort of highlight that because it was there.

All right. Is POEA banned in Europe?

A. Yes, it is. It's banned basically everywhere except the U.S.

Q. To this day -- or let me ask you a more specific question.

As of when Mr. Pilliod stopped spraying Roundup, to the best of your knowledge, was POEA being used in Roundup?

A. Yes.

Q. Now, you're familiar with something called a long-term animal carcinogenicity study?

A. Yes, bioassay, yes.

Q. The jury has heard plenty about that and I'm not going to get into too much detail, but let me just ask you a straightforward question: Has Monsanto or anyone ever done a long-term animal carcinogenicity study on POEA?

A. No, it's never been done. It's been ignored.

Q. And I'll ask you another question: To the best of your knowledge, has a long-term carcinogenicity study in animals ever been done on Roundup which includes all these different things?

A. No. Only the pure glyphosate.

Q. So just that one?

A. Yes. In fact, many of the studies were run on Aldrich Chemical high-purity glyphosate without the other reactants in it as well. So, yes.

Q. What does that mean?

A. Well, some studies are run on what we call MON and then a number which is actual glyphosate from Monsanto. Other studies have been run where the published study shows that the glyphosate was from a chemical company that sells reagent chemicals to laboratories. So that's another difference.

But the heart of this is that Roundup itself with all that stuff in it hasn't been evaluated by

Monsanto or other studies.

Q. All right. Now, I want to turn to something called -- a term called synergy. Have you ever heard of something called synergy?

A. Certainly. It's a toxicological principal.

Q. What is it?

A. We take two chemicals and we know the dose at which that chemical produces an adverse health effect, and we -- and there's actually human studies of this too between asbestos and cigarettes, for example.

But if we do it with an animal study and the dose is 2 milligrams of one chemical, 2 milligrams of the other chemical, and they both produce a certain health effect, the 2 milligrams, you would expect to have double the reaction at 4 milligrams when you take them both together, but instead you don't, you end up with 10 or 40.

You know, in other words, when you combine the two, it greatly enhances the chemical beyond additivity. That is the toxicological definition. And it's not a common thing we see. There are different chemicals that act synergistically, and we take special concern with those in toxicology because of the increased hazard.

Q. All right. So let's use a hypothetical here.

All right. Let's say we had something with

just glyphosate. Okay? And let's say that causes some theoretical damage, one. Okay?

A. Okay.

Q. All right. And then we add another chemical. We'll say a POEA. All right?

And you said that was approximately 40 times more toxic; right?

A. Right.

Q. So we would say 40; right?

A. Yeah.

Q. So normally toxicology you would just add -- well, that's actually -- yeah, that's right, we just add one plus 40 and get a toxicity of 41; is that fair?

A. Right.

Q. But synergy, what would that mean when you put these together?

A. Simply a higher number.

Q. Okay. So like, I don't know, 100, would that be fair?

A. Yeah.

Q. And so one of the ways of looking at synergy, for example, with Roundup, is whether or not glyphosate is toxic and then what happens to the toxicity when they're both studied?

A. Exactly.

Q. I want to look at a study actually kind of hits this issue on the head.

Turn to Exhibit 2303 in your binder.

A. Okay.

Q. Is this a study that you've reviewed?

A. Yes.

Q. A study that you relied upon in understanding the toxicity of glyphosate in Roundup?

A. It is.

MR. WISNER: Your Honor, permission to publish?

MR. EVANS: No objection.

THE COURT: Granted.

(Exhibit published.)

BY MR. WISNER:

Q. All right. Doctor, this is a study -- we actually discussed this earlier with the jury briefly with Dr. Portier. It's titled "The mechanism of DNA damage induced by Roundup 360 PLUS, glyphosate and AMPA in human peripheral blood mononuclear cells — genotoxic risk assessment." Do you see that?

A. Right.

Q. And it has authors here, Dr. Wozniak her colleagues; do you see that?

A. Yes.

Q. And I just want to quickly ask you a question about this title. The jury has heard about Roundup, they've heard about glyphosate. What is AMPA?

A. AMPA is the primary metabolite of glyphosate. Glyphosate is reduced to AMPA when one takes it in systemically.

Q. So right now we've been talking about absorption for a bit. When we talk about AMPA, that's when we're moving on to metabolism; is that right?

A. Right.

Q. Now, in this study, what were they trying to do in this study, sir?

A. Well, the design was to test peripheral blood mononuclear cells for genotoxicity.

Q. And did they test both glyphosate, Roundup, and metabolite?

A. Yeah, that was a very smart, well-designed study.

Q. Why is that?

A. Because it didn't just focus on glyphosate under the assumption that that was the only toxicological agent within the formula.

Q. Now we go to a chart here, Chart B. What does Chart B reflect?

A. This is -- what's critical to note on this

chart is the bottom axis, that's concentration of glyphosate in the body at micromolar levels. So we see at .5, 10, 100, 250.

Now we see at 250 a little error bar on top of that. It looks like a T if you look at it closely. That's the plus or minus value at the 95 percent level of confidence. And we can clearly see that the 250 bar is significantly larger than the 100 bar.

If you go back to zero and .5, those bars are probably not different because of that statistical measurement bar on top, that plus or minus.

But we can conclude from this, in fact the authors even put an asterisk on it, that means that at 250 there is a statistically significant change occurring at the 95 percent level of confidence.

Q. And just to be clear, what is this chart actually reflecting?

A. It's actually damage to the DNA, measurable damage to the DNA.

Q. Is that what it says right here on the side?

A. So the important thing to remember, that's occurring -- clearly occurring at 95 percent confidence at 250 micromolar solution.

Q. So I want to keep this one in mind, but now let's look at one they looked at with regards to

Roundup.

So here we have concentration of Roundup PLUS; do you see that?

A. Yeah. Now, again, look at where the significant difference starts appearing. In this case it occurs somewhere around, oh, I don't know if that's four and a half, less than five.

Q. So right around here.

A. Remember that the other bar occurred at 250. This bar is occurring at only around four and a half or five micromolar.

Now what's important to that are two things. It shows a huge difference in terms of potency. If we take a hand calculator and divide 250 divided by four and a half, it will give you the difference.

The other thing to note that I am very interested in as a toxicologist that that's a five micromolar, and in the studies and even in this study people who are not even directly exposed to glyphosate but just bystanders will show levels in their blood of .5. Applicators or those who are poisoned will show way above five.

So this study is not one of these studies that are, you know, 10,000 times the dose a human receives. This is a study that's within range of what humans are

exposed to.

Q. Now, here's what I want to focus on. We have -- we have this glyphosate data, right, and we have this risk in here. And you can see right around here that at 500 we're at about 12. Do you see that?

A. Yes, on the glyphosate, right.

Q. Okay. So then when we go to Roundup also at about 12, we're at about, what is that, between 5 and 10?

A. I would estimate that to be about probably about 8.

Q. Okay. So when we look at the dose difference between what Roundup -- at what point Roundup starts causing genetic damage versus when glyphosate starts causing genetic damage, what do we learn from this?

A. Well, your Roundup, but your lines should be lower. See, Roundup damage occurs at the earlier bar at around four and a half.

Q. Is that right?

A. Yeah. Yeah. And the dose on the bottom scale is a little less than five, probably around four and a half. DNA damage, percent of DNA damage about six.

Q. So I guess a way of putting this, you start seeing statistically significant DNA damage at Roundup at 5 uM; correct?

A. Yes.

Q. So that's 5 uM. Okay.

A. Right.

Q. And when did you start seeing statistically significant damage for glyphosate?

A. Switch back, but I think it was 250.

Q. All right. So --

A. Yeah.

Q. Is that right?

A. Yeah, around 250.

Q. All right. So 250.

Let's get this up on the board because you were talking about synergy earlier. Glyphosate causes damage by itself at 250, but Roundup -- which includes glyphosate; right?

A. Right.

Q. -- plus other chemicals produces damage approximately 5; is that right?

A. Right.

Q. So using these two numbers, how much more genotoxic is Roundup relative to glyphosate?

A. About 50 times.

Q. So earlier we talked about how POEA was 40 times, by itself, more toxic.

A. Right.

Q. But when you have them together, it's 50 times more toxic?

A. Yeah, this is more important actually. Earlier that was on mammalian or aquatic toxicity, general toxicity effects, where this is specifically DNA damage on a percentage of DNA. This is a very serious adverse effect.

Q. Now, I just want to take a look at the metabolite data because -- while we're here.

Now, we look at the metabolite data. What sort of doses did they use here?

A. Well, again, we see significance probably around about 450 micromolar. And at the percentage range, that could be around maybe 5 percent.

So it's -- yeah, I'd say about 450.

Q. Okay. Now, on the next page there's actually a similar diagram looking at oxidative stress; is that right?

A. Yes.

Q. And if we look at the oxidative stress data, is it consistent with the straight DNA damage?

A. It is.

Q. Okay. And if you look down here -- well, let's just go through it because I don't want to go too quickly.

So if we look at glyphosate, you again see the damage occurring at 250 and 500; right?

A. Yes.

Q. And it becomes statistically significant at the 250 point; is that right?

A. That's right.

Q. All right. And then for Roundup, we again see the first statistically significant result at 5?

A. Yes.

Q. Okay. And that's the same ratio, 50 times?

A. It is.

Q. All right. Go down to the AMPA. We see the first result -- statistically significant result occurring at 500. Do you see that?

A. Right.

Q. And what is the significance of the fact that we're seeing genetic damage and oxidative stress in the metabolite of glyphosate?

A. Well, that -- it's what we consider an active metabolite.

Q. What does that mean?

A. That the -- although the activity is slightly different, it still possesses the adverse toxic characteristic.

Q. All right. I want to go through a couple

other studies and kind of ask you some quick questions about them because the jury has seen them and I want to make sure we're all on the same page.

So the first one is a study by Bolognesi from 1997. It's Exhibit 1508. Are you familiar with that study?

A. I am.

MR. WISNER: Permission to publish?

It's been published before.

MR. EVANS: No objection.

(Exhibit published.)

BY MR. WISNER:

Q. All right. So this is the Bolognesi study. And the title is pretty straightforward, "The genotoxic activity of glyphosate and its technical formulation Roundup."

And this is from 1997. Do you see that?

A. Yes.

Q. And if we go to the sort of Figure 2 here and look at the data here talking about the SCE; do you see that?

A. Yes.

Q. What is SCE?

A. That's sister chromatid exchange. That's a test method used in vitro, that means in a test tube, to

measure DNA damage.

Q. And we have here the control group. Do you see that at the left side?

A. Yes.

Q. Okay. And then you see a sort of -- sort of trend increase related to as you increase the dose relative to the SCE; is that right?

A. Right.

Q. And then we have down here much smaller doses. Do you see that?

A. Yes.

Q. What is the significance of seeing this similar trend there as well?

A. Well, if you look at the caption underneath, you're dealing with glyphosate in box A and Roundup in box B.

Q. So what does this show you?

A. Again, a much higher potency.

Q. Of Roundup?

A. Yeah.

Q. And this is how many years old?

A. The study?

Q. Yeah.

A. Oh, it's dated way back to '97, yeah.

Q. So it's been in the public peer-review

literature since 1997?

A. Yes.

Q. Okay. And if you go to the conclusion of the study, it says right here -- it says down here:

> The higher activity of technical formulations in inducing toxic and genotoxic damage in different experimental systems suggests a role of the surface active agents and/or coformulants in the potentiation of the effects of the active ingredient.

Can you tell us what that means in English?

A. Well, the concern is the additive, the surfactant tallowamine, and other surfactants that have been used over the years such as cocoamine and many others that have been used in Roundup, that the scientists who published the study are concerned that there's a role in these additives in the product that make it much more potent.

Q. It says here:

> Considering the wide use of this herbicide for agricultural and nonagricultural uses, such as weed killing in water systems, parks, and gardens, the risk assessment process of commercial

technical formulation has to be considered of primary importance.

Do you see that?

A. Yeah, very strong warning, yes.

Q. And do you agree with these authors back from 1997 --

A. Yes.

Q. -- who studied Roundup?

A. Yes. I've reviewed materials dating back to that era and back at that time, yeah.

Q. Now, the jury saw yesterday an internal Monsanto expert's report that looked at this exact study by Dr. Parry. Have you had a chance to see that?

A. I'm very familiar with it, yes.

MR. WISNER: Permission to publish, Your Honor? Exhibit 37.

MR. EVANS: No objection.

THE COURT: Granted.

(Exhibit published.)

BY MR. WISNER:

Q. So this is the first study that was prepared by Dr. Parry. I don't want to go through it in too much detail. I want to get going to talk about the Pilliods.

But on page 8. So if we look here at the bottom of -- sorry -- page 11, and we're talking about

glyphosate and talking about bacteria and cytogenetics; do you see that? I have it on the screen.

A. Yeah. I was looking at something else. Okay.

Q. And you see he's making some recommendations here; do you see that?

A. Yes.

Q. All right. Go to the second page. He asks this question. It says:

> Assessment of the individual components of the Roundup mixture to determine whether there is any components which act synergistically to increase the potential genotoxicity of glyphosate.

Sir, that "synergistically" reference, is that a toxicological term?

A. Yes, it is.

Q. And that's what we're talking about here; is that right?

A. Exactly.

Q. And I guess my question is: After Dr. Bolognesi and the colleagues said we're going to study Roundup and after their own experts said we got to study the synergy, are you aware if Monsanto ever did that?

A. They have not.

Q. All right. I want -- we talked a little bit about absorption. We talked a little bit about metabolism with the A -- with the metabolite.

I want to talk a little bit about distribution because I think this is an important thing for us to focus on.

Have you studied what happens to glyphosate in the body after it has been absorbed?

A. I have.

Q. And have there been studies published about that?

A. Yes.

Q. I want to go through one of those studies, specifically a study by Dr. Brewster and colleagues, Exhibit 1433.

Do you have it in front of you, sir?

A. I do.

Q. And this is a study that you reviewed and discussed in your expert opinions and reports?

A. It is.

MR. WISNER: Your Honor, permission to publish?

MR. EVANS: No objection.

THE COURT: Granted.

(Exhibit published.)

BY MR. WISNER:

Q. So we're looking at here, it's an article. Let's start off at the top. As you can see here, sir, it's an article from 1991. Do you see that?

A. Yes.

Q. And it's entitled "Metabolism of glyphosate in Sprague-Dawley rats: Tissue distribution, identification, and quantitation of glyphosate-derived materials following a single oral dose."

What is this title telling us that this is about?

A. This is really an ADME study.

Q. And what are they doing here? What's the process they use?

A. Oral dosing the material as opposed to intravenous or dermal.

Q. And to who or what animals? How is it -- walk us through the process of how this experiment is done.

A. Yeah. Sprague-Dawley rats in groups are injected -- controls are injected with vehicle only, and other groups of rats are injected at various concentrations. I say injected. Fed various concentrations.

Q. So these animals, these rats are given a dose of glyphosate; is that right?

A. Yes.

Q. And then what happens after they're given that dose?

A. The radioactivity, in other words, the glyphosate is labeled, it's tagged with a radioactive tracer, a very low level but enough that an instrument can detect it. And when the animal is sacrificed -- and this is how I did my studies actually back in 1980s -- upon sacrifice the various tissues and organs are immediately removed. I actually dropped them in liquid nitrogen for immediate preservation. I don't know if they did that here.

But the tissues are then counted on a simulation counter for radioactivity. And one can then measure and know precisely how much glyphosate distributed to various parts of the body.

Q. So by looking at where the radioactive particles end up in the rat, you can figure out the distribution of glyphosate?

A. Yes.

Q. And that's distribution following oral consumption?

A. That's right.

Q. All right. So we go into the study. There's this table, and I want you to walk us through what this

table is showing. It says: Tissue to blood ratios of glyphosate-derived radioactivity at selected times after oral administration of 10 milligrams of glyphosate per kilogram of body weight.

Do you see that?

A. Yes.

Q. All right. So what is this chart showing us?

A. This is showing from two hours, six hours, a little over one day, and then three days, and then one week, seven days. In other words, 168 hours, that's seven days.

So this is showing in the groups of animals -- and this is very similar what I did with my postmortem studies, sacrificing and the time intervals and then letting them sit before harvesting.

But this is showing that the blood plasma, if you look at the values, decline over a week. The abdominal fat, not a lot of change because it's not a highly fat-soluble compound.

But what's striking is look at the bone. We go from 5 to 14 to 89 to 173 to 131, after 131 hours after administration.

So we are seeing some preferential distribution into the bone, into the bone marrow.

Q. And so what we see here -- I want to make sure

I fully get this. So we have at the beginning, so after two hours of eating the glyphosate dose, we have high concentrations in the small intestine; is that right?

A. Yes. And that's expected because that's where absorption is occurring.

Q. Because they eat it, they ate it?

A. Yeah.

Q. And then as we get through to the seven-week period, almost all of it is gone at that point; is that right?

A. Well, it's greatly reduced from 285 to 9. So, yeah.

Q. But we see it migrate from the small intestine to the bone; is that right?

A. Yeah. The bone is a preferential point of distribution. In fact, another study found that 1 percent of total dose goes to the bone.

Q. So when we talk about the exposure of an individual to glyphosate, does this study show that after approximately a week, the dose of your exposure kind of settles into the bone?

A. Yes, it does.

Q. And are you familiar with something called lymphoma?

A. Very much.

Q. Is lymphoma a cancer that starts in the bones?

A. Yeah. The stem cells are in the bone marrow. That's where the malignancy starts.

Q. Now the study here stops at seven days; right?

A. Yes.

Q. So we don't know what happened if they had looked at -- seen what the concentrations were 14 days out?

A. That's right. That's what I said early. I only have data from several studies out to seven days. So we really don't know what the persistence rate is. But it's significant to the Pilliods in that they were spraying on a weekly basis.

Q. And that's what I was going to get at. Every week they're getting a dose of glyphosate. Does this study indicate that the result of that dose was going into their bones?

A. Well, it's certainly going to the target area to cause lymphoma. There's no question.

Q. And so like, for example, Mr. Pilliod, you understand he had a systemic NHL; right?

A. Yes.

Q. You understand it materialized all over his bones?

A. Yeah, he had a diffuse B-cell, yeah.

Q. All right. I want to move on to another topic here. And it's more about absorption, but it's more specific to Roundup, okay. And I want to talk specifically about the actual absorption rate of Roundup into the body. All right?

A. Yes.

Q. I understand you've reviewed all the studies that have looked at that; is that right?

A. I have.

Q. And I believe there's a summary of those studies. It's Exhibit 3083 in your binder. Is that from your expert report?

A. It is.

MR. WISNER: Permission to publish?

MR. EVANS: No objection.

THE COURT: Granted.

(Exhibit published.)

BY MR. WISNER:

Q. So we have this chart here. And let's start off with -- why don't you tell the jury what this chart is reflecting.

A. This is reflecting studies that have been carried out primarily by Monsanto or their subcontractors to show the dermal absorption of glyphosate through the skin using either human cadaver

skin, rat skin, or primate, monkeys, or in vivo rats. In vivo means living rats.

And on the left axis is the percent absorbed. Remember I said that typically the agencies use -- historically have used about 3 percent dermal absorption. You can see on the left axis a 3.

And below is a time scale. Starting from the first dermal absorption study in 1983 by Franz. And then Maibach in '83, Wester in '91, TNO in 2002, and then a peculiar thing happens. Monsanto started using a lab called DTL in 2010. And all of a sudden, the dermal absorption has dropped to almost zero. And I find this scientifically puzzling and have researched the reasons why.

Q. Now I want to talk about how these dermal absorption studies are done. Are they sometimes done in living animals?

A. Yes. They're done in living animals. In this case what they're representing here and some -- in one or two examples, living rats and primates, monkeys.

Q. Now, those ones done at DTL, were those done on skin?

A. On?

Q. Just skin?

A. They were run on harvested skin from humans.

When I say harvested, either cadaver or from living humans who underwent, you know, breast reconstruction or some procedure where they had excess skin to remove and donate.

Q. I have two cups and a piece of paper. Can you help us use these things to illustrate how this study works?

A. I can, but I actually brought my own little piece of paper.

Q. Oh, okay. Perfect. I got two cups.

MR. WISNER: May I approach, Your Honor?

THE COURT: Yes.

THE WITNESS: Yeah, what you're asking me is how one measures dermal absorption. And that's done through a process called a Franz cell. You note that first study we talked about was by Franz.

Franz is a very well-known toxicologist who specializes only in dermal absorption. We call that, in toxicology, percutaneous absorption.

And what the Franz cell does is it takes a piece of skin and, in the DTL studies, human skin, and the way the Franz cell works is that you have a reservoir containing fluid. And that fluid is at physiologic pH, it's at the right strength, it's at 37-degrees Celsius, body temperature. And it even has a

stirring mechanism so it's moving, the fluid is kind of moving around. And then the skin membrane is placed over that cell. And on the other side is another cell that has the same fluid in it.

Now, in the one side, glyphosate is added. And in almost all these studies, just glyphosate, not Roundup. But in most of these studies, it's glyphosate. And it's usually used at one or two different concentrations.

And then over a period of hours, usually 12 to 24 hours, the liquid on the opposite side that doesn't have glyphosate is then removed after 12 or 24 hours or other time intervals and tested for glyphosate to see how much glyphosate moved through that skin membrane.

And these -- for example, the first study here by Franz showing 4 percent absorption used a -- well, I better check to make sure it's not the in vivo. I think that was the Franz cell study.

But that's how it works. That's how it's measured.

BY MR. WISNER:

Q. Okay. Now, using this example, I mean, how do you actually measure the transference? Do you just look at the other container or do you also look at the skin?

A. I'm not sure I understand.

Q. Sure. So in the example you have, you had the skin in between; right?

A. Right.

Q. When you're looking to see how much is absorbed, do you look at just what's in the other container or do you also look at the skin -- I don't know. I'm asking.

A. Oh, no, no. Yeah. What's measured under OECD regulations is how much fluid transferred, that's the flux, how much fluid is in the cup that didn't have any. And also how much remains in the epidermis.

And the way the skin is prepared from the human, the subdermal dermal area is removed so all you have is the epidermis. And that's how the studies are run. But the epidermis is also tested.

And a lot of these studies, what it is, they'll use a radio tracer glyphosate and measure the radioactivity that goes to the other cell. And also measure the tissue afterwards to see how -- and the tissue is washed, and the wash water is measured for any activity. So they wash the tissue.

But they also measure the tissue to see how much is stuck, basically forming that reservoir we talked about in the tissue.

Q. Now, looking at these studies here, I'm going

to talk to you in some detail about Maibach, Wester and TNO studies. But I want to quickly just address these DTL studies, a series of them starting in the late 2000s; do you see that?

A. I do.

Q. Did that laboratory do anything unique to the skin that they were testing?

A. Yes.

Q. What did they do?

A. Well, the protocol for many years under OECD has been to harvest the skin from a human or a cadaver and carefully maintain that under temperature control at 5 degrees Centigrade. That's refrigerator temperature. And then use that in the experiment with an affixed amount of time, usually five days.

And that's because then the skin -- and this has all been published by Wester actually as well in a publication. That skin remains what we call viable. There's still living cells in that skin.

And the skin structure and integrity of the skin has not changed too much since it was harvested.

But what DTL did, they basically baked and cooked and froze the skin before use. They heated it to 60 degrees Centigrade.

Q. You have to speak in Fahrenheit.

A. Okay. About 140 degrees Fahrenheit. And if any of you have ever poured, you know, an egg mixture, you take the yolk and you mix it with a -- and you pour it in a frying pan at 140, what happens?

Q. It cooks.

A. Yeah, it cooks. That's why I used the word "cook."

But then they take that membrane before they use it and they freeze it to minus 20 Centigrade.

Q. What's that in Fahrenheit? I have no idea.

A. I don't either.

Q. Okay.

A. I said it's below zero, way below zero.

But that is -- and I've looked at all of these detailed studies very carefully for any other change in protocol. That's the only protocol change I could find.

And then I did find a paper by Wester who's previously showed skin absorption through different models at anywhere from, you know, 2 to over 4.4 percent. The only explanation I could find for these detailed studies is the protocol change in terms of the handling of skin membrane.

Q. What happens to human skin when you cook and freeze it like that?

A. Well, it certainly alters the mortar that is

between the bricks in the epidermis and that keratin layer.

It also inactivates and kills the active enzymes. And also it changes what we call the configuration of protein. That's what you see when you cook an egg.

So, I mean, there are things that occur that -- and in the Wester study, it's ill-advised to use that technique. And it's interesting because Wester was actually at one point a consultant for Monsanto.

Q. Well, let's look at some of these studies pretty quickly.

Let's start with the Maibach study. Can you turn in your binder to Exhibit 27. Is that a fair and accurate copy of that study that you reviewed?

A. Yes, it is.

MR. WISNER: Your Honor, permission to publish? Exhibit 27 was entered into evidence early this week.

MR. EVANS: No objection.

(Exhibit published.)

BY MR. WISNER:

Q. All right. So we have here this Maibach study. It's from 1983. Do you see that?

A. Yes.

Q. And this was done at the University of California School of Medicine. Do you see that?

A. Yes.

Q. And it looks like the titles here are: "Elimination of C-glyphosate in Rhesus Monkeys Following a Single Dose." And then "Percutaneous Absorption of C-glyphosate in Roundup Formulation in Rhesus Monkeys Following a Single Topical Dose."

What is the distinction between these two titles?

A. Well, the difference -- and this is critical, I think, to understand -- is one set of monkeys were blasted with an IV intravenous dose of glyphosate. It was injected directly into their bloodstream. So the entire dose impacts the body instantaneously.

In the second group, it was more real world. It was putting a patch on the breast of the monkey that had a known amount of glyphosate on it and absorbed dermally through the skin, which as you saw in earlier documents here, it takes awhile to absorb. It absorbs slowly and steadily.

So the manner in which it was administered is very different in those two groups.

I do want to point out that this is a -- title number B there with the radioactive glyphosate through

dermal dosing is clearly the most reliable scientific methodology we can use outside of using a human. Primates are somewhat similar to humans, and this was dermally administered and it's a very real world result as opposed to injecting the monkey with the drug, or worse yet, using an artificial, you know, laboratory experiment.

So the study itself in that sense is highly credible.

Q. All right. Turn to the second page here. It says here:

> 25 microliters of the labeled Roundup formulation were spread over 7.9 square centimeters of the shaved abdomen of each of six male Rhesus monkeys.

Do you see that?

A. Yes.

Q. So was Roundup used in this, or just glyphosate?

A. It's my understanding it was a Roundup formulation. I don't know which formulation for sure, but, yes.

Q. All right. And then it says:

> Urine samples were collected at 4, 8, 12, 24, 36, and 48 hours post-application

and then processed and analyzed by liquid --

I wont even say those words.

A. Scintillation. I talked about that. It's how you count the radioactivity.

Q. Oh, got you. All right.

So how are they measuring absorption in these animals?

A. Simply by the amount appearing in the urine.

Q. Is that an accurate way of collecting all the absorbed dose?

A. No.

Q. Why is that?

A. Well, because some of it goes out in the feces.

Q. Now, you talked about how there's different routes of exposure in these studies, one is by injection and one is by dermal application; right?

A. Yes.

Q. How do those different forms of administration affect how it is excreted out of the animal?

A. Well, the principle in toxicology you have to be careful with regarding IV injection is that the blood level peaks within a few minutes to an extraordinarily high level. And in what we call zero order kinetics,

the liver can only process so many milligrams of material per hour. In other words, if I were to drink alcohol here in front of the Court and I drank one cup of wine versus five cups of wine, my liver is still only metabolizing at 112 milligrams per kilogram per hour. Okay.

So if I were to take that four cups of wine and drink it over 24 hours, my liver would be able to metabolize it and keep my blood level very low. If I were to drink it all four cups at once, I would overwhelm my liver, it can't process it that fast. And where would it go? It would have more spillover into the urine because it's water-soluble just like glyphosate. You'd see more going out into the bladder.

And so the dose method is critical in understanding what we're looking at. In this case, there was an assumption made that it's all going out in the urine even when you give it by IV as opposed to the dermal study.

So I'll let him ask a question. I don't want to ramble on.

Q. Now, if we go to -- into this document a little bit farther, it talks about the recovery rate. It says right here:

The total percent recovery (percent

label removed by washing plus total percent label contained in urine) was low, i.e., 16 percent.

Do you see that?

A. Yes.

Q. All right. What does "recovery rate" mean in these studies?

A. Well, when using the radio tracer, the amount of radio tracer used, if you had 100 percent recovery and you assumed correctly, which this is not correct, but if you assume it's all going out in the urine, you'd end up with all of that radioactivity back in the urine. Instead they only found 16 percent of it. So 84 percent of it was unaccounted for.

Q. Do you have a -- well, let's see what they say. It says right here:

> A definitive explanation for the low recovery is not provided in the report, but the author does state that previous experience would suggest that much of the test material may in some way bind to or in the skin and cannot be removed by washing. In support of this, it has been reported, (Vickers, 1963) that a "chemical reservoir" is formed in the skin after

drug application....

I'll stop right there. Do you see that?

A. I do.

Q. And so earlier today when we were talking about this chemical reservoir, I mean, is this where you're getting it from?

A. In part.

Q. Okay. Now it says at the end of that, it goes:

> ...which is eventually shed without penetration. Thus it is concluded that "the bound material is not apparently available for systemic absorption."

Do you see that?

A. Yes.

Q. Is that true? Well, actually, let me ask the first question: What does that mean?

A. Well, it's actually an assumption in this case. Assumption that it's not available for systemic absorption. Yet I mentioned earlier the Wester study of urine showing it coming out for seven days. So this was just an assumption that was written in the paper.

Q. And in that Brewster study that we looked at earlier, seven days later they found glyphosate in the bones; right?

A. Right. Right.

Q. Was that glyphosate excreted through the urine or feces?

A. No.

Q. All right. Well, let's quickly look at the Wester study, and I think after that will probably be a good time to take a break for lunch.

It's Exhibit 1445 in your binder.

Is that the Wester study?

A. I have my own copy. I don't have it in the binder.

Q. Oh, is it not in the binder?

A. 1445. No, but I have it.

THE COURT: There's no 1445 in the binder.

MR. WISNER: Yeah, because I put it in late. I have a copy right here. Sorry.

Permission to approach?

THE WITNESS: Wester from '91?

BY MR. WISNER:

Q. That's right.

A. I have it right here.

Q. It's Exhibit 1445, Wester from 1991. Is this a copy of the publication you reviewed?

A. Yes.

Q. Is that what was reflected in that chart

earlier?

A. Yes.

MR. WISNER: Permission to publish?

MR. EVANS: No objection.

THE COURT: Granted.

(Exhibit published.)

BY MR. WISNER:

Q. So we have this study, and it has a couple of people on it, Dr. Wester; do you see that?

A. Yes.

Q. It has Dr. Maibach.

A. That's right, from the study we just looked at.

Q. And this is from 1990; is that right?

A. 1991.

Q. It looks like it was accepted in December.

A. That's true, it was accepted in '90.

Q. Okay. And so who commissioned this study?

A. I believe it was commissioned by Monsanto.

Q. Okay.

A. Let me just check the comment.

Well, you know, it doesn't say. I'm not sure.

Q. All right, fair enough.

The last one, the Maibach study, was that commissioned by Monsanto?

A. Yes.

Q. All right. So as we go into this, I just want to go straight to this sort of picture here. Is this a diagram of how they applied it to monkeys?

A. It is.

Q. And what are we seeing here?

A. These are measured known areas containing a specific amount of glyphosate per square centimeter. And this was done with apes. And monkeys had two different doses. One which was very realistic of that that an applicator would have on their skin, and the higher dose was more consistent with if someone spilled the pure product on their skin.

Q. Did they also measure injection versus dermal?

A. Yeah, they did it two ways. They did dermal like we see here. They also did injection.

Q. So let's look at the results of that study. I believe it's Table 4.

A. Yeah, it is.

Q. Okay. And what are we seeing here in this table, Doctor?

A. Well, dose C, those animals were injected at a very high dose of 5,400 microgram per 20 centimeters square. That's a dose, as I say, more consistent with spilling the jug of material directly on the skin as

opposed to diluting it with water and then spraying it.

Dose D is similar to if you diluted the product and then, you know, sprayed it and had it on your skin.

And what we're seeing here is the percent of the applied dose that made it through the skin. If we look at dose D, which is that of an applicator, we see that the urine was .8 percent and the feces was 3.6 percent which totals 4.4 percent total.

Surface washes, that means after the study was done they washed the surface of that area where the patches were placed. And 77 percent of it washed off that had not been absorbed. And the contaminated solids is this material that could be accounted for in the study, and it totaled 81.8 percent.

So they didn't reach 100 percent. They couldn't account for 100 percent. And the OECD policy is in these studies ideally you want to be plus or minus 10 percent. You know, recover 90 percent or everyone 110 percent. But they're at 81.8 percent, a little bit shy. But you have to remember that there is a reservoir, there is glyphosate that remains in the epidermis that cannot be accounted for that doesn't wash off.

Q. And that's a reservoir that would just

continue to deliver dose even after this study?

A. That's correct. But, you know, the bottom line with this study, it was conducted on primates at realistic doses, real world doses through the skin. And the primates, the best we can do out -- you know, doing this with a human which would be unacceptable, and in fact, there's concern that this is not even a good procedure for a monkey. But the bottom line is you had 4.4 percent dermal absorption at the real world dose.

Q. So I guess my question here is .8 in urine, .36 in feces, does that suggest to you that when you excrete glyphosate as you would actually experience it in the real world, that it primarily comes out through the feces?

A. Yeah. And you can see the inverse. In the IV dose, there 2.2 percent came out in the urine -- not the -- no, that wasn't IV, that was the high dose, I'm sorry. But we do have another study that shows the inverse with the IV.

Q. Okay.

A. But we see with the high dose it was 2.2, .7, 2.9 percent total.

Q. So here's my question. They only recover 81 percent of the dose; is that right?

A. 81.8, yes. They're a little shy of the

90 percent.

Q. Under OECD, guidelines what do you assume about the missing dose?

A. Well, the OECD guidelines, I've cited them exactly in my report and I'm going to cite them right now, that the wording is: Unless there is an absolutely clear, definitive proof that it's not bound in the skin, that the unaccounted-for must be added to the dermal dose. And there is no absolute, you know, proof that the skin doesn't retain it. On the contrary, the studies show that the skin does retain bound glyphosate.

So if you take the 4.4 and you add the unaccounted-for, now we're above 20 percent dermal absorption.

Q. Now --

A. However, that was not accounted for in that manner. In fact, in this study, what's amazing is when we look at the conclusion, they report that the absorption was only what was reported in the urine, which we see in the paragraph that's highlighted it says:

> However the percutaneous absorption of glyphosate to the Rhesus monkey is low, .8 to 2.2 percent.
>
> Well, they ignored the feces.

Q. And I guess my question to you, and after this question we can take a break for lunch, but in any of the literature that you've seen presented by Monsanto, whether it be in a label or even in the academic scientific literature, this absorption rate of 20 percent or even the chemical reservoir issue, has that ever been disclosed publicly?

A. I've seen it in the Monsanto document.

Q. I'm talking about publicly, outside of the litigation, in the real world?

A. No.

MR. WISNER: Good time for a break, Your Honor.

THE COURT: All right. We're going to take our break, ladies and gentlemen. We're going to have our lunch. It's going to be 45 minutes today. And we're going to resume at quarter of the hour. Thank you.

(Luncheon recess was taken at 12:01 p.m.)

AFTERNOON SESSION 12:52 p.m.

(The following proceedings were heard out of the presence of the jury:)

THE COURT: You have an issue?

MR. BROWN: Yes, Your Honor. I apologize. I would like the witness to be outside the courtroom while

we discuss this.

THE COURT: Okay. If you wouldn't mind, Dr. Sawyer, stepping out of the courtroom for a minute.

MR. BROWN: Your Honor, this morning we were discussing the issue of the witness having been retained by another lawyer, law office in another related matter. And that has nothing -- as I said this morning, absolutely nothing to do with this case, and the witness should be absolutely precluded from mentioning that retention at all.

Now --

THE COURT: I thought that was clear, this wasn't coming up.

MR. BROWN: But now, Your Honor, one of the issues that is coming up is because the witness is not a board-certified toxicologist. And we should be able to discuss that with him in front of the jury.

THE COURT: Okay.

MR. BROWN: And not be fettered by the fact that he was retained, at some point, in a case that was totally different from what we're presented with here.

And if it comes up, there's some ambiguity about whether it should come in or not. It doesn't matter. We should be able to, in this case, before this jury, challenge his qualifications based on the state of

the record as it stands in this matter.

And if we're not able to do that, then we're really prevented from fully examining this witness and exploring his credentials here.

THE COURT: Well, I thought I was pretty clear that unless there was some direct link, which I can't imagine, because your firm's business, in my view, has nothing to do with this case.

So I'm not sure if your point is that they're claiming he's not a board-certified toxicologist, that you would be able to say --

MR. WISNER: It's actually more complicated than that.

THE COURT: I actually have thought about this. It's not coming in. His firm's business has nothing to do with this case, nothing. It just doesn't.

MR. WISNER: Respectfully, Your Honor, if they're going to attack him for not being an expert, and he has hired him --

THE COURT: That's none of your business. You don't know on what terms. You have no idea on what terms they've hired him. And it's nobody's business what they are -- because it's his firm or his partner's firm's business, and it has nothing to do with this case.

So it's not coming in. The more I thought about it, it's just not related. You can't make Mr. Brown the issue.

If Monsanto had hired him in some capacity, we could have a conversation. But it's Monsanto's -- has hired a lawyer whose firm, not related to even this lawyer, hired Dr. Sawyer under circumstances you know nothing about. And an attempt to use that is not relevant, and I think it would be very prejudicial.

Be even if you knew the circumstances, it just wouldn't be related.

MR. WISNER: Fair enough. I'll just say for the record that the facts you're assuming aren't true. So this person isn't unrelated to Monsanto's relationship to that law firm. This guy is involved with Monsanto. That's my understanding.

Secondly, it was specifically about his ability to be a toxicologist and testify about the very issues he's testified about here today. That was what he was hired to do.

So it's fine. I understand it's not coming in. It won't come in. But I think this idea that it's not appropriate --

THE COURT: Well, let me just say this: I'm assuming, at least based on Mr. Brown's representations,

that he was obtained in a case that had nothing to do with Monsanto.

MR. BROWN: That's absolutely right, Your Honor. And the partner in the office that had that case doesn't even know Monsanto, has never spoken to anybody at Monsanto, and knows nothing about this case, period.

So I don't know what Counsel is referring to, because it's inaccurate.

MR. WISNER: We're debating hypothetical facts now. I have a different factual basis of my understanding. I don't really care. I understand Your Honor's concern.

I do think that it's a bit disingenuous for attorneys to suggest that Dr. Sawyer is somehow unqualified to testify when those very attorneys have hired him to do that testimony.

But if Your Honor says it's irrelevant, that's fine. I just have to tell him it doesn't come in no matter what. In case there's any ambiguity, I'll make sure he knows.

MR. BROWN: I just want to make sure there's no ambiguity in it. I'll say again for the record: I did not retain Dr. Sawyer for anything, at any time, at any place.

MR. WISNER: I can't even tell you how many times Monsanto's counsel has used my firm's websites against me.

THE COURT: You know what --

MR. WISNER: They use statements made by lawyers against me all the time. I don't care.

THE COURT: That's for another time.

First of all, lower the temperature. And two, we're just talking about one thing.

MR. WISNER: Fair enough, Your Honor. The problem is, they send out these categorical statements. It's another lawyer in the law firm, I have nothing to do with it. And they use the exact same arguments to personally attack me, both in the media and in courtrooms. That's why I get heated about it, because it's so disingenuous.

THE COURT: That's why I have to say this. Because in litigating all the Roundup cases, all the litigation is here because there's history. It's something that's not appropriate. I'm not part of it. I'm just presiding over one case.

MR. WISNER: Sure.

THE COURT: And my single decision about the one incident in one case is that it's just not relevant to Dr. Sawyer's testimony and expertise in this case.

So we're just going to leave it at that.

MR. WISNER: We're good, Your Honor. We're good.

THE COURT: Let's bring the jury out. Thank you.

(The following proceedings were heard in the presence of the jury:)

THE COURT: Ladies and gentlemen, we're going to continue with Dr. Sawyer.

Mr. Wisner?

MR. WISNER: Thank you, Your Honor.

BY MR. WISNER:

Q. Hi. Did you have a good lunch?

A. Very good.

Q. All right. Just before the break, we were talking about the Wester study.

Do you recall that?

A. Yes.

Q. And I want to discuss a couple of comments and technical terms in some of the documents that are already in evidence.

The first one I want to look at is Exhibit 25 in your binder.

This is an email exchange within Monsanto, correct?

A. Right.

Q. And this is a document you reviewed and discuss in your report?

A. It is.

MR. WISNER: Your Honor, admission to publish Exhibit 25? It is already in evidence.

MR. EVANS: No objection.

BY MR. WISNER:

Q. All right. I want to talk about this email. It's dated February 7th, 2003.

Do you see that, sir?

A. Yes.

Q. And in the email, it's from somebody named Fabrice Broeckaert.

Are you familiar with Dr. Fabrice?

A. Somewhat.

Q. You've seen him in internal documents before?

A. Oh, yes.

Q. So it says here that the subject line is what, sir?

A. I'm sorry, I couldn't hear.

Q. What's the subject line?

A. Subject line is "Dose Absorption."

Q. Okay. It says:

"98 percent of the absorbed dose originates

from field application, and so the impact will be negligible. The work of Wester showed 2.2 plus or minus 1.5 percent in vivo with the concentrated formula, and a max of 2.2 plus or minus .5 percent in vitro with the spray dilution."

Are those numbers the ones we discussed in the Wester study?

A. Yes.

Q. Is that the one that does not include the feces?

A. Correct.

Q. So it's just the urine excretion?

A. That's right.

Q. It says:

"I suppose that's the reason why a derm pen value of less than 3 percent was selected."

What is a derm pen value?

A. That is a regulatory value for dermal absorption.

Q. And how is that used in a regulatory context?

A. In calculating the dose.

Q. It says:

"We should remember that Wester excluded the presence of glyphosate in the skin due to the

absence of partition of glyphosate with the stratum corneum."

What does that mean?

A. It means they're assuming that there is no -- they're assuming that it remains bound permanently.

Q. In the skin?

A. Yeah.

Q. All right. And it says:

"By contrast, from the Franz study, a large amount of glyphosate was detected in the epidermis, between .5 and 5 percent. And as we know now, 5 to 20 percent of the dose of glyphosate could be stored in the skin."

Do you see that?

A. Yes.

Q. Is that consistent with what we were discussing earlier today, specifically as it relates to the dermal reservoir?

A. Yes.

Q. I want to show another document that relates directly to the Wester study. It's also in evidence. It's Exhibit 37 in your binder.

A. Oh, yes.

Q. Sorry, Exhibit 34 in your binder.

A. Yes.

Q. Are you familiar with this email, sir?

A. I am.

Q. Is it one that you discuss in your report?

A. Yes.

MR. WISNER: Permission to publish, Your Honor?

MR. EVANS: No objection.

THE COURT: Granted.

BY MR. WISNER:

Q. So this is an email exchange. And before I go into it, I want to ask you a very specific question.

Has Monsanto, since Wester, done any dermal absorption study in primates?

A. No.

Q. And we're talking about monkeys here?

A. Right.

Q. Let's start off with the origins of this. We have this email, and on it is Dr. Saltmiras, Dr. Farmer, and others.

Do you see that?

A. Yeah, I do. Yeah. Basically, the top toxicologists at Monsanto in this email, two of them.

Q. And then we have "PK recovery."

What does that refer to?

A. That has to do with the amount of total

radioactivity that was recovered in the study.

Remember, we want to get 100 percent, and they had 82 percent. In one study, they only had 16 percent. So it has to do with the recovery.

Q. It goes on to say:

"Our dermal absorption end point is based on the literature, and as I recall, we failed to get the original data to support the results. The movement of glyphosate in the blood flow from dermal contact is different to that through oral or intravenous exposure. The little data we have suggests that the excretion is significantly more through the feces than the urine."

Do you see that?

A. Yes. That's what the studies documented.

Q. Would you agree with this email that is actually sent -- the earlier page here -- from Richard Garnett.

Do you see that?

A. Yes.

Q. So this statement here that you get more excretion through the feces than the urine, that's what we've been showing the jury all morning?

A. Correct.

Q. It goes on to say:

"Dermal exposure is the greatest risk of exposure to operators. Therefore, we need to be secure on the ADME of such exposure."

Do you agree that dermal exposure is the greatest risk for people applying Roundup?

A. Absolutely.

Q. Why?

A. People don't drink it, they don't shoot it through an IV. It doesn't get in in any significant amounts through any other -- well, there is inhalation of the aerosol, and that's well-documented in studies, but not to the same degree as dermal. Dermal is the predominant route.

Q. So in the response email here, it says:

"To fully address this issue would likely require a repeat of the monkey dermal and intravenous studies."

Is that referring to the Wester study?

A. Yes, it is.

Q. Okay.

"We no longer own the custom-designed monkey chairs that prevented exfoliated abdominal skin from contaminating the excreta."

I want to bring up an issue. One of the

criticisms that's been raised against your opinion that it's mostly excreted through the feces is that, in these monkey studies, the animals will touch the stuff on the exposed skin and eat it.

Are you aware of that criticism?

A. Yes.

Q. Is that a valid criticism?

A. No. The methodology, when you actually read what Monsanto did in the experiment, they had a breastplate on the animal. And they had the animal restrained. And so that assumption is nothing more than a dumb excuse.

Q. Okay.

MR. EVANS: Your Honor, move to strike.

THE COURT: Stricken.

MR. WISNER: Fair enough.

BY MR. WISNER:

Q. I guess my question is more -- I don't want you to comment on Monsanto's feeling, okay?

A. I'm sorry.

Q. We'll let the jury figure that out, okay?

A. Certainly.

Q. What I want to focus on is the facts.

MR. EVANS: Move to strike, Your Honor.

THE COURT: Overruled.

Eliminate the colloquy altogether.

MR. WISNER: Okay.

THE COURT: Thanks.

BY MR. WISNER:

Q. It says right here that:

"It prevented exfoliated abdominal skin from contaminating the excreta."

What does that mean?

A. That there would be no cross-contamination.

Q. Can you explain that.

A. Well, for example, if material from the original application and the gauze pads were to fall into the fecal collection pan, or if hands were to remove the shield, the breastplate, and touch and then touch other things. That's all.

Q. Have you done research into what these monkey chairs are?

A. Well, I was trained years ago in terms of the various modes of animal studies. I always used mice and rats. I never used primates. I wouldn't do that.

But there's a standard protocol. It's actually well-documented by regulators, in terms of how to position the monkey to collect feces for 24 hours, and how to prevent cross-contamination with dermal absorption pads and so on. It's all part of the GLP and

OECD regulations.

Q. I understand that in your report, you actually include some photographs of these monkey chairs.

Is that right?

A. Exactly. So we can understand how such a preposterous assertion could not be -- the chairs actually show how they're restrained and what holds them in place and how the breastplate is protective and that kind of thing.

Q. So they can't, like, scratch it?

A. Exactly.

Q. The photographs in your report, are they on page 3075?

A. Yes.

MR. WISNER: Your Honor, permission to publish?

MR. EVANS: No objection.

THE COURT: Granted.

BY MR. WISNER:

Q. These are the photographs that show this. Let's show the top part first.

As we can see here, there's this plastic part around the monkey.

Do you see that?

A. Yes.

Q. What is that plastic part?

A. Breastplate.

Q. And how does that affect whether or not they're scratching it or not?

A. Well, they can't get in.

Q. Okay. And then we have the primate chairs here.

Are these the sort of example of what those look like?

A. Yes.

Q. Okay. Down here at the bottom part, there's a collection bin.

Do you see that?

A. Yes.

Q. What is that for?

A. That is for urine.

Q. And is that where they go and look for whether or not there's glyphosate being excreted?

A. Yeah.

Q. Let's go back to Exhibit 34.

In Exhibit 34, it states right here:

"Furthermore, it is not clear that such a study is necessary and would be totally without risk. Should we arrange a conference call to discuss this?"

Do you see that?

A. Yes.

Q. Look at the email response. It states here -- this is what I wanted to ask you about, because I would like to hear your opinion on it.

It says:

"The outcome was that the animal data confirmed the Wester findings, such a study would be too risky, potential for finding another mammalian metabolite."

That's what I wanted to ask you about.

What is a mammalian metabolite?

A. When animals are studied, we generally have rat, hamster, mouse, and then we have primates. Typically, that would be a monkey. And rabbits are also studied.

Rabbits and guinea pigs have very different metabolic pathways in some cases. In some ways, guinea pig is more similar to man, but rabbits are different. It has to do with the kind of substances they consume. Humans are omnivore; we eat anything. Bunny rabbits, they don't eat any meat. I guess you would call them vegans. And so because of these differences in species, different metabolites can be formed.

So if you only studied rats, there could be a

metabolite that would not show up in the rat. It might show up in a guinea pig. Or it might show up in a primate, most likely, because the primate has the closest metabolic pathways to the human.

So from a scientific standpoint, what this is getting at is that the mammalian study, the monkey study, might actually discover a new metabolite. And metabolites can be harmless, or they can be carcinogenic or toxic. We don't know.

Q. Well, we know about one metabolite to glyphosate, right?

A. Yes.

Q. ADME?

A. That's all we know. And that's largely from rodent studies. So we don't know for sure what all the metabolites are. No one knows, because the studies weren't run.

Q. Well, we haven't been exposing humans to it and seeing what's in their blood, right?

A. No. There's been no human experimental studies. That would be unethical.

Q. Now, the metabolite ADME, we saw that earlier.

Is that the one that was common to glyphosate, regarding genotoxicity?

A. Yes.

Q. This is the chart we were looking at earlier -- I'm sorry.

The metabolite -- it's not ADME, it's AMPA?

A. Right.

Q. Okay, thanks.

So we were talking about this. We've talked already about these studies that had the cooked skin.

Do you recall that?

A. Yes.

Q. And we talked about these studies already, right?

A. Right.

Q. I want to talk briefly about the TNO study.

A. Okay.

Q. What does the TNO study show?

A. The TNO study is very interesting. It revealed a statistically and significantly higher rate of dermal absorption when actual Roundup was used as opposed to just pure glyphosate.

And in this graphic, that 10 percent levels, because they use pure Roundup. And for the very reasons I talked about this morning, in terms of enhancing dermal absorption, there it is.

Q. Was that study completed?

A. It was terminated.

Q. And that was terminated after they had the results showing what?

A. 10 percent dermal absorption.

Q. And would that -- give me some context.

How does that compare to the dermal absorption rates that have sort of been informing the toxicology before that?

A. Well, it would be more than -- it would be 3.3 times the governmental limit.

Q. Now, this TNO study that was terminated after they saw this 10 percent absorption rate, was it ever published in the literature?

A. I get my studies mixed up.

No.

Q. All right. I guess, when we talk about it being terminated, who terminated the study?

A. Monsanto.

Q. All right. Let's move on to another study called the Farm Family Exposure Study.

Are you familiar with that study?

A. Yes.

MR. EVANS: Your Honor, I need to approach on that.

THE COURT: You need to approach?

MR. EVANS: Yeah. Sidebar, please.

THE COURT: Okay.

(Sidebar discussion not reported.)

BY MR. WISNER:

Q. Dr. Sawyer, we talked about that 3 percent dose calculation -- dermal absorption rate.

Do you remember talking about that?

A. Yes.

Q. To be clear, it's not a limit set by government; it's just a number that has been used --

A. It's the number that has been agreed upon by the regulatory agencies.

Q. Okay. So it's not a limit --

A. No, not a limit. That's not the right word.

Q. The Farm Family Exposure Study, if you look in your binder at Exhibit 1582, is that a copy of that study?

A. Yes.

Q. Is this a document and study you relied upon in forming your opinions in this case?

A. Yes.

MR. WISNER: Permission to publish, Your Honor?

MR. EVANS: No objection.

THE COURT: Granted.

///

BY MR. WISNER:

Q. So this is a study:

"Glyphosate biomonitoring for farmers and their families. Results from the Farm Family Exposure Study."

Do you see that?

A. Yes.

Q. We have someone here by the name of John Acquavella.

Do you see that?

A. Yes.

Q. It says he's from Monsanto?

A. Yes.

Q. Is it your understanding that this is a Monsanto study?

A. Yes.

Q. What did this study involve?

A. Testing the urine from farmers and family members for glyphosate. And that's under the assumption that 100 percent of it comes out in urine.

Q. Did they measure feces?

A. No.

Q. Did they check to see if there were any dermal reservoirs in their skin?

A. No.

Q. So they just went and saw a certain number of families spraying it, and they checked to see how much glyphosate was in their urine.

Is that right?

A. Yes. They also administered a questionnaire, basic questionnaire.

Q. All right.

A. Yeah.

Q. Now, the -- how many -- all right.

This study, sir -- well, let me just ask you a quick question: Were the farmers who were spraying this spraying it with -- you know, as we discussed this morning, with the Roundup in the short little thing?

A. No. This was an applicator study. When I say "applicator," farm applicator. Big booms, tractors. Sometimes open cab, closed cab, and they distinguished that in the studies.

Q. Is the rate of exposure of a farmer applying glyphosate in the context of an enclosed cab different than someone out spraying it in their backyard?

A. Yeah. The equivalency, based on a published table by Monsanto, for example, six hours in a tractor application with gloves is approximately twice the dose that a home applicator would receive in one hour.

Q. Oh.

A. So, I mean, there are some similarities. Because the home applicator is getting an intense exposure for a short period, while the applicator in the tractor requires more hours of application to get a near-equivalent exposure.

Q. So if it's one hour to six, it would be fair to say about a one to six ratio?

A. Roughly. I have a table that shows it more precisely.

Q. That's okay. We don't have to get into it in too much detail, but I did want to point out something that was in this study.

Before I do that, will you verify for the jury what year this was published?

A. March 2004.

Q. If you go to the final conclusion of this study, it says:

"The results of our analysis suggest that modifying specific practices should be effective in minimizing glyphosate exposures for farmers, spouses, and their children. For farmers, the use of rubber gloves when mixing and loading pesticides or when repairing equipment was associated with measurably reduced urinary concentrations."

Do you see that?

A. Yes.

Q. Is it your understanding that the use of something like rubber gloves reduces one's exposure?

A. Oh, yeah. During mixing, that is one of the key components to reducing exposure.

Q. And is that one of the reasons why farmer exposure levels are significantly different than home and garden users?

A. Yes.

MR. EVANS: Objection. Speculation, Your Honor.

THE COURT: Overruled.

BY MR. WISNER:

Q. Well, sir, I don't want to spend too much time on all of this, but I want to ask you some questions about the labels for glyphosate.

If you look at Exhibit 854 in your binder.

Is that a label for Roundup from 1978?

A. It is.

MR. WISNER: Permission to publish, Your Honor?

MR. EVANS: My understanding is that the Pilliods didn't start using the product until 1982, so just some more foundation with respect to that.

THE COURT: With respect to the label, did we agree there was a period of use?

MR. WISNER: I thought it was by the end of use. I can lay some foundation, Your Honor.

THE COURT: Go ahead.

BY MR. WISNER:

Q. Dr. Sawyer, to the best of your understanding, is the label that you're looking at essentially the same label that was in use in 1982, when the Pilliods started spraying?

A. Yes.

MR. WISNER: Permission to publish?

MR. EVANS: No objection.

THE COURT: Granted.

BY MR. WISNER:

Q. All right. So we're looking here at the Roundup label. A little hard to read.

You see here that it says: "Date, 1978."

Do you see that, sir?

A. Yes.

Q. All right. So we look at the Roundup label here.

Can you read it, or is it too small?

A. Oh, no, I can read it.

Q. I want to look at the precautionary statements

section very quickly.

It says:

"Hazard to humans and domestic animals.

Warning: Keep out of reach of children.

Causes eye irritation. Harmful if swallowed.

Do not get in eyes, on skin, or on clothing.

First aid: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician. Flush skin with water. Wash clothing before reuse."

Do you see that?

A. Yes.

Q. Does it say anything about gloves?

A. No.

Q. And have you reviewed the labels as they existed through when Mr. Pilliod stopped spraying Roundup?

A. Yes.

Q. Specifically for lawn and garden?

A. Correct.

Q. Has Monsanto ever told lawn and garden users to wear gloves?

A. No.

Q. And if we look here, I'm looking through this.

Do you see anything about immediately washing

your hands after use?

A. No.

Q. Does it say anything about a dermal reservoir?

A. No.

Q. About genotoxicity?

A. No.

Q. Does it say anything about cancer?

A. No.

Q. And then we'll go through more of the labels with the Pilliods later. I don't want to go through them all now, I just wanted to set the foundation here.

I want to look at an exhibit you relied upon. Look at Exhibit 26 in your binder.

Sir, are you familiar with this document?

A. I'm sorry?

Q. Are you familiar with this document?

A. Yes.

Q. It's one that you relied upon?

A. Yes.

MR. WISNER: Your Honor, permission to publish? It's already in evidence.

MR. EVANS: No objection.

THE COURT: Granted.

BY MR. WISNER:

Q. Okay. So we have here an email, and there's

an attachment.

Do you see that, sir?

A. Yes.

Q. And this is from 2002; is that right?

A. That's correct.

Q. So here is a document on operator exposure for MON 2139, an Excel sheet with calculations I made.

In this document, the exposure was first estimated using the UK POEM model in UK conditions.

What is the POEM model?

A. That's the predictive operator exposure model. It was designed specifically to determine the internal dose of pesticides or herbicides in the body.

Monsanto adopted and used this model for many years in determining whether their product met specifications.

Q. Now, if we turn to the next page, we actually have what appears to be that operator exposure assessment.

Do you see that?

A. Yes.

Q. And when we see here it says MON2139, what is that referring to?

A. That's the specific Roundup formulation. There are many different MON numbers.

And Monsanto does not provide on the label what all of the ingredients are; they're marked trade secrets. So we don't really know what all the ingredients are in MON2139.

Q. If we look back here, in the summary, it says: "The purpose of this document is to evaluate the operator exposure when spraying Roundup under UK conditions. First, exposure was estimated using the UK POEM model considering worst case situations, low spray volumes, high dose. Exposure was calculated for three different types of applicator: Tractor-mounted with cab, handheld equipment with hydraulic nozzles, and handheld equipment with rotary disk atomizer."

Do you see that?

A. Yes.

Q. In your opinion, in these three different possible ways of spraying, which one is the closet to what the Pilliods experienced?

A. They used the hydraulic nozzle.

Q. Okay.

"Secondly, exposure field studies related to handheld application of glyphosate were reviewed and summarized. Measured exposure

values were normalized in milliliters per hours sprayed in order to be compared to the UK-POEM default values. Finally, several actions are proposed to refine the exposure assessment."

Do you see that?

A. Yes.

Q. And if we look down here, there's a table describing -- what is this describing, sir?

A. The spray volume and dose for different types of applicators. Tractor-mounted, backpack, or a CDA.

And that's what I described earlier, a control disk atomizer that releases a fairly uniform droplet size to decrease the amount of drift and overspray.

Q. I'm going to come back to that in a second. I want to go to the second one, which talked about the hydraulic sprayer.

Do you recall that, sir?

A. Yes.

Q. And it has here a diagram.

What is this diagram showing?

A. It's showing the spray head nozzle located next to the operator.

Q. So they're talking about the distance between these two; is that right?

A. Yeah.

Q. All right. Walk me through a little bit of how the study was actually done.

A. Well, the measurements were based on where the spray head was, relative to where the person was standing. And then how many feet up and how many feet horizontally.

Q. So if -- so when we talk about this sort of hydraulic nozzle here, right, this is, I guess, sort of comparable to having its, like, feet right there and the spray head over there?

A. Yes.

Q. All right. And when they measured this exposure and people operating, spraying Roundup, did they come up with any recommendations for the label?

A. Yes.

Q. Let's take a look at those.

MON2139 label recommendations:

"Wear suitable protective gloves and face protection, face shield, when handling or applying the concentrate."

Do you see that?

A. Yes.

Q. And have you reviewed the labels? We already established that.

In any of the labels that you reviewed prior to the time that Mr. Pilliod stopped spraying, does it ever say to wear protective gloves or face protection?

A. No.

Q. It says:

"Wear suitable protective clothing, coveralls, suitable protective gloves, rubber boots, and face protection, face shield and dust mask, when spraying through ultra-low-volume application and mist blower equipment."

Do you see that?

A. Correct.

Q. What is a coverall?

A. A second layer of garment, usually impermeable, to keep the legs dry, free of any drift.

Q. It says to wear suitable protective gloves --

A. Let me finish.

When I say "drift," a commonly forgotten problem is that when spraying, the lower legs -- depending how high the weeds are, rub against the legs. And whatever wet material is on that leaf ends up on the applicator's leg. That's the reason for having a semi-permeable or at least a second layer of protection on the legs. In other words, coveralls or at least frontal covers.

Q. And it talks about protective gloves, rubber boots, and face protection, a face shield and dust mask.

What is a dust mask?

A. A dust mask is unable to take out HEPA particulate, but it could capture aerosol droplets that would absorb in the mask.

And in this case, we're not dealing with fine dust or noxious submissions or gases. We're dealing with an aerosol, so a dust mask would capture that.

Q. It says:

"When spraying through ultra-low-volume application and mist blower equipment."

Is that comparable to what comes out of one of these machines?

A. Mist equipment, no.

Q. Okay.

A. However, the ultra-low-volume application is exactly what we're dealing with. We're dealing with a -- especially with the premanufactured unit there, that's a very low-volume applicator.

Q. To the best of your knowledge, all these warnings about coveralls, gloves, boots, face protection, is it on there?

A. No.

Q. It says:

"Wear suitable protective clothing, waterproof jacket, and trousers."

I'll stop right there.

What is a waterproof jacket and trousers?

A. Liquid-impermeable.

Q. And it says:

"Suitable protective gloves and rubber boots when using low-volume nozzles in knapsack sprayer, handheld rotary CDA sprayers, and handheld weed wiper equipment."

Do you see that?

A. Yes. And a CDA sprayer is a safer sprayer than what you have on your bench.

Q. And Doctor, in your opinion, as one who has been studying this for a while, would taking these sort of precautions, would that reduce a person's exposure when spraying Roundup?

A. Yes. There have been passive dose symmetry studies published that have demonstrated this.

Q. I understand you've had a chance to talk with the Pilliods and explore their usage, right?

A. I'm sorry?

Q. You've had a chance to explore the Pilliods' usage, right?

A. I interviewed them by phone, at least once.

Q. And I guess I want to talk about the Pilliods for a minute. Let's start off with Mrs. Pilliod, okay?

Have you evaluated whether or not the Pilliods -- Mrs. Pilliod's exposure to Roundup was of a sufficient amount to cause her NHL?

A. Yes. I gathered the information from their deposition testimony, and also by direct phone interview.

I ascertained the information to calculate the number of days used for direct comparison to the peer-reviewed study by McDuffie and Eriksson, as well as the Agricultural Health Study, which lists what we call quartiles of exposure. In other words, the lowest 25 percent, the 25 to 50, the 50 to 75, and the 75 to 100 percent.

And I compared their days of exposure to those three studies to determine whether they were in reasonable range of that -- of those who were studied in the human epidemiology database that showed an increased risk of non-Hodgkin's lymphoma.

Q. Now, that raises an issue that I actually want to talk to you about before we get into the Pilliods much further.

There's been some discussion about the dose level used in rodent studies and how that compares to

human exposures.

Are you familiar with that concept?

A. Absolutely.

Q. Putting that aside, has there actually been a dermal rodent study that looked at Roundup?

A. No. It's never been done. It's only been done on glyphosate.

Q. Are you familiar with the George study?

A. Yes.

Q. That was a different type of study.

Is that right?

A. Yes.

Q. What kind of study was the George study?

A. The George study was performed on a large group of mice. In fact, Swiss albino mice, I believe.

Q. What?

A. Swiss albino mice.

Q. What did the study -- what was it doing?

A. Well, I used that study not to determine whether glyphosate is a carcinogenic; I looked at the aspects of that study that were designed to determine whether glyphosate versus Roundup can promote cancer.

In other words, if you shave a mouse, as they did in that study, and you treat that mouse on the skin with 7,12-DMBA -- that's

7,12-dimethyl-benzo[a]anthracene, a very powerful, well-known carcinogen. That's what's in cigarette smoke. In fact, it's the most powerful carcinogen in cigarette smoke, and it's barred from cigarettes.

So take the mouse skin, and a known dose was applied to the skin of 20 mice. A vehicle was also used, and there was control group and so on.

But when they used a low dose of benzo[a]anthracene, a low enough dose that over the period of weeks studied, none of those 20 mice developed skin cancer; it was zero out of 20 animals.

And then what they did, which I think was brilliant, they actually applied Roundup; not just glyphosate, they applied Roundup onto the skin, as well. In other words, they did both. They put the DMBA on the skin, and they put the Roundup on.

But the interesting thing is, they used a dose of Roundup similar to what the Pilliods were exposed to. Not a dose a thousand times higher, not a hundred times higher, but a similar dose equivalent.

And after several weeks of -- after that was applied to the skin, I think it was applied three times a week. After a number of weeks, 40 percent of the animals presented with skin cancer, malignant papillomas.

And what it shows is that Roundup has a tremendous ability to promote malignancy from a carcinogen. And the study was well in excess of 95 percent confidence interval. So very significant finding, in terms of showing the powerful promotion effect of Roundup itself.

Q. So if we go back in time and look at the Pilliods -- we'll use the mice here as an example.

You have a mouse at this time point, right? And it's initiated with a carcinogen; is that correct?

A. Yes.

Q. And you said the chemical was found in cigarettes, right?

A. DMBA, yes.

Q. And say they used another chemical that we know initiates cancer, okay?

You add Roundup to the mix, and that leads to more cancer; is that right?

A. Significantly more. Statistically and significantly elevated.

Q. How is this fact considered when you're looking at -- well, I'll back up.

You know that Mr. and Mrs. Pilliod, they both smoked for 20 years?

A. That's right.

Q. That's the same sort of chemical that would initiate cancer?

A. It's the same chemical.

Q. And then after they smoked for 20 years, they sprayed Roundup for 30?

A. That's right.

Q. And again, that's glyphosate -- that actually ends up in the bones?

A. Yes.

Q. All right. Well, let's go back to the Pilliods again. I want to talk to you about their total exposure.

You said you did a calculation of their total days of exposure; is that right?

A. That's right.

Q. And I believe we have that -- a chart discussing that in your binder. It would be Exhibit 3073.

Is that a chart you prepared in your report?

A. Yes.

MR. WISNER: Your Honor, permission to publish?

MR. EVANS: No objection.

BY MR. WISNER:

Q. All right, Doctor. I have to confess. During

the opening statement, I told this jury that the Pilliods have been exposed to 1,500 gallons of Roundup.

What is the truth of this?

A. No. They were exposed to almost 1,500 days of exposure. As far as gallons, it was only about 360 to 387, as per the testimony and the depositions of the Pilliods.

Q. So looking at the total days of exposure, cumulatively it was over how much --

A. Approximately 1,500 days.

Q. All right. Help us read the chart.

On the left side, you have dates, 1982 to 2012.

What is that reflecting?

A. Period of residency in which they maintained the Agate property. That was the primary residential property.

Q. And my understanding is that you have a cutoff date here on when the cancer happened; is that right?

A. I do.

Q. You understand that Mr. Pilliod continued to spray until 2017?

A. I'm sorry?

Q. You understand that Mr. Pilliod continued to spray until 2017?

A. Yes.

Q. Okay. All right.

So we have these different properties. And you have calculated here a date of exposure of 1,080 days of exposure at the Agate property.

Can you briefly explain to the jury how you came up with that number.

A. Yeah. I simply found in the deposition, and confirmed through teleconference with the Pilliods, how often they sprayed; that is, how many days a month at each property and how many months a year at each property, which was nine months a year. And the duration of exposure. The duration of spraying, actually. And the duration of spraying was one hour or more.

Q. And when you calculated these doses -- sorry, these days of exposure, did you compare them to the data we have in the published literature about, you know -- in the epidemiological literature?

A. Yes. As I said, I used the Agricultural Health Study. I also used the McDuffie study and the other study.

Q. All right. So let's use, for example, the McDuffie study. The jury has seen this.

That had a finding for greater than two days

per year, right?

A. Yes.

Q. So that meant anybody in the high cohort could be between 2.1 to infinity; is that right?

A. That's right.

Q. Now, there's an expression, the dose makes the poison.

Have you heard that before?

A. Yeah. That's my entire career.

Q. What does it mean?

A. Well, that basically a famous French toxicologist determined hundreds and hundreds of years ago that everything is toxic; it's a matter of dose.

And my mentor, Dr. Goering, told me a horrible story once. A father punished his child for not finishing his dinner by pouring some salt on the table and making him eat it. He died within about 45 minutes from a convulsion. Even table salt is toxic; it's a matter of dose.

Q. Because they broke it off at greater than two days per year, does that capture the level of exposure that the Pilliods had?

A. No. That breaks it down to -- two days a year is pretty minimal exposure. And then out to infinity, that could be someone who has thousands of days in a

lifetime. So it's a pretty wide range.

Q. Same thing with greater than ten days. We heard about that from the Eriksson study?

A. Right. That gives us a little bit of a better differential from a baseline versus somebody whose exposure is higher. So that's a better differential, yeah.

Q. And I guess the question, simply put: Were Mr. and Mrs. Pilliod's levels of exposure of sufficient volume to put them into a higher risk of contracting non-Hodgkin's lymphoma?

A. Extremely, yes. No question.

Q. I understand that one of the things you discussed with the Pilliods was their use of protective gear; is that right?

A. Of what?

Q. Protective gear.

A. Yes.

Q. Let's start off with Mrs. Pilliod.

Did Mrs. Pilliod use protective gear?

A. No. None whatsoever. She used -- not always, but very often, she wore shorts, short-sleeved shirt, open shoes, sandal. So she had bare legs, bare arms, exposed socks, if any.

Q. And Mr. Pilliod, did he wear any protective

gear?

A. He wore long pants, long sleeves, straw hat. And on occasion, he wore gloves.

Q. Had the Pilliods been told to wear protective gear, and had they followed that instruction, wearing rubber boots, gloves, maybe coveralls when they were spraying, would that have reduced their exposure?

A. It would reduce it. It wouldn't zero it, but it would reduce it. The sprayer itself is problematic because it produces an aerosol that drifts with the wind.

Q. And had their exposure been less, would that have reduced their risk of getting NHL?

A. Certainly.

Q. I asked you about this earlier, and I think I have to make sure I finish up on this.

But we talked briefly -- we talked about the POEA surfactant.

Do you remember that?

A. Yes.

Q. Are there alternatives to POEA?

A. Yes.

Q. And are those alternatives less toxic?

A. Yes. I mean, there's numerous nonionic surfactants. One that we are all familiar with, that I

use every morning and evening, is my contact lens solution. That has a nonionic surfactant, but it's harmless.

Another good example is the European Union. They now use a polyoxyethylated ether amine instead of the tallow amine, which is about -- I think -- I believe, from what I've read, it's about 40 percent less toxic than the POEA used in the U.S. by Monsanto.

So certainly there's alternatives, and they've been around a long time, too. But not in the U.S. They're not used here.

Q. Is that called POEEA?

A. Yes, it is.

Q. Had the Roundup that Mr. and Mrs. Pilliod been using contained a less toxic surfactant like POEA, would that have reduced their risk of contracting non-Hodgkin's lymphoma?

A. It would have significantly reduced the actual potency of the dose they received by a good margin.

MR. WISNER: Your Honor, may I briefly just speak with Counsel?

THE COURT: Sure.

MR. WISNER: Thank you, sir. I have no further questions at this time.

THE COURT: Very good.

Do you have cross-examination, Mr. Evans?

MR. EVANS: I do, Your Honor.

CROSS-EXAMINATION

BY MR. EVANS:

Q. Good afternoon, ladies and gentlemen of the jury.

Good afternoon, Dr. Sawyer. My name is Kelly Evans. I don't believe we've met before, have we?

A. No.

Q. Okay. You started out by saying that you were a forensic toxicologist, correct?

A. That is correct.

Q. And you said that a forensic toxicologist, the word forensic means a debator; is that right?

A. That's right. That's the definition of forensics; it's for debate in a legal setting.

Q. Okay. And we're not here to debate today. I'm here to ask you a series of questions, and you're going to do your best to answer them.

Is that fair?

A. Yes.

Q. Okay. And when you say forensic toxicologist, what that means in practice is your job is as an expert witness, as a litigation consultant for attorneys.

Is that fair?

A. In part.

Q. We've heard from some other witnesses so far, we'll hear later, that they're -- for example, we saw Dr. Weisenburger yesterday, who is a pathologist at City of Hope Hospital, and he's a witness in this case.

But your career, you've actually been a witness not only for Roundup, but a witness in several hundred cases, true?

A. I can't answer that accurately without giving it some thought. I would say -- I can't give you a number, but yes. Reasonable.

Q. Okay. The point is, you've testified in court dozens, if not hundreds, of times, correct?

A. Yes. I was trained in the State toxicology department as a forensic toxicologist. That's what I was trained to do.

Q. And as an experienced witness, you know the importance of selecting words carefully, correct, sir?

A. I don't understand exactly what you mean.

Q. Words are important. What you say from the stand is important, right?

A. Of course.

Q. And so, for example, earlier today, when you said the glyphosate was very similar to sarin, that was for a specific reason, correct, sir?

MR. WISNER: Objection. Argumentative. Misstates the record.

THE COURT: Overruled.

You can answer.

THE WITNESS: That's not what I said. I said that an organophosphorous compound is what glyphosate is, and organophosphorous compounds are closely related to organophosphates, which sarin is.

So I did not state what you said. That was not very accurate.

BY MR. EVANS:

Q. But you, nonetheless, chose to use the word sarin in connection with your discussion of glyphosate, right?

A. I certainly did, and rightfully so.

Q. And you, when Mr. Wisner brought this out, you said, without a question, you ought to wear gloves, right?

MR. WISNER: Objection. He moved to strike that testimony.

THE COURT: Okay. Approach.

(Sidebar discussion not reported.)

BY MR. EVANS:

Q. And then Mr. Wisner proceeded to take the Roundup, touching part of it with gloves, right?

A. Correct.

Q. And demonstrated how you spray it?

A. That's correct.

Q. Okay. Now, this, you understand, is a bottle that was actually at the Pilliods residence --

A. Yes.

Q. -- is that correct?

And you were asked some questions about -- this is a pre-diluted bottle, right?

A. Yes.

Q. And you talked about the percentage of glyphosate in this bottle.

Do you know what that percentage is?

A. It's between 1 and 3 percent.

Q. Right. And the vast majority of what's in this bottle is actually water, true?

A. That's right.

Q. Okay. Now, do you know, in talking with the Pilliods, how they -- which properties they actually used this type of a bottle at?

A. Yes.

Q. Where did they actually use this?

A. They actually used the prepackaged on all of the properties at different times.

Q. Okay. And so the way this works is this, you

pull out and pump it; is that right?

A. That's right.

Q. And then you shoot it, correct?

A. Yes.

Q. Okay. And the point being, with respect to -- you said that there's this nozzle that you can spray it so you can have wide disbursement or a stream, right?

A. Yes.

Q. Okay. And one of the things that you talked to the Pilliods about was the issue about whether they sprayed -- spot spraying, right?

A. Yes.

Q. And for those of us that have used Roundup, you have -- you're basically walking around trying to find a weed, and you're spot spraying, right?

A. You would have to explain that better. I'm not sure I understand the question.

Q. Okay. Let's just talk about in general.

The difference between spot spraying -- do you understand what spot spraying is?

A. Certainly.

Q. Okay. How would you define spot spraying?

A. Well, based upon my experience and my interview with the Pilliods, at the property at Stabulis Road, for example, there was very little spot spraying.

It was heavily overgrown to the point, when they first started, they couldn't even use the sprayer. It was too deep.

In other locations, such as at their home on Agate, there were areas on the concrete area near the pool where they were able to spot spray. So I ascertained information from my interview with them. I also had satellite images from Google Earth showing the properties from the air.

So they did both. But the Stabulis property, especially, was one of heavy spraying and heavy contact with the vegetation on their legs and body. So there's a lot of variability.

Q. Right. And we're going to talk about that more in particular. And really, the ladies and gentlemen of the jury have heard about a lot of the studies you talked about today with prior witnesses, so I'm not going to spend much time on those.

But again, back to your choice of words, when you say, talking about some of the trace elements that are in the bottle of glyphosate, when you talked about -- like, formaldehyde, I think you mentioned, right?

A. Yes.

Q. And you say those are additive, you know that

when Roundup is studied in epidemiology studies, whatever is in Roundup, including whatever trace amounts of anything there, that's what's being studied in the epidemiology.

Fair?

A. Good point, yes.

Q. Okay. And the results of those studies -- and we've spent several days already talking about epidemiology; we're going to leave that off to the margin.

But the results of those studies are the results of Roundup in people, correct?

A. Yes.

Q. Not rodents or monkeys or other things you've talked about today, but the epidemiology studies are science with respect to people who are using Roundup in the real world.

Fair?

A. Yes.

Q. Now, you're not here -- let me -- strike that.

As I understood what you testified to earlier, you said that you have an opinion that Mr. and Mrs. Pilliod's cancer is caused by Roundup.

Fair?

A. No.

Q. You don't think that?

A. I believe I said significantly. It's substantially exacerbated by Roundup, not only caused by Roundup.

Q. And to that point, you personally did not look at whatever other possible alternative causes they may have or not have in their medical history, true?

A. Yeah. I stated in my deposition that I defer that to other experts in this case.

Q. Right. And that's the point. You're deferring those issues, and we heard from, again, Dr. Weisenburger yesterday and the day before.

You're deferring to the oncologists in this case with respect to those specific issues of what other alternative causes or not, whether there's a differential diagnosis that could be done or not.

Those are issues that the oncologists and Dr. Weisenburger, the pathologist, they're analyzing that, not you, true?

A. Yes. I defer that. Mainly because of the enormous amount of work I undertook already.

As a toxicologist, I could assess whether there were other compounding factors. But it's just beyond my ability, in terms of time-wise, you know, to handle that. So I deferred that. Not that I'm

incapable of assessing other toxins.

Q. You just didn't in this case?

A. Correct.

Q. I just wanted to make sure.

And the issue of what you just got done telling the ladies and gentlemen of the jury is that you spoke with -- and, in fact, read the deposition of -- Mrs. Pilliod with respect to the actual days of use, correct?

A. I'm not sure I understand. Are you asking me if the Pilliods remember exactly what calendar days?

Q. No. The opinion you just expressed in your chart. And we can pull this up in your report -- we actually had it. Mr. Wisner just showed it.

This chart is based upon what Mrs. Pilliod calculated, correct?

A. Yeah. This is days per year. I was trying to differentiate.

It sounded like you were asking me whether they remembered if it was a Tuesday or a Thursday or a Sunday morning. I didn't understand your question.

Q. This was the opinion you gave, which is the 1,080 days of exposure, right?

A. Yes.

Q. And that's just from Mrs. Pilliod's

deposition, correct?

A. No. That's not what I said. I also interviewed her via teleconference, is what I said. And her husband.

Q. Okay. Now, you have reviewed her deposition, though, correct?

A. Of course.

Q. And you know that the calculations that are contained in Exhibit 3073 that you shared with the jury, those were actually made by Mrs. Pilliod after she spoke with an expert for Plaintiffs, correct?

A. I don't know that for sure, no.

MR. EVANS: May I approach, Your Honor?

THE COURT: Yes.

BY MR. EVANS:

Q. Handing you what's marked as Exhibit 6531.

Have you seen -- you can take a moment to look at this and tell me if you've seen this before.

A. I have not seen this, no.

Q. That's all right.

Did you review -- I think you've already said you reviewed Mrs. Pilliod's testimony in her deposition?

A. Yes.

Q. And do you recall where she said that she and Mr. Pilliod went to Chicago and spoke with Dr. Nabhan?

Do you recall that?

A. Yeah. I do know she stated that in deposition, yes.

Q. And do you recall that she stated that, when she spoke with Dr. Nabhan -- and when was that meeting with Dr. Nabhan, do you know?

A. No. I don't see -- well, I mean, I see the date of her ticket, her flight plan. But I can't say from that when she spoke with Dr. Nabhan.

Q. Okay.

A. In the vicinity of this flight plan, I suspect.

Q. So December of 2018.

Is that fair?

A. Yeah.

Q. And actually, the flight plan is one part of this exhibit, but the other part of the exhibit is, after speaking with Dr. Nabhan, on her way back home, she testified, I believe, that she actually tried to calculate -- tried to estimate the usage that Mr. and Mrs. Pilliod had used of Roundup over the course of 35 years.

Does that sound right?

A. I'm not sure where I see that information on here.

Q. Well, if you would, please, sir, turn to 6531.

A. I see that.

Q. Page 4.

A. I don't see anything about 35 years.

Q. Okay.

MR. EVANS: Permission to publish, Your Honor?

MR. WISNER: I don't believe the foundation has been laid that he's seen this before.

THE COURT: Okay. Do you want to give him an opportunity to review it?

BY MR. EVANS:

Q. Again, take a minute to look at it. If you tell me you haven't seen it, that's fine.

A. I haven't seen it.

Q. All right. Fair enough.

So do you recall reviewing the deposition and her stating that on the plane ride home, she filled out, again, on the back of an airline ticket, her calculations of use?

A. I vaguely remember that in the deposition, but not in any great detail.

Q. Okay. Well, Mrs. Pilliod will be here, and we can certainly ask her about that.

Nonetheless, the amounts that are on your chart came from what she explained in her deposition?

A. Yes. And confirmed during my teleconference.

Q. Okay. Now, I have a chart I would like to talk about for a minute.

MR. WISNER: No objection, Your Honor.

BY MR. EVANS:

Q. We'll put it on the screen, as well.

Just so we can confirm here, they had four different properties that they owned over time, correct?

A. Yes.

Q. Okay. And the bottom one here is the Agate or Agate property. That's their residence, correct?

A. Correct.

Q. This is, again, the same chart you showed the ladies and gentlemen of the jury.

From 1982 to 2012, they testified that they used Roundup at the Agate property, correct?

A. Yeah. Four days per month, times nine months, divided by 36 days exposure per year from 1982 to 2012 -- for 30 years -- equals 1,080 days of exposure.

Q. And we're going to get there, trust me. I'm just asking a simple question.

This is one of the properties they used Roundup on, correct?

A. Correct.

Q. And you see there's a white line in each of

the years. Because a quarter of each year, they testified that they actually did not spray Roundup basically from November 1 to February 1.

Is that fair?

A. That's right.

Q. Okay. And so that's with each one of these different properties.

And the Stabulis property, the one you talked about where they used it sort of the widest, they used Roundup there for about two and a half years.

Is that right?

A. Right.

Q. And then the Gabor property, they had that for a little over six years, correct?

A. Yes.

Q. And again, with each of these properties, they sprayed during that time period from February 1 until November 1?

A. Yes.

Q. Okay. And then the Hartvickson property here, correct, and that was a property they owned for just a couple years?

A. That's right.

MR. EVANS: May I approach, Your Honor?

THE COURT: Yes.

BY MR. EVANS:

Q. Handing you a copy of your report in this matter.

It looks like you already had a copy, correct?

A. Yes.

Q. But this is where that chart came from, correct?

A. Yes.

Q. Okay. And with respect to the usage at each of these properties, I just want to make sure we have an understanding of that.

In the Agate property, there were 270 gallons used for the period of 30 years; is that right? Is that what the chart says on page 12 of your report?

A. For Alberta or Alva?

Q. Total amount.

A. Total? Okay. 270.

Q. It says 270, right?

A. Yes.

Q. This is total, 270 gallons.

And the Stabulis property, you calculated 45 gallons, correct?

A. Yes.

Q. And the Gabor, there were 63 gallons, correct?

A. Yes.

Q. And Hartvickson, I think you said a total of 9 gallons, right?

A. That's right.

Q. And so the total is how many gallons? 387?

A. I would have to calculate it. I don't think I totaled that in my report.

Q. Well, let's see if we can do the math here.

This would be 72, that would be, what, 112, 117, 317, 387, right?

A. That's consistent.

I do have a footnote that states:

"According to the deposition of Mr. and Mrs. Pilliod, it was between 360 and 387."

Q. But if you add the numbers you have in your chart, it comes out to 387. If you want to take a piece of paper and pencil, that's fine.

A. No. I said that is consistent with the footnote in my report.

Q. Okay. And then you said that there was -- I believe you said 1,512 days total amongst all these properties.

Am I right?

A. Yes.

Q. And if you divide 387 by 1,512, it comes out to basically .25, right?

About a quarter of a gallon each time they were out on a day, correct?

A. Well, not necessarily, no.

You have to remember that they were using primarily prepackaged, pre-diluted. But also the concentrate, which gets diluted at a very high ratio. You're not including that in the math, so the math is actually flawed.

Q. Okay. I'm just trying to understand.

I thought -- 387 is the gallons, right? Total gallons used?

A. You don't understand my point.

Q. Okay. Explain to me, please, what you're saying.

A. They didn't just buy prepackaged, pre-diluted. They also bought the concentrate, which then they would dilute, which would make more gallons. They would have more gallons than just the 387.

Q. Sir, we can look at your report. If you want to go ahead and look at it again.

I thought this was your calculation of the number of gallons used by the Pilliods.

A. No, you're missing the point. You're taking the total days and dividing it by 387.

Q. No, I'm doing the opposite, actually.

A. Yeah, I'm sorry, the opposite.

And if you buy a gallon of concentrate, that makes many gallons of actual spray.

Q. Right. And how many gallons did they use on their four different properties?

A. As you and I agreed, 270 at the Agate property, 45 at -- et cetera.

Q. So when you add all them together -- let me make sure I've got this right, that I understand it.

They used approximately 10 to 15 percent where they would actually mix it themselves, right?

A. Right.

Q. Okay. And once they mix it, they would spray it, and that's what they're using here, correct?

A. Not exactly. What I understand the Pilliods were referring to is the number of gallons they purchased.

But in actuality, if you purchase 387 gallons, and 50 of those gallons are in concentrate, that makes many more application gallons because you dilute it out.

And you're not acknowledging that.

Q. I'm trying to understand your report. Put it up on the screen, page 12.

This is your chart, correct?

A. Yes. This is objective information I

received. I didn't make it up. This is information I received from interview and from deposition.

Q. And the top caption you wrote on your chart is "Individual Amount Sprayed," correct?

A. Yes.

Q. And so if you add that up, Mr. Pilliod sprayed at the Agate property, 202 gallons, correct?

A. Yes.

Q. And Mrs. Pilliod sprayed 67.5 gallons, correct?

A. Yes.

Q. So the total on that property is 270 gallons, correct?

A. Yes.

Q. Right. And the same with these other three properties. There were 45 gallons, 63 gallons, and 9 gallons sprayed at each of those properties, correct?

A. No. No. That's where we have a problem.

If we take that last one at 9 gallons, that means she purchased 9 gallons. But depending on how much of that was diluted would have resulted in actually more spray material. And that's not taken into account in that table.

Q. So when you said in your chart that this is the amount they sprayed, I thought you actually said

this in testimony to Mr. Wisner's questions, too.

When he said it wasn't 1,500 gallons, it was actually 387, that's not correct?

A. That's the gallons purchased. And I'm being very conservative in this chart because I don't precisely know how many of those gallons were premixed versus Super Concentrate.

This is a conservative chart. In other words, the actual amount sprayed is actually more because some of those gallons had to be diluted into additional gallons.

Q. So what's your calculation, then, of the actual -- even though the column here says "Individual Amount Sprayed," what's your calculation of the actual number of gallons that they sprayed?

A. I didn't do that. Again, I conservatively decided that, even if some of these, which we know, whatever, 10 or 15 percent of them are Super Concentrate, I treated it as premix. I was very conservative.

So she actually sprayed -- him and her, both the Pilliods sprayed more material than is represented here, because some of it was in the form of a concentrate that had to be diluted.

Q. So in your chart on Table 3, where you say

"Individual Amount Sprayed," and you broke it down to each one of them, that wasn't actually correct; it was actually something plus some additional amount?

A. Yeah. And instead of guessing what that amount was, I've been careful and conservative, and I'm reporting it as if there was no dilution involved on any of them.

And I would think you would appreciate that. I'm being conservative to be accurate.

Q. And again, you think that Mr. and Mrs. Pilliod testified that they actually sprayed more than 387 gallons?

A. No. That's not what the testimony was. That's what they purchased. You're failing to understand the difference between what was purchased versus what was sprayed.

Q. All right. Now, can you turn to page 13 of your report.

And with respect to the Agate Court property, do you see your description here?

A. Yes.

Q. And you say:

"Spraying occurred here from 1982 - 2012, 30 years. Total gallons sprayed of diluted Roundup Super Concentrate and ready-to-use

Roundup was 270 gallons."

Correct, sir?

A. Yes. But that is how much was purchased, not how much was actually sprayed after dilution. I didn't make that calculation because I didn't have accurate numbers to calculate it with. So I erred in the mode of being conservative, which I think Defense would appreciate. That I'm not exaggerating, I'm underestimating.

Q. I would actually just appreciate you being accurate with respect to what your report says.

And I want to make sure I underline this here:

"Spraying occurred here from 1982 to 2012, 30 years. Total gallons sprayed of diluted Roundup Super Concentrate and ready-to-use Roundup was 270 gallons."

Did I read that correct, sir?

A. Yes.

Q. Okay.

"Providing an average spray of 9 gallons per year."

Did I read that correct, sir?

A. Yes.

Q. Now, you then go on to say "25 to 75 percent."

That's the amount Mrs. Pilliod used versus

Mr. Pilliod, correct?

A. Yes.

Q. And you say here:

"Mrs. Pilliod testified that they sprayed for one hour a week, one hour on a given day of spraying; hence, .25 gallons per week per spraying session."

Correct?

A. That's right.

Q. Okay. Now, that is the combined amount that they are using between the two of them, .25 gallons, correct?

A. That's right.

Q. Okay.

A. But, again, that's not diluted material. I know it says diluted; but what I mean by that is 270 gallons of what they purchased. They purchased the diluted and the undiluted.

Q. Okay. So Mrs. Pilliod is going to be here, and she'll testify and so will Mr. Pilliod, but I'm just going by your report, okay? Plain language.

And then you say:

"Per the distribution of spraying, this equates to .063 gallons for Alberta Pilliod and .188 gallons for Alva Pilliod per spraying

session."

Correct?

A. That's right.

Q. And so if the total amount per day on this property is .25 gallons, that's actually a quarter, correct?

A. Yes.

Q. So on this property, when they would spray on those days, they would spray a quarter, right?

A. Yes.

Q. Now, Mr. Pilliod would spray three-quarters of that, so he would be spraying three cups when they were spraying at the Agate property, correct?

A. Yes.

Q. And Mrs. Pilliod would be spraying one cup, correct?

A. Correct.

Q. Now, that same calculation -- feel free to look at your report -- that same calculation applies to the other days when they were actually using Roundup, correct?

They would spray about an hour at a time, and during that time, they would spray about a quarter, with three cups for Mr. Pilliod and about one for Mrs. Pilliod. True?

I mean, we can look at your report here. This is Stabulis.

Do you see that?

A. If you would like me to answer your question, please don't interrupt.

The ratios are the same, correct. However, at Stabulis, the frequency was double.

Q. Okay. So each day, for those 1,512 days they sprayed on the four different properties, the same equation applies, correct?

A. Yes.

Q. All right. Now, with respect to your calculations that you testified about, you took these total days that Mrs. Pilliod talked about, and you then took those and compared it to the Eriksson and McDuffie studies, correct?

A. As well as the Agricultural Health Study.

Q. As well as the AHS?

A. Yes.

Q. Again, I'm not going to get into it, but you do understand that the numbers that you're comparing to in the McDuffie and Eriksson study, those are unadjusted numbers, correct?

A. Not exactly. There's a minimum of one hour, and there's a minimum of ten days.

Q. I'm talking about the actual results of the -- when you do the comparison -- we're not going to get into it because I know the jury has heard this numerous times.

I just want to make sure that you understand that the numbers, with respect to the greater than two times or greater than ten days lifetime, those are unadjusted numbers, true?

A. Yes.

Q. Now, are you aware that Mrs. Pilliod testified that she actually got Roundup on her skin, she said, 20 times, on her exposed skin?

A. That's in my report, correct.

Q. So over the course of 30 years, spraying on the Agate property and these other three properties, she testified that about one time a year, she got Roundup on her exposed skin. True?

A. Yes. And I'm going to qualify that in terms of my interview. That is where she observed Roundup on her skin. Not the aerosol, that any applicator is exposed to, that is unnoticeable. It's noticeable wetness on the skin.

Q. Well, again, Mrs. Pilliod will be here, so we'll hear from her directly.

But you're not saying to the ladies and

gentlemen of the jury that this entire cup that she was using actually got on her exposed skin, correct?

A. Of course, not.

Q. So if she's spot spaying on the Agate property, you were not actually able to calculate how much actually got on her exposed skin, correct?

A. No. But I know it was more than the average sprayer because of the fact that she was largely wearing shorts, sandals, and short sleeves.

And the studies of McDuffie, Eriksson, and especially the Agricultural Health Study not were not designed towards home applicators that dress in such a fashion.

Q. Could you answer my question, which was: You were not able to calculate, on the Agate property, how much of the cup that she used actually got on her exposed skin.

You couldn't do that calculation, could you, sir?

A. No.

Q. Thank you.

And you also couldn't do that calculation on the Gabor property. True?

A. Yeah, I think that's reasonable.

Q. And you also couldn't do it on the Hartvickson

property. True?

A. Correct.

Q. And same goes for Mr. Pilliod: You couldn't calculate how much he got on him, his skin, for any of those three properties, correct?

A. Mathematically, that's correct.

Q. And the reason you couldn't do that, and your report in your deposition said that this property, the Agate property, their residence actually has, for example, a swimming pool and decking around it, correct?

A. Yes.

Q. And it has a driveway, right?

A. Right.

Q. And they talked about how they would go around and spot spray.

And when you look at the aerial view of that, you said it's like Swiss cheese. I don't have any way of calculating where they were spraying and how they were spraying, right?

A. Yes, that's true.

Q. And again, you didn't do calculations for either of these two, correct?

A. That's right.

Q. So the one you did do the calculation on was the Stabulis property, right?

A. Yes.

Q. And that calculation -- again, that's a vacant piece of property that they were, I believe, saying they were spraying more in a dispersive manner, right?

A. It was heavily overgrown, correct.

Q. I think they said they weren't using Roundup until they cut down the overgrowth and were trying to keep it down, correct?

A. But still heavily overgrown in terms of contact with the skin.

Q. And you calculated an estimate with respect to the exposure there, but that actually wasn't the basis for your opinion, which is just the total days used, correct?

A. Both are my opinion.

Q. Well, I understand.

But what you told the ladies and gentlemen of the jury about was the 1,512 days of total use overall, correct?

A. That's probably the most significant finding, actually. Because that is comparing her to the real world situation of other sprayers.

Q. Now, the Pilliods used from '82 to 2002, 20 years. And with respect to that time period, you don't have a calculation of how much actually was on

either Mrs. Pilliod or Mr. Pilliod's skin, correct?

A. Correct.

Q. Now, the -- did you also review Mr. Pilliod's deposition?

A. Yes.

Q. And do you recall that Mr. Pilliod said that he actually went to the Stabulis property about half the time by himself, correct?

A. Yes.

Q. And so on the days when he was out there by himself, Mrs. Pilliod would not have sprayed anything on those days, correct?

A. Yes.

Q. Now, did you also read in Mrs. Pilliod's deposition that the calculations that she prepared after meeting with Dr. Nabhan, Plaintiff's expert, that she actually spoke with her husband before the deposition and told him -- again, this is just from her deposition, which said that because of Mr. Pilliod's cognitive abilities now, that he should defer to her with respect to these estimates.

Am I right?

A. Yes. I recall her telling me that because of the chemotherapy, he has some memory impairment.

Q. Now, when you look back at estimates that go

over the course of 35 years, that can be a pretty hard thing to do, right?

A. Yes.

Q. You testified a little bit earlier about the absorption of Roundup, right?

A. Yes.

Q. And you have previously said that Roundup does not accumulate in the body, correct?

A. It does not bioaccumulate in the body; only in the skin.

Q. And it's not persistent in the body, correct?

A. We don't know for sure. The studies only go out to about a week. So there's not really sufficient data to rule that out. And there's insufficient data to say that it bioaccumulates in the body. All we know is for seven days.

Q. You testified before that it wasn't persistent, correct, sir?

A. Beyond seven days, I have no information to support that, yes.

Q. Now, with respect to --

THE COURT: Mr. Evans, if you're going to segue to something else, now is a good time to take our afternoon break.

MR. EVANS: Okay.

THE COURT: We'll start at five of the hour.

(Recess taken at 2:42 p.m.)

(Proceedings resumed at 3:02 p.m.)

(The following proceedings were heard in the presence of the jury:)

THE COURT: Mr. Evans?

MR. EVANS: Thank you, Your Honor.

BY MR. EVANS:

Q. Dr. Sawyer, you would agree that the rates of NHL in the country have been flat over the past 20 years, correct?

A. For approximately the last 20. However, I am familiar with the study published in the Journal of Clinical --

Q. Can you answer my question?

Is that correct?

A. Yeah, yeah. In 1950, there was a huge rise. In the 1970s. The last 20 years --

Q. Right, the last 20 years.

A. 20 years, right. But there was a rise prior to that.

Q. You talked a little bit about inhalation, and also skin irritation.

You've previously stated that it's very difficult to actually inhale Roundup, correct?

A. I can't answer that unless you describe the question better.

Are you talking about deep lung or upper respiratory or just what?

Q. You can't answer that?

A. Not the way it's worded, no. You're not defining the respiratory tract properly.

Q. Does Roundup have a low inhalation toxicity?

A. It does in the sense that the majority of the dose is via dermal, as opposed to inhalation.

Q. And so the fact that Roundup -- it's very difficult to inhale glyphosate vapor, you disagree with?

A. No, not at all. Glyphosate, as I stated, is not very volatile. Very little of it goes into the gaseous state. It's in the atomized aerosol state. And that is captured in the upper respiratory mucous membranes and upper respiratory tree and it's absorbed. It never makes it to the deep lung because it's highly water-soluble. That is a very basic, fundamental toxicological process.

Q. And you previously stated that Roundup has a low skin irritation, correct?

A. Yes, that's correct. As per the definitions accepted by most governmental agencies, it is a skin irritant, but not a high-level irritant.

Q. Now, speaking of governmental entities, you're aware that after IARC came out in 2015, there have been several governmental agencies around the world -- including the U.S. EPA, Health Canada, Europe -- several places that have all concluded, again, that glyphosate is not carcinogenic, correct?

A. Yes. Some have made updated reviews; some have not.

Q. And the jury has seen those before.

And my question to you is: The -- like, for example, you rely upon the George study, right?

We talked about the George study?

A. As I specifically stated, only with respect to cancer promotion. I instructed the jurors that I did not use that study to determine whether glyphosate is or is not a carcinogen.

Q. And even IARC said the George study was not something they could rely upon, correct?

A. With respect to whether it causes cancer, that's true; not with respect to whether it's a promoter.

Q. Now, back to the Pilliods specifically. You do not have an opinion that Mr. Pilliod would not have gotten his NHL if he had not used Roundup.

You have not formed that opinion, correct?

MR. WISNER: Objection. Ambiguous.

BY MR. EVANS:

Q. Do you not understand the question?

THE COURT: I'm going to sustain.

Why don't you restate.

MR. EVANS: Okay.

BY MR. EVANS:

Q. You have not reached an opinion about whether or not Mr. Pilliod would still have gotten NHL if he had never been exposed to Roundup a day in his life, right?

A. Have I made an opinion? Is that the question?

Q. You haven't reached an opinion about whether or not Mr. Pilliod would still have gotten NHL if he had never been exposed to Roundup a day in his life?

A. I have. I have an opinion.

Q. And what's your opinion, sir?

A. That certainly based on his exposure days exceeding one hour, and his exposure days exceeding ten days lifetime -- which is a doubling of the risk in the epi study -- and that his days are so far beyond that. And he's even nearly beyond -- he's in the top quartile, actually, of the Agricultural Health Study in terms of exposure days. Certainly the dose was sufficient to increase the likelihood of malignancy.

Thus, I cannot say he would not have gotten

it, but I can say that his probability of having a clinically full-blown malignancy is much higher. It was substantially increased.

Q. Let me ask it a different way.

It's not -- it was not necessary for Mr. Pilliod to have used Roundup for him to have gotten NHL, correct?

A. No. No.

Q. So I'm correct?

A. Many of us in this room will eventually have some type of cancer.

But we're talking about the probability of substantially enhancing it. In this case, we have both the Pilliods with the same NHL.

Q. And again, sir, with respect to Mr. and Mrs. Pilliod, you have deferred the analysis of their individual cases with respect to other alternative issues, medical records, et cetera, to the oncologists, true?

A. That's right.

Q. All right. Now, in this case -- again, you're a forensic toxicologist. And in non-Roundup cases, you've been paid hundreds of thousands of dollars each year for your work, including testifying in court, correct?

A. Yes. And I pay my staff their retirements, their half of the FICA, my office rent. I could go on all day talking about where that hourly money goes. I get about this much of it.

Q. And sir, in this particular case, you have charged over $20,000, even before coming and testifying today, correct?

A. Probably. I have an enormous amount of work in this case.

Q. And the hourly rate is -- your hourly rate is $650 an hour?

A. Yes. And that pays my employees, as well.

Q. And your per-day rate to testify is $5,600, regardless of how long Mr. Wisner or I actually question you, correct?

A. No. I have a half-day rate if it's local.

Q. But if it's the full day, you charge $5,600?

A. That's right.

Q. Now, even though you are a forensic toxicologist, that's your career, there is something called the American Board of Toxicology, right?

A. Yes.

Q. And you are not certified by them, are you, sir?

A. No. I took the exam 23 years ago. At the

time -- which, we had two babies. I never opened the book and studied for it. And that exam -- my colleagues have taken it, actually attended a course to do it. I took it cold. I passed two of the three sections, I failed one section.

Q. So you are not certified by the American Board of Toxicology, right?

A. No, I'm not. And I don't wish to be. I'm a forensic toxicologist. Some day, if I have time, I may take the ABFT exam, which is designed for forensic toxicologists, but I have not done so.

Q. And you actually took those boards twice, correct, sir?

A. No. I only took the section I failed twice, not the full exam.

Q. And you didn't pass it?

A. No. Again, I took it without opening the book.

MR. EVANS: Okay. No further questions. Thank you very much for your time.

THE COURT: Redirect?

MR. WISNER: Yes, Your Honor. Very briefly.

///

REDIRECT EXAMINATION

///

BY MR. WISNER:

Q. Doctor, on cross-examination, there was a bit of a conversation you had with Mr. Evans about, you know, Super Concentrate and whether it was diluted or not.

Do you recall that?

A. Yes.

Q. I believe he showed you this portion of your expert report, right?

A. Correct.

Q. And he talked about the Agate Court property in Livermore.

Do you see that?

A. Yes.

Q. If you turn the page and go to the bottom, where you talk about dose, it says:

"The Pilliods used Roundup Super Concentrate in their residential landscaping work approximately 15 percent of the time, and diluted it with water per the label instructions."

Do you see that?

A. Yes.

Q. Is that what you were talking about with Mr. Evans?

A. Yes.

Q. The next page, you actually show the label for the concentrate, right?

A. That's right.

Q. It says right here that glyphosate is about 50 percent of it; is that right?

A. Yep.

Q. And the part that I was interested in was this dilution here. It says:

"For best results, add 2 1/2 ounces to 1 gallon of water."

Is that right?

A. That's right.

Q. All right. See if we can do the math on this.

How many ounces are in a cup?

A. Eight.

Q. So let's keep it simple and go up conservatively.

Let's say there's three gallons per a cup of concentrate; is that right? Or let's do two.

A. In a gallon?

Q. I was going to get there.

A. I think it's 16 in a gallon, isn't it? Sixteen cups.

Q. Yeah, that's right.

So there's about two and a half gallons per cup that gets made, right?

A. Yeah.

Q. And there's 16 cups in a gallon?

A. Right.

Q. So 16 times two and a half, it's about 50 gallons per --

A. Close to 50, yeah.

That's what I was getting at, in terms of I grossly underestimated. And rather than being rewarded for it, I was punished. I underestimated it. In forensic work, I never want to overestimate it. And I did not factor that in.

Q. So that whole thing about one cup and three cups, that could conceivably relate to multiple gallons depending on whether or not it was concentrate?

A. That's right.

MR. WISNER: No further questions, Your Honor.

THE COURT: Any other questions?

MR. EVANS: No, Your Honor. Thank you.

THE COURT: All right. Thank you. You may step down. We're all done.

Ladies and gentlemen, that's it for the day, I think. Oh, I'm sorry. I'm sorry.

MR. WISNER: You're making me the villain.

THE COURT: I'm so sorry.

MR. EVANS: I think everyone is ready to go, Your Honor.

THE COURT: I am really sorry. I want to apologize to the lawyers. I just threw them under the bus.

We're going to finish watching Dr. Reeves' -- I'm sorry, I got ahead of myself.

We're going to finish more of Dr. Reeves' deposition testimony. And we'll probably -- I'll reward everybody by leaving in an hour. We'll shave off a minute or two.

MR. WISNER: Can we have a quick sidebar?

THE COURT: Sure.

(Sidebar discussion not reported.)

MR. WISNER: Yesterday when we stopped, I'm just going to back it up two minutes to put the testimony in context. So it will be slight repetition of two minutes.

THE COURT: Okay.

MR. WISNER: And, Your Honor, I think we actually fixed the sound.

THE COURT: Oh, okay. That's good.

MR. WISNER: We got a bum file.

///

(Video excerpts from the deposition testimony of William Reeves played in open court; not reported herein.)

MR. WISNER: Your Honor, there's a technical problem. Could we get five minutes?

THE COURT: Yeah, sure. We'll take a quick five-minute break if you need to go to the bathroom. We'll be another 20, 25 minutes, just so you know. Just go and come right back, because I'm going to be sitting here at the bench.

(Recess taken at 3:50 p.m.)

(Proceedings resumed at 3:56 p.m.)

(The following proceedings were heard in the presence of the jury:)

THE COURT: Well, sir, the good news is you can hop right back up because we're going to adjourn for the day.

I just want to remind you, this is the weekend, right. You're not coming back until Monday. We won't see you tomorrow, it's Friday. We've heard a couple weeks of evidence, but we're nowhere near through.

So don't think about what you've heard yet until we've heard everything from the plaintiffs and defendants. So let's just do the whole juror amnesia

thing, which is when you walk out, you forget you're a juror, go out and enjoy your family and not think about this case until we come back Monday morning at 9:00.

Thank you for your time and attention, and we will see you Monday morning at 9:00. Okay.

(The following proceedings were heard out of the presence of the jury:)

THE COURT: Just a couple of housekeeping things.

How are we on time in terms of our schedule? How is that going?

MR. WISNER: We're actually a little bit ahead of schedule. So we're doing good. I think next week, Monday, Tuesday will be videos.

THE COURT: Oh, okay.

MR. WISNER: I raised it earlier this week. But we would like to get those depositions --

THE COURT: Well, I'm going to have Koch and Raj for you -- actually, I planned to give it to you today, but I don't have it complete, so what we can do is scan and send them to you probably by end of business today.

MR. WISNER: Great. We are calling a live witness on Tuesday. We're calling Dr. Pease. But that shouldn't -- he shouldn't be very long at all. 30,

40 minutes.

THE COURT: That's fine. I just wanted to get an idea of how things were going and if we were sticking with our schedule.

You'll get the depo designations for Koch and Raj today. And then -- well, I have the weekend, so I'll work on more of the deposition designations.

MR. ISMAIL: Your Honor, you excluded Dr. Pease in your Sargon order.

THE COURT: I did?

MR. ISMAIL: You did.

MR. MILLER: But then you allowed Prop 65 in.

MR. EVANS: There were multiple bases for that exclusion, not just that.

THE COURT: Well, then we have to have that conversation.

MR. MILLER: Well, I think we should have a conversation. Your Honor reversed -- the Court will remember --

THE COURT: I know with respect to Prop 65. But having already ruled to exclude it -- the Prop 65 ruling doesn't necessarily reverse the Sargon order. So we should talk about that instead of assuming that it's okay. We'll have to talk about it Monday morning.

MR. WISNER: Fair enough.

THE COURT: We do need to talk about that.

MR. MILLER: Sure.

THE COURT: Other than that, I'll see you at 8:30.

MR. ISMAIL: Your Honor, there is one thing. When Mr. Wisner and I approached the Court after the live witness left, we said there was one issue with Dr. Reeves. And this is a mutual mistake in how the chart was submitted to the Court.

There's a small portion of Monsanto's designations that didn't make it into the materials that were provided to the Court. There are a handful, if that's a fair characterization.

MR. WISNER: Seven.

MR. ISMAIL: Seven objections that the plaintiffs have to that designated testimony. Neither side is claiming that there's waiver because of the paper issue.

THE COURT: Okay.

MR. ISMAIL: So can we tender that to the Court?

THE COURT: Sure.

MR. ISMAIL: I don't think it's -- here it is for Your Honor.

THE COURT: That's fine.

MR. ISMAIL: And I believe you have the transcript still for Dr. Reeves.

THE COURT: Oh, yeah.

All right. So I'll take a look at these. And I'll do that right away just so we can continue.

MR. ISMAIL: Okay.

MR. WISNER: And then there is -- Dr. Heydens' is ready to go except for those -- there's a couple of portions of testimony that you asked us to meet and confer on.

THE COURT: Right.

MR. WISNER: We agreed on some of it, but some of it we didn't.

THE COURT: What didn't you agree on?

MR. WISNER: I think they're ready to submit that to you.

THE COURT: Okay.

MR. WISNER: It's their testimony. We've objected. It was originally sustained, remember, and then --

THE COURT: Right. And then defendants submitted some revised -- anyway. Mr. Griffis said that was preceded by something else.

MR. WISNER: Okay.

THE COURT: So I'm assuming you're going to

give me the document that superseded --

MR. GRIFFIS: You would like paper rather than hear from me?

THE COURT: No. If it's a really short thing, we can talk about it right now. But I need to be a little more familiar with it so when you're arguing I have some idea what you're talking about.

MR. GRIFFIS: Sure.

THE COURT: Excuse me, the conversation in the back. We are still on the record, and the reporter is still taking -- if you want to have a conversation, please step outside. Thank you.

MR. GRIFFIS: We can easily do it either way, Your Honor. There are a number of portions -- this is a number of sections of testimony about some EPA documents.

And you ruled out testimony that was about documents that weren't part of our RJN and then said, of course, if you -- if you want to discuss specific portions, we can do that.

We reached partial agreement on some, and there is some that are still in dispute.

MR. ISMAIL: The EPA documents that we talked about?

MR. GRIFFIS: Not the EPA documents. Some of

the references to them in the testimony, plaintiffs said were fine. Some we cut, and some we asked for --

THE COURT: Actually, I think you need to submit them to me. Just on-the-fly right now, we would be here for another hour trying to figure out where we are.

MR. GRIFFIS: Okay. We'll put --

THE COURT: If you can just submit it on paper, I would appreciate it. That way I can look at it, and it will keep the argument very short so it's targeted.

MR. GRIFFIS: We'll put that together.

THE COURT: All right. I think we're all set then.

(Proceedings adjourned at 4:04 p.m.)

State of California)
)
County of Alameda)

We, Kelly L. Shainline and Lori Stokes, Court Reporters at the Superior Court of California, County of Alameda, do hereby certify:

That we were present at the time of the above proceedings;

That we took down in machine shorthand notes all proceedings had and testimony given;

That we thereafter transcribed said shorthand notes with the aid of a computer;

That the above and foregoing is a full, true, and correct transcription of said shorthand notes, and a full, true and correct transcript of all proceedings had and testimony taken;

That we are not a party to the action or related to a party or counsel;

That we have no financial or other interest in the outcome of the action.

Dated: April 11, 2019

Kelly L. Shainline
CSR No. 13476, CRR

Lori Stokes
CSR No. 12732, RPR