Exhibit 1

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

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

FRIDAY, SEPTEMBER 22, 2017

The videotaped deposition of JAY IRWIN GOODMAN, PH.D., called for examination, taken pursuant to the Federal Rules of Civil Procedure of the United States District Courts pertaining to the taking of depositions, taken before JULIANA F. ZAJICEK, a Registered Professional Reporter and a Certified Shorthand Reporter, at the offices of Warner Norcross & Judd LLP, 120 North Washington Square, Lansing, Michigan, on September 22, 2017, at 9:12 a.m.

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REPORTED BY: JULIANA F. ZAJICEK, RPR, CSR.

I N D E X

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E X H I B I T S

E X H I B I T S (Continued)

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THE VIDEOGRAPHER: We are now on the record. My name is Marc Myers. I am a videographer for Golkow Technologies. Today's date is September 22nd, 2017. The time is now 9:12 a.m. This video deposition is being held in Lansing, Michigan, in the matter of In Regards to the Roundup Products Liability and it's pending in the United States District Court, Northern District of California. The deponent is Dr. Jay Goodman.

And at this time will the attorneys please introduce themselves and will the court reporter, Juliana Zajicek, please swear in the witness.

MR. WOOL: David Wool for the Plaintiffs.

MS. TABATABAIE: Tara Tabatabaie for the Plaintiffs.

MR. WOOL: And do we have anybody on the phone?

MS. TREMBOUR: Good morning. Rosa Trembour, Lockridge Grindal Nauen.

MS. PIGMAN: Heather Pigman from Hollingsworth on behalf of Monsanto.

MR. KLENICKI: Erica Klenicki from Hollingsworth on behalf of Monsanto.

(WHEREUPON, the witness was duly sworn.)

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JAY IRWIN GOODMAN, PH.D.,
called as a witness herein, having been first duly sworn, was examined and testified as follows:

EXAMINATION

BY MR. WOOL:

Q. Good morning, Dr. Goodman. How are you?

A. Terrific.

Q. Will you please state your name for the record?

A. Jay Irwin Goodman.

Q. And have you ever given a deposition before?

A. Yes.

Q. You have, okay. Well, so you probably know the drill, but I'm going to go over a couple of ground rules.

A. Okay.

Q. I'm going to be asking you a series of questions today. Your counsel will -- will object at certain times, so it's important that you give your counsel a moment after I ask my question for her to get her objection in when she does.

Also, it is important that you give audible answers to all of my questions, so no nodding

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yes or shaking your head no.

Does that sound fair?

A. Yes.

Q. Okay. And I assume that if you give me an answer that you have understood my question. If at any point you don't understand the question that I've asked you, just please ask me and -- and I'll repeat it.

And the last thing is that I tend to talk fast, so if you want me to slow down or anything in that respect, just ask me and I'll do my best to accommodate.

Fair enough?

A. Fair enough.

(WHEREUPON, a certain document was marked Deposition Exhibit No. 25-1, for identification, as of 09/22/2017.)

BY MR. WOOL:

Q. Okay. I'm going to hand you what has been marked as Exhibit 1.

Do you recognize that document?

A. The top page is the -- the top -- the top page is the top page of the report that I provided,

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yes.

Q. Okay. And that document contains your resume, correct?

A. I don't know. I'd have to look to see.

Q. Okay. Well, take a moment to -- to look, if you don't mind.

A. I haven't verified every page, but it certainly looks like my resume is there.

Q. Okay. Do you -- do you remember submitting your resume along with your expert report?

A. Yes, of course.

Q. And is everything contained in that resume that you submitted up-to-date?

A. Yes, it is accurate up to and including today.

(WHEREUPON, a certain document was marked Deposition Exhibit No. 25-2, for identification, as of 09/22/2017.)

BY MR. WOOL:

Q. Okay. I'm going to hand you what has been marked as Exhibit 2. And this document is described as your supplemental reliance list?

A. It appears to be so.

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Q. Okay. I'm going to go back to those in a -- in a minute.
What is your -- is your specialty?
A. My specialty is -- my specialty is in toxicology and more specifically in terms of carcinogenesis, particularly mechanisms underlying carcinogenesis, rational approaches to evaluating the carcinogenic potential of chemicals and includes hypothesis-driven research relative to mechanisms underlying carcinogenesis.
In terms of specialty, in terms of teaching, if that -- if -- if that is what you meant to include?
Q. Sure.
A. In terms of teaching, my responsibilities for teaching to the medical students, partic- -- typically in the area of chemotherapy, and for graduate students, typically in the areas of toxicology related to carcinogenesis, safety assessment, and basic aspects of toxicology.
Q. Okay. And when you say "safety assessment," what do you mean by that term?
A. By that term I mean evaluating the potential of a chemical to -- to cause harm, and with

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me it is usually but not always with related -- related to the potential to act as a cancer-causing agent.
Q. Are you familiar with the term "hazard assessment"?
A. Yes, of course.
Q. Okay. Is that analogous to what you just described as a safety assessment?
A. No. Certainly I'm familiar with hazard assessment. I know what that is, but a hazard -- a hazard assessment is like night and day different from a safety assessment.
Q. Are you familiar with the term "risk assessment"?
A. I am.
Q. Okay. Is that analogous to the term you just described as safety assessment?
A. You know, sort of, it is. We can say safety assessment, risk assessment. It's -- it's sort of whether you are going to look at the side of the coin in terms of conditions under which this might cause adverse effects or you are going to look at the side of the coin under -- certainly with an interest in whether or not it causes adverse effects -- but

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under what conditions might it not cause adverse effects.
Q. So -- so --
A. So they are very closely related.
Q. Okay. So just so that I'm clear, what are the differences between a safety assessment and a risk assessment, as you understand it?
A. First of all, I consider expertise in -- in both, which I should have said, and many times -- many times I use this interchangeably.
Q. Okay.
A. It's -- it's -- it's a nuanced and a bit from perspective. Again, safety assessment, in terms of, well, what are the conditions under which this chemical might -- might not be problematic, risk assessment, part of the conditions under which it could be problematic, but the difference is really nuanced. I -- we can use them interchangeably.
Q. Okay. Have you ever been hired by a -- a chemical company as a consultant?
A. Yes, I have -- I have been retained by a chemical company as a consultant.
Q. Now, I don't want you to get anything -- into anything that is -- is confidential, but if you

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can, can you tell me what chemical companies you have done consulting work for?
A. The only chemical company that I can tell you that I've consulted for, because I do have confidentiality agreements with them, is -- there is one chemical company where it -- it is in the public record, because I was coauthor on a manuscript. At the time I was a consultant to the company and a couple of the coauthors worked for the company, and that is Syngenta.
Q. And can you tell me whether you ever served as a consultant for Monsanto?
A. Never.
Q. Never.
What was the work that you did for Syngenta -- or did -- or sorry, strike that.
What -- did your work for Syngenta involve a specific product?
A. It did.
Q. It did.
What was that?
A. I have a confidentiality agreement with them and I -- I really cannot talk about the specifics.

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Q. Fair enough.
You said that you produced a -- a publicly-available manuscript --
A. That is correct.
Q. -- as part of that work?
And what was the title of that manuscript, if you remember?
A. The title was something about evaluating the user -- something about using toxicogenomics relative to evaluating an aspect of carcinogenesis. If -- if you want, I can quickly thumb through my CV and --
Q. I -- I don't need you to do that.
A. Okay.
Q. Can you just give me the approximate date when you performed that consulting work for Syngenta?
A. Oh, gosh. I would say that was more recent than 10 years ago and probably -- probably at -- at least two or three years ago and certainly more recent than 10 years ago.
Q. Fair enough.
Have you ever served as an expert witness before?
A. I have.

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Q. What was the nature of the case for which you served as an expert witness?
A. First of all, let me say that in terms of serving as an expert witness before, in terms of being deposed, this was decades ago. Probably it could be 25 to 35 years ago.
Q. Okay.
A. And since I have -- have done that.
Q. Do you remember what that case was about or involved?
A. One case involved medical malpractice and it involved a question of dosing and side effects of a corticosteroid. And the others -- you know, it is so far away, the -- the other two or three, which involved allegations of contamination of groundwater from in two cases a municipal and in one case a private landfill.
Q. So if I understand your testimony correctly, there were two cases, two separate cases involving groundwater contamination and you served as an expert witness in both of those cases?
A. Let me be more clear.
As I remember, I think there were three. Two of them involved landfills owned by a municipality

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and one was private.
Q. A private landfill?
A. Privately owned.
Q. A privately-owned landfill.
And did the two involving a -- a municipality -- strike that.
Did the -- the same municipality own the -- the landfill in the -- the two cases that you described as -- as publicly-owned landfills, I guess?
A. No. There was -- there -- they were two different municipalities.
Q. Okay. Did all three of those cases involve the same or similar allegations?
A. It was a long time ago. Similar.
Q. Okay. Did they involve a specific chemical or compound?
A. You know, again, it -- it was a long time ago and we were dealing in -- in each case with more than one compound.
Q. Did you testify --
A. Well, with -- with more than one -- more than one chemical. In some cases they were metals and those would not be a compound.
Q. And were you retained by the defendants in

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all three of those cases?
A. In those cases, it was for the defense.
Q. Do you regard -- strike that.
Do you remember the -- the allegations that the plaintiffs were alleging in those cases?
A. In general, the plaintiffs were alleging contamination of groundwater as a -- from -- from a particular landfill.
Q. Were they alleging that they had suffered personal injuries as part of that contamination?
A. In one case the answer is yes, but I -- I just don't recall the details.
Q. Fair enough.
And there are no other cases that you can recall as you sit here today for which you testified as an expert witness?
A. That's correct. There might be another one, but as I sit here today, that is what I recall.
Q. And the approximate date of those three cases was sometime, you said, about 25 years ago?
A. In terms of the four, including the medical malpractice, this -- this was roughly in the order of 25, it could be 30 years ago.

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Q. And do you recall the outcome of any of those -- the three cases involving groundwater contamination?
A. Any of the three.
I do recall that on one of them the case was -- on one of them the -- the court's decision was against the defendant and that was reversed on appeal. In terms of the other two, I -- I don't recall.
Q. Did you know any -- strike that.
A. And I should tell you that in terms of the appeal, I participated in -- in -- in -- in that also.
Q. What did you do for the appeal, if you recall?
A. It was an extension of the original evaluations that I made.
Q. So would it be fair to say that you testified to approximately the same opinions that you gave at the -- at the trial court?
A. In the appeal there was no -- there was no testimony by me. It is my vague recollection that this consisted of documents prepared by the attorneys that were submitted to the court. And I -- I do not know -- I certainly did not testify during the appeal or as part of the appeal.

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Q. So if I'm understanding correctly, you advised the attorneys on -- in the appeal as to the, say, accuracy of their scientific representations to the court?
A. Yeah, I was -- I was involved in -- in providing some toxicology input to that and that's really the best that I recall.
Q. Now, prior to being retained as an expert in this case, did you know anybody who is or was at any time an employee of Monsanto?
A. Yes.
Q. Okay. And who was that? Or who were those people, I should say?
A. There weren't many. Let me tell you that I -- I have been in the -- in the toxicology area for many years and I travel around a lot, fortunately, and I get to meet a lot of people. So there is the possibility that I have on a casual occasion met. Two -- two of them -- three of them that I can recall. One is James Sherman who I believe no longer works for Monsanto. Another one, who I've met on brief occasions, not recently, is a fellow named Larry Kier. And the third person who I know is a person named Jerry Hjelle. And it's -- I'm going to mix this up.

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Jerry Hjelle, and it's -- the name is something like H-I-J-L-E (sic) or -- who I believe is now retired from Monsanto.
Q. And how did you know Mr. Sherman?
A. I knew Mr. Sherman because I met him at some scientific meetings that I attended and met him as -- at some organization I was involved in where he had some involvement and met -- met him there.
Q. And what was the approximate timeframe when you met him?
A. We are talking about Jim Sherman?
Q. Sherman, yes.
A. I would say I probably first met Jim Sherman -- again, we are talking approximate.
Q. Okay. Right, approximately.
A. I -- I guess I first met Jim Sherman probably 10 or 12 years ago and I have not seen him for probably two to four years.
Q. Have you communicated him -- with him since -- strike that.
Have you communicated with Mr. Sherman in the past two to four years?
A. I have not.
Q. Now, how did you meet Larry Kier?

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A. Basically, the same way that I met -- that I met Jim Sherman. I probably met him at a Society of Toxicology meeting or two and also as part of an organization that I was involved in, he was involved in that organization, and I see him at some of their meetings. Not very often. And we did not have lengthy, deep interactions.
Q. And approximately when did you meet Mr. Kier?
A. Larry Kier, I -- I met Larry Kier, again, it probably would be, I want to say, about roughly 15 years ago, and I don't think I've seen him in the last five years.
Q. Did you ever communicate with Mr. Kier personally about glyphosate or Roundup?
A. No.
Q. No.
And -- and I -- I know you just answered this question, so I'm sorry, but when was the last time you said that you saw Mr. Kier?
A. The last time I saw him must have been five years ago, roughly.
Q. Okay. And have you communicated with him in any way within the past five years?

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A. No.
Q. And you said you saw him, and maybe I'm -- I'm missing this, at a Society of Toxicology meeting or some other sort of -- of meeting of that nature?
A. I think -- well, probably once or twice in terms of a hello in passing at an annual Society of Toxicology meeting, and then a particular organization that brings various scientists together is one that both he and I were involved in for a period of time, and I got to meet him in a casual sort of way several times.
Q. And what organization was that?
A. That would be the International Life Sciences Institute and most -- mostly with one of their subdivisions called the Health and Environmental Sciences Institute -- Institute.
Q. And what does that subdivision do?
A. All of -- and in the International Life Sciences Institute, if we could use just the acronym ILSI --
Q. Okay.
A. -- I-L-S-I, I think is the best organization in the world in terms of bringing together scientists from industry, government and

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academia to advance science-based safety assessment.
Q. And you were at that meeting as a representative of the -- of Michigan State University?
A. No. I -- I -- I -- I -- I cannot represent Michigan State University. That would take approval of probably the president of the university. So any -- any of these activities that I am involved in, it is as -- as Jay Goodman.
Q. Okay. So no industry group sponsored your -- your attendance to -- to that meeting?
A. That is -- that is not correct. The International Life Sciences Institute is funded to a large extent by contributions they receive from industry.
Q. And do you receive any financial compensation from your work for the -- the ILSI?
A. No. What -- what they did is they -- they reimbursed me for travel expenses. There was no -- no honorarium involved.
Q. Now, the last Monsanto employee that you testified that you were acquainted with is Jerry Hjelle, am I -- I saying that correctly?
A. It's some -- it's Jerry Hjelle.
Q. Hjelle.

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A. And it's spelled something like H-I-J-L-E.
Q. And how do you know Mr. Hjelle?
A. Primarily through the International Life Sciences Institute, and there was a period of time when he and I were involved and there was some, excuse me, some overlap.
Q. Okay. And to the best of your recollection, those are the only three Monsanto employees that you were acquainted with prior to being retained as an expert in this case?
A. To the best of my recollection, that's correct.
Q. Okay. Now, are you acquainted with a Sir Colin Barry?
A. I am.
Q. Okay. And how do you know Sir Colin?
A. I know him from seeing him, speaking with him at some scientific meetings, and we are probably talking now about three or four scientific meetings. I know him through some corres- -- e-mail correspondence that we have. And some of that correspondence does relate to a -- a manuscript that we were coauthors on, and -- I think. And then on -- I think that's it. And -- and -- and then we -- we

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also might be, I'll have to think about that, we might be in the future contributing manuscripts separately, separately, to a special issue of a particular journal. And I think that his name was on the list of possible contributors, but it would be not a coauthored. It would be separate publications.
Q. And what is that issue?
A. This is a special issue of a journal of the British Toxicology Society. And I'm cringing a little bit, it's coming, coming close to the time when the -- my manuscript is due.
Q. And does -- strike that.
What does -- what does your manuscript involve? Does it involve a specific chemical or...?
A. No. My manuscript in -- in a very broad sense will be some aspects of the -- of the standard rodent bioassay. I haven't really -- I haven't really defined it thoroughly yet.
Q. And what manuscript were you coauthors on?
A. It was a -- with Colin Barry, there was a manuscript that I'm going to call The Appeal.
Q. Okay. I'm -- I'm familiar with that.
A. And we were coauthors on that. And with The Appeal there was a -- like a letter, a short

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letter to the editor that had probably 200 or so people who sort of signed and Colin was also one of the signers of that.

Q. Have you ever communicated with Colin Barry about glyphosate and/or Roundup?

A. No communication from me to him dealt with -- dealt with glyphosate or Roundup. On one e-mail that he sent as part of the underlying discussions before what I'm going to call The Appeal manuscript was completed, there is a -- a line at the bottom of one e-mail -- excuse me -- where -- where he says something about I am -- I am going to a Monsanto shareholders meeting. Glyphosate is going to be discussed. Should be interesting.

Q. And you did not -- strike that.

Did you have any oral communications with Sir Colin Barry about -- regarding glyphosate?

A. Never.

Q. Same question about Roundup?

A. Never.

Q. Okay. Now, you know a Helmut Greim as well, is that correct?

A. I do.

Q. And how do you know -- I presume it is

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Dr. Greim?

A. It is.

Q. Okay. How are you acquainted with him?

A. I'm acquainted with him because I do -- have seen him on occasion at -- at scientific meetings. Helmut Greim, Dr. Greim, was also involved with International Life Sciences Institute, and I probably first met him through some International Life Sciences Institute meetings or projects.

Q. Have you ever communicated with Dr. Greim about Roundup or glyphosate?

A. Never.

Q. Never.

Now, I'm not going to make you flip through your -- your resume, but at one point you were President of the Society of Toxicology, is that correct?

A. That's correct.

Q. Okay. And what is the Society of Toxicology?

A. The Society of Toxicology is the largest professional society of toxicologists in the world. The membership today is probably about 8,000 to 8500 and it was probably 5 or 6,000 when I was -- at the

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time I was president.

Q. How does the Society of Toxicology receive its funding, if you know?

A. The society receives its funding, A, from member dues. It receives the bulk of its funding from its annual meeting in terms of registration fees and as part of the annual meeting there is a very large presence of -- of exhibitors, in terms of exhibitors that are in the business of selling scientific instruments, some of them are some contract laboratories, some of them are, like, the National Institute of Environmental Health Sciences has a booth, and they all pay something for this. And there are also some donations from industry. The bulk of it comes -- the bulk of the finances come from the annual meeting.

Q. Did you receive any compensation --

A. I should say also, they -- they are now having some, what I will call, freestanding meetings outside of their annual meeting, but I don't think that -- I -- I don't think that those are moneymakers. If they -- if they are, it's very little money that is made on that. It's really done for the -- to advance the science.

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Q. And were you compensated for your time as President of the Society of Toxicology?

A. No.

Q. No.

A. Except -- I -- I -- when I -- when I traveled to -- when I -- when I -- when I traveled to board meetings, there were times that I did travel on behalf of the Society of Toxicology, I was reimbursed for travel expenses, but no -- no salary, no honorarium, no help in terms of any office-type expenses.

Q. Okay. And different toxicologists have different philosophies, is that fair?

A. I would -- I would put it a little bit different. I would say that different -- different toxicologists might have different perspectives.

Q. And would you agree that some toxicologists view their role as to try to find the poison, so to speak?

MS. PIGMAN: Objection; calls for speculation.

BY THE WITNESS:

A. I -- I don't -- I don't think that that is correct. There may -- I don't think -- I have not met toxicologists who have told me that my role is to find

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the poison.
BY MR. WOOL:
Q. Okay. So is it fair to say you don't view that as your role?
A. I do not view that as my role and I can only speak for a limited number of toxicologists who I've met and I've never heard any of them articulate what you just said.
Q. Fair enough.
I'm going to hand you what will be marked as Exhibit 25-3, and I will represent that this is your retention letter with the Hollingsworth firm.
(WHEREUPON, a certain document was marked Deposition Exhibit No. 25-3, for identification, as of 09/22/2017.)
BY MR. WOOL:
Q. Do you recall receiving this letter?
A. Yes.
Q. And the date on the retention letter is December 29th, 2015, is that correct?
A. That is correct.
Q. When were you first contacted about serving as an expert in this litigation?

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A. Approximately.
Q. Approximately.
A. The first week of December of 2015.
Q. And who contacted you?
A. Mr. John Kalas.
Q. And let me go ahead and mark Exhibit 4 and I'll ask you about this in a minute.
(WHEREUPON, a certain document was marked Deposition Exhibit No. 25-4, for identification, as of 09/22/2017.)
BY MR. WOOL:
Q. Now, prior to being contacted by Mr. Kalas, had you performed any research on glyphosate and/or Roundup?
A. Prior to being contacted by him, I did read the -- what I'll call the write-up that IARC had published in a journal called the Lan -- Lancet. And also a number of years ago I was a member of the Board of Scientific Counselors of the National Toxicology Program, and the National Toxicology Program did, not -- not a bioassay, but they did a 90-day toxicity study on glyphosate and I was a member of the board at the time that that 90-day study was reviewed.

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Q. Were you involved in -- in the review of that study?
A. Yes. The Board of Scientific -- this was for the National Toxicology Program, and it is typical, not always, that their documents are submitted to the Board of Scientific Counselors for review prior to having them made public.
Q. Had you formed an opinion on the carcinogenicity of Roundup and/or glyphosate after participating in that review?
A. I did not. That was -- that was not a carcinogenicity study. It was a -- a 90-day study which is designed to ask about potential toxicity at various organ sites but not carcinogenicity, because a study for a duration of 90 days is certainly not sufficiently long.
Q. Now, had you formed an opinion about the genotoxicity of Roundup and/or glyphosate prior to December 29th, 2015?
(WHEREUPON, there was a short court reporter clarification.)
BY MR. WOOL:
Q. Had you formed an opinion about the genotoxicity of Roundup and/or glyphosate prior to

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being retained by the Hollingsworth firm in December of 2015?
A. What I can tell you is that part of this 90-day study did include a -- a separate series of evaluations of the genotoxic potential of glyphosate and those evaluations turned out to be negative. And so, based on that, it appeared to me, but without a firm conclusion, those -- based on those three, it appeared that glyphosate is not genotoxic.
Q. And do you recall what tests were performed in that review?
A. Oh, certainly Ames test was performed. So I was on the Board of Scientific Counselors roughly from 1989 to 1992 or so. So we are talking a while ago. Certainly it was the Ames test. It was probably one or two of the mammalian tests in vitro and I just do not recall if an in vivo study was -- was performed.
Q. Do you believe that you could form a firm opinion as to the genotoxicity of Roundup based only on the Ames test or on -- on in vitro tests?
A. My answer to that is no. In my opinion, in terms of a firm opinion, I think that the inclusion of some in vivo studies is appropriate. So this

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evaluation that the NTP did was -- was somewhat limited, although, again, the -- the thrust of the NTP evaluation was this 90-day toxicity study.

Q. And your involvement, and I'm sorry if I asked this, was limited to reviewing that study --

A. My involvement --

Q. -- the entire NTP study?

A. My involve -- involvement was limited to reviewing that study. I was not involved in the planning of the protocols.

Q. Okay. Now, I marked as Exhibit 4 your invoices.

Can you take a look through those really quick?

A. Sure.

Q. I -- I just want to make sure that those reflect all of the invoices and -- and are accurate, et cetera.

A. These are the invoices that I have submitted, yes.

Q. And do these accurately reflect all of the time that you have spent on your glyphosate and Roundup opinions up to August 6th -- 6th, 2017?

A. As -- as -- as noted on the August 6th,

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2017 invoice, right under Invoice it says the period covered is June 7 through July 24.

Q. Oh, so my apologies.

A. It -- it -- it accurately covered -- accurately represents my invoices up to and including July 24, 2017.

Q. And how much time do you believe you've billed since this invoice was submitted?

A. I don't know. I'm sorry.

Q. And you can approximate.

A. Sin- -- since -- since the -- since the one dated August 17th was submitted?

Q. Correct.

A. I have not billed for any time since then. There -- there have -- there has been some time accruing, if you will, but the most recent invoice that I have received is the one that I have -- the most recent invoice that I have submitted is the one dated August 6th, 2017.

Q. And how do you document the time that you spend working on -- on this Roundup case?

A. I keep -- I keep notes.

Q. Does anybody help you with keeping notes or --

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A. Just me.

Q. Just you.

A. It's just me.

Q. Okay. And how much time do you believe that you have spent since July 24th, 2017, working on this case?

A. Well, you know, I -- I keep notes. I -- I don't keep a running -- I don't keep a running tally. I would say that it is, in rough ballpark terms, something between 25 and 50 hours.

Q. Okay. Now, if you turn to the invoice dated August 23rd, 2016, which I believe is the third page going chronologically.

A. I see that.

Q. Now, if you look at Item No. 2, it states:

"Initial draft report sent to H. Pigman and E. Klenicki on 6/15 of '16," is that correct?

A. Correct.

Q. Okay. And on June -- so is -- is it accurate to say that on June 15th, 2016, you submitted your first draft report to Ms. Pigman and Ms. Klenicki?

A. Yes, that's what I mean by "initial."

Q. And at that point in time had you formed a

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firm opinion as to the genotoxicity of glyphosate and/or Roundup?

A. At that point my -- I -- I had not formed a firm opinion, but I was starting to develop a preliminary opinion was starting to gel.

Q. And so as of June 15th, 2016, it would be fair to say that you had not formed a definitive opinion as to the genotoxicity of Roundup?

A. That is correct.

Q. Okay. Now, in performing your work on -- on the Roundup case, did you receive any help from a -- a research assistant or -- or anything like that?

A. None. It's all me.

Q. It's all you.

Did anybody help you summarize articles?

A. It's all me.

Q. Did anybody from Monsanto send you article summaries or anything like that?

A. Never.

Q. Okay. I'll ask you to take a look at Exhibit 2. You can probably put Exhibits 3 and 4 to the side for a while.

And what is Exhibit 2?

A. Exhibit 2 is titled "Supplemental

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Materials Considered List." Along with my report there was a listing of materials considered. And since my report was submitted, I have not stopped in terms of, if you will, keeping an eye out for glyphosate-related literature.

Q. And as you sit here today, does that list in Exhibit 2 represent everything that you have read or relied upon in forming your opinions?

A. It does.

Q. It does.

And have you reviewed everything that's on that list?

A. I have.

Q. I mean read every article, not read the -- reviewed the entries?

A. The -- the -- I -- I have. Now, for some of the articles I spent more time on than -- than some others, but I did review the materials on this Supplemental Materials Considered -- on this Materials Considered List with the supplements added to it.

Q. Okay. And in Exhibit 1, your expert report contains an appendix which is a number of EPA tables, is that correct?

A. That's correct.

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Q. And did you review all of the studies that are summarized in those tables?

A. The answer is yes. The answer is yes. I could have constructed those tables on my own. It would have taken a long period of time. It is my opinion that the EPA's Office of Pesticide Programs tables, which -- which are -- are my appendix here, are -- are very thorough. I think that they did a very good job. And that's why, with proper referencing, I've included their tables. But I did ask the Hollingsworth attorneys if they could send me the references on the tables, and you will see that that is part of this Materials Considered List.

So while I have the EPA tables here, in no way did I simply rely on those tables. I -- I did want to -- it was -- it was not -- it was imperative in terms of looking at the underlying references.

Q. Okay. Let me go back to -- to Exhibit 1 and specifically your resume really quick.

A. Sure.

Q. So I -- I just wanted to touch briefly upon your role on, I believe you serve as an editor or -- or on the board of two journals, is that correct?

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A. Currently that's correct.

Q. Okay. And what are those journals?

A. One is Toxicology where I am a member of the editorial board. The other is Regulatory Toxicology and Pharmacology where I am a -- one of the associate editors.

Q. Okay. And for Toxicology, what do you do in your capacity as -- let's see, what did you say -- as an editor on the board?

A. As a member of the editorial board, I do -- when -- when a -- when a manuscript is submitted to the journal, the editor, and in the case of Toxicology there is an editor for North America and there is a separate editor for, I think, Europe and the rest of the world. And manuscripts that these two individuals receive, they then send out for review. Often at least one of the reviewers is a member of the editorial board. They do have -- sometimes all of the reviewers -- multiple reviewers review each manuscript. Sometimes they are all members of the editorial board, sometimes it's members of the editorial board and someone who may not be on the editorial board. And so at their decision, they would ask me if I -- if I have the time and feel that I have

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the expertise to do a thorough review of a particular manuscript submitted for publication.

Q. And what do you do for the -- for the other journal?

A. For the other journal --

Q. Similar?

A. I -- I do something that is really very -- that is very similar. I think that as an associate editor there are times where I may receive some of the, in quotes, more difficult manuscripts.

Q. What do you mean by more difficult manuscripts?

A. They may be more complex, they may be more -- more complex, they may be more involved. That -- that is not always -- that is not always the case.

Q. Okay. So let me just ask you some basic questions about your expert report -- expert report --

A. Sure.

Q. -- in Exhibit 1.

Are all of the opinions that you intend to offer at trial confined in that report?

A. Yes.

Q. As you sit here today, to the best of your

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knowledge, do you intend to offer only those opinions that appear in that report?
A. As of today, this report is -- is my independent report based on my evaluation and as of today the opinions expressed here are what I anticipate presenting, if -- if I am involved in this court proceeding that you are alluding to.
Q. Are the opinions contained in your report complete?
A. The opinions, the opinions are complete. The report is, in my opinion, is still, if you will, a sort of a -- well, my opinion, I'll -- in a sense sort of a living document because, as I indicated here, since submitting the report I have not stopped in terms of looking at glyphosate-related -- related papers. I -- I cannot see how my opinions here would -- would change, but depending upon what happens in the literature, I can't tell you that something is absolutely 100 percent not possible.
Q. Fair enough.
As you sit here today, are there any changes or edits that you feel you would need to make to your report to -- to make it complete and accurate?
A. No. I think my report -- my -- I think --

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I -- I feel that -- I feel that my report today is -- is accurate. On this date the report we -- on this date my current opinion is not -- opinions are no different than the opinions expressed on 31 July of this year.
Q. And do you anticipate doing any specific additional work on your report?
A. Well, as I -- as I said, I -- I continue to look at the glyphosate-related literature. So there will be some additions to this -- these materials considered. At this point right now I do not -- I do not anticipate revising my report. As I said, the opinions expressed in the report are the opinions that I hold today, but in terms of something happening in the literature, I -- I -- I can't tell you absolutely nothing ever, never will change. Right now these are my opinions.
Q. And is there any information that you wanted to form your opinions that you didn't receive?
A. If -- if what you're asking is: Was there a time that I requested information, such as when I requested the actual papers that are referenced in the EPA tables, if what you are asking is: Did I make a request for information and then that request was

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denied, if that is your question, my answer is no.
Q. Okay. So there are no studies that you're aware of that you wanted to see or -- or review that you didn't have access to?
A. That is correct. But I would tell you that a -- a large number of the papers referenced in this Materials Considered List are papers that I found or the papers that I knew about that were relevant here.
Q. Okay. And the opinions contained in your report, are -- strike that.
How would you describe the level of confidence that you have in your opinions as they are represented in your report?
A. I describe the level of confidence I have as extremely high.
Q. Okay. And you are not offering an opinion in your expert report related to epidemiology?
A. You are correct. I -- I am not an epidemiologist. I do not claim expertise in epidemiology.
Q. Okay. And you aren't offering an opinion on any of the long-term animal cancer studies, is that correct?

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A. I am not offering -- at -- at -- in the early -- in the early, early time of my involvement, I did review a number of the cancer bioassays. I did review a number of the cancer bioassays, I did become familiar with them, and that becomes necessary in terms of placing in context the report that I wrote.
Q. Sure.
But are -- are there any opinions specific to the animal cancer bioassays that are contained within your report?
A. My report does not provide opinions on the cancer bioassays.
Q. Okay. And would it be fair to say that your opinions are limited to those involving the genotoxicity and oxidative stress of Roundup glyphosate-based formulations and glyphosate?
A. Opinions on that per se and opinions on how that might relate to potential carcinogenicity.
Q. And it is your opinion that a substance can be carcinogenic but not be genotoxic, is that accurate?
A. Yes.
Q. And a substance can be carcinogenic and not promote oxidative stress, is that also accurate?

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A. My opinion is that I think that, while there are a lot of papers in the literature, a lot of discussion about the role of oxidative stress in carcinogenesis, I do not believe that the information that I have seen allows one to then make the leap that because in some experimental systems some aspect of oxidative stress was observed, that this means that carcinogenesis will result.

Q. Okay. So am I correct that you do not intend to offer opinions related to any potential mechanism for carcinogen- -- genesis other than genotoxicity and oxidative stress? As it relates to glyphosate-based formulations and glyphosate?

A. Well, if -- if one is going to offer opinions in terms of genotoxicity, as you just alluded to, there are some non-genotoxic compounds that are carcinogenic and I consider my expertise in the -- in the area of -- area of carcinogenesis. So, but my opinion is what is presented here.

Q. Okay. So -- so, to ask my question again, so it would be fair to say that you are not offering any opinions related to any other potential mechanisms of carcinogenesis in this litigation other than your opinions related to genotoxicity and oxidative stress?

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A. At this point, the answer is yes.

Q. Okay. And do you have any reason to anticipate that changing down the road?

A. I have -- as I sit here today, I do not have reason to believe that that will change. But I cannot tell you that absolutely, unequivocally it will not change.

Q. Fair enough.

So before we really dig into your report, I -- I want to kind of ask you about some of the -- the definitions and -- and terms that you use just so that we can be sure that we are on the same page.

A. Good idea.

Q. All right.

Now, you describe a number of studies as -- as both positive and negative throughout your report. Fair?

A. That is correct.

Q. Okay. And what do you mean, just so we are on the same page, by the term "positive"?

A. Well, if we are talking about -- if we are talking about a genotoxicity study, then when I say positive, I am saying that in my opinion that this is a properly-conducted study and the results of the

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properly-con -- properly-conducted study provide a indication that the compound in question was genotoxic in this particular assay.

So what I'm saying is that it is not just looking at, for example, whether a particular author said, I observed genotoxicity. But I think one has to look in a constructive, critical fashion at the study, at the study design, in terms of the procedures that we used and -- and make a -- an in-depth evaluation.

Q. Okay. So -- so I think I understood your answer. I just -- I just want to make sure that I am clear that when a study is described in the body of Exhibit 1, which is your expert report, as positive, that means that that description of positive is your opinion of the -- the study, having completed a thorough review of -- of the materials?

MS. PIGMAN: Objection; vague and mischaracterizes the portions of the report.

BY MR. WOOL:

Q. Okay. Let -- let's strike that.

So when you characterize a study as positive in the body of your report, is that your opinion that -- that it -- the study is positive?

MS. PIGMAN: Again, objection; vague. It

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mischaracterizes portions of the report.

BY THE WITNESS:

A. Well, if -- if in the report I said, Auth- -- Author X in his or her paper said that compound X was -- was genotoxic, that is me just reading or saying what the author said. If in the report I say that my opinion in terms of eval- -- evaluating this is that the study was positive or that the study was negative, then that's my opinion of the particular study based on a constructive, in-depth consideration of experimental protocol, methodology, et cetera.

BY MR. WOOL:

Q. Okay. So this isn't meant to be a -- a trick question or anything. I'm just trying to make sure that -- that we are on the same page and that I understand what exactly you are saying. So if -- and maybe this would be best if we looked at an example.

So if you will turn with me to page, let's see, 18 of your report.

A. I'm there.

Q. Okay. You described the results of a number of Ames tests related to glyphosate-based formulations, correct?

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A. Yes.
Q. Okay. And you state: "All of the studies were negative" at the end of the first paragraph, correct?
A. Yes.
Q. Okay. And that statement is your opinion, not the -- not a reflection of -- of the description of the reports by the authors?
A. Correct. That statement -- that statement is based upon my reading and evaluation of the particular report or study.
Q. Okay. And -- and so would I be -- strike that.
Would -- would it be fair to assume that but for those instances where you described the conclusion as that of the author of the study that -- that when I see the word "positive," that means that that is your opinion as it relates to the -- to the study?
MS. PIGMAN: Objection; vague and out of context. It misstates his report.
BY THE WITNESS:
A. It would be helpful to me if you could clarify a bit and point to an example of -- of what

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you are talking about.
BY MR. WOOL:
Q. Okay. We'll get to that in a minute.
So just really quickly, I don't want to spend too much time on this, when you describe a study as negative, what do you mean by that term?
A. Well, when I describe the study as negative, what I mean is that the results of the study indicate that the compound in question did not produce genotoxicity in that particular test system. And if I said that, then it is -- it means that I have reviewed aspects of the experimental protocol and reviewed the study overall and -- and did more than just look at the author's bottom-line conclusion.
Q. Okay. So would it be fair to say you reviewed the experimental protocol in all of the studies that you describe as negative in your expert report?
A. I would say that I reviewed the -- I reviewed the information that was available to me. In some of the Monsanto, I'll call them, internal studies, I reviewed them as best I could based upon the information provided. And there was some, some variability in terms of the depth to which they went

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into the protocol, but if I did review them, it -- it -- then it means that there was sufficient information for me to -- to reach a conclusion.
Q. Okay. And do you include studies that you might describe as inconclusive within the -- the term "negative" as it is presented throughout your report?
MS. PIGMAN: Objection; vague.
BY THE WITNESS:
A. I -- I look at the -- I mean, I -- just in isolation, I -- I look at the term "in" -- "inconclusive" does not have, to me, the same meaning as positive or negative. In -- to me, inconclusive means, in this context, based upon the data presented, that one cannot draw a firm opinion in terms of plus or minus.
BY MR. WOOL:
Q. Fair enough.
Now, you use the -- the term "underlying study report" fairly frequently throughout your expert report.
What -- when you use that phrase, what do you mean by "underlying study report"?
A. Could you give me an example so that --
Q. Yeah.

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A. I just -- I really want to be clear when I respond to you.
Q. So -- so at the top of Page 18, in describing the -- the 38 Ames tests, the first line reads: "I have reviewed the underlying study reports" --
A. Yes, yes.
Q. So --
A. What that -- what that means is -- what that means is that I -- I did not simply look at a table, like, for example, one of the EPA Office of Pesticide Programs table and just read across in terms of what was on the table and -- and -- and accept that without looking at the reference for it. And that's what I mean by "the underlying report."
Q. So -- so I -- I feel like you sort of told me what you didn't do when you say you reviewed the underlying study report. I -- I'm just trying to -- to get a sense as to does -- does that include the, I guess, all of the underlying data for -- for those studies or --
A. It includes the underlying data that -- that were -- it includes the underlying data that were available to me.

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Q. Okay. Now, would you say that you employed a -- a specific methodology in reaching your opinions, such as weight of the evidence, for example?
A. Just -- just to clarify, when you are talking about in terms of reach my opinion, for example, my opinion relative to genotoxicity and glyphosate-based formulations?
Q. Correct.
A. I would say what I did was I reviewed a -- a very large body of -- of information and came to a conclusion based on that. What I did not do was say that here is a stack of pluses and here is a stack of minuses and somehow put them on a balance. It -- it's based on an overall review of the body of literature.
Q. Okay. And would you agree that -- that some tests -- or strike that.
Did you afford some of the -- the various tests that you describe as genotoxicity tests or tests for oxidative stress, did you afford some of those tests greater weight than others?
A. In general it's my opinion that the -- in general, it's my opinion that the in vivo studies trump the in vitro studies. So I do give more weight to in vivo studies.

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Q. Okay. Now, if -- if we take this outside of the context of -- of your report, just looking at if you were evaluating anything within the -- the context of genotoxicity, would it -- would that be the same approach that you would take?
A. Yes. Yes. I mean, the approach that I took in terms of evaluating the data that forms the basis for this report is an approach that's taken over -- over decades -- over my decades in -- in terms of working, researching in this area.
And so when I review this literature, in a -- in a sense this is really not different than my role as a editor for a journal reviewing a manuscript. It is not different than my role in reviewing a grant application submitted to a particular grantor. It is not different than the approach I take when a colleague of mine comes to me and says, Jay, I'm drafting this manuscript. Could you take a look at it and -- and give me opinions.
Q. Sure.
Now -- now, again, outside of the context of your report, and I know that you have quarrels with the -- the -- the human studies, how would you prior -- prioritize human studies evidencing evidence

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of genotoxicity or oxidative stress relative to in vivo and in vitro studies?
A. By human studies, am I correct that you are talking about living human beings?
Q. Correct.
A. As opposed to human cells and culture.
Q. Correct, living human beings.
A. Yeah, I -- I -- again, I -- I -- I think that in vivo studies, in -- in my opinion, in general trump in vitro studies.
Q. Right. So -- so I guess I'm asking, if you found a -- a study that you considered to be reliable and methodolog- -- methodologically sound that measured genotoxicity in living humans, would that be afforded more weight than an in vitro study or in vivo, or I guess that would be an in vivo study, that -- that's how you would characterize it? Strike that question.
A. You know, I -- I -- I'm a little confused. Could you please rephrase?
Q. So I'm saying, would you consider -- let -- let me ask this:
Would you consider a study measuring genotoxicity in living humans to be an in vivo study?

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A. Yes.
Q. Okay. And if you were evaluating the ultimate question of whether a chemical caused genotoxic or genotoxicity in humans, would you prioritize an in vivo human study above an in vivo animal study, for example?
A. First that would depend, again, on a -- a review of the study and the methodology.
Q. Right, assuming it was reliable and methodologically sound.
A. But in -- in -- in general, again, I -- I think that studies in vivo trump studies in -- in vitro. That doesn't mean that the in vitro studies are worthless. That doesn't mean that the in vitro studies are automatically discounted, but I would tend to give more weight to the in vivo.
On the other hand, if you have a situation where you have one in vivo study, do I think that that is going to erase a whole host of well done in vitro studies and well done in vivo studies in rodents, the answer is -- the answer is no. But I still, in general, would give more weight to the in vivo study.
Q. And it's fair to say that you give more weight to the mammalian studies versus non-mammalian

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studies?
A. The answer -- the answer is -- is yes. You know, in all of what we are talking about is context related, and -- and -- and it really depends on -- on the particular -- on the particular context.
Q. Okay. So in the context of your report, do you believe that any of the non-mammalian tests should be afforded any weight?
A. I do think that the -- I do think that what we'll call the Ames test, which is -- involves bacteria in in vitro is something that certain -- that's something that should be certainly afforded some weight, that it -- it is valuable. And if you want to mention another non-mammalian test system, then we can -- we can talk about that.
Q. I -- I guess we'll get to that soon enough.
Okay. So let's talk about the Ames test. So you can turn to Page 18 of Exhibit 1.
A. I'm there.
Q. You are there already.
Okay. So first, I guess, let's -- let's make sure that we are on the same page as far as definitions can -- go.

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You use the acronym GBF, which I take to mean glyphosate-based formulations, is that correct?
A. That is correct.
Q. Okay. And what do you mean by glyphosate-based formulations?
A. I mean formulations that contain glyphosate along with other chemicals.
Q. Are there any specific chemicals that -- that you consider to be contained within glyphosate-based formulations or are you just talking about it's glyphosate and -- and something else?
A. Well, I'm -- first, I'm talking about it is glyphosate and something else. Among the something else are some chemicals that are called surfactants.
Q. Okay. So when you use glyphosate-based formulation throughout your report, does that include formulations that contain surfactants?
A. Yes.
Q. And what is a surfactant, so we are clear on that?
A. Surfactant is a chemical that tends to adhere to surface of cells.
Q. And so what are the surfactants that -- that you are aware of that are contained within

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glyphosate-based formulations?
A. You know, I can't really give you the chemical names. These are long, convoluted chemical names and I -- I can't give you the -- the specific names.
Q. Okay. So what is the Ames test designed to tell us?
A. The Ames test is a test that is designed to tell us whether a mutation has occurred.
In the Ames test -- in the Ames test what one is doing is monitoring for what we would call a reverse mutation. That is, the Ames test consists of bacteria that have a mutation in a gene that encodes a product which is involved in synthesis of a chemical that the organisms require for growth.
The amino acid histidine is -- is one of these. And so these bacteria have been selected because they contain a particular mutation in a crucial gene. And then, in the Ames test, what we are looking for is a mutation that reverses this and mutates the mutated gene so that it is back to normal.
Q. So do you believe it's possible that a substance can be genotoxic in humans and not promote a mutation in bacteria in the Ames test?

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A. Yes.
Q. Okay. How many strains of bacteria are typically used in an Ames test?
A. There are at least four strains of Salmonella typhimurium and then there can be several strains of another bacteria and it just slips my mind.
Q. I'm sorry?
A. It just slips my mind.
Q. Okay.
A. These proceedings are rather foreign to me and it just slips my mind.
Q. When you say, "These proceedings are rather foreign to" you, are you talking about the deposition --
A. Yes.
Q. -- or the -- okay.
A. Yes.
Q. I figured it wasn't the Ames test.
A. I'm talking about the deposition. So -- so it's -- no, no, no. So excuse me. That's all right.
And so each of these strains contains a different type of mutation. So one may contain what we call a point mutation, which means a switch in a

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particular base pair, one may contain an addition or deletion, which leads to what we call a frame shift.

And so what one is doing, really, in the Ames test is you're able to evaluate, for example, whether it was a point mutation or whether it was an addition or deletion that caused a frame shift mutation. It is really rather elegant.

Q. Okay. So, in the first line on Page 18, you say that you: "have reviewed the underlying study reports for 38 Ames tests as well as the relevant study summaries for at least 12 additional Ames tests."

Is that correct?

A. Yes.

Q. Okay. And if I look at Appendix 1, which is Page 45 of your report.

A. Just one moment, please, and I'll -- I'll be there.

Q. Okay. I -- I'm just trying to make sure I -- I have a grasp on all of the -- the studies that you've looked at.

A. I'll -- I'll be there quickly.

Q. Okay. I think that -- so by my count there are 31 tests listed in Appendix 1. And then --

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A. I'm sorry. Excuse me. We are on Page 45?

Q. Correct.

A. Okay.

Q. And then you Count 12 -- sorry. Strike that.

So when you say re -- you reviewed the underlying study reports for 38 Ames tests, are all of the results contained in Appendix 1 within that 38-study-report number that you report on Page 18?

A. Should be.

Q. Okay.

A. Are you saying that there is --

Q. No, no. I -- what I'm -- I'm just trying to -- to ask is, so -- and a better way of asking it, I -- I guess, is that you reviewed the underlying study reports for all of the test results contained in Appendix 1, is that correct?

A. That is correct. I did receive the -- the references which are listed under the Reference column and -- and I -- I certainly did look at and consider those. So my evaluation is not, not simply based on looking at the table.

Q. Right. Okay. And so my question is, by my count there are 31 tests reported in Appendix 1.

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So I'm curious, if you know, what the other seven tests were for which you reviewed the underlying study reports?

MS. PIGMAN: I'm sorry. Are you asking him to compare Appendix 1 to his Materials Considered List --

MR. WOOL: I'm just asking him if -- if he --

MS. PIGMAN: -- and figure out which ones are not there or --

MR. WOOL: Yeah, I'm just -- right. So what I'm asking is just if he knows or if he has a way to, I guess, possibly quickly -- quickly direct me to what additional seven Ames tests he -- he reviewed the underlying study reports for.

BY MR. WOOL:

Q. And if you can't, if you don't know, that's fine. It is not a big deal. I am not fixated on that.

A. Well, let me...

It will take me a little time to --

Q. Okay.

A. -- try -- to -- to try to reconcile this.

Q. Okay. So I -- I'm not really that hung up on -- on that.

Okay. So do all of the underlying study

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reports that you reviewed comply with OECD guidelines?

A. Some of the -- some of the -- some of the reports were performed quite a while ago and some of them were probably performed before there were OE -- OECD guidelines, that could be, and some of them were probably performed before the most current OECD guidelines.

Q. Okay. For -- are you aware of any that were performed after the most current OECD guidelines that do not comply with OECD guidelines?

A. I'm not.

Q. Okay. And you state you reviewed 12 additional study summaries.

So -- so what do you mean by a study summary in this context?

A. The additional studies, the additional study summaries were summaries from Monsanto.

Q. Okay. So as a -- a peer reviewer on either of the two journals that you serve on, would it be enough for you to review a study summary in your review of articles submitted for publication?

A. In -- in -- in this particular context where there is so much of a genotoxicity data, the -- the answer would -- the answer is yes.

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Q. Okay. Let's see. So your conclusion is that:
"All of these studies indicate that GBFs do not cause mutations in bacterial-based systems."
A. Yes.
Q. Is that correct?
A. Yes.
Q. And can you -- strike that.
And is your opinion that this data set is conclusive?
MS. PIGMAN: Object. Objection; vague.
I'm sorry. Go ahead, you can answer.
BY MR. WOOL:
Q. You can answer.
A. It is my opinion that this data set is -- it is my opinion that this data set is -- is highly convincing. I'm not sure exactly what you mean by the word "conclusive."
Q. I'm --
A. I think the data set is highly persuasive.
Q. Okay.
A. I think it's convincing.
Q. Yeah, that -- that's a good enough answer.
Are there any studies contained within

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this data set of glyphosate-based formulations that have -- or Ames tests regarding glyphosate-based formulations that you did not consider due to methodological flaws?
A. I considered the studies that were -- were provided to me and I did not -- I did not exclude any of them.
Q. Okay. And out of this data set, do you know how many, if any, of the studies were publicly available?
A. The -- the ones that were received from Monsanto, I think that some of them are publicly available in that glyphosate has been on the market a long time and, for example, the Environmental Protection Agency as well as in Europe periodically review and re-review chemicals that -- that they permit. It's not -- it's not that we approve this chemical and it's approved for eternity. And so I think that in either the initial reports or subsequent ones that there are genotoxicity data and that if one looked at, for example, the EPA report as they reviewed and re-reviewed, that you would find -- find these.
Q. Okay. I think that's probably enough.

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Okay. So for the studies that were provided to you, were there any occasions where you found the provided data insufficient or you needed more information for this Ames test data set that we are discussing?
A. I did not find the data -- the studies that were provided to me contained sufficient information for me to -- for me to draw a conclusion.
Q. Okay. Do you mind if we take a quick --
MS. PIGMAN: I was going to ask the same question, if you were ready to --
MR. WOOL: Yeah. No, I'm --
MS. PIGMAN: -- take a quick break.
MR. WOOL: Need a quick bathroom break.
MS. PIGMAN: It sounds great.
THE VIDEOGRAPHER: Off the record at 10:45 a.m.
(WHEREUPON, a recess was had from 10:45 to 10:53 a.m.)
THE VIDEOGRAPHER: This the beginning of Disk No. 2 and we are back on the record at 10:53 a.m.
BY MR. WOOL:
Q. Okay. Dr. Goodman, I believe I was asking you about the Ames tests as they relate to -- or the -- the glyphosate-based formulation results of the

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Ames test. Before we move off of Ames test, let me just ask you really quickly about the -- the results of the Ames test related only to glyphosate.
For any of the tests related to glyphosate, did you discount any of the studies due to methodological flaws?
A. No.
Q. Did you discount any of those studies due to noncompliance with OECD guidelines?
A. No.
Q. Okay. So let's talk about the in vitro studies with glyphosate-based formulations, which I believe began on Page 19 of your report.
A. I am there.
Q. Okay. So in your own words, what does this test tell us?
A. Well -- well --
MS. PIGMAN: Objection; vague. Which -- which test?
BY MR. WOOL:
Q. No, no, I'm not talking about a specific test. I'm just asking in general, an in vivo chromosomal aberration or -- or a test for chromosomal damage in mammalian cells, what is that?

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A. Excuse me. Maybe I didn't hear you right. I thought you said in vivo. Here we are talking about in vitro.
Q. I'm sorry. I meant in vitro. You caught me.
A. That's fine.
Q. What does an in vitro test for chromosomal damage tell us?
A. Well, first of all, in vitro means cells in culture. And actually the original meaning was -- for in vitro is in -- in glass, and we don't use glass anymore, but we keep the -- keep the name.
So in vitro test means we are evaluating cells in --
Q. And -- and to be clear, I'm -- I'm just sort of asking for what the -- the results of an in vitro test for chromosomal damage reveal to you as a -- as a genotoxicologist?
A. What it reveals to me is whether there was damage to -- to the cell -- the chromosomes of the cell.
Q. Okay. And are these typically performed in rodent and human cells, is that accurate?
A. The vast, vast majority that I have seen

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are in -- in rodent and/or human cells.
Q. Okay. And so there are two tests that you evaluated within this data set, one positive and one negative, correct?
A. Um-hum.
Q. Okay. And the Koller, am I pronouncing that correctly, test was reported as positive, correct?
A. One moment, please.
Q. By -- by the author, I mean.
A. Correct.
Q. Okay. And your conclusion for Koller, as I understand it, is that the positive results seen in the test were secondary to cytotoxicity?
A. Yes, the -- the -- it is -- it is -- it is based upon the Koller et al. publication that there was damaged cell membranes, an aspect of cytotoxicity, even at the lowest concentration employed.
Q. And did the test also show chromosomal damage?
A. It did.
Q. Okay. And can you definitively rule out genotoxicity as a cause for that damage?
A. The issue here now revolves around the

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definition of genotoxicity. In my opinion, a compound that is genotoxic -- a genotoxic compound, a compound that is genotoxic is where the compound itself or a metabolite damages -- can damage the genetic material in terms of is that compound genotoxic. One can have genotoxicity, that is damage to the genetic material, that might occur secondarily or tertiary to an event that the compound produces. And under those conditions, in my opinion, it is not appropriate to label the compound as being genotoxic.
Q. Okay. And -- and so I'm asking in Koller, can you definitively rule out that the glyphosate-based formulation caused the positive -- or sorry. Strike that.
Can you definitively rule out that the glyphosate-based formulation caused chromosomal damage that was not secondary to cytotoxicity?
A. What I can say is that the cytotoxicity observed is a very large confounding effect and based upon that it -- in my opinion, it would be inappropriate to use Koller et al.'s results to claim that glyphosate is a genotoxic compound.
Q. Okay. So the other test that you looked at within this data set is Holeckova, if I'm saying

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that correctly?
Is that correct? It is at the top of or the kind of the main body paragraph on Page 19.
A. Yes.
Q. Okay.
A. In terms of the pronunciation, I -- I don't know the individual.
Q. Right.
A. So I'm not sure what the correct pronunciation is.
Q. And you don't provide any criticisms of the -- the study divine -- design in Holeckova, correct, in your expert report?
A. That is correct.
Q. Now, at the bottom -- okay. So, in the -- in the middle of the paragraph, you stated that:
"The author reported a slight but statistically significant increase in polyploidy...at only one of the concentrations tested, the 56 molar concentration," correct?
MS. PIGMAN: Objection. You read only part of the sentence.
BY MR. WOOL:
Q. I guess I didn't read the -- the

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parentheses, but is that the -- the gist of what you were saying?
A. Yeah, there were three different concentration -- three different concentrations listed here and there was no chromosomal damage reported at any of those three concentrations.
Q. Okay. And is it your opinion as you sit here today that statistical tests were performed for the other concentrations?
A. You know, I've reviewed so much in terms of this. I would -- I would have to look at the actual Holeckova paper before opining.
Q. Okay. Is -- well, strike that.
Okay. Let's go to the in vivo mammalian gene mutation assay. It's on Page 25 and I'm not going to ask you too many questions on this.
You state that you reviewed the underlying study reports or relevant study summaries for four in vitro mammalian gene mutation assay studies on glyphosate.
Is that correct?
A. Yes.
Q. Okay. Do you know which study summaries you reviewed for this data set?

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A. Right now, right now at this moment, I cannot tell you. If I go back and have time to go through the materials considered, I could eventually dig that out.
Q. Did you discount any studies in this data set due to perceived methodological flaws?
A. No.
Q. No. Did you discount --
A. By -- by discount, meaning just toss it aside?
Q. Did you -- did you say that they were unreliable and -- and afford them no weight, for example?
A. No.
Q. Did you review the studies in this data set to ensure that they were OECD compliant?
A. I reviewed them in terms of whether I thought that it was a properly conducted study. I did not take it and lay it down side by side with the OECD guidelines.
Q. Okay. So going down now to C, which is the in vitro tests for chromosomal aberrations in mammalian cells, can you sort of describe where this test fits within the hierarchy of -- of tests -- in --

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in respect to sort of importance or weight?
MS. PIGMAN: Objection to the form and assumes facts not in evidence.
BY THE WITNESS:
A. Where it fits.
In general, in terms of evaluating the genotoxicity of compounds, there are several tests that are employed, if you will, as a battery of tests. One of them includes the Ames test, and recognizing that the Ames test with different test strains had a lot of sub tests, but one is the Ames test. Another would be to use a test in terms of mammalian cells in culture in vitro, looking for indications of mutagenicity. Another would be to use mammalian cells in vitro looking for indications of chromosomal damage. And another would be in vivo looking for an aspect of genotoxicity, and -- and typically what one is looking for are a question of whether or not there is an increase in micronuclei in bone marrow.
BY MR. WOOL:
Q. Okay. So if you look on page --
A. That -- that would be the general -- the basic general approach in terms of saying, here is a compound, is it genotoxic.

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Q. Sure.
So, now, if you look on Page 26, and this is just a housekeeping question, you cite to Matsumoto 1995 as a reported negative study.
A. One moment, please, so I can get there.
Q. It is in the sort of second paragraph.
A. Okay. I see it.
Q. And I'm just asking about this study --
A. Sure.
Q. -- because I don't believe it appeared on your reliance list and we weren't able to find it on PubMed, so I just wanted to ask if you had a copy of the study and ask where you -- where you got the study?
A. Matsumoto is not on the list?
Q. I do not believe so.
A. Can I take a really fast look?
Q. Yeah, you can take a quick look.
A. You know, there are hundreds of these. I apologize. It is not on the list.
Q. Right. So I -- so I guess my second question is just if -- if you recall where you got the study?
A. Sitting here today, I can't recall where

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I -- where I -- I can't recall where I got the study. I would --
Q. Fair enough.
A. Well, I -- it's -- I -- it's -- it's concerning to me that it's in the report and not on the list. I will have to look into that.
Q. Well, if -- if you want to amend later, we won't object.
Okay. So, now, in the last paragraph before we get to Point D, you discuss the Lioi 1998 study?
A. I do.
Q. Okay. And the criticism that you have of this study, if I'm correct, is that the author should have conducted a cytotoxicity evaluation at 72 hours.
Is -- is that accurate?
A. Yes. And the reason is the 72-hour time point was the time point that was used to ask the question of whether there was an indication of genotoxicity.
Q. Okay. Now, just so I'm clear, if you go to Appendix 8, there are two Lioi studies that are listed, both from 1998, I believe, and -- and both positive.

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Is this criticism for both of the -- the studies, both Lioi 1998 A and B, or is it confined to --
A. What --
Q. -- to one of them?
A. Tell me which --
MS. PIGMAN: I'm sorry. What appendix, please?
BY THE WITNESS:
A. -- appendix, please?
MR. WOOL: Appendix 8.
MS. PIGMAN: 8, thank you.
MR. WOOL: Page 59.
BY THE WITNESS:
A. One second, please.
It is -- it is 1998 A, because 1998 A Lioi is looking at human lymphocytes and in 1998 B they are looking at bovine lymphocytes.
BY MR. WOOL:
Q. Okay. Would -- strike that.
Do OECD regulations or other regulations that you are aware of require testing for cytotoxicity at the 72-hour interval?
A. The OECD regulations, as best I can recall, do not specify the -- do not specify 72 hours,

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but the OECD -- OECD regulations do very clearly talk about the importance of a cytotoxicity evaluation.
Q. Okay. But in -- in this test it looks like they evaluated for cytotoxicity at six hours, correct?
A. It does.
Q. Okay. So what do you believe indicates that cytotoxicity would have been present at the 72-hour interval?
A. The fact that it wasn't evaluated means that I don't know. What we do know is that as -- as cells are cultured with a chemical, there can be progressive changes over time. And the difference between six hours and 72 hours is a rather substantial period of time and, therefore, we just don't know whether there was cytotoxicity, cytotoxicity at 72 hours.
Q. Would measuring the mitotic index indicate whether there was cytotoxicity?
A. That could be a -- that could be an -- an indication, for example, if mitotic index decreased markedly.
Q. Okay. So if glyphosate was cytotoxic in this study, would you expect to see a significant

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decrease in the mitotic index?
A. It doesn't have to be necessarily, but it could -- it could happen, that is a decrease at 72 hours would be -- could be indicative of cytotoxicity and...
Q. If there was no decrease at 72 hours, would that provide evidence of the absence of cytotoxicity?
A. It would provide some evidence of the absence of cytotoxicity. Here and -- here they -- I -- I do think they should have, again, done the same viability evaluation at 72 hours as they did at six hours.
Q. Is it plausible that the results of these studies were due to the genotoxicity -- genotoxic properties of glyphosate?
A. I can't rule that out and I can't rule that in without having them have done their cell viability evaluation.
Q. Okay. For -- and I'm just referring to the in vitro tests for chromosomal aberration in mammalian cells as that -- those test results relate to glyphosate.
Were there any negative tests that you

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decided not to consider due to methodological flaws in the study design?
MS. PIGMAN: Objection; vague. Are we -- is it just glyphosate or both glyphosate and glyphosate-based formulations?
MR. WOOL: It -- I haven't specified. It -- it is just glyphosate.
MS. PIGMAN: Okay.
BY THE WITNESS:
A. Not that I can recall.
BY MR. WOOL:
Q. Okay. Did you discount or afford less weight to any of the studies due to -- any of the negative studies just within the glyphosate in vitro tests for chromosomal aberrations, did you afford any of the negative tests less weight due to noncompliance with OECD guidelines?
A. I did not, but I did not take these tests and lay them down next to the OECD guidelines and compare point by point. I did evaluate them. I -- I did ask whether or not that they in general appeared to follow the OECD guidelines, but, again, I did not lay them down and see that they followed it point by point.

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Q. Okay. So let's move on to the in vitro tests for micronu- -- micronuclei induction in mammalian cells. You see I have a pretty difficult time with some of these words.
A. It's -- it's understood. It is a lexicon all to its own.
Q. Okay. And out of this data set, you report six studies, four positive, two equivocal, is that correct?
MS. PIGMAN: I'm sorry. What -- we are still on Page 26?
MR. WOOL: Well, it -- it goes on to --
MS. PIGMAN: Okay.
MR. WOOL: -- 26 to 27.
MS. PIGMAN: Oh, thank you.
MR. WOOL: So I guess to the top of 27.
MS. PIGMAN: Thank you. Sorry.
BY THE WITNESS:
A. Yeah, what you said is correct.
BY MR. WOOL:
Q. Okay. And the first positive study that you describe is the -- the Koller study, which I believe we -- we've talked about a little bit before, is that correct?

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A. We have talked about Koller et al. 212 before.
Q. Okay. And micronuclei induction is evidence of genotoxicity, is that fair?
A. Yes, micronuclei induction is evidence of genotoxicity.
Q. Okay. And so you discount the results of this study due to cytotoxicity, fair? Or strike that.
You discount this study because you -- your opinion is that the genotoxicity -- genotoxic effects observed are secondary to cytotoxicity?
MS. PIGMAN: Objection; form.
BY THE WITNESS:
A. Once you see -- once you -- once -- once you observe cytotoxicity at the concentration used to evaluate genotoxicity, this is a major confounding event. And once that -- once that happens, the --
BY MR. WOOL:
Q. No, no. I'm just telling her --
A. -- and one -- and once that happens I think that one cannot use the results of the study to talk about that genotoxicity was a direct result of the chemical in question.
Q. Okay. So I'm going to mark, I believe we

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are on 5, Exhibit 5, which is the study by Koller et al., and this one has a Bates number which is MONGLY00327331.
(WHEREUPON, a certain document was marked Deposition Exhibit No. 25-5, for identification, as of 09/22/2017.)
BY MR. WOOL:
Q. Okay. I'm handing you that study.
MS. PIGMAN: Thank you.
BY MR. WOOL:
Q. Okay. Now, I'll ask you to turn to Page 808 of this study, please.
A. I'm there.
Q. Okay. Now, if you look at the bottom, you will see Figures -- or it is described as Figure 1. C and D are the bottom two graphs.
A. Correct.
Q. Okay. So what are Figures C and D showing us? And you can take a minute to...
A. C and D are looking at -- C and D are looking at two parameters that could be involved in terms of cytotoxicity. It will take me a minute to see what they mean exactly by SRB and NR. I just

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don't want to say something without seeing the --
Q. Sure, take -- take your time.
A. -- seeing their definition of the acronym.
Q. Yeah, so -- so I think the acronyms are on the first page. If you look, it says abbreviations.
A. Okay.
Q. Okay. So now having seen the abbreviations, what are Figures C and D telling us?
A. These are some evaluations for cytotoxicity and what they are telling us in Figure C is that we are seeing some cytotoxicity at 100-milligrams per liter of concentration, and in Figure D, some aspect of cytotoxicity, again, at 100-milligrams per liter of concentration.
Q. Okay. And for which compound are we seeing evidence of cytotoxicity in Figure C?
A. Let me look at the method to be sure.
Q. Okay. And if you look under --
A. I'm just not sure here whether it's glyphosate or glyphosate-based formulation.
Q. Right. So in -- in Figure 1 sort of under the -- the graphs -- the legend, I believe it describes what the -- the two respective symbols indicate. If I'm not mistaken, the triangle with the

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cross line is glyphosate and Roundup is the circle with the cross line.
A. Okay.
Q. Okay. So let's look at -- at Figure D, for example. The line with the -- the triangle in the cross line appears to be more or less straight across.
Is that an accurate description?
A. Yes.
Q. Okay. And the -- and the other line appears to -- to plummet downwards, is -- is that an accurate description?
A. Correct.
Q. So what does the straight across line on -- with the triangles indicate?
A. Straight across, a cross line, would be by this parameter that cellular integrity was intact.
Q. Okay. Okay. Now, if you -- okay. Now I would ask you to turn to the next page, Page 809.
A. Okay.
Q. Okay. And in the Discussion section, the first line reads:
"Our results show that R," which I'll represent is Roundup, "but not its active principle G," which I'll represent is glyphosate, "causes

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pronounced cytotoxic effects in human-derived buccal epithelial cells."
Did I read that correctly?
A. You did.
Q. Okay. And -- and it also goes on to say:
"Furthermore, the genotoxicity tests show that the herbicide as well as its formulation induces strand breaks that lead to formation of comets as well as nuclear anomalies that reflect DNA instability including chromosomal damage."
Did I read that correctly?
A. You did.
Q. Okay. So, I guess, do you disagree with that conclusion?
A. Well, if we could look at Figure 1 in terms of the portion of it in the upper left, Figure 1-A, here we are looking at lactate dehydrogenase release from the cells. Release of lactate dehydrogenase from the cells is an indication of damage to the cell membrane, such as it becomes leaky and cell contents can leak out of the cell. And what we are seeing is with the formulation you are seeing evidence of cytotoxicity at 10 milligrams per liter.

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Q. Okay. And what about with glyphosate?
A. One is not seeing that with glyphosate until getting to higher concentrations.
Q. All right. Now, within this same data set, so you can put that exhibit aside --
A. I'm sorry. I can put -- put No. 5 aside?
Q. Yes.
A. Okay.
Q. Okay. You talk about the Roustan 2014 study and you note that:
"Roustan et al. 2014 failed to demonstrate the dose-response relationship which is anticipated if induction of micronuclei were due to treatment with glyphosate," correct?
A. Yes.
Q. Okay. And you don't provide any other opinions for discounting this study in your expert report, is that correct?
A. Yes. I think dose -- dose-response is a -- is an important consideration.
Q. And sitting here today, it is your belief that Roustan did not show a clear dose-response, correct?
A. Correct.

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Q. Okay. All right. So for the in vitro micronuclei induction in mammal cells data set as it relates only to glyphosate, you're not aware of negative studies, is that correct?
MS. PIGMAN: Objection; vague.
BY THE WITNESS:
A. Well, I -- I was not clear as to the question. Please rephrase that.
BY MR. WOOL:
Q. Okay. Within this data set, are there any studies that you would consider to be negative?
A. Such as -- the "this" refers to which data set please?
Q. The -- in Number E, the in vivo -- wait. Did I -- hold on. Sorry, I -- I clipped the wrong page.
The in vitro tests for micronuclei induction in mammalian cells for glyphosate only.
MS. PIGMAN: So this is Section D of his report, just to be clear?
MR. WOOL: Correct.
MS. PIGMAN: Okay.
MR. WOOL: On Page 26.
BY THE WITNESS:

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A. Okay. So what are you asking now?
BY MR. WOOL:
Q. So -- so there are no negative tests that you note within this data set, am I correct?
A. Yeah, correct. I -- I think the four -- four were possibly suggestive and there were two that were equivocal.
Q. Okay. So if you'll look on page --
A. As reported by the authors.
Q. But you performed an independent evaluation?
A. That's correct.
Q. Okay. I just wanted to be clear about that.
Okay. So now let's move on to for glyphosate only the in vivo test for chromosomal aberrations in mammals, which is on Page 27.
A. I see it.
Q. E of your report.
So I've asked you this question several times, but you report that you read some of the underlying study reports or the relevant study summaries for three of the chromosomal aberration tests and two rodent dominal -- dominant lethal tests

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and all were negative, which in parentheses you write, "(no indication of genotoxic potential.)"
Is that correct?
A. Yes.
Q. Okay. And do you recall which summaries you reviewed and which underlying study reports you reviewed for this data set?
A. I -- excuse me. I cannot tell you that today.
Q. Okay. Would you have a -- well, I -- I guess strike that. I -- I don't need to know.
Okay. So let's go to Page 29, if you will, which is --
A. I'm there.
Q. -- in vivo tests for micronuclei induction tests in mammals related to glyphosate.
And by your count there are 19 total tests, three positive and 16 negative, correct?
A. That's what the first paragraph says.
Q. Okay.
A. And -- and what this is, the -- this is as reported by the author.
Q. Did you discount any of the negative studies due to method -- methodological flaws --

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A. No.
Q. -- in study design?
Did you discount any of the negative studies due to noncompliance with the OECD guidelines?
A. No, but, again, I did not lay down each study and look at it in parallel to the OECD guideline.
Q. Okay. This is just a -- a quick sort of housekeeping question. If you will turn to Page 6 -- Pages 64 and 65 of your report, which is Appendix 11.
A. Okay. Let me -- let me just straighten this out so I don't get myself confused.
Appendix which page, please?
Q. 11. 64 and -- and really 65 is -- is what I'm asking about.
A. I'm on 64 now. Okay.
Q. So if you just look at the top of Page 65, there is a blank for the test endpoint and -- and a lot of blanks for the -- for various data points in -- in this test. I was just curious if you knew what -- what this top row on Page 65 in Appendix 11 was referring to?
A. Yeah. I think that the top row in Appendix 11, I think, is really -- belongs to --

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should be a continuation of the bottom row on Page 64.
Q. Okay. Perfect. That -- that's what I thought. I just wanted to -- to make certain of that.
A. Well --
Q. Well, maybe not certain, but best guess?
A. No, the confusion was on my part. I -- I should have broken the table in a more clear fashion.
Q. That's fine.
Okay. So I -- I just wanted to clear that up and -- and make sure I wasn't missing anything.
A. Under -- understood.
Q. You can -- you can turn back to -- to Page 29 now.
A. I'm there.
Q. Okay. Now, one of the positive in vivo tests for micronuclei induction in mammals for the glyphosate-only data set was Bolognesi study in -- in 1997, is that correct?
A. Bolognesi, yes.
Q. Okay.
A. Bolognesi is one -- is one of those we are talking about, yes.
Q. And you criticized the study because of the IP route of administration, correct?

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A. Correct.
Q. And just so we are clear, what is the IP route of administration?
A. The IP route of administration is when the material of interest is put into a syringe fitted with a hypodermic needle and injected into the abdominal cavity. So it would be injected into the abdominal cavity which is -- has a very, very rich blood supply and typically what is injected in this fashion gets very, very rapidly absorbed as compared to a more -- a more slow, if you will, more physiological absorption as if one ingested material containing the compound.
Q. When you say "a more physiological absorption," what -- what do you mean by that?
A. Well, if -- if I could, please, first, I called the IP a highly non-physiological route of administration, and that is, we do not get exposed to compounds by having them injected into our peritoneal cavity.
Q. Okay.
A. And it gives a very, very rapid absorption in a sense something similar to if you administer the compound intravenously.
Q. Okay. But when you say a -- a

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physiological route of absorption, within the -- the context of your report, what are you considering to be a physiological route of absorption?
A. Physiological --
Q. A physiologically relevant route of absorption?
A. Physiologically relevant would be from oral absorptions, it could be from inhalation and could be from dermal absorption, that is, absorption from something that landed on our skin.
Q. Okay. And going back to Bolognesi for a minute, you are critical of the study because IP administration, as you say, might result in toxicity that would not be observed following a more physiological route of administration, correct, that's one of the criticisms?
A. That is one of the criticisms. And the other is that one of the things that we are trying to do in our experiments is to ask about the potential human, human relevance here. And if one is using a route of administration that is unphysiological, as I've discussed before, it is not giving you a reflection of what can happen from -- from real-world exposure.

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Q. Right.
And but, so your criticism related to the IP route of administration is that it doesn't reflect real-world -- world exposure. You are -- you are not saying, if I understand it correctly, that the IP administration itself is resulting in cytotoxicity, am I correct about that?
MS. PIGMAN: Objection. Sorry. Let him finish his question. Sorry to interrupt.
MR. WOOL: Okay. Sorry, sorry.
BY MR. WOOL:
Q. No. And I'm just trying to understand that you -- I mean, you do have a secondary criticism that cytotoxicity cannot be ruled out. But are you saying that the IP route of administration can result in -- in cytotoxicity?
MS. PIGMAN: Objection; misstates the report and the testimony.
BY THE WITNESS:
A. I believe that -- that because of what I just described, that the IP route of administration by -- by giving you a very rapid absorption and very high blood level very quickly can result in adverse effects that might not be seen if the same dose was

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administered by a physiological route of administration.
BY MR. WOOL:
Q. And when you say "adverse effects," are you talking about adverse genotoxic effects?
A. Geno- -- genotoxicity would be an adverse effect, an example of an adverse effect, yes.
Q. Okay. So, this particular quarrel about the route of administration is not related to whether or not the -- the test shows genotoxicity, it is that the test is -- is not physiologically relevant, if I'm understanding correctly?
MS. PIGMAN: Object. Objection; misstates the testimony and the report.
BY THE WITNESS:
A. There is a difference between having an observation under some experimental conditions --
BY MR. WOOL:
Q. Right.
A. -- and then whether that observation has some relevance to the in vivo situation, to the human in vivo situation, and using a non-physiological -- a highly non-physiological route of administration has the possibility to be a -- a very, very real

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confounding factor.
Now, if Bolognesi et al. did do -- did do some evaluations for cytotoxicity and that these were bona fide, good, well-characterized, well-performed studies for cytotoxicity, and they were negative, then my criticism of the route of administration would not be as severe as it is.
Q. Okay.
A. And so that's why in about the middle of that paragraph I point out that there was no evaluation of cytotoxicity in the study.
Q. Okay. And can you tell me what -- what is the PCE/NCE ratio?
Does -- does that mean anything to you?
A. Well, it's a -- polychromatic erythrocytes --
Q. And --
A. -- versus --
Q. Go ahead.
A. -- versus non-chromatic.
Q. And what is that a measure of?
A. That is -- polychromatic would be an -- an indication of micronuclei. That is because you have these micronuclei which are clusters of genetic

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material, when the cell is stained, these clusters can show up as highly stained spheres. And so, but polychromatic meaning that instead of having the uniform staining that you would expect from the normal genetic material, you have some heterogeneity in the staining.
Q. So what does a measure of -- of that ratio reveal?
A. That is an indication of micronuclei -- that is taken as an indication that micronuclei have been present.
(WHEREUPON, a certain document was marked Deposition Exhibit No. 25-6, for identification, as of 09/22/2017.)
BY MR. WOOL:
Q. Okay. So I'm going to hand you what's marked as Exhibit 25-6. This has a Bates number which is WEEDPROD00001252. And this is the Bolognesi 1997 study.
Okay. So I just want you to turn to Page 1959 of the study. And if you look at --
A. I'm there.
Q. -- Table 1.

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I -- I just want to know what Table 1 is telling us with respect to the PCE/NCE column?
A. Well, it is telling us whether there was an increase in these polychromatic erythrocytes versus the -- those that appear normal in the -- in the -- in the saline.
Q. Okay. And that's really probably all I wanted to ask about this one for right now. We might come back to it later.
Okay. So now within this in vivo test for micronuclei induction in mammals as it relates to glyphosate, I believe for Appendix 11 I counted nine studies by IP injection.
And you can turn to Appendix 11, which is, I think, on 64 and 65 again, and you can just verify if I was correct about that.
I guess it starts on -- on Page 62.
A. Okay. All of them on -- all four on 62 are IP administration. All four of them on Page 63 were IP administration. And one out of six on Page 64 is IP administration.
Q. Okay. And did you discount any of the negative studies due to perceived methodological errors or shortcomings?

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MS. PIGMAN: Objection; vague.
BY THE WITNESS:
A. The -- the answer is no. And so -- the answer is no, I did not.
BY MR. WOOL:
Q. And -- and to clarify, I was just speaking about the -- the negative IP injection studies.
A. Okay.
Q. Same -- same answer?
A. Same answer.
Q. Okay. Now, what is the importance, if any, you'll note on that some of the -- the tests utilized two treatments, it seems like some only one.
What is the significance, if any, to you of multiple doses versus a single dosing in any -- in this particular test?
A. Overall I think that the multiple dosing is a more -- multiple dosing I think is -- is a somewhat more -- more thorough test, if you will.
Q. And why is that?
A. It is because one is pushing the system in terms of using more dosing as compared to using less dosing.
Q. Do you think multiple dosing is more

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physiologically relevant?
A. It depends on -- it depends on -- on -- on -- on -- on route of administration and depends on amount of compound -- of compound used. I do think that under -- under appropriate conditions of the test system that those tests that are using multiple doses, reasonable tests, I think is providing a more stringent evaluation.
Q. And what do you mean by "a more stringent evaluation," just so I'm clear?
A. More sensitive.
Q. Okay. And -- and if you look at the top of Page 62 at the Bolognesi study and the, I believe it's pronounced Maas study, directly underneath it, this table indicates that both of those studies utilized two treatments.
Am I reading that correctly?
A. You are.
Q. All right. Okay.
A. Two intraperitoneal treatments.
Q. Right, right.
Do you distinguish between two -- strike that. We can just move on.
If you want to turn back to -- to Page 29,

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I think I have one more question or a quick line of questions related to this data set.
A. I'll get there.
Okay. I'm on Page 29.
Q. Okay. And you state:
"In one study, a significant" -- and I'm reading the -- the second sentence.
"In one study, a significant" --
A. Ex -- excuse me, the second sentence?
Q. Of the -- sorry. Of the bottom paragraph.
A. Okay.
Q. "In one study, a significant increase was reported to occur in female mice following treatment with a dose of 500" -- I mean, "5,000 milligrams per kilogram," and that's in parentheses, "(Suresh 1993a)."
And you go on to state: "This is in contrast to two studies," which are "(Jensen 1991; Fox and Mackay 1996) which reported negative results when glyphosate doses of 5,000 milligrams per kilogram were used."
The next sentence: "To place this extremely high dose into perspective, it should be noted that the US EPA estimates that the exposure of

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the US population to glyphosate by food and water is .08 milligrams per kilogram a day," which is citing to "(Solomon 2016) and US EPA considers children 1 to 2 years old the most highly exposed subpopulation with an estimated combined exposure of 0.47 milligrams per kilogram a day," cited to the "(EPA 2016) making a 5,000 milligram per kilogram dose to the mice equivalent to 56,818 and 10,638 times higher than the human daily dose, respectively."
Did I read that correctly?
A. You did.
Q. Okay. So what is the -- the relevance to you of the EPA estimate that you cite on Page 29?
A. Well, the relevance of this is that we are looking at a -- an estimate of real world -- an estimate, and I think it is a -- EPA typically makes conservative estimates, of a -- a real-world exposure and this value is the EPA estimate for children. And they are making -- it's -- it's -- it's really a pretty high number, but it's a conservative number.
Q. So do you believe that exposure to glyphosate through food and water is relevant to the claims asserted by the -- the Plaintiffs in this lawsuit?

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A. Could you, just to be sure we are on the same page, what -- what claims are you talking about?
Q. Well, let me -- let me ask you this:
What is your understanding of the exposures that -- that Plaintiffs in this lawsuit -- strike that.
What -- what is your understanding of the exposure claims that are being asserted by Plaintiffs in this lawsuit?
A. My understanding is that the claim is that people who are exposed to glyphosate through glyphosate-based formulations contracted cancer because of that and more specifically non-Hodgkin's lymphoma.
Q. And what is your understanding of the -- the mechanism through which they are alleging they were exposed to glyphosate and glyphosate-based formulations?
A. I do not know that.
Q. Is that relevant in determining whether a mechanism of exposure is -- is physiologically relevant or not?
A. Well, help me a little bit. What routes of exposure are they?

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Q. Well, I'll -- I'll probably ask you about -- about this again --
A. Sure.
Q. -- but we can -- we can move on. Let's see. Okay. Let me just finish this up and then I guess lunch might be here, maybe, hopefully.
Okay. So your conclusion, which is stated -- okay. Sorry.
So would I be fair in characterizing your conclusion of the in vivo tests for micronuclei induction in mammals related only to glyphosate is that this data set demonstrates that glyphosate is not genotoxic?
A. By the -- by the particular test used, the test did not show glyphosate genotoxic by this particular test, and I can think that that consider -- is factored into the overall evaluation.
And -- and furthermore, you know, with -- with this EPA estimated combined -- combined exposure of .47-milligram per kilogram per day, which is really the highest estimated exposure that I have -- have seen, you know, one can really take this a -- a step further to gain more insight.
And so, for example, one can say, Well,

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rather than just children, what if people in general were exposed to this .47-milligram per day, which is the highest estimated exposure, and you could say, Well, if we're interested in what is happening in the body, what does -- what could this represent in terms of what the cells are -- are bathed in, if you will.
And so if you look at .47-milligram per kilogram per day and we take our average person, the typical is that the average person weighs 70 kilograms, which would be 100 and -- 154 pounds. So we can multiply .47 by 70 and say this is the amount in milligrams that a person would take in per day.
We know that of the body weight, about 60 percent is fluid. And so we can say for a 70-kilogram person, this is about 42 -- that may not be right -- 42 liters of fluid. So we can say we have .47-milligram per kilogram per day times 70 is the total intake in 42 liters of fluid. And that comes out to about 780-milligrams per liter or 0 point -- .78-milligrams per liter or .78 micrograms per milliliter.
And then we can then say in terms of any of these dosing scenarios, let us say that a person

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exposed -- was exposed to 5,000 milligram per kilogram and we can multiply this by -- by -- by 70, go through the body water, and then say, Well, if we look at what the result is from the EPA high level exposure, what is the ratio of that to what these doses might have produced, if we assume that all of it is absorbed and we have some blood level.
And it turns out to be -- in this case it will turn out to be hundreds of thousands of times higher than what one could estimate under a very conservative scenario for an individual who was exposed to EPA's high estimate.
Q. And -- and you stated in your report, sort of a basic maxim of toxicology is that the dose makes the poison?
A. Correct.
Q. And would you consider sort of the effective dose, as in the amount that is actually absorbed or amount of a substance that is absorbed to be more relevant than the amount of administered dose? In -- in --
A. Yes, I -- I -- yes, I do think that if -- I do think that it -- when we have data on blood level or plasma level of a particular -- particular chemical

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that this is important because we really don't have a situation where 100 percent of the dose is absorbed, and that's why in the calculations I referred to earlier I made this conservative assumption that all of it is absorbed.

Q. Okay. And -- and that sort of calculation that's -- that you just detailed, is -- is it fair for me to -- to assume that that is part of how you calculated physiological relevance as it's described throughout your expert report?

A. Well, I talk about physiological relevance in terms of -- in terms of route of administration, I do talk about it in terms of dosing, I try to make some estimate in terms of the dosing used versus real-world exposure and with the most recent example I gave you tried to make some estimate of what you were just alluding to, and that is the internal dose and what might be the ratio, if you will, between the internal dose for a person who had this EPA-estimated combined exposure very high of .47-milligrams per kilogram versus what we are seeing here in some of the experimental situations.

Q. And you considered that EPA dose to be very high for the purposes of your expert report?

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A. I considered the EPA estimate to be high because there really -- there really are three, I think three numbers that I've seen around. One is this estimate of combined food and water of .088-milligram per kilogram per day. A second is in terms of applicators at the 90th percentile, meaning looking at the high exposure applicators, and there I think this was in the Solomon 2016, it was estimated at point -- point -- 0.02-milligram per kilogram per day. And the third number that I see is this 0.47-milligram per kilogram per day. That is the most conservative number. And so that is the number that I used in my -- in my example.

Q. Okay. Fair enough.

Okay. So we kind of got off track for a minute. So let's kind of -- I just want to make sure that -- that we are on the same page because I'm going back to the in vivo micronuclei data set as it relates to glyphosate and this is what I --

A. So which -- which page are we on, please?

Q. We are on Page 29 --

A. Okay.

Q. -- to 30.

A. I'm there.

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Q. I've probably got three more questions and then we can break for lunch.

A. It's -- it's all right.

Q. Okay. So is it plausible that the positive results in Bolognesi, Suresh and -- and Maas were due to genotoxicity?

A. Because of the confounding effect -- because of the confounding situations that I pointed out, I think that we -- you just cannot say that the results shed light -- the -- the -- you cannot say that the results are an indication of genotoxic potential of the compound. When we have these confounding situations, I think that you cannot draw a conclusion from the paper.

Q. Okay. So you -- you cannot definitively rule out genotoxicity as a -- a cause of the -- genotoxicity in glyphosate as a cause of the results, fair?

A. Not quite.

Q. You can rule it out?

A. I -- I -- I'm -- you know, there are very few and maybe no circumstances where -- where something is absolutely definitive, and so -- there is no absolutely definitive.

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What I can say is that I think that these studies should be interpreted as not providing evidence for glyphosate being genotoxic.

Q. Okay. And within this data set that we've just been discussing, did you discount any of the negative studies due to methodologic -- methodological flaws?

A. I did not.

Q. Did you discount any of the negative studies due to noncompliance with OECD guidelines?

A. I did not. And, again, I did not line them up with the OECD guidelines and go line by line down the list.

Q. Okay. Fair enough.

MR. WOOL: And I'm -- I'm ready for a break if everyone else is.

THE VIDEOGRAPHER: Going off the record at 11:57 a.m.

(WHEREUPON, a recess was had from 11:57 to 12:50 p.m.)

THE VIDEOGRAPHER: This is the beginning of Disk No. 3 and we are back on the record at 12:50 p.m.

BY MR. WOOL:

Q. How was your lunch, Dr. Goodman?

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A. Terrific.
Q. Awesome. What sandwich did you have?
A. Turkey Tom, No. 4.
Q. Not the Gargantuan.
If you can, could you please turn to Page 20 of your expert report, which is the in vivo test for chromosome aberrations in mammals.
A. I'm there.
Q. Okay. Now, you report three tests, two positive and one negative, correct?
A. That's correct.
Q. And -- and to be clear, the -- the positive test, I'm not saying that's your conclusion, that's indicated to be the author's conclusion.
A. That is right.
Q. Okay. So do you believe that the Dimitrov test that you cite to provides evidence that glyphosate-based formulations are not genotoxic?
A. Yes.
Q. Okay. So can you describe how the Dimitrov study was designed for me, please?
A. I reviewed so many papers that I can't recall this specific one in detail, but if you have a copy of it, we can talk about it.

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Q. I -- I think this is one that we -- take -- take a look, I might go into something else, but unfortunately I feel like this might be one that -- that we don't have a copy of, so I'll just ask some basic questions about this.
So do you know whether Dimitrov measured cytotoxicity?
A. I can't -- I cannot -- I cannot recall offhand.
Q. Okay. And I would assume the same answer for whether Dimitrov involved one or -- or multiple doses of the glyphosate-based formulation?
A. As I said, I reviewed a lot a lot of different studies and I really need to see the -- see the paper in order to opine.
Q. Okay. And let's just take a look at Appendix 3 really quick, which is on Page 50 of your report.
A. I'm there.
Q. Okay. And do you recall, I can't remember if your report says, is this one of the -- the studies that you reviewed the -- the underlying study for?
A. For -- for all --
Q. For Dimitrov?

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A. For all of the -- for all of the papers in the EPA's tables, I -- I did look at the underlying study. I did not base my opinion simply on the -- on the table.
Q. Fair enough.
And so I'm correct that Dimitrov involved one oral dose of the glyphosate-based formulation?
A. I don't see that. I see .05, .01, .5 and 1.
Q. Okay. And the test material stated in the EPA table is Roundup, correct?
A. Correct.
Q. Okay. So in a test like this, would you agree that it's important that the authors use a sufficient dose to ensure that the compound reaches the bone marrow of the animal?
A. I think that -- I think one does have to have sufficient dosing. It is really -- really -- certainly, certainly not routine in these studies that actual measurements of the compound in bone marrow are made.
Q. So looking at a negative study like -- like Dimitrov, and -- and maybe this is my fault for not giving you the study, is there a way that you can

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measure that the compound actually reached the bone marrow?
A. I cannot.
Q. For any of the negative studies, whether they are glyphosate or involve glyphosate-based formulations, can you definitively say whether the compound reached the bone marrow?
A. Well, you know, we can turn this around, because there are some studies using Roundup that are reported as positive.
Q. Right, right.
A. And -- and so in -- in none of these studies can I definitively tell you that it reached the bone marrow. In the positive study, it certainly, certainly appears that way because there -- because there is a -- a positive result.
I also think that in terms of their all data, and I can't put my finger on it right now, in terms of showing that following the oral administration that there is some absorption of Roundup into the blood. If it is in blood, then certainly it is getting to the bone marrow, but I can't tell you in this specific study how much.
Q. After Roundup is absorbed to the blood,

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what is the time interval at -- at which you would expect it to reach the bone marrow?
A. Very quickly. Bone marrow is one of the tissues in the body that has a -- a very rich -- a very rich blood supply. By very rich, I mean there is a lot of blood that is flowing through bone marrow.
Q. But sitting here today for any individual negative study, whether with glyphosate or glyphosate-based formulation, you wouldn't be able to definitively tell me whether or not the active ingredient or -- or compound reached the -- the bone marrow, correct?
A. I would have to reason by analogy and say that there are -- but I can't put my finger on it -- studies that show that following oral administration that one does get Roundup, glyphosate levels in the blood. If there is a level in the blood, then one is going to have it appear in bone marrow.
Q. So after it appears in -- in bone marrow, how long would you expect to -- strike that.
How long after the -- the whatever compound we are talking about reaches the bone marrow would you expect to see measurable results?
A. I'd say it has to be -- I -- I -- I think,

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I think that it has to be in terms of multiple hours, because -- but I can't -- I can't tell you -- I can't tell you the exact number. In other words, I don't -- I don't think it was -- it would be something that would happen in a matter of moments, but I can't tell you how many hours that would take.
Q. So sitting here today for Dimitrov, for the Dimitrov study, or any study, really, that -- that involves bone marrow, you could not definitively say that the negative result observed was due to an absence of genotoxic activity without knowing definitively whether or not the -- the substance reached the bone marrow, fair?
A. No. Again, reasoning by analogy, administration of Roundup or glyphosate results in measurable blood levels of the compounds of interest. If it is in the blood, it is going to get to the bone marrow. And the fact that we also have some other studies that purport to be -- to be positive might be an indication of getting to bone marrow, but one has to, again, review the studies. In sum -- in summary, because glyphosate was not measured in bone marrow, I cannot tell you how much glyphosate was there. Because there are data in the literature about

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absorption of glyphosate into the blood following oral administration, I can say that following oral administration one will get some glyphosate in the -- in the -- in the bone marrow.
Q. And how long after oral administration would you expect the compound to reach the bone marrow?
A. I would expect that -- I would expect that it might take more than just a couple of minutes. I certainly think that by the time we get to 15 minutes to two hours it should have reached the bone marrow. Probably quicker than 15 minutes.
Q. So is it your testimony sitting here today that for any of the tests measuring bone marrow, that an oral dose of glyphosate definitively reached the bone marrow?
A. I think that with a high degree of certainty I can tell you that it reached the bone marrow and this is based on reports that I can't put my finger on right now that following oral administration one does get blood levels of the compound. Again, if it is in the blood, there is a very large, heavy, rich blood supply to bone marrow and so what is in the blood, some of it is certainly

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going to get to the bone marrow.
Q. So for -- in of the -- any of the oral studies looking at bone marrow, are you aware or can you point me to a source that measures peak concentrations of glyphosate in the blood?
A. You know, offhand I cannot do that. I am not an -- offhand I cannot point you to a study where they included what I'm going to call toxicokinetics, absorption, distribution, metabolism, along with the evaluation of chromosome aberrations in this case.
Q. Is it your belief that -- that there are some of the negative -- or there are some negative studies out there that did take that measurement of peak concentrations in the blood for the negative bone marrow studies where glyphosate or Roundup was administered orally?
A. I cannot recall seeing such studies.
Q. Okay. For the Dimitrov study, do you know or -- or did you look to see whether that study complied with OECD guidelines?
A. Again, I did not lay them down side by side, but I will tell you that the methodology, procedure that I used here was -- used here was the same in terms of all of the studies that I evaluated.

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So there was not a unique set of criteria applied to positive studies and a unique set of criteria applied to studies that reported negative results.
Q. All right. So you go on to discuss the Prasad 2009 study?
A. Excuse me, are we back on Page --
Q. We are back on Page 20 --
A. -- 20? Okay.
Q. -- if you'll follow me.
A. Sure, sure.
Q. And let's see, I believe your first criticism is that the GBF used was cytotoxic to the bone marrow, correct?
A. Yes.
Q. Okay. And we talked about the mitotic index before?
A. Yes.
Q. Okay. And do you believe that based on, was it a -- was it a decrease or an increase in this one in the mitotic in- -- index -- a decrease in the mitotic index -- that you could, therefore, attribute the results of that study to cytotoxicity?
Am I following you?
A. The decrease in -- the decrease in mitotic

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index -- back up.
Mitotic index is a -- is a -- a -- a measure of cell proliferation. The decrease in the mitotic index of cell proliferation is a indicator of cytotoxicity. And under conditions where there is evidence of cytotoxicity, I think that that is a major confounding factor that does not let you draw a conclusion from the study that the compound in question is genotoxic, because the genotoxicity might have occurred, might likely have occurred secondary to the cytotoxicity.
Q. Let's take a look at the Prasad study real quick. I just want to make sure that I didn't write on the --
A. Is that in one of the exhibits you gave me?
Q. No, no, I'm about to --
A. Oh, okay.
Q. -- hand it to you.
A. Okay.
Q. I'm marking it as Exhibit 25-7.
(WHEREUPON, a certain document was marked Deposition Exhibit No. 25-7, for identification, as of

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09/22/2017.)
BY THE WITNESS:
A. Thank you.
MS. PIGMAN: Thank you.
BY MR. WOOL:
Q. Okay. And I believe if you look -- let's just go to Page 4, if you will.
I'll note, if you look at Table 2, I believe that's measuring the effect of -- of the glyphosate on the mitotic index.
Am -- am I correct?
A. That's what it says.
Q. Okay. And if you look at what is described as Group 2 --
A. Excuse me. Okay. So Group 2 you are talking about the benzo(a)pyrene (BAP)?
Q. Correct. And is that what you would call a positive control?
A. Yes.
Q. And what is the purpose of a positive control?
A. The purpose of a pos- -- positive control is to ask, Is my system working? So in this case you have a test system, excuse me, that is designed to

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evaluate an aspect of genotoxicity. We are taking a -- a -- a known genotoxic compound and saying, Do we have -- is -- is this known genotoxic compound giving a positive result. If the answer is yes, then you say, Well, my -- my system is -- is working.
Q. Okay. And if you look at Group 2, it says (B)AP.
A. Which stands for benzo(a)pyrene.
Q. And that's a known genotoxin, correct?
A. Correct.
Q. And if I am reading the table correctly, which I -- I might not be, so correct me if I'm wrong.
A. Well, let's discuss it.
Q. Well -- so, it -- it appears to me that benzo(a)pyrene is showing a even more pronounced effect in the mitotic index, am I correct?
A. More pronounced than what, please?
Q. Than either Group 3 or 4.
A. That's correct.
Q. So you would not conclude from these results that -- that benzo(a)pyrene is not a genotoxin?
A. No. 1, benzo(a)pyrene is a -- is well known from a variety, a variety of studies as being

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genotoxic. If I were doing and I were designing this particular study, I would have done a dose-response with benzo(a)pyrene, a concentration response with benzo(a)pyrene to ask about cytotoxicity versus genotoxicity. And if I was designing this study, I would have selected a -- emphasized a concentration of benzopyrene that did not produce cytotoxicity.

One of the potential problems here is that benzopyrene itself is not genotoxic. It has to be metabolized to a form that is genotoxic. And it is possible -- I don't know the specifics -- it is possible that Swiss albino mice may -- I don't know what their capacity is to metabolically activate it, from the -- but the main point is that if I was doing this study, I would have done a benzopyrene dose-response evaluating cytotoxicity and genotoxicity and picked from my marker of is the system working a concentration of benzopyrene that did not produce cytotoxicity.

Q. For either Groups 3 or 4, are the decreases in the mitotic index statistically significant?

A. According to the author, the supercript -- superscript -- superscripted symbol after 4.12

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plus/minus .05 and 3.54 plus/minus .01 says that the p-value is less than .05 and the author says this represents a significant decrease compared to untreated control.

Q. Okay. Now, is it your opinion that -- that the results of this Prasad study could indicate genotoxicity in glyphosate-based formulations?

A. That it could indicate genotoxicity?

Q. Right. Can you definitively say that the observed results are due to cytotoxicity?

A. What I can say to you is that because of the cytotoxicity in combination with the highly unphysiological IP route of administration, that the -- these -- this -- this -- these represent serious confounding factors, and based on that, I think that one cannot interpret the results of these studies as indicating that the compound in question is genotoxic.

Q. Okay. So the -- the physiological relevance of the route of administration, does -- do you believe that goes to the question of whether the substance being tested is genotoxic or whether the results are relevant for humans?

A. In terms of the non-physiological route of

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administration, that is something that I think is -- indicates that while the result reported by the author might be true, that is -- this is, the author did this and the author saw that.

Q. Right.

A. The biological relevance or significance for humans be -- is -- is highly questionable.

Q. Okay. So to -- to answer my question, the -- the issue of physiological relevance goes to whether you can extrapolate the results to humans, not to the question of genotoxicity generally, correct?

MS. PIGMAN: Objection; misstates his testimony.

BY THE WITNESS:

A. Now, I -- I think that if one is seeing genotoxicity under these particular circumstances that one cannot say that the genotoxicity observed is a direct effect of the chemical itself.

Again, I am considering a genotoxic compound as one where the compound itself or a metabolite can -- can bind to damage the genetic material. And while the author under their experimental conditions observed what they report to be as a genotoxic effect, it very likely, in my view, could be something secondary to the compound of

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interest rather than a primary effect of the compound of interest.

BY MR. WOOL:

Q. But that is due to cytotoxicity, correct, that -- that's your testimony?

A. Yes, I think that would be, with the unphysiological route of administration, that you can have cytotoxicity and genotoxicity secondary to that.

On top of that, in the Prasad et al. 2009 paper you actually have evidence of cytotoxicity in the relevant cell population.

Q. Right. So -- so my -- my question is, which I don't think you've answered, is much simpler.

So your issue with the route of administration, as -- as I understand it, what -- what I'm trying to determine is whether this is -- the quarrel that you have with IP route of administration just goes to whether you can extrapolate the results to humans. Like let's say for a minute that humans were only exposed to glyphosate-based formulations via IP injection.

MS. PIGMAN: Objection; form and misstates his testimony, asked and answered.

BY THE WITNESS:

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A. So I apologize if I -- if I have not been clear.
BY MR. WOOL:
Q. Sure.
A. So let me please try once more.
I think that with the IP route of administration one might get cytotoxicity which then could lead to genotoxicity and under those circumstances I would not -- I would not consider the compound itself to be genotoxic, because I believe that the appropriate definition of a genotoxic chemical is where the chemical itself or a metabolite directly interacts with, binds with, damages the genetic material. So I think that the result might be a, what could be called a genotoxic endpoint, but that it could be very likely occurring secondary rather than as a primary effect of the chemical.
Q. So is your testimony that administering glyphosate-based formulations via the IP route, that that route of administration itself has an effect on cytotoxicity?
MS. PIGMAN: Objection; asked and answered.
BY MR. WOOL:
Q. You -- you can answer.

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A. I'm saying that -- that I think -- I'm saying that I think that it very well could, and if we could please go back to some of my comments this morning, I indicated that in terms of IP injection it leads to a -- a very high, very quick, very rapid blood level and that the effects from this could be cytotoxicity. And, again, in this particular Prasad et al. 2009 publication, we actually have empirical data saying that there was cytotoxicity in the relevant cell population being evaluated.
Q. Okay. So going to my question from a minute ago, and I know that -- that cytotoxicity can have genotoxic-like effects, but -- but are you able to definitively say that the effects that you were observing in Prasad, for example, are due to cytotoxicity?
Can you make that definitive conclusion due to the increases that you see --
A. My -- my --
Q. -- or decreases in the mitotic index?
A. My -- my answer is that in light of the cytotoxicity observed, that this is a serious confounding phenomenon and that that makes it, in my view, not appropriate to conclude that the results of

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the test indicate that glyphosate is a genotoxic compound.
Q. Would it also be inappropriate to conclude that the effects that we are seeing in Prasad are definitively due to cytotoxicity?
Would that be a scientifically-reliable conclusion?
A. I -- you know, I -- I think we are sort of --
Q. I'm just asking you if you can --
A. -- passing --
Q. -- if you can --
A. -- passing each other.
Q. Sure.
So, and -- and again, so, can -- would it be scientifically reliable for me to say that the observed effects in Prasad are due to cytotoxicity?
A. But that's not the way I think --
Q. But --
A. -- one should evaluate this.
Q. Sure.
A. I said one could --
Q. But that's not the question.
A. -- say that there is a serious confounding

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issue here, which means that this, the results of this test are not -- are not valid with regard to evaluating genotoxic potential.
Q. And, again, you haven't answered my question. I -- I understand that -- that you're disregarding the tests and -- and that -- that's not something that -- that I'm quarreling with you on.
I am simply trying to -- to get at the -- what I believe was my original question, which is that it appears to me that you cannot definitively rule out genotoxicity as a result, as a cause of the results that you see in -- in Prasad?
MS. PIGMAN: Objection; asked and answered, form, and misstates his testimony.
BY THE WITNESS:
A. I think what you're proposing -- what you're -- what you're proposing is really not the way to evaluate these genotoxicity tests. If the -- if the -- if -- if there are some serious confounding aspects here that one cannot draw the conclusion that the reported observation of genotoxicity is related to the compound of interest.
BY MR. WOOL:
Q. Okay. Right.

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But -- but so we would agree that the positive control demonstrated a -- a decrease in the mitotic index as well, correct?
A. That is correct.
Q. Okay. And the conclusion that you would draw from that is not necessarily that the positive control -- strike that.
And the -- the -- the conclusion that you would draw from that is not that benzo(a)pyrene is not genotoxic, correct, can we agree on that?
A. Only -- we can agree on that only because there is such a wealth of information in the literature with regard to benzo(a)pyrene being genotoxic. And what we can -- can conclude from here is that they really should not have simply used one concentration of benzo(a)pyrene, that there should have been a dose-response consideration and they should have chosen to focus on doses, concentrations that did not cause cytotoxicity.
Q. Okay. We can move on.
So let me ask you about the Helal and Moussa art -- article.
A. Excuse me. Excuse me. Let me -- let me -- let me just --

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Q. Put it away.
A. -- put this one away.
Q. And I think you are already there. It is at the bottom of Page 20.
A. I'm there.
Q. Okay. And you state that -- that Helal and Moussa might be positive, that's your ultimate conclusion, correct?
A. Yes.
Q. And if you turn the page, you state that, in effect, that you give the study less weight because it didn't comply with the OECD guidelines.
MS. PIGMAN: Objection; misstates the report.
BY MR. WOOL:
Q. Okay. Why -- why don't you tell me how much weight you gave Helal and Moussa.
MS. PIGMAN: Objection; misstates his testimony.
BY MR. WOOL:
Q. Okay. Well, did you give Helal and Moussa any weight?
A. I did. I said -- I -- I did. I said that -- I said that -- that I consider their study as might -- as might be positive.
Q. Okay.

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A. So I -- I did give it weight.
Q. And am I fair in saying that you gave it less weight because it didn't comply with the OECD guidelines?
MS. PIGMAN: Objection; vague.
MR. WOOL: I'm asking it.
BY THE WITNESS:
A. I think it's fair to say that I gave it less weight because in my opinion they should have used -- they should have evaluated more cells. And while I reference the OECD guidelines for -- for 200, but I think -- I think, basically, my concern is that they used too -- too few cells.
Q. Okay. Let's move on to the in vivo tests for micro -- micronuclei induction in glyphosate-based formulations which should be in the middle of Page 21 on --
A. I'm there.
Q. -- your report.
All right. Now, if you look at Appendix -- well, first, you state that you reviewed 20 studies and essentially all were negative, correct?
A. Well, I -- that I reviewed 20 studies reported to be negative, yes.

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Q. Okay. And if we look at Appendix 4 in your report, which is on Page 51.
A. I'm there.
Q. Okay. So the -- the first study is the Bolognesi study, which this table reports as positive.
Is your description of all 20 being negative an indication that you believe that the -- the Bolognesi study is negative?
A. No, I think we -- we -- we had discussed the Bolognese study and I -- I do not think that it's positive.
Q. Okay. Would you describe the Bolognesi study as negative for micronuclei induction in mammals?
A. I would describe the study as being -- being very compromised because of the intraperitoneal route of administration and because they -- they did not evaluate cytotoxicity. So I would consider it as -- as compromised, as confounded, and I would not use this as evidence that glyphosate is a genotoxic compound.
Q. Okay. And -- and I'm not -- this isn't a -- a tricky question, but so I will represent to you that I believe there -- there are 20 studies listed in

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Appendix 4.
So your opinion should be that -- that you reviewed the 20 studies and that 19 were negative, maybe one equivocal, fair?
MS. PIGMAN: Objection; misstates his report.
BY MR. WOOL:
Q. So, and I'm just trying to -- to correct. So -- so you would agree that there are not 20 negative studies?
A. I would agree that -- I would agree -- I would agree that there are not 20 studies where the author reports a negative effect.
Q. Okay. And I believe the Prasad study that we just looked at also measured micronuclei inductions.
And do you have that? I'm not going to ask you about the study. I just want to know because I -- I don't think that's included, and I believe that suggested a positive result for micronuclei induction.
A. For Prasad?
Q. Yes.
A. Let's see.
Q. I think that it's --
A. Yeah.

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Q. -- that study.
A. That is not included.
Q. Okay. So, and, again, not a trick question, so the numbers should be 19 negatives and we can describe Prasad and -- and Bolognese however we want, but you would agree that both of those studies are not negative for micronuclei induction?
MS. PIGMAN: Objection; misstates his report and the testimony.
BY THE WITNESS:
A. Could you repeat that, please?
BY MR. WOOL:
Q. Would -- would you agree that the Bolognese study and Prasad study are not properly characterized as negative studies for in vivo induction of micronuclei and glyphosate-based formulations?
A. Well, first of all, in terms of -- in terms of these 20 studies, with all of these data somehow I missed the Prasad.
Q. Fair, yeah.
A. Okay. I missed the Prasad.
Q. I'm not...
A. What I would agree -- what I would agree

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with is that I think that the Bolognese study, which is in the table, I think that one, based on what I said previously, cannot conclude that it is positive. I think that at best one can say that this is inconclusive because of the confounding factors. And I would say the same for the Prasad 2009 paper that you just showed me.
Q. For Bolognese, do you believe that a reasonable scientist could reach a different conclusion about the -- the Bolognese study?
A. If you -- if you want to say in terms of a -- a reasonable scientist in the broad sense, they might, but I would disagree with them.
Q. Fair enough.
A. For the -- for the reasons that I present --
Q. Right. And --
A. -- excuse me, for the reasons that I presented.
Q. And I'm just asking because the EPA, I'm assuming, based on this table result, viewed it differently than -- than you?
A. Well, I think that what the EPA is doing here is they have reported the result as reported by

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the author of the manuscript.
Q. Okay. And we had talked about cytotoxicity and Prasad. I can't remember if we spoke about it specifically to micronuclei formation, so if I asked you this already, I apologize.
But is it your testimony that cytotoxicity would -- would increase the number of observed micronuclei?
A. My -- my -- it is my testimony that cytotoxicity likely can increase the number of micronuclei.
Q. Can cytotoxicity decrease the number of micronuclei?
A. If you get cytotoxicity to the point that you are killing the cells and the cells totally fragment, then you won't see micronuclei.
Q. So is it possible that cytotoxicity can mask the results of a genotoxic compound in -- in that regard?
A. If you -- if you did have -- if you did have a massive amount of cytotoxicity, then it could mask this and that's why I am saying, that when you see cytotoxicity, it is a major confounding issue and that this makes the study inconclusive. But you --

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you are correct. Massive cytotoxicity could mask.
Q. Okay. Now, you single out a Kier 1992 article that evaluated the ability of RODEO to cause formations of micronuclei.
A. I did.
Q. Okay. Why did you single out that study?
A. Well --
Q. Kier, I mispronounced his name.
A. It's -- it's all right.
Well, there is -- there is such a massive amount of literature that we are trying to get our hands around, and I decided that what I should do is not restrict myself to just the studies that the Environmental Protection Agency looked at. And I thought it best to go a bit beyond what they did. And going a bit beyond what they did, I picked out another study. And there came Larry Kier 1992.
Q. And earlier we had talked about the definition of glyphosate --
A. But -- but -- but in terms of the Kier paper, if I could, please.
Q. Sure.
A. I think -- I think that the Kier paper is -- is really rather -- rather important in terms of

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this is one that used male and female mice, this is one that used -- really, upped some doses that were -- were very high, it did use a positive control that worked, and the highest dose used is close to the lethal dose and one did not see micronuclei.
Now, to your point before, is it possible that there was a massive amount of cytotoxicity --
Q. I'm -- I'm not asking that.
A. But you still have the lower doses, the lower doses here, and the lower doses that Kier used are still high doses.
Q. Sure.
Now, earlier when we talked about the definition of glyphosate-based formulations, I believe your definition included a surfactant, am I correct?
A. Yes, to the -- to the best of my knowledge, the glyphosate formulations -- glyphosate-based formulations include one or more surfactants.
Q. And sitting here today, do you know if the RODEO formulation that was tested contained a surfactant?
A. The answer is that I do not know this for a fact.

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Q. Would you agree that -- that the presence of surfactants or absence thereof is an important consideration in determining whether a glyphosate-based formulation is, in fact, genotoxic?
A. Well, if one wants to evaluate genotoxicity of glyphosate-based formulations, this has been done, there are many, many studies that have been done on this. It is -- it is -- it is -- it is my understanding, I might be wrong, my understanding that all of the glyphosate-based formulations do contain one or more surfactants.
Q. Okay. Okay. And now, within the data set which we just discussed, which to be clear are the in vivo tests for micronuclei induction in animals using glyphosate-based formulations, are there any studies that you discounted due to methodological flaws?
A. Any studies I discounted?
Q. Any negative studies, I should clarify.
A. The answer -- the answer to that question is no, but let me please remind you of my earlier comment that the -- the overall criteria that I used in looking at these studies was, was/is consistent and there was not a, a set of criteria for positive studies and a separate set of criteria for negative

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studies. It was measured against one set of criteria.
Q. Okay. Let's go to the next section, which is at the bottom of 21, which are other assays for detecting DNA damage.
Are you following me?
A. I am.
Q. And am I correct that you did not consider any of -- or you did not put any weight on any of these studies within this category?
A. I think that -- I did not put any weight. I -- I think that as -- as stated in my -- as stated in my report, I do think that there are some issues associated with these other studies as enunciated in -- in my report.
Q. Sure.
So do you give any evidentiary weight to -- to studies outside of the confines of the -- the four types that -- that you outline as -- as being the most reliable?
A. I did not -- I did not call them -- the four that you are talking about, I did not call them the most re- -- the most reliable.
What I did say is that typically when hand -- when, metaphorically speaking, handed a

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compound and asked to evaluate its genotoxic potential, that typically one would do, one, an Ames test which involves multiple sub tests, one would do, two, a test in mammalian cells and culture that -- that reports -- can -- can report evidence of genotoxicity, and this would be either the mouse lymphoma test which tests at the thymidine kinase locus, or using Chinese hamster ovary cells which tests at the HGPRT locus, hypoxanthine-guanine phosphoribosyltransferase, that one would use a mammalian test system in in vitro either for chromosome aberrations or micronuclei in vitro. So we are looking in vitro for an indication of mutation and for an indication of, if you will, larger scale damage to the genome, and then a study in vivo, typically, which would be the bone marrow micro -- micronucleus evaluation.

Q. Okay. So, let -- let me ask it like this, I guess.

Do you consider the Sister Chromatid Exchange assay to be fundamentally unreliable?

MS. PIGMAN: Objection; misstates his report.

MR. WOOL: I'm asking him if he considers it to be.

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BY THE WITNESS:

A. I -- I -- the -- the problem I have with the Sister Chromatid Exchange assay, where I was happy, happy, happy to see that it has been -- that OECD dropped it is, you know, frankly, I always had difficulty in trying to understand the underlying basis for that assay. And -- and so I think that -- I think OECD was right. I wish that it happened a few years earlier in terms of dropping this for -- from consideration. I just -- I just don't have a good feeling if -- if it comes to using a particular assay where I can't really get my hands around, if you will, what's going on.

Q. So that I think in a roundabout way you might have answered my question, but so to be clear, do you consider this assay to be unreliable?

A. I consider that this assay should not be used because of a lack of understanding of, if you will, what it -- what is going on.

Q. Okay. Now, if we look at your opinions on Page 30, which is still other assays --

A. I'll -- I'll be right there.

Q. -- for evaluating DNA damage, but this is just limited to glyphosate.

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A. I'll be right there.

Okay. I'm there. I'm on Page 30.

Q. In the first two lines of the last paragraph on Page 30, it appears you state that the:

"Positive results using the Comet assay were reported by Maas et al. 2009b and Alvarez-Moya et al. 2014. However, neither of these studies included an evaluation of glyphosate-induced toxicity."

And, in effect, you go on to say that because a positive result in the Comet assay can be secondary to cytotoxicity, you cannot view the results as evidence of genotoxicity.

Fair enough?

A. Not quite.

Q. Okay.

A. Because I also say there was a lack of dose-response.

Q. Okay. So is it your opinion sitting here today that these tests did not show a clear dose-response?

A. Yes.

Q. Okay. And is it your opinion sitting here today that they did not evaluate for cytotoxicity?

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A. Yes.

Q. Okay. Were it for not -- strike that.

But for those shortcomings, would you have given weight to these two studies?

A. Well, but that's a -- that's a big but.

Q. Sure.

A. That's a big but. If -- if -- if these -- if these -- if these studies were conducted properly -- well, let me -- let me -- let me try to be clear on both of these.

In my opinion a properly-conducted Comet assay is a, one, a very appropriate way to estimate, evaluate potential genotoxicity.

Q. And to be proper, it must evaluate for cytotoxicity and show dose-response, fair?

A. I think that in -- that in terms, those are two -- those are two very important criterion, yes.

Q. Okay. And -- and the absence of those two criterion in -- in these two studies which we just described, which are Maas 2009b and Alvarez-Moya 2014, is what renders those tests unreliable in your opinion, correct?

A. In -- in my opinion that is -- that pro --

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those are confounding issues and in my opinion that precludes drawing a conclusion from these studies.
Q. What is the trypan blue test? Have you heard of that before?
A. I have.
Q. And what is that?
A. Try -- trypan blue is a -- is a dye and typically when cells are -- are viable, they do not take up -- they do not transport this dye from the outside of their cell membranes to the inside.
Q. Is the trypan blue test a measure of cytotoxicity?
A. It can be.
Q. It can be.
Do you consider it a reliable measure of cytotoxicity?
A. I con -- I consider it a measure of cytotoxicity.
Q. If somebody had measured cytotoxicity in a study that they submitted to you in your capacity as a reviewer for the journals that you serve on, would you consider that adequate in -- in testing for cytotoxicity --
A. Yes.

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Q. -- in your decision to publish it?
A. Yes.
Q. Okay.
Let's go back to Page 22 of your report, which is still the other assay section, but this time looking at glyphosate-based formulations.
A. I'm there.
Q. Okay. And -- okay. Let me ask you some questions about the Peluso study which is detailed at the bottom of Page 22.
So, first of all, is evaluating DNA adducts in mice using the 32-P-postlabeling technique a valid way for assessing genotoxicity?
A. When the 32-P-postlabeling technique is -- is -- is performed -- performed properly, it -- it is -- it is a way -- it is -- it is a way of evaluating genotoxicity in terms of evaluating reaction of the chemical in question or adducts of the chemical in question with a DNA base.
Q. Okay. And you discount this study. The -- I guess the only criticism that I see is that it utilized the IP route.
Is -- is that correct?
A. Yes, yes.

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Q. And --
A. And -- and -- and -- and -- and also as I -- as I recall, although not right in here, as I recall they did not do an evaluation for cytotoxicity.
Q. And your criticism that -- that they did not do an evaluation for cytotoxicity for the Peluso et al. 1998 study utilizing the 32 post -- the 32-P-postlabeling technique, that opinion is not contained within this paragraph at the bottom of Page 22, am I correct?
A. The comment about cytotoxicity?
Q. Correct.
A. That is correct.
Q. So as you sit here today, it is your belief that -- that they did -- that Peluso et al. 1998 did not measure for cytotoxicity?
A. As -- as I -- as I recall. And, again, there have been a lot of, a lot of lot of studies that are reviewed. As I recall, Peluso et al. did -- did not evaluate for cytotoxicity.
Q. Okay. And we've discussed the IP route of administration, so you don't have to explain your -- your opinions about it again, but as it relates to the 32-P-postlabeling technique, is -- is there any reason

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that that particular test would make the IP route of administration less reliable?
A. I think, I -- I think that in terms of the -- if -- if -- if there is cytotoxicity produced in any of these genotoxicity evaluations, then I think that that is a major confounding issue.
Q. So what is DNA adduct formation?
A. A adduct is a covalent binding of the chemical of interest or a metabolite with DNA, typically with one of the DNA bases. So you actually have a covalent bond formed.
Q. And is -- is that adduct formation evidence of genotoxicity?
A. Correct.
Q. And how does cytotoxicity impact that DNA adduct formation, or how does it confound the DNA adduct formation, I should say?
A. Well, in terms of -- in term -- in terms of cytotoxicity, as you have cells that are damaged and -- and -- and possibly moribund, the -- one of the things that happens is that some internal components of the cell can release enzymes which degrade DNA and this can lead to potential artifacts, if you will, or call it potential spots that one sees in the P-32

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postlabeling.
So once you start releasing enzymes, they have a chance to start chewing up the DNA, this can possibly be reflected as a positive in the postlabeling.
So do you want me to describe...
Q. All right. Is that -- is that true for both necrotic and apoptotic cell death?
A. Is what true, please?
Q. That -- right, what you just described, that -- that the internal components can release enzymes which degrade the DNA?
A. Yes, I believe so.
Q. Okay. And let's go back to the Bolognese 2007 study, because I believe they -- they touch on some of the DNA damage that we are discussing in this section.
A. Would you -- which page are you on -- are you on, please?
Q. Let me -- let me grab it first and then I will tell you.
So it's the 1997 Bolognese study. And let's see. And in your report on Page 23.
A. I'm there.

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Q. Okay. So Bolognese also evaluated DNA for oxidative damage, correct, accurate description of the '97 study?
A. Yes.
Q. Okay. And am I correct that the two reasons that you give for discounting the study are the lack of evaluation of cytotoxicity again and the IP route of absorption?
A. The IP route -- the IP route of administration, yes.
Q. Of administration. I'm sorry. Okay.
So let's turn now, I want to address your conclusions regarding glyphosate and then glyphosate-based formulations.
So -- so you conclude on Page 20 -- oh, wait, I'm looking at glyphosate-based formulations.
Okay. So you conclude on Page 31 --
A. I'm almost there.
I'm there.
Q. Okay.
-- that: "Based on the data and discussion presented above, I conclude that glyphosate should be viewed as a non-genotoxic compound. While there were occasional positives, some of which might

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have occurred by chance, among the very numerous tests for genotoxicity, these are far outweighed by the overwhelmingly negative results."
Correct?
A. Yes.
Q. Okay.
A. That's what I wrote and that's what I believe today.
Q. Okay. That accurately reflects your opinion?
A. Correct.
Q. Okay. And when you say it should be viewed as non-genotoxic, just so I am clear, are you saying that the evidence indicates that it is definitively not genotoxic or that there is not sufficient evidence to conclude that it is genotoxic?
Do you understand the -- the distinction that I'm drawing?
A. Okay. So you are asking me what I conclude.
What I conclude is based upon this -- based upon my independent and thorough evaluation of this big body of -- of data is that after all of this due consideration, that glyphosate should be viewed as

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a non-genotoxic -- as a non-genotoxic compound based upon all of these data.
Q. And -- and so I guess -- I don't know that that answers my question.
I guess, do you view the -- the data that you reviewed regarding glyphosate as conclusively showing that it is not genotoxic?
A. In my opinion the re -- my review of this large body of data leads me to conclude that glyphosate should not be viewed, should not be characterized as a -- as a genotoxic compound. This is a huge, huge data set.
Q. All right. And you go on to note that your conclusion is consistent with a number of agencies and -- and a couple of articles.
A. That is correct.
Q. Okay. And let's see. So why, if you go to page -- or I guess let me ask this: Do you believe that the European -- the European Food Safety Authority is an authoritative source of information as it relates to the genotoxicity of glyphosate?
A. I would not use the word "authoritative." In my mind, the European Food Safety Administration is a -- a very -- is a well -- is a highly-regarded

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organization. And -- and I'm using the word "organization" loosely because I'm not sure if it's actually a... In my -- in my opinion, EFSA is a highly-regarded organization. I think EFSA has a great degree of credibility in my opinion. I have not done a scientific survey, but generally I think EFSA is viewed as a credible organization.

Q. Is that why you put that your conclusion is consistent with EFSA in your report?

A. Is that why?

Yeah, what -- what I did is I made an independent, in-depth, constructively critical evaluation of this large body of data here related to genotoxicity and reached my conclusion and then I said, like, And by the way, it's consistent with.

So if the EFSA report did not exist, if there was no EFSA report, not one word of my conclusion would change.

Q. Did EFSA's conclusion impact your opinions at all?

A. Impact my opinion?

Q. Did you believe that it bolstered your opinion?

A. No. I made -- I -- I made my opinion

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based upon my review of the literature. The EFSA report did not bolster my opinion. And I put in that "my conclusion is consistent with" in terms of naming a number of different organizations and some review articles that reached a -- a similar conclusion.

Q. Okay. So next you talk about the joint Food and Agricultural Organization, FAO, of the United States World Health Organization.

A. Excuse me. I don't think it is the United States.

Q. I'm sorry. You're right. You're right.

A. It is just World Health Organization.

Q. United Nations. Good -- good catch.

Okay. Now, the joint FAO/WHO conclusion was limited to expose -- exposures via the oral route, correct?

A. Yes, yes. WHO limits itself to -- to food.

Q. Okay.

A. The -- not the WHO. Excuse me. JMPR limits its consideration to residues on -- on food.

Q. Okay. Now, let's go down to No. 5. You cite that your conclusion is consistent with Williams et al. 2000, which I believe is an article by -- is it

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Gary Williams?

A. That is correct.

Q. Okay. Do you know Gary Williams?

A. I do.

Q. How do you know him?

A. Gary Williams is a well-known, well-respected pathologist. He is a human pathologist, M.D., pathologist and toxicologist.

Q. What do you mean by "well-respected"?

A. I think that there are many people who -- who read and -- his -- his publications, who read them, evaluate them and think highly of his -- of his publications. In addition to presentations that he has made at -- at meetings.

Q. So you would say his name carries a lot of weight within the genotoxological community?

A. I'd say that -- I -- I would say that I think that he is a -- a -- a well-respected scientist --

Q. Does that mean --

A. -- in the area of toxicology.

Q. Does that mean -- or strike that.

Now, this article, the 2000 article was published in Regulatory Toxicology and Pharmacology?

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A. It was.

Q. Is that -- remind me, is that the journal that you served on the board of or as an editor for?

A. As an associate editor for, you are correct.

Q. Okay. Did you serve -- did you work for -- or work on that journal in any capacity in 2000 when this article was published?

A. Thinking back, I could have been on the editorial board at that -- I -- I don't remember if I was on the editorial board 15 years ago.

Q. Fair.

A. 17 years ago. Possibly not.

Q. Is it possible that you were a reviewer for this article?

A. You know, when --

Q. I'm not asking you if you remember specifically. I'm just asking if it's -- if it's possible.

A. I do not recall specifically.

Q. Okay. What -- and you currently serve as an editor for Regulatory Toxicology and Pharmacology, correct?

A. I currently serve as an associate

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editor --
Q. An associate.
A. -- for the -- for this journal, you are correct.
Q. And does that mean that you have some --
MR. WOOL: It is really hot in here.
BY MR. WOOL:
Q. -- have some decision-making authority in terms of what articles are or are not published?
A. Some decision-making authority is -- is correct. All of my -- what I do is I -- I make recommendations to the editor and the editor has the ultimate authority.
Q. Does Regulatory Toxicology and Pharmacology require that all authors who contribute significantly to a work be acknowledged?
A. For Regulatory Toxicology and Pharmacology, and for other journals, I do not think the instructions for authors explicitly say what you are saying. What they do ask is for individual authors, they ask questions about potential conflicts of interest and there are -- Regulatory Toxicology and Pharmacology now uses, which many other journals use, a sort of generally-accepted form that they ask

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authors to fill out which relates to conflict of interest. Whether or not that form was used in 2000, I don't know. In other words, I -- I -- I -- that form might have come into being after 2000.
Q. If I wrote an article and gave it to you and asked you to put your name on it to try to -- and pretending you weren't an editor, and we submitted that to Regulatory Toxicology and Pharmacology with your name on it, would it be improper for the journal to publish that article?
MS. PIGMAN: Objection; form.
BY THE WITNESS:
A. No. What -- what would be improper, of course, is if I were the reviewer of an article that I submitted. That would never happen because it is the editor who determines the reviewers and the editor would never send a manuscript submitted by Individual X to Individual X to be reviewed.
BY MR. WOOL:
Q. So you are telling me that if -- if I wrote an article, just gave it to you to slap your name on and we took my name off, that that would be proper for publication in Regulatory Toxicology and Pharmacology?

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A. Absolutely not. That is -- that is absolutely not what I said.
Q. Okay. Is -- is the situation that I just described -- strike that.
Would the situation that I just described be acceptable to you as an editor for Regulatory Toxicology and Pharmacology?
A. Just to be clear, are you asking me if an individual who made substantial contributions to a manuscript should be considered an author, or the other way around, if an individual made substantial contributions to a manuscript, would it be wrong not to consider him or her as an author?
Is -- is that basically what you are asking me?
Q. No, what I'm asking is if I made substantial contributions to the article and then, essentially, asked somebody who did not contribute to the article to put their name on it and remove my name so that the article would either get published or carry more weight, would that be improper?
A. That would be highly, highly improper.
Q. Okay. And if you as an editor on that journal -- on Regulatory Toxicology and Pharmacology

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discovered an instance of -- of that sort of impropriety, what sort of action would you take?
MS. PIGMAN: Objection; beyond the scope of the report, calls for speculation.
BY MR. WOOL:
Q. You -- you can answer.
A. Well, I could tell you that we're talking hypothetically now. I can tell you that at the very least I would go to the author, assuming that we have solid evidence that what you said is true, is go to the authors, at the very least, and say that you have to issue a correction saying that Individual X should have been listed as an author. At -- at the very least that's what I would do.
Q. You said "at the very least." What would you do at the very most?
MS. PIGMAN: Objection; be call -- beyond the scope of his report and calls for speculation.
BY THE WITNESS:
A. At the very most I suppose there could be consideration for having the manuscript withdrawn, but, but this really is context dependent. It is a case-by-case consideration and one would have to have a lot of specific detail.

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BY MR. WOOL:
Q. Okay. So kind of just because we are on this -- the topic and I think you mentioned that part of your criteria in evaluating some of these articles was what you would do in -- in your capacity as -- as an editor on -- on various journals, if somebody submitted to you for publication an article that was not compliant with OECD guidelines, is that a reason that you would consider in not publishing the article?
MS. PIGMAN: Objection; misstates his testimony.
BY THE WITNESS:
A. No. No. Because I think that when you look at the, what I'll call the research community, particularly the academic research community, there is not a need for them, in terms of if they are doing a genotoxicity evaluation, to follow the letter of the OECD guidelines. There is a need for them to be very careful and very thorough in terms of performing what I will call a -- a credible study. So if it is a study that involves a genotoxicity evaluation, it is in my mind imperative that there be some evaluation of cytotoxicity, that there be some questions and some evaluations of dose and/or time response, that there be some real consideration given to the rationale

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for -- for dose selection. These are the sorts of things that we would look for.
BY MR. WOOL:
Q. And would you reject an article for publication because it utilized the IP route of administration in evaluating genotoxicity, say, in an in vivo test for micronuclei induction, hypothetically?
A. For that one, for that one piece, again, this is all context related, so I cannot tell you, given that one piece of information, what I would do in terms of -- a re -- review articles are on a -- on a case-by-case basis.
MS. PIGMAN: David, when you have a moment, can we take a quick break?
MR. WOOL: Yeah, and if we can turn -- I don't know if we can do anything about the -- we -- we can go off the record now.
THE VIDEOGRAPHER: Going off the record at 2:13 p.m.
(WHEREUPON, a recess was had from 2:13 to 2:23 p.m.)
THE VIDEOGRAPHER: This is Disk No. 4. We are back on the record at 2:23 p.m.

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BY MR. WOOL:
Q. All right. Dr. Goodman, I believe before we went off the record I had asked you about your conclusions regarding the genotoxic -- toxicity tests performed on glyphosate. And so I wanted to ask you some similar questions about your conclusions regarding glyphosate-based formulations.
So if you can, will you turn to Page 24 of your expert report.
A. I'm there.
Q. Okay. And your conclusion as stated in your expert report is, quote:
"I conclude that GBFs are not genotoxic. It is important to note that the results of the reliable, reproducible guideline studies indicate that GBFs are not genotoxic. The few non-guideline studies which report that GBFs are genotoxic have methodological faults."
Did I read that correctly?
A. You did.
Q. And does that accurately state your opinion regarding glyphosate-based formulations?
A. Yes.
Q. Now, you mention in there "reproducible

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guideline studies," correct?
A. I do. I -- I mean, when I say, "it's important to note and talk about guideline studies," this paragraph, what I say, "I conclude that GBFs are not genotoxic," this is based on the whole body of relevant literature that I reviewed and is not limited to these guideline studies.
Q. Okay. Fair -- fair enough.
A. I just added a sentence about the guideline studies.
Q. And what is the importance of reproducibility in the -- the scientific community?
A. Well, it -- it -- it -- it is -- it is very important even if experiments are -- are very well and very thoroughly performed, there is always a chance that a hiccup happened and so re -- the question of reproducible -- reproducibility is an important aspect.
Q. And of these studies that you reviewed pertaining to glyphosate-based formulations, would you agree that a significant number are not publicly available?
A. I -- you know, with -- without -- without quibbling as to what does a significant number mean,

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many, many of them are not available publicly.
Q. Do you believe that the different compositions of glyphosate-based formulations could have an effect on the reported results of any of the studies?
A. That -- that is -- that is possible.
Q. Did all of the studies that you reviewed clearly identify their component parts? And, again, I'm talking about glyphosate-based formulations.
A. They did not fully identify the component parts. Some of them, but not all of them, referred to a particular formulation. So some of them referred to -- to Roundup. I think there was one in terms of it may have been one with Larry Kier who talked about a formulation called RODEO, but beyond that, in terms of them saying, And this Roundup product contained this and this and this and this and this, the answer is no.
Q. Is it possible in your view that glyphosate could interact with a surfactant to produce a result not seen in glyphosate alone?
A. Yeah, it is -- as you worded, it is -- it is possible that as part of a mix -- that with any chemical, that when it is part of a mixture one might

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get, in our case, toxicological results that are not quite the same as when the chemical is evaluated as a pure chemical.
Q. So sitting here today, how can you state conclusively that any of the positive tests -- or strike that.
So is it -- do you believe that it's important to identify all of the component parts of any given glyphosate formulation?
A. You know, I think I'd say to you that you have to be specific in terms of "identify all of the components." The analytical chemist these days has a -- a very powerful telescope and we can start measuring smaller and smaller and smaller quantities.
Q. Is it important to know the relative concentrations of all of the glyphosate-based formulations?
A. Important to know for what reason?
Q. In measuring the genotoxic effects or lack thereof of glyphosate-based formulations?
A. Evaluation of the genotoxic potential can be done without -- without knowing the individual components, because what we are evaluating is the effect of the mixture.

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Q. But do you believe that, let's say, two different compounds, both with the same chemicals but with different concentrations of each, so a different percentage of -- of Roundup and surfactant in one versus the other can have different genotoxic effects?
A. Well, excuse me. In terms of different concentrations of -- of Roundup, I think you meant different concentrations of glyphosate?
Q. Right, so -- so different -- yes, you're -- good catch.
Yes, so I -- I guess my question is: In evaluating the genotoxic potential of a glyphosate-based formulation, is it important to you to know not only the chemical composition of -- of that formulation, but also the amounts of -- of each chemical contained therein?
MS. PIGMAN: Objection; form, asked and answered.
BY THE WITNESS:
A. Well, it -- yeah. If the objective of a study is to ask, in our case, about genotoxic potential of Product X, one can evaluate that mixture as a mixture and make a conclusion in terms of what was or was not -- what were or were not the effects of

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this mixture without knowing the individual components.
BY MR. WOOL:
Q. Can you extrapolate the results of -- the results as they relate to that one mixture to glyphosate-based formulations on the whole?
A. Well, you know, mixtures toxicology is -- I don't want to cop out now -- is a tough, tough issue. It is a tough, tough issue. It seems that there is a -- a lot of similarity but not identity between these different glyphosate-based formulations. And within the studies that I have reviewed, a number of different glyphosate-based formulations have been used. So, in terms of my conclusions, my conclusions are certainly based primarily -- are based on this evaluation of some different formulations.
Q. And so, as I understand it, the -- the results on the whole that you've looked at regarding glyphosate-based formulations are that the results are negative, more or less fair, negative for genotoxic potential?
MS. PIGMAN: Objection; form, it misstates his testimony.
BY THE WITNESS:

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A. My conclusion is that the glyphosate-based formulations should not be viewed as genotoxic, that they are not genotoxic, that they should not be considered as genotoxic.
BY MR. WOOL:
Q. And how many different Roundup formulations do you believe exist on -- on the market or -- or have been avail -- made available to consumers?
A. I do not know.
Q. Okay. Do you know the number of different formulations that were considered in the tests that we've talked about today?
A. I did not -- I did not segregate the -- the information in that fashion.
Q. Is it possible that glyphosate-based formulation components other than the active ingredient itself could have genotoxic properties?
A. By "the active ingredient," we mean glyphosate --
Q. Right.
A. -- is involved?
THE COURT REPORTER: I'm sorry. I didn't hear that.

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BY THE WITNESS:
A. I said by the -- by the act -- excuse me -- by the active component, I presume that you mean glyphosate, and now you are talking about other --
BY MR. WOOL:
Q. Well, you -- you changed it a little bit. You said "active component." I said "active ingredient."
A. Active ingredient.
MS. PIGMAN: Well, why don't we just have a clean record, David --
MR. WOOL: Right.
MS. PIGMAN: -- if you could ask your question again, and we'll --
MR. WOOL: Sure.
BY MR. WOOL:
Q. Okay. So is it possible that components of glyphosate-based formulations other than the active ingredient can have genotoxic properties?
A. You know, on -- on a -- on a theoretical, hype -- hypothetical basis, the answer might be yes.
Q. Okay.
A. But among the key components of the glyphosate-based formulations are surfactants. There

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are a variety of reports from the Environmental Protection Agency where they have evaluated a number of different -- of different surfactants and have not expressed concern with regard to genotoxicity and in many cases with regard to potential carcinogenicity. There was one, which I can't put my finger on right now, where they did say that for this particular component, it's -- and now I'm paraphrasing -- reasonable to use as long as the concentration does not exceed 30 percent. But I can't put my finger on that particular report right now.
Q. And to the best of your recollection --
A. 30 percent is a lot.
Q. Right. And to the best of your recollection, what did they say happened if -- if you exceeded 30 percent?
A. They didn't. They didn't -- they -- they didn't. They -- they -- they talked about evaluating it, and I do not recall. I do not know if they did. I do not recall what they said would happen if you exceeded 30 percent.
Q. And so did you believe that a surfactant combined with glyphosate could have an effect not -- not seen in either -- a genotoxic effect that would

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not be present in studies involving either of those two components alone?
MS. PIGMAN: Objection; form.
BY THE WITNESS:
A. Well, first of all, we have a wealth of data on genotoxicity evaluation of glyphosate-based formulations, and I think, when evaluating this, it is proper to say that the GBFs, glyphosate-based formulations, are -- are not -- are not genotoxic.
BY MR. WOOL:
Q. Okay. So I don't think you -- you've really ask -- answered my question, so maybe I'll ask it a different way.
A. Okay.
Q. As an a genotoxicologist, if you were asked to evaluate the genotoxicity of a formulation, not a glyphosate formulation, just that you know there is an active ingredient and different component parts, would you rather test the formulation or would you prefer to test the component parts individually?
A. Well, I think the component parts should be evaluated and I think some evaluation should be done on the formulation, as was -- as was done here.
Q. So your answer is that they should both be

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tested, both the component parts and the formulation?
A. I think that I would qualify my answer, though, and that is if you have multiple, multiple, multiple different formulations, then I -- I really think that it becomes problematic if you are going to ask for every test to be done on every formulation.
Q. Do you believe that the data set regarding glyphosate-based formulations and their relationship to genotoxicity is robust enough to reach a definitive conclusion that glyphosate-based formulations are -- are not genotoxic?
A. I think it's robust enough to reach the conclusions that I have reached in my report. This is based upon the large, large body of information that I -- that I have reviewed and including -- including more than one glyphosate-based formulation.
Q. Did you review any of the genotoxicity tests involving any of the alleged inert ingredients in glyphosate-based formulations?
A. The only other data that -- I did review information available from the Environmental Protection Agency on surfactants, but -- but in terms of getting into what other components might be present, the answer is no.

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Q. If there were genotoxicity tests involving various surfactants used in glyphosate-based formulations, would you want to review those tests?
A. Well, I did review some EPA reports on a variety of surfactants and I -- at this point, again, I -- I -- I cannot tell you the names of those surfactants.
Q. Are those reports listed on your reliance list, your supplemental reliance list?
A. Yes. Yes.
Q. Approximately, if you can, how many surfactants did you review reports for?
A. I, roughly now, I -- I think that we're talking about six or eight -- somewhere between six and nine reports and each of the reports involved more than one surfactant.
Q. Did those reports run the surfactants through all or any number of the -- the four tests that you highlight as being the most reliable?
A. A number of them did involve the Ames test, some of them involved some other tests, some of them involved looking at what we'll call chemical structure activity relationships, but I can't recall if all of the reports involved all of the studies that

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we've talked about.
Q. And -- and the tests involving chemical structure relationships, can you reliably infer genotoxicity or the absence thereof from a -- a chemical structure --
A. Structure activity.
Q. Activity, yeah.
A. I think that it's certain -- it is certainly not definitive. I think it provides a -- an indication, but it is -- it is -- it is -- it is not definitive.
Q. Do you recall if any of the reports that you reviewed involved the surfactant POEA?
A. I do not recall.
Q. Have you heard the term "POEA" before?
A. The answer is yes. I'm trying to think where. The answer is yes and it -- it might be one on that -- it might be one of those that the EPA reviewed.
Q. Do you have an opinion on whether POEA is genotoxic?
A. I know right now I cannot tell you because I don't remember if POEA was in the EPA report.
Q. Have you heard of the chemical

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1,4-dioxane?
A. Yes.
Q. Do you have an opinion on whether 1,4-dioxane is genotoxic?
A. I don't know.
Q. Do you have an opinion on whether it's carcinogenic?
A. I don't know.
Q. In what context did you hear about 1,4-dioxane?
A. It was probably in some paper or papers that I've read. Years ago there were times when one would sometimes mistakenly consider 1,4-dioxane with an environmental contaminant called dioxin and they are two very, very, very different molecules. But I really do not have anything -- I have nothing approaching in-depth knowledge of dioxane.
Q. Of 1,4-dioxane?
A. Of 1,4-dioxane.
Q. Okay. All right. Let's talk about AMPA very briefly. I'm probably not going to spend too much time.
A. Excuse me. Are we on a particular page or --

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Q. No, no, no, no. I was just trying to think of where I'm going to go next.
So I believe if you go to Page 9 of your report.
A. I'm there.
Q. Okay. At the very bottom you note that:
"Importantly, a genotoxicity evaluation is one screening tool that can be employed when considering the potential of a chemical to cause toxicity (e.g., cancer) and the results of this should be viewed within a context that can include rodent cancer bioassay and epidemiological data."
Did I read that correctly?
A. You did.
Q. And that accurately reflects your opinion?
A. It does.
Q. Okay. And so -- so my question to you is: Is it possible to infer causality with rodent cancer bioassay data alone?
MS. PIGMAN: Objection; form, vague, outside the scope of his report.
BY MR. WOOL:
Q. You can answer.
A. The rodent bioassay is a qualitative test

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which asks whether or not, under the particular conditions of the test, which are typically very high doses that are employed, does the chemical in question cause cancer at one or more particular sites in male and female rats and male and female mice, and it can be various strains involved, or stocks involved.
Q. In the context of determining carcinogenicity, is it possible to infer causality with genotoxicity evidence alone?
A. No. I think that genotoxicity data is one piece of the -- is one piece of the evaluation.
Q. Now, the -- the same question, is it possible to infer causality on the basis of epidemiological data alone?
A. I am not an epidemiologist.
Q. Fair.
A. I am not an expert in epidemiology. What I do know is that what epidemiology can tell us is whether there is an association between A and B. If indeed there is an association between A and B, that in no way means that A causes B.
Q. Okay. That's fine.
Let's go to Page 35, which should be --
A. Almost there.

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Okay.
Q. Okay. And in the middle paragraph, you discuss the findings of an article by Maas et al. 2009, correct?
A. I do.
Q. Okay. And that report demonstrated a statistically significant increase in micronuclei following treatment with doses of 200 and 400-milligrams per kilogram using the IP injection method, correct?
A. Yes.
Q. Okay. And so is it your belief as we sit here today that Maas didn't show a dose-response relationship in that study?
A. Yes.
Q. Do you believe that dose-response is a necessary prerequisite to -- to show genotoxicity?
A. I think it is a -- I think it is a important -- a important aspect in terms of whether or not one -- one sees dose-re -- dose-response. I think it is an important aspect. However, it is certainly possible as long as we are staying below doses in concentrations that cause cytotoxicity, it is possible that in a hypothetical particular test system, perhaps

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they use three doses and the low and the middle dose did not produce a positive result and the high dose did. Under those conditions, as long as we did not have genotox- -- have cytotoxicity and cytotoxicity was evaluated, then I would probably consider that as a valid test.
Q. Is it possible for a substance to be genotoxic in certain lower doses but -- but not -- but have a different effect at higher doses or have no dose at a higher -- or have no effect at a higher dose?
A. The answer is -- the -- the -- the answer is that -- that that is correct. And, again, I think that this points to a need for a cytotoxicity evaluation.
So, for example, one can have adduct formation with DNA and adduct formation with DNA is not a mutation. It takes a few rounds of replication to, quote, fix that into a mutation. So if you have a very, very high dose and you have adduct formation but you've killed the cells, then you are not going to see mutation.
Q. Now, you said that you have adduct formation, but it takes a couple of rounds of

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replication -- of --
A. Of cell replication.
Q. -- to fix it?
A. Correct.
Q. So --
A. By -- by -- excuse me. By "fix," I don't mean "fix" in the sense of repair. But what I mean "fix" in the sense of translate that into a mutation.
Q. Okay. So I'm -- I'm just trying to understand. So a couple of rounds of improper replication can lead to a mutation, is -- is that?
A. No, no, no, no.
Q. No?
A. So -- that is -- that is not correct.
Q. Okay.
A. So one can have a, for example, an add -- with DNA we are dealing with what I'll call DNA bases and there are antiparallel strings and the bases base pair with each other, so -- in a specific way. One can have adduct formation that results in what I will call mispairing, that is, the base doesn't pair with what it normally does. And if that's the case, then one round of replication can put in a base that didn't belong there. The second round of replication could

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put in the base that pairs with the base that didn't belong there and now you have an inheritable mutation.
Q. Okay. So your third criticism of the Maas study is that the doses were extremely high and then you note that:
"Since AMPA is a biodegradation product of glyphosate which is sometimes found in the soil, it is reasonable to assume that exposure to it is much less than exposure to glyphosate."
I guess, why do you believe it's fair to assume that -- that there is less exposure to AMPA than glyphosate?
A. Well, first because it is a biodegradation product. Not all of the glyphosate is degraded to AMPA. And second, because it is sometimes found, not always found, and so because it is a degradation product and because it is sometimes found in soil, I think that there would be much less exposure. In other words, because it's found in soil, I mean, the only way you are going to be exposed is if you -- if you step on it barefoot, if you happen to pick up the soil in your hand, if you happen to eat the soil, or if you throw dry soil in the air and inhale it. These are really rather unlikely scenarios.

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Q. You don't believe somebody could be exposed to AMPA through dermal absorption from -- from spraying glyphosate-based pro -- formulations?
A. Not -- not -- not directly. It is -- it is my understanding that it's microbes in soil that do the degradation. So if what you are saying is that glyphosate could be sprayed, land on the ground, some of the microbes in the soil do degrade some of its AMPA, and I, for example, happen to walk barefoot over that spot, perhaps there would be a small amount absorbed through my skin.
Q. Okay. And your conclusion is that the results of the four mammalian-based AMPA genotoxicity assays are inadequate for use in making a decision regarding whether or not AMPA is a genotoxic compound?
A. Yes, based on the -- based on the rationale as presented.
Q. And this conclusion differs somewhat from the conclusions regarding glyphosate-based formulations and glyphosate, correct?
A. Yeah, yeah, yeah, it -- it -- it -- it -- it differs -- it differs a bit because I do think that in these studies there are confounding effects and that because of those -- and those confounding effects

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rise to a level that make interpretation of the study into a yes or a no, not possible.
Q. Fair enough.
So let's talk about your opinions related to oxidative stress really quick. I believe that starts on Page 37 of your report.
A. Could be.
I'm there.
Q. Okay. Now, would you describe yourself as an expert in oxidative stress?
A. I think I describe myself as someone who has expertise in oxidative stress as it relates to the, what I will call the -- the cancer problem or to carcinogenesis, because in order to -- to be an expert in carcinogenesis, one has to gain substantial knowledge about factors that might or might not contribute to carcinogenesis.
Q. Now, can I use the acronym ROS to describe what you would know as reactive octave -- oxygen species?
A. Please do that.
Q. Okay. Thank you.
Are you of the opinion that ROS formation and oxidative stress can only be involved in carc- --

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carcinogenicity when a compound has been found to be genotoxic?
A. I think that the -- the role of oxidative stress in carcinogenicity is really unclear. It is a fascinating body of literature. There is a lot of indication and talk that it may play some role, but what we really lack is we really lack studies that really do a thorough job in terms of dose-response and temporal relationships relative to carcinogenicity.
Q. So fair to say there isn't conclusive evidence that genotoxicity is a necessary prerequisite to show that oxidative stress can be involved in carcinogenesis?
A. Oxidative stress might produce a genotoxic event. It might do it directly, it might do it indirectly. That -- that -- that is theoretically possible.
Q. So do you believe that oxidative stress can cause cancer?
A. I don't believe that we have the data that would permit me to make that conclusion. I -- I think the, if you will, no -- no pun intended, I think the jury is out on this. There is a need for a -- a considerable more research in this area. It's a

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fascinating area and should be researched.
Q. So as you sit here today, to the -- to the best of your knowledge, it's possible that oxidative stress could promote carcinogenesis regardless of whether there is concurrent genotoxic activity?
A. You know, I cannot tell you with regard to oxidative stress or anything else that something is absolutely, totally, completely impossible. I -- I -- I -- I -- I cannot -- I cannot tell you that.
Q. Fair enough.
MR. WOOL: Do you guys want to take a quick break?
MS. PIGMAN: Okay.
THE WITNESS: Sure, if I can get out where it is a little cooler.
THE VIDEOGRAPHER: Going off the record at 3:01 p.m.
(WHEREUPON, a recess was had from 3:01 to 3:11 p.m.)
THE VIDEOGRAPHER: We are back on the record at 3:11 p.m.
BY MR. WOOL:
Q. All right. Dr. Goodman, I'm going to try and get us out of here sometime in the -- in the next

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hour, hopefully.
So I have a couple of more questions for you about IP injection studies and -- and physiological routes of exposure.
Do you know if the EPA uses IP injection studies to measure genotoxicity?
A. I -- I do -- I do not know. If -- if they do, then I hope that they are including a cytotoxicity evaluation.
Q. Does the European Food Safety Authority use IP injection studies to measure genotoxicity?
A. I don't know. If they do, then they should be using -- in -- incorporating an evaluation of cytotoxicity.
Q. Does -- do you know if Monsanto uses IP injection studies to measure genotoxicity?
A. I don't know.
Q. Do you believe that IP injection studies are a generally-accepted methodology to measure genotoxicity?
A. If -- if one is doing this and evaluating cytotoxicity, then I think that it -- in my opinion, it is less than ideal and could -- could be deemed acceptable.

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Q. Now, you are not an industrial hygienist, correct?
A. Correct.
Q. Do you have any expertise in measuring or calculating exposure?
A. No. Except -- except in terms of some of the calculated examples, which are really rather simplistic, in my report and the -- the way I expanded on it this morning in terms of calculating what hypothetically could be a body fluid level and comparing the highest daily dose that EPA talks about with a in vitro concentration or in vivo dose.
Q. Okay. Now -- now, that leads me to sort of my next point. You talked about the highest daily dose that the EPA calculated, and I believe --
A. Excuse me. I'm not sure if calculate -- it is either calculated or estimated.
Q. Oh, okay. Fair enough.
And I believe the other source that you provided for human dose was from Solomon 2016, is that correct?
A. That is correct. Solomon 2016 certainly was the one I referred to with regard to the applicator exposure.

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Q. And --
A. I did talk about -- I'm sorry.
Q. No, no. You -- you can go ahead.
A. I did talk about -- and I should say the -- the .47 milligram per kilogram a day for children was summed -- was EPA said was summed up for multiple routes of exposure. I did also say that from food and water, I think it is EPA that made the estimate of .088 milligram per kilogram per day.
Q. Now, aside from Solomon 2016 and the EPA article that you referenced, are you aware of any publications or articles that measure exposure among humans?
A. I am not. The estimated -- estimated exposures are the three that I -- that I talked about and I -- I did not go further than that.
Q. Okay. And the -- the estimated exposure in Solomon 2016 was based upon measuring the amount of glyphosate excreted in the urine of the applicator surveyed, is that correct?
A. It's been a while since I've looked at that publication. I'd really like to see it before saying yes or no. I am confident that in terms of the -- at the 90th percent level, the higher level of

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exposure estimated for applicators was .021-milligram per kilogram per day.
Q. If Monsanto had reason to know that glyphosate absorbed dermally was primarily excreted through the feces, would it be inappropriate to measure glyphosate excreted through urine as a method of -- of measuring exposure?
A. Based upon the information that you've given me, I would say -- I would say no. But then we'd have to talk in context as to -- as to just -- as to just -- just what was done.
Q. So hypothetically speaking, if you as a genotoxicologist knew that a potential toxic compound was primarily excreted through the feces, would it be an appropriate measure of exposure to look only at urine?
A. First of all, maybe I should have said this earlier, I -- I view myself more than a genotoxic -- toxicologist, as it -- as I did --
Q. Fair.
A. -- act on my expertise earlier.
If, in fact, the individual who did the exposure evaluation based on urine was cognizant of the fact that most of it is excreted in feces, and it

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depends what they did. If they said, Well, we measured it in urine, we found some in urine, and so there was some exposure. If they left it like that, okay.
If, on the other hand, they want to relate what is in urine in a more quantitative sense as to exposure, then it would have been, in my view, incumbent upon them to show that they're cognizant of a large amount being excreted in feces and, if you will, make a correction, in other words, to say, If we see such and such amount in urine, then we know there is such and such amount in feces, and assuming the data are there to support that.
Q. And without knowing that correlation, would it then be inaccurate to rely solely on the amount of a chemical excreted in urine to infer total exposure?
MS. PIGMAN: Objection; this is all far beyond the scope of his report.
BY THE WITNESS:
A. I -- I'm not an exposure, exposure expert. I think, again, that if one wanted to say, ask whether or not there was exposure in sort of a yes-or-no measurable level and one looked at urine, I think that

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would be -- would be okay.
BY MR. WOOL:
Q. But if you wanted to quantify the total amount of exposure to a chemical in -- in milligrams per kilogram a day, would looking only at urine in the hypothetical that I gave you be proper?
MS. PIGMAN: Objection; beyond the scope of his report and outside of his area of expertise, as he stated.
BY THE WITNESS:
A. Yeah, I think there, there are other factors that would have to be accounted for, and I cannot tell you in depth. I can't go in depth beyond the generality that I just stated.
BY MR. WOOL:
Q. Okay. And -- and this is one of the last points on this topic, but on, say, the bottom -- or the middle paragraph of Page 20 of your report, you state that --
MS. PIGMAN: Hold on. Can you give us a second.
BY THE WITNESS:
A. Excuse me. I'm getting there.
Almost there.
I'm there.

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BY MR. WOOL:
Q. Okay. The bottom sentence of the middle paragraph states:
"The much higher rate of absorption following IP administration might result in toxicity that would not be observed following dosing under more physiologically" -- "physiological routes of administration."
Did I read that correctly?
A. You did.
Q. So what -- what I'm asking about is you -- the -- the first part of this sentence where you say, "the much higher rate of absorption."
I guess first, what -- what you're referring to, the absorption of the chemical into the -- into the bloodstream, is that what that's referring to?
A. Yes, there -- as -- as I indicated this morning, there is a very, very rich blood supply in the peritoneal cavity and administering compounds by the intraperitoneal route results in a very quick, and in addition to very quick, probably a very high percent of the material being absorbed really quickly. So you get really high peak blood levels.

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Q. Okay. So -- so that's what I wanted to -- to get at.
So you are -- you are saying that this results in higher peak concentrations in the blood?
A. Yes.
Q. And do you have a citation for that or is that just well known within the field?
A. I can't give you a citation off the top of my head, but in the field I think it is -- it is well known that the IP route of administration gives you a very, very quick absorption, quicker than you would get by a oral administration or -- or dermal application.
Q. And -- and it is your opinion that that results in higher peak concentrations in the blood, correct?
A. From the IP administration, then one would get higher peak concentrations in the blood and, therefore, those higher peak concentrations might cause adverse effects that were not seen -- that would not be seen where the blood level is lower.
Q. Okay. Let's talk about some of the -- the human tests, which are -- which you discuss starting on Page 12 of your report. Although let's actually

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start with Bolognese, which is on Page 15.
A. Okay. I'm sorry. Are we on Page 12 or 14?
Q. I'm sorry. Page 15 of Exhibit 1.
A. I'm there.
Q. All right. So this is a biomonitoring study in five Columbian regions, correct?
A. Yes.
(WHEREUPON, a certain document was marked Deposition Exhibit No. 25-8, for identification, as of 09/22/2017.)
BY MR. WOOL:
Q. Okay. And I will mark as Exhibit 8 a copy of Bolognese's study and it has a MONGLY number at the bottom which is MONGLY04882823. I'm handing you Exhibit 8.
MS. PIGMAN: Thank you.
BY MR. WOOL:
Q. Okay. And if you turn to the Method section, which is on page -- or actually, let's just look at the -- the author's description.
A. Excuse me. Do you mean the summary?
Q. Yes, the summary.

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So, in essence, the study was carried out over five regions in Columbia. Some where aerial spraying occurred, some where it -- it did not, fair?
A. Some where there was aerial spraying of a glyphosate-based formulation and some where there was no aerial spraying of a glyphosate-based formulation, yes.
Q. Okay. And it says sort of in the -- in the middle of that:
"Lymphocytes were cultured and a cytokinesis-block micronucleus cytome assay was applied to evaluate chromosomal damage in cytotoxicity."
Do you see that sentence?
A. I do.
Q. Okay. Now, is that a valid method of measuring genotoxicity?
A. In gen --
Q. In general?
A. In -- in general the answer is yes.
Q. Okay.
And in your report, I just want to make sure I am clear, you were not disagreeing that genotoxicity was noted within the exposed populations,

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is that correct? Your...
A. That is correct. That is correct.
Q. Okay.
A. I am not disagreeing that there was some genotoxicity noted in some populations.
Q. Okay. And the authors noted a significant increase in the frequency of binucleated micronuclei?
A. Yes.
Q. Is that correct?
Okay. And you were not -- or are you disagreeing with that finding of the authors?
A. I am not disagreeing with that finding.
Q. Okay. And BNMN, binucleated micronuclei, is an effect of genotoxicity, is -- is that accurate?
A. The presence -- the presence of micronuclei is an -- is a indicator -- can be used as a indicator of genotoxicity.
Q. Okay. And so one of your criticisms, if you look at the middle of the page, you state:
"However, the highest reported frequency of BNMN was in Boyaca where no aerial spraying of glyphosate was conducted."
That's in the middle of the page.
A. That's correct. I see that and that is

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correct.
Q. Okay. And so is it your belief that the highest rates of BNMN occurred in Boyaca?
A. It -- it is. I'm -- I'm taking what the author has said as -- as correct based upon, based upon the information presented in the manuscript.
Q. And is it your belief that the highest rates of BNMN occurred in Boyaca following the exposures in the other areas?
MS. PIGMAN: Objection; form.
BY THE WITNESS:
A. I'm not clear on that.
BY MR. WOOL:
Q. Meaning, I guess what I mean by that is that Boyaca had the highest frequency of BNMN compared to the exposed populations in the other regions?
A. Yes, but the -- the key aspect that -- that I would like to include here is that Boyaca was the -- an area where there was no aerial spraying, and -- and I know that they say glyphosate, but I'm pretty sure they mean a glyphosate-based formulation.
Q. Okay. So why is it pertinent to you in your discussion of Bolognese that the highest reported frequency of BNMN was in Boyaca?

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A. Well, that is important to me because in -- in evaluating the results of this study, the thing that was paramount in my mind was whether there would be a -- an appropriate positive correlation between the degree, level of spraying of the -- in this case they are -- they are saying glyphosate and the genotoxicity reported. So while the report might be correct in terms of saying, Yes, we did observe micronuclei, the question is, Can you from that say that this is due to glyphosate or a glyphosate-based formulation.
Q. Is it your belief that the population of Boyaca was not exposed to glyphosate or glyphosate-based formulations?
A. I am taking the -- you know, I forgot -- I just don't know whether it is a he or she. So I am taking the -- the -- the author's word for this when the -- when the author says that there was no glyphosate spraying. And, again, I'm sure that he or she means glyphosate formulation spraying in this area.
Q. Okay. So --
A. I have no independent knowledge of this.
Q. So if you turn to Page 991 of the

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Bolognese study, I'd ask you to look at Table 2.
A. I'm there.
Q. So on the left-hand column it says "Region" and below that "Phase 1."
Are -- are you following me?
A. I am.
Q. Okay. And below Phase 1 it says, "Number of subject" -- "subjects" and then "BNMN."
A. Yes.
Q. Correct?
Okay. Okay. And I guess in the -- in the table description it defines Phase 1 as five days after spraying, correct? Oh, sorry. Phase 1 as -- as being before exposure and then Phase 2, five days after spraying, and then Phase 3, four months later?
A. It looks like that. It looks to me that's what it says.
Q. Okay. Now, if you go down to BNMN reported in Phase 1, under Boyaca it reports 5.64?
A. That's correct.
Q. Okay. And so am I correct that that is the frequency of BNMN prior to aerial spraying of glyphosate-based formulations in any of the other regions?

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A. Yeah, Phase 1 was -- was --
Q. Okay.
A. -- was before.
Q. And -- okay. And if we go down to Phase 2, the number that I see for Boyaca is 4.96.
A. I see that.
Q. Okay. And that number appears to be lower to me than the number under Valle de -- del Cauca, I guess is how I pronounce that, the -- the furthest province to the right?
A. It does. It's -- it's also rather interesting that there doesn't seem to be any statistical analysis here.
Q. Okay. But so in -- in this section, if we are looking at Phase 2, does it appear to you as though the frequency of BNMN is higher in both Valle del Cauca and Nario than Boyaca?
A. The number -- the -- the -- the numbers are higher. Whether there is a statistical difference, I don't know.
Q. Okay. Now, if you turn to Page 988, which I think is back a page or two -- or actually...
A. I'm sorry...
Q. You know, I might just skip that question.

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Let me just go to the bottom of Page 994. And if you look at the -- the very last paragraph on -- on that page that carries over to the next page, the authors state in the second sentence that:
"The frequencies of BNMN in Nario and Putumayo during the second and third sampling fell within the range of values observed in Boyaca, an area where people were exposed to a complex miss" -- "mixture of different pesticides (including glyphosate)."
Do you have any reason to believe that the people in Boyaca who were sampled by this study were not exposed to glyphosate?
A. Based upon -- based upon what is said here, the an -- the answer is no, but because they were exposed to a complex mixture, I don't see how you are able to point to any one or combination of those -- to any one of those and say that the effect observed was due to this particular chemical.
Q. Do you believe that the subjects in the exposed populations of the Bolognese study experienced significantly elevated levels of micronucleus formation and peripheral blood lymphocytes following exposure?

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A. By "significant," do you mean statistically significant? Because I don't see that they did statistics.
Q. Okay. Let's just ask if the levels were increased, do you have any reason to disagree with that finding?
MS. PIGMAN: Objection; form.
BY THE WITNESS:
A. If you just look -- if you just look at the numbers, you can say that one number appeared to be higher than the other. Now, is that really different, meaning was it a different population, you can't really start talking about that without some statistical analysis.
BY MR. WOOL:
Q. Can you definitively rule out exposure to glyphosate-based formulations as a cause of both the BNMN and the micronucleus formation and peripheral blood lymphocytes for the exposed populations in this study?
A. Well, I think that the -- I think that -- I think that the authors really speak for themselves on this point where they say, "There is not sufficient information to correlate the frequency of micronuclei

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to the pesticide exposure."
Q. So you would defer to the authors?
A. Well, I look here and look at the paper, I think that the authors have placed a -- a proper context on their -- on their -- on their -- on their findings.
Q. I'm going to hand you the -- the Paz-y-Mino study.
A. So are we finished with No. 8 for the time being?
Q. Yes, we are finished with -- well, hold on.
I'm going to mark the Paz-y-Mino study as Exhibit 9?
MS. PIGMAN: Which one?
MR. WOOL: The 2007 study, which I believe is the first that you discuss in the Human Study section.
(WHEREUPON, a certain document was marked Deposition Exhibit No. 25-9, for identification, as of 09/22/2017.)
BY THE WITNESS:
A. Thank you.
MS. PIGMAN: Thank you.

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BY MR. WOOL:
Q. And take a moment to glance over the study if you need to.
A. I do.
Q. Okay. And you describe these --
A. I -- I mean I do need a moment to --
Q. Oh, yeah, yeah, yeah. Okay. Go ahead.
A. All right. I've looked it over.
Q. Okay. And this study is -- conducted a Comet assay, is that correct?
A. That is correct.
Q. And what is a -- a Comet assay? You might have answered that earlier. If so, I apologize.
A. I do not think I described that earlier.
Q. Okay. Very well.
A. So, what is a Comet assay.
A Comet assay is an indirect measure of -- of genotoxicity. When compounds interact with DNA cells have an ability to repair the damage. Repair of the damage starts with making a strand break in the DNA strand near the damaged site as the cell then tries to cut out this damaged site and patch over it. During this process, there is a break in the strand of DNA as it's trying to cut out that one patch. So if

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one then places the cell -- isolates the nuclei and places the cells under alkaline pH conditions, this causes the DNA strands to unwind. And if there are strand breaks, one will see fragments of the DNA. And if there are no strand breaks, then you'll see big pieces of DNA.
Q. And do you believe -- oh, go ahead. Sorry.
A. And then one puts these nuclei in an electrical field, the DNA is negatively charged, and that means that in the electrical field the negatively charged DNA will move towards the positively charged anode and what you will see is -- what you will see is streaming, if you will, of the DNA. If the -- if there are no strand breaks, you'll see that most of the DNA will stay bunched up to where the nucleus was. If there are a modest amount of strand breaks, you'll see some streaming. If there is a great amount of strand breaks, you'll see more streaming. And if you picture this and then you use your imagination a little bit, you can say, Well, you know, this looks a little bit like a comet that has a head and then has a faint tail. And so that's why this is called a Comet assay.

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Q. And is a Comet assay a valid test for assessing genotoxicity?
A. Yeah. You know, actually, I think we did go over this part a little bit this -- this morning.
Q. Yeah, that's what I was thinking.
A. But the -- the answer is that a -- in my opinion, that a properly-formed Comet assay is certainly a -- a -- a good test to use for evaluating genotoxicity.
Q. Okay. And if you turn to Page 457, the Paz-y-Mino study.
A. Okay. I'll -- I'll get there.
I'm there.
Q. Okay. The first full paragraph states that: "The exposed group consisted of 24 random" --
A. I'm sorry.
Q. Are you there?
A. Yes. I -- I just touched her papers. I said I was sorry.
Q. It states:
"The exposed group consisted of 24 randomly selected individuals" in "(Table 1) who lived 3 kilometers or less from an area on the border between Ecuador and Columbia where aerial spraying

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with a glyphosate-based herbicide had occurred continuously during three days between December 2000 and March 2001, sporadic aerial spraying continuing for three weeks following continuous spraying (MREE, 2003, at Accon Ecolgica 2004)," is the source for that.
So do you have any reason to disagree that the exposed group was exposed to at least multiple days of aerial-based glyphosate formulation spraying?
A. Do I have any reason to disagree with --
Q. Yes, to -- to make that?
A. No, I do not.
Q. All right. Now, if you go to Page 12 of your report, you indicate that you have four major concerns that cast serious doubt on the validity of -- of this study.
A. That is correct.
Q. Okay. Now, is it a totality of those four concerns or does any one concern on its own in your mind render the results of the paper invalid or questionable?
A. I think each individual concern, each individual concern that I ar- -- I articulated raises a level of concern in my mind. And my level of

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concern gets raised higher as we start looking at one, two, three and four. So each individual one would raise a level of concern. The combination of them is additive, if you will.

Q. But none of the four concerns listed on pages -- pages 12 and 13 taken individually would -- would cause you to kind of invalidate in -- in your mind the results of the study?

MS. PIGMAN: Objection; misstates his testimony.

BY THE WITNESS:

A. Yeah, what -- what I said was that each one individually I think is, as I said, a major concern. And with that major concern for any one of them, I would have questioned the validity of the study. When I see four of them, I really, really question the validity of the study.

BY MR. WOOL:

Q. So let's talk about the first one, I guess.

Fair to say that the subjects, the exposed subjects in the Paz-y-Mino study experienced a -- a number of wide ranging health effects, if you will?

A. I have a Ph.D. I am not a medical doctor, but it seems to me, looking at these different

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effects, it seems to me that these individuals were, in a layman's term, hurting.

Q. And you state after quoting the article that:

"These people appear to be seriously ill. A thorough investigation would have been necessary in order to ascertain the cause or causes of their illness, including what other chemicals they were exposed to, and how that might have contributed to the DNA strand breaks reported. Under these circumstances, it is not appropriate to simply conclude that DNA damage is related directly to GBF exposure."

A. That's what I said and that's what I believe today.

Q. Okay. Do you have any reason to believe that the subjects were exposed to something else that would have caused those symptoms?

A. I am a Ph.D., not a medical doctor, but it seems to me, again, that -- that these folks were, in layman's terms, hurting. It just looks like a -- a variety of problems here and I think that it would have been highly appropriate to inquire as to was there anything else that they were exposed to besides

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glyphosate that might have caused these symptoms and, B, if one or more of those other factors were factors that could have contributed to the genotoxicity results reported.

Q. But sitting here today -- or -- or strike that.

Okay. If you look at the top of Page 5 -- 458, I'm sorry, top of Page 458?

A. I'm there.

Q. Okay. The second paragraph down states:

"None of the indi" -- "individuals analyzed in this study (neither the exposed group nor the control group) smoked tobacco, drank alcohol, took non-prescription drugs or had been exposed to pesticide" -- "pesticides during the course of their normal daily lives. All of the individuals included in this study mainly worked at home, sometimes cultivating and harvesting crops without the use of pesticides" -- I mean "without the use of herbicides, pesticides or similar substance" -- "substances in the named activities and their windowed houses did not contain asbestos in the ceiling or roofs."

I know I struggled with that, but I -- did I read that correctly?

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A. You did.

Q. Okay. Do you have any reason to disagree with that finding?

A. No.

Q. And sitting here today, do you have any reason to believe that something else caused these symptoms?

A. Again, as a layman looking at this laundry list, long laundry list of symptomology, it's -- appears to me that -- that these people are hurting and that there should have been some evaluation as to what might be the cause of all of these different symptoms that they were exhibiting.

Q. And sitting here today, you don't believe that glyphosate-based formulation exposure could have caused all of these symptoms?

A. What I'm saying is, as a -- as a -- as a layman, I'm not making a -- a diagnosis. If I do not know exactly what the symptoms are and all of the symptoms are of glyphosate poisoning, it would -- I think that it would have been highly appropriate for the authors of this study to have sought some medical advice as to are any or all of these symptoms associated with glyphosate poisoning. If so, how much

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glyphosate would it take to cause this and what are other factors that may cause this plethora of malaise.
Q. Now, if you look at the end of the second paragraph on Page 457 of the Bolognese study --
A. Are we --
Q. -- or sorry, the first --
A. Which column?
Q. The -- the left-most column.
A. Excuse me. We are talking Paz-y-Mino, right?
Q. Yes. Did I say Bolognese?
A. You did.
Q. I'm sorry. It's been a long day.
A. That's -- that's okay. I understand.
Q. So I'm looking at the last sentence of the first full paragraph.
A. Oh, on the right or left column?
Q. The left column.
A. Okay.
Q. And it said -- and it states:
"Exposed group individuals manifested symptoms of toxicity after several exposures to aerial splay" -- "spraying, with half of the individuals in the group having received spraying directly over their

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houses and the other half living within 200 meters to 3 kilometers from the sprayed areas."
Did I read that correctly?
A. You did.
Q. Do you have any reason to disagree with that finding?
A. No.
Q. So it sounds to me like the authors are saying that these symptoms manifested after exposure, is that correct?
MS. PIGMAN: Objection; vague and form.
BY THE WITNESS:
A. Well, they -- they did say "after several exposures," but this does not get to the point that I was making in terms of what else might have been going on in their environment that could have contributed to the -- these symptoms. I mean, for -- for example, we -- we -- we would not do experiments on animals that started exhibiting this laundry list of -- of -- of -- of symptoms --
BY MR. WOOL:
Q. So --
A. -- without investigation and calling in a veterinarian and saying what might be going on here.

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Q. So to the best of your knowledge, those symptoms are not consistent with the acute toxicity caused by glyphosate exposure?
MS. PIGMAN: Objection; asked and answered.
BY MR. WOOL:
Q. You can answer.
A. That's -- that's -- that -- that is -- that is -- that is not correct. What I said is I am a Ph.D., not a medical doctor, and I do not know all of the symptoms of glyphosate poisoning and I do not know the particular concentrations, exposures necessary to cause this particular plethora of -- of ailments.
Q. Okay. I'm going to mark Exhibit 25-10 for you, which is --
A. So, are we finished with --
Q. We -- we might come back to it.
A. Okay.
(WHEREUPON, a certain document was marked Deposition Exhibit No. 25-10, for identification, as of 09/22/2017.)
BY MR. WOOL:
Q. And I believe that you reference and discuss this article in another part of your report.

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A. Which one are we on now?
Q. This is an article by Zouaoui.
A. Yes.
Q. Okay. And this article, in sum, describes acute intoxications after ingesting glyphosate and this is for cases where, and I believe there were attempted suicides and -- and some accidental cases, correct?
A. That is correct.
Q. Okay. Now, if you look in the Abstract section, it is roughly in the middle, there is a sentence that reads:
"The most common symptoms were oropharyngeal ulceration, nausea and vomiting. The main altered biological parameters were high lactate and acidocid" -- "acidosis. We also noted respiratory distress, cardiac arrhythmia, hyperkalemia, impaired renal function, hepatic toxicity and altered consciousness."
Did I read that correctly?
A. You did.
Q. Okay. And does that sound similar to you, I know you're not a medical doctor, but to the symptoms that you describe on Page 12 of your expert

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report?
A. The symptoms that I describe on my expert report were taken verbatim from the Paz-y-Mino study and there is some relatively slight overlap between the malaise reported in Paz-y-Mino 2007 and some of the symptoms that you just read from the abstract of the Zouaoui 2013 paper.
Q. Do you believe the Zouaoui 2013 paper is a methodologically-sound article?
A. Yes.
Q. Okay. Let's go to Page 13 of your expert report and sub-point 3.
A. I'm there.
Q. Okay. So can you explain what the issue is that -- that you're sort of describing with the -- the rank number methodology in Zouaoui?
A. In reading this --
Q. I'm sorry. Not in Zouaoui. In -- in Paz-y-Mino?
A. Paz-y -- this is -- it's okay.
In reading -- in reading this, I, frankly, was confused by what they meant by -- by "rank number." And because I was confused by that, I looked at the reference that they gave for the way they

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approached the evaluation, which is the Anderson et al. 1994 reference, saying to myself, Ah-Ha, I am going now to find out what rank number means and how one arrives at this. And to my surprise, the Anderson et al. 1994 paper doesn't say anything about a rank number from 0 (A) to 400 (E), at which -- which surprised me.
Q. And does that shortcoming lead you to question the results reported by Paz-y-Mino?
A. The shortcoming leads me to wonder about the analysis. And Paragraph 3 also contains a -- a second concern. So Paragraph 3 is really a --
Q. So let's --
A. -- a multi-concern paragraph.
Q. Right. So -- so let's talk about that second concern. What -- to -- in sum, you sort of take issue with the -- actually, why don't you just explain the -- the second concern to me in your own words.
A. Okay.
So I did describe the Comet assay to you, and you can see, I hope, by my description, and if not I'll be glad to try to clarify, that there can be -- if one is doing this by eyeball, which is what was

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done, just a person looking, you can see that there can be some subjectivity in terms of is the tail bigger, how much bigger is this tail. There can be some subjectivity here. And one way to try to minimize variability coming in from subjectivity -- and by subjectivity I don't mean anything in terms of somebody being malicious, I don't mean anything in terms of somebody trying to -- to put their finger on the scale to skew things. I'm just talking about honest subjectivity. And so one way to try to minimize this is to have a individual read the results as opposed to having one individual read this piece of the results and another that piece and another that piece of the results.
And so in Anderson et al., which is the reference that Paz-y-Mino referred to in terms of their methodology, makes a point, and I think a very valid point, that one can minimize variability due to subjectivity by having a individual do the analysis. And what I point out here is that in light of citing this particular reference, I find it strange that Paz-y-Mino did not say, And according to our reference for the methodology, Author X on the paper is the one who did the scoring. The lack of that leads me to

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suspect that perhaps there were multiple individuals involved in the -- in the scoring.
Q. But would you agree that the suspicion is speculative?
A. Absolutely, yes, it is speculative but, speculative but. If it were not for the fact that Paz-y-Mino et al. 2007 referred to Anderson et al. 1994 as their reference for the way they performed this aspect of the analysis, I don't think this would have risen to such a level of concern, but since they point to Anderson, and Anderson did this with one, if you will, observer, it is strange to me that Paz-y-Mino did not point -- did not point out that they had one person. And if they did not point it out, one can suspect that there may have been several.
Is this speculative, the answer is yes, but I ask you to view that within the context of the analysis I just gave you.
Q. And had multiple people actually reviewed the results, would that have rendered the results unreliable, saying they didn't cite to this Anderson article, they just said, We used multiple reviewers, would -- would that have rendered the results under -- unreliable?

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A. If they used multiple reviewers -- multiple reviewers, I would have expected them to say something about comparison, how these reviewers compared, how the -- how the results reported by these reviewers compared, compared with, with each other. I think it could have been problematic if -- if, for example, speculating, that there was one individual that reviewed controls and that there was another individual who reviewed some of the mid dose and another some of the high dose and then another some more of the high dose and another some more of the -- of the mid dose.

I am not at all saying that anybody did anything malicious. I'm not even suggesting that anybody put their finger on the scale to tilt anything, just that eyeballing with this type of analysis can be -- there is subjectivity that comes into it, to play.

Q. So using multiple reviewers per se wouldn't be unreliable, it would depend on how they used those reviewers --

A. It would --

Q. -- is that correct?

A. It -- using multiple reviewers -- multiple

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reviewers or multiple observers, however we want to categorize this, in and of itself, in my opinion, would not be problematic, but I would have expected them to talk about how the different reviewers compared with each other and, again, I think it could be problematic if you have one individual review a piece of the results and another individual review another piece, and another one another piece and then you put them together.

Q. Fair enough.

So let's go to your second criticism of -- of the Paz-y-Mino 2007 study.

A. We are back on Page 12?

Q. We are on Page 12 to -- to 13.

A. Okay.

Q. And your issue is the -- the lag time -- sorry. Or why don't -- why don't you describe briefly why this issue that you raise in Point No. 2 makes you question the validity of the results?

A. Well, I question it because if one is going to do the -- take the blood samples, a -- a reasonably long time after the exposure to the glyphosate-based formulation, then there is the very real chance that these individuals were exposed to

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another compound or compounds that could have produced the genotoxic effect.

Q. But, again, that's somewhat speculative, fair, that there is another compound that they were exposed to?

A. Yes, it is speculative, but it -- I think it's -- it's -- it's reasonably speculative because a period of a couple of weeks to a couple of months is a relatively long time and provides opportunity for exposure to I don't know what else.

Q. Okay. So viewing the -- kind of the results and conclusions of Paz-y-Mino 2007 and the 2000 -- is it '9 Bologne- -- yeah, Bolognese article, is it plausible that the observed effects were due to the genotoxic properties of glyphosate-based formulations?

A. It's my view that the concerns that I've raised rise to the level where one cannot come to a yes-or-no conclusion in terms of genotoxicity on the data presented. Yes, they did measure and observe a measure of genotoxicity, but I think, based upon my concerns, that one cannot say that it was glyphosate or a glyphosate-based formulation that produced these effects.

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Q. Okay. Okay. So I think I'm finished with -- with those two studies.

And let me just ask you a -- a quick question on -- do you recall when you received your Notice of Deposition?

A. Oh, do I recall when I received my Notice of Deposition? Yeah. The -- I received the Notice of Deposition while I was in -- in Europe. I travel so much. Time changes, which could have been a week or 10 days ago or a week ago or when did I get that. So I returned from Europe on last Thursday --

MS. PIGMAN: If you don't -- you don't have to guess or speculate.

BY THE WITNESS:

A. Some -- some -- sometime between five and ten days ago.

BY MR. WOOL:

Q. Okay. Do you recall when you departed for Europe?

A. Oh, well --

MS. PIGMAN: Objection. Irrelevant and --

BY THE WITNESS:

A. Yes, I do. September 6th. September 6th.

BY MR. WOOL:

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Q. September 6th, okay.
And we -- we talked about the materials that you produced, but did anybody help you gather -- aside from the -- the attorneys at Hollingsworth who probably viewed them -- or reviewed the materials for relevance, but did anybody help you look through your publications, materials reviewed, anything like that to search for responsive articles to the -- responsive documents to the Notice of Deposition?
A. No. Nobody. It -- it was me and my computer.
Q. Okay. So I've asked you a number of questions today about whether or not you might have discounted any negative studies due to methodological flaws or noncompliance with the OECD guidelines, correct?
A. You -- you did say that a number of times and my response is that there is a set of criteria that I employed and that set of criteria was employed to the studies and regardless of whether it was a study where the author reported a positive effect or the author reported a negative effect.
Q. Okay. Sitting here today, can you point to a negative article cited in your expert report that

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you disregarded due to methodological flaws?
A. I cannot. I cannot.
Q. Okay. And can I assume that for any opinion that we didn't specifically discuss today that your accurate and complete opinion or opinions are contained within your expert report?
MS. PIGMAN: Objection; asked and answered.
BY THE WITNESS:
A. I --
MS. PIGMAN: You can answer.
BY THE WITNESS:
A. I -- I stand by my report. The opinions that are expressed in the report were my final opinions on 31 July 2017 and I stand by them today.
BY MR. WOOL:
Q. Okay. Do you have, I believe it's Exhibit 2, your -- your supplemental reliance list handy?
A. I do have it handy. I do have it handy. I think it is -- it's not there. I do have it. It is in my hand.
Q. Okay. I'll ask you to turn to Page 2.
A. I'm there.
Q. Okay.

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A. It starts with Reference 12.
Q. And -- oh, no. I want you to look at Reference No. 18.
And can you tell me if you relied upon that study?
A. If it is in this list, it is one of the papers that I reviewed, looking in terms of the large, large number of papers that I reviewed. If you want to ask me something specific about this, I'll really have to see the paper.
Q. It -- I just want to ask, it appears to be an Ames test, is that correct?
A. It -- it does -- it -- it -- it is -- it is not an Ames test. It is not an Ames test. They are looking here for some type of genetic recombination and then this -- this is not within the scope of the Ames test as I described to you -- to you earlier.
Q. Okay. Let's see. Do you recall at all whether you relied upon that article in -- in forming any of your opinions?
MS. PIGMAN: Objection; asked and answered.
BY THE WITNESS:
A. If it is on the materials list, it is an

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article that I -- that I did look at and my opinion is based on an evaluation of this large body of -- of information.
BY MR. WOOL:
Q. Okay. Why don't you take a look at No. 11 on your reliance list, and I don't know if you'll be able to tell me, but just looking at the -- the name of the study what type of study that is?
A. I'm sorry. In terms of all of these articles, I -- I -- I -- I would have to see the -- I would have to see the reference before opining.
Q. Okay. Fair enough.
MR. WOOL: I think that's it.
MS. PIGMAN: Okay. Well, let's go off the record, take a quick break.
THE VIDEOGRAPHER: Going off the record at 4:15 p.m.
(WHEREUPON, a recess was had from 4:15 to 4:33 p.m.)
THE VIDEOGRAPHER: This the beginning of Disk No. 5. We are back on the record at 4:33 p.m.
EXAMINATION
BY MS. PIGMAN:
Q. And, Dr. Goodman, I know we've been here a

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while today, so forgive me. I'm going to jump around quite a bit and just touch on a few things that you and Mr. Wool discussed earlier. If I lose you in my jumping around, please let me know, and like Mr. Wool, I'll be happy to repeat or rephrase the questions so that they make sense.

Earlier today, toward the beginning of the day, I think, you were asked if you considered or reviewed the items on your Materials Considered List and your supplemental Materials Considered List.

Do you recall that series of questions?

A. I do.

Q. In addition to those -- the materials on that list, is there anything else that you relied on in reaching your opinions in this case?

A. Well, in addition to a thorough review of the materials on the list, this is really done with a background of -- of decades in terms of toxicology, in terms of toxicology research, teaching, in areas related directly to the matter at hand.

Q. And so is it fair to say that you brought, in working on this matter and reaching your opinions, you also relied on the training and experience you've accumulated over the years?

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MR. WOOL: Objection to form.

BY THE WITNESS:

A. That -- that is -- that -- that is correct. It is a body of -- of knowledge built up over decades.

BY MS. PIGMAN:

Q. Okay. We're going to jump topics.

You were asked a series of questions throughout the day, I think, about whether you compared what were reported by the authors as negative studies to OECD guidelines.

Do you remember those questions?

A. I do.

Q. And just so we're clear, what was your review methodology for the positive and negative studies that you looked at?

A. Well, what I tried to take into consideration were questions of -- questions of -- of dose-response, questions of toxicity, questions of appropriateness of dosing, particularly whether excessive doses were used, dose time responses, and basically the template, if you will, was used for all of the studies evaluated.

Q. In addition to the things that you just

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named, did you also consider, for example, root of exposure?

A. Yes.

MR. WOOL: Objection; leading.

BY MS. PIGMAN:

Q. And did you also consider whether the study had a sufficient amount of test material or subjects?

A. Yes, I did look at -- at this in terms of did it appear to be a -- a reasonable number of -- reasonable number of subjects.

Q. And how, if at all, did the methodology you applied to the studies compare to the OECD guidelines?

A. The methodology I applied in -- in my opinion is -- is consistent -- consistent with the OECD guidelines, although it -- it is not necessarily exactly following, but it is certainly consistent with the guidelines and consistent with the -- with the -- with the spirit of the guidelines. We have to remember that a lot of, a lot of, a lot of the studies that I looked at are studies in the -- that were in the peer-reviewed literature, studies that come from academic laboratories where they are or should be

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following good basic experimental techniques and approaches, but, frankly, my -- my academic colleagues vary greatly in terms of their knowledge of OECD guidelines. And so I think what we're looking at, basically, is for good, solid, reliable experimentation and when this -- when this is done, even if the author doesn't re -- doesn't know it, they are still doing it consistent with basically the spirit of the OECD guidelines.

Q. Did you do a weight of evidence analysis?

A. I did not. It sounds to me like by weight of evidence what you are asking is did I say this number of studies were positive and that number were negative and -- and sort of weigh them. What I did is my own independent, constructively critical, in-depth analysis and reached a conclusion based upon an evaluation of a very large body of data.

Q. Another quick jump in topic.

You were asked a lot of questions about whether you discounted any studies reporting negative results due to inconsistencies with that methodology you just described.

Do you recall those questions?

A. I do.

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Q. And, for example, do you recall being asked whether you discounted negative reports, again, by the authors using the IP route of administration?
A. I recall I was asked that, yes.
Q. And what did you -- and I -- if I recall correctly, and please correct me if this is wrong, but your testimony was that you did not, is that right?
A. That's right. The IP route of administration is, as I said, it's non-physiological, it is very extreme. One gets rather very high blood levels that you would not see by normal routes of administration. And so I think that one can look at this and say, Well, you know, if I don't see an effect, and in this case a genotoxic effect, under some extraordinary, in quotation marks, harsh testing conditions, then I'm not going to see an effect under mild conditions.
Q. And is mild another word for appropriate?
A. Mild is another word for appropriate.
Q. Do you -- another jump.
Do you recall earlier that Mr. Wool asked you about whether you reviewed genotoxicity studies related to surfactants?
A. I do.

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Q. And I believe you testified that you reviewed various EPA reports describing genotoxicity studies on surfactants, is that right?
A. I did.
Q. Did you also consider any, what I will call primary or original data authors generated about the genotoxicity of surfactants?
A. I did, and I -- I did review a number of those studies, a number of -- they are and there is a -- a handful, eight, ten, fifteen that are in the supplemental material. As I said earlier, these -- these proceedings are -- this -- this venue is -- is -- is very new to me and in coping with this venue, I -- there was some things I did forget to mention.
Q. And is it true that for the assessing the genotoxicity of surfactants, you reviewed the underlying study reports where those were available to you?
A. Yes, which, again, is somewhere between eight or ten or fifteen of the references provided in the supplemental Materials Considered List.
Q. We are going to jump topics again. I again apologize for that, but do you recall being asked questions about whether the route of

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administration used in a study goes to the assessment of genotoxicity or to the relevance of that study's findings to humans?
A. Mr. Wool did ask me a question like that, yes.
Q. And just so we're clear on the record, which of those things does it go to?
A. In my opinion, it goes to both.
Q. And could you explain that for us?
A. Well, it goes to both in terms of the appropriateness of the study and whether it is a -- a problematic confounding factor and if it is a problematic confounding factor, it goes to the approp- -- appropriateness of using that study as a basis for, if you will, translation of the results to humans. So it goes to both.
Q. Okay. I have one last question which requires one last jump in topics.
Do you recall being asked questions about whether oxidative stress is a sign of carcinogenicity?
A. I was asked a question along those lines. I don't remember now if that is the exact wording, but that certainly is the meaning that I took away from the question.

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Q. And -- and what is your answer to that?
A. My answer, my answer to that is that the available data in terms of glyphosate, glyphosate-based formulations and oxidative stress in -- in my opinion cannot be used as a basis to claim that glyphosate or glyphosate-based formulations cause cancer. And that this is taking into account also the fact that in many, if not all of these studies, but at least in many of them there were very, very high concentrations used and using that information that I gave you in terms of even using the EPA's high dose estimate for glyphosate -- for glyphosate exposure of the 0.78 micrograms per mL, we can see that in the experimental conditions they were many tens to many hundreds of times higher than that.
MS. PIGMAN: All right. Doctor, given with that, subject to potentially questions if Mr. Wool has any more, I am finished.
MR. WOOL: I'll be quick.
EXAMINATION
BY MR. WOOL:
Q. Can you take a look at Reference 185 on your supplemental reliance list, please.
MS. PIGMAN: That's Exhibit 2?

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MR. WOOL: In Exhibit 2, correct.
MS. PIGMAN: Okay. And I'm sorry. 180?
MR. WOOL: 5.
BY MR. WOOL:
Q. And my question is, if you will recall earlier I asked you some questions about the Ames tests that were not reported in Appendix 1 or Appendix 6. And I just wanted to ask you if -- if you recognize that test as one of the Ames tests that you report as negative in your report that -- that you relied on that is not in Appendix 1 or 6?
A. You know, I -- I just can't answer that question at this time.
Q. Fair enough.
A. Because -- excuse me. I almost made it without coughing. Because of all of the materials that I reviewed, I -- I just can't respond at this time.
Q. Okay. And if you'll turn to Page 24 of your report, which is Exhibit 1.
A. I'll be -- I'll be there in a moment. I'm there.
Q. Okay. Your opinion about glyphosate -- about the genotoxic potential of glyphosate-based

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formulations is that glyphosate-based formulations are not genotoxic, correct?
A. That they are not genotoxic, should not be considered genotoxic, and I consider those phraseologies as having the same meaning.
Q. And that conclusion is not limited to geno -- I -- I mean, sorry, that conclusion is not limited to glyphosate-based formulations being non-genotoxic in humans in physiologically-relevant routes of exposure, is it?
A. Maybe could you rephrase that, please.
Q. Is -- is this conclusion limited to genotoxic -- sorry, sorry. Strike that. I keep -- okay.
Is this conclusion limited to genotoxic -- glyphosate-based formulations through physiologically-relevant routes of exposure in humans?
MS. PIGMAN: Objection; form.
BY THE WITNESS:
A. It is -- it is -- it is not limited. It is a deliberately broad statement that in my opinion glyphosate-based formulations should not be considered genotoxic. Glyphosate-based formulations are not genotoxic based on an evaluation of this large body of

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literature.
BY MR. WOOL:
Q. And so it would be your conclusion that if glyphosate-based formulations were injected into a human via the IP route of exposure in large doses like you've seen in some of the studies, you would not expect to see genotoxic effects?
A. A --
Q. Related to geno --
A. A, I would hope nobody ever did that.
Q. For sure.
A. B, I think that in the -- if that horrific scenario were true, I think that if one overloaded a person with -- with glyphosate, that there is a chance that one could produce cytotoxicity and have genotoxicity secondary or tertiary to that, but we're really talking about a extreme, extreme hypothetical.
Q. Right. But -- but in that extreme hypothetical, it is your opinion that you would not expect to see genotoxic effects related to the -- or caused by the glyphosate-based formulation, the effects would be secondary to cytotoxicity, correct?
A. To the extent that there were any genotoxic effects observed in this hypothetical

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scenario, it's my opinion that it would be due to secondary or tertiary effects and would not fall into the definition of a genotoxic compound that I gave you, and that is where the compound itself or a metabolite binds to, damages genetic material.
Q. I'm -- I'm going to ask this one question again just because I worded it so horribly and -- and you objected, just so I get a clear answer.
And so is it your conclusion that glyphosate-based formulations are not genotoxic to humans regardless of the -- the route of exposure, and setting aside genotoxicity that's secondary to cytotoxicity?
MS. PIGMAN: Objection; form.
BY THE WITNESS:
A. I -- my -- my -- my conclusion is really what is stated in the report. I conclude that glyphosate-based formulations are not genotoxic.
BY MR. WOOL:
Q. Okay.
A. I conclude that glyphosate-based formulations should not be viewed as genotoxic. And I view these two statements as -- as having the same meaning.

MR. WOOL: I don't have anything else.
MS. PIGMAN: Nothing further.
THE VIDEOGRAPHER: This concludes the deposition. We are going off the record at 4:51 p.m.
(Time Noted: 4:51 p.m.)
FURTHER DEPONENT SAITH NOT.

REPORTER'S CERTIFICATE

I, JULIANA F. ZAJICEK, C.S.R. No. 84-2604, a Certified Shorthand Reporter, do hereby certify:

That previous to the commencement of the examination of the witness herein, the witness was duly sworn to testify the whole truth concerning the matters herein;

That the foregoing deposition transcript was reported stenographically by me, was thereafter reduced to typewriting under my personal direction and constitutes a true record of the testimony given and the proceedings had;

That the said deposition was taken before me at the time and place specified;

That I am not a relative or employee or attorney or counsel, nor a relative or employee of such attorney or counsel for any of the parties hereto, nor interested directly or indirectly in the outcome of this action.

IN WITNESS WHEREOF, I do hereunto set my hand on this 24th day of September, 2017.

JULIANA F. ZAJICEK, Certified Reporter

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Please read your deposition over carefully and make any necessary corrections. You should state the reason in the appropriate space on the errata sheet for any corrections that are made.

After doing so, please sign the errata sheet and date it.

You are signing same subject to the changes you have noted on the errata sheet, which will be attached to your deposition.

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ACKNOWLEDGMENT OF DEPONENT

I,_____, do hereby certify that I have read the foregoing pages, and that the same is a correct transcription of the answers given by me to the questions therein propounded, except for the corrections or changes in form or substance, if any, noted in the attached Errata Sheet.

_____

JAY IRWIN GOODMAN, PH.D. DATE

Subscribed and sworn to before me this _____ day of _____, 20____.

My commission expires:_____

_____

Notary Public