STATE OF WEST VIRGINIA

IN THE CIRCUIT COURT FOR THE COUNTY OF HARRISON

LENORA PERRINE, CAROLYN HOLBERT, WAUNONA MESSINGER CROUSER, REBECCAH MORLOCK, ANTHONY BEEZEL, MARY MONTGOMERY, MARY LUZADER, TRUMAN R. DESIST, LARRY BEEZEL, and JOSEPH BRADSHAW, Individuals Residing in West Virginia, On Behalf Of Themselves And All Others Similarly Situated,

Plaintiffs,

vs. Case No. 04-C-296-2

E.I. DU PONT NEMOURS AND COMPANY, a Delaware Corporation Doing Business In West Virginia, MEADOWBROOK CORPORATION, a Dissolved West Virginia Corporation, MATTHIESSEN & HEGELER ZINC COMPANY, INC., a Dissolved Illinois Corporation Formerly Doing Business In West Virginia, NUZUM TRUCKING COMPANY, a West Virginia Corporation, T.L.

DIAMOND & COMPANY, INC., a
New York Corporation Doing
Business in West Virginia,
and JOE PAUSHEL, an Individual
Residing in West Virginia,
Defendants.
_____

The Telephonic Videotaped Deposition of
DAVID GARABRANT, M.D., VOLUME II,
Taken at 2900 South State Street,
Ann Arbor, Michigan,
Commencing at 9:04 a.m.,
Friday, June 8, 2007,
Before Leisa M. Pastor, CSR-3500, RPR, CRR.

APPEARANCES:

AMANDA SLEVINSKI (via telephone)
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ALSO PRESENT:
John Asher - Video Technician

Ann Arbor, Michigan
Friday, June 8, 2007
9:04 a.m.

VIDEO TECHNICIAN: We are now on the record. This is the videotaped deposition of David Garabrant being taken on Friday, June the 8th, 2007. The time is now 9:04 and 28 seconds a.m. We are located at 2900 State Street, Ann Arbor, Michigan. We are here in the matter of Lenora Perrine, et al., versus E.I. DuPont Nemours And Company, et al. This is case No. 04-C-2962. This matter is being held in the Circuit Court of Harrison County, West Virginia. My name is John Asher, video technician. Will the court reporter swear in the witness and the attorneys briefly identify themselves for the record, please.

DAVID GARABRANT, M.D.,

was thereupon called as a witness herein, and after having first been duly sworn to testify to the truth, the whole truth and nothing but the truth, was examined and testified as follows:

MS. SLEVINSKI: Amanda Slevinski for the plaintiffs.

MR. PATTERSON: Clayton Patterson on behalf of Law Office of Gary Rich for the plaintiffs.

MR. DANNINGER: Tim Danninger, Squire, Sanders and Dempsey for DuPont.

MR. WICKLINE: Scott Wickline, Allen, Guthrie, McHugh & Thomas also on behalf of DuPont.

MS. SLEVINSKI: Y'all set?

MR. DANNINGER: We are here.

THE WITNESS: Yes.

EXAMINATION

BY MS. SLEVINSKI:

Q. All right, good morning, Dr. Garabrant. Yesterday afternoon, we left off, we'd been discussing some of the research you had been involved with. Today I'd like to focus on your report that you submitted in this particular case. Your report, well, actually, do you have it handy? It was Exhibit No. 151?

A. Yes.

Q. Okay, and do you have the completed version that had the complete page 4 that you can refer to?

A. Yes.

Q. Okay, now your report is divided into general main sections; am I correct? That one is opinions regarding Dr. Werntz's proposed cancer screening program, there's another main section that is opinions regarding Dr. Werntz's proposed screening for noncancer effects; is that correct?

A. Yes.
Q. And under -- within those two main topics, there's 12 subopinions that you go into more detail about, correct?
A. Yes.
Q. Okay, let's go ahead and start on page 3 of your report, No. 1.
A. Okay.
Q. Your opinion No. 1 says that Dr. Werntz' basis for claiming increased cancer risk around smelter sites is not reliable; is that correct? Does that correctly state your opinions?
A. Yes.
Q. And you set out your reasons below there are for that in the narrative portion; is that correct?
A. Yes.
Q. And you set out the basis for that opinion, the materials you relied upon in reaching it, correct?
A. Yes, yes.
Q. Okay, I'm going to go ahead and ask you to go step by step through the meat of your opinion. You start out talking about the Tokudome study, and you state that by -- and states that this is one of the references --
COURT REPORTER: Could you please slow down because I don't have the documents in front of me so I

can't follow along so I'm trying to just go based on how you're speaking.

(Discussion off the record at 9:08 a.m.)

(Back on the record at 9:08 a.m.)

BY MS. SLEVINSKI:

Q. You started out discussing four studies that Dr. Werntz cited in his proposed medical -- and it's your opinion that these materials Dr. Werntz cited are not reliable, correct?

A. No, it's not that they're not reliable, it's that they don't support his opinion.

Q. Could you explain how they don't support his opinion? In general, we'll go through it individual -- like take it apart, is there a brief way you can summarize why they don't support his opinions in general?

A. Yes, the first is that the Tokudome study has nothing to do with residents around a smelter site; it's a study of workers at a smelter.

Q. Okay. Well, let's start with that.

A. And it shows no increased risk of stomach cancer, so it doesn't support Dr. Werntz's opinion that stomach cancer is a disease that should be monitored for.

Q. Okay, well, let's take a look.

MS. SLEVINSKI: Could you please hand Dr. Garabrant No. 137?

MARKED BY THE REPORTER:
DEPOSITION EXHIBIT NUMBER 137
9:09 a.m.
COURT REPORTER: Okay, I've done so.
MS. SLEVINSKI: Thank you.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, if you -- this is the Tokudome; is that how it's pronounced, Tokudome?

A. Well, I'm not an expert in Japanese, but that's how I think it's pronounced.

Q. I'll just go from there. Does this appear to be the study we are, in fact, talking about?

A. Yes.

Q. All right. All right, now you say that it does not support Dr. Werntz's opinions but there is an increased risk of cancer generally surrounding smelter sites and specifically for this article, stomach cancer, am I following you correct?

A. No, you're not following me --

Q. Okay.

A. -- correctly.

Q. Well, could you clarify then, please?

A. Okay. This is a study of smelter workers. It doesn't have any relationship to cancer risks around smelter sites.

Q. So in your opinion, if the particular study is not an exact replica or, you know, an exact same situation, it's not a valuable or it's not evidence or information that should be considered in reaching a conclusion?

MR. DANNINGER: Objection to form.

A. That's not my opinion.

BY MS. SLEVINSKI:

Q. So if there was not an exact match as far as the study is concerned -- strike that. If you -- we're going to rely upon a study of smelter workers, what aspects of it would make you more inclined to say it was a good study as far as extrapolating it to a community around the smelter?

A. Well, there would be a long list of things that I would consider before I would extrapolate from a population of smelter workers to a population of community residents; do you want me to start listing them?

Q. Yes, sir, would you, please?

A. Okay, well, the first is that I would want to ensure that both -- both populations had comparable demographics, so in terms of age distribution, sex, race, ethnicity, those sorts of factors. And secondly, and probably most importantly, I would want

to be sure that the exposures of the smelter workers were comparable to the exposures of the community residents, and there's absolutely no reason to believe that's true in this instance. The Tokudome study is a study of copper smelters in Ooita Prefecture in Japan.

Now, how in the world you could extrapolate that to the general population of West Virginia, I think is a startlingly inappropriate comparison.

Q. Can I interrupt you for just one second to ask a question, please? So you don't believe that using a study that focused on a population in a different country is appropriate, the results from that study are appropriate to use in comparison to a U.S. population?

MR. DANNINGER: Objection, form.

A. That's not my opinion.

BY MS. SLEVINSKI:

Q. Well, you just said that this study that was conducted in an area of Japan was not appropriate to compare to a U.S. population in West Virginia?

A. I just said that I think it is inappropriate to compare smelter workers, copper smelter workers in Japan, to the general population of West Virginia.

Q. Is it inappropriate to compare Japanese smelter workers to a population that lives in -- or somebody

very near a smelter, a zinc smelter in West Virginia?

A. I'm sorry, could you repeat that?

Q. Yes. Do you think it's inappropriate to compare the results of a study that focused on Japanese smelter workers to a situation in the United States where the people are living in an area very near a zinc smelter?

A. Well, there's a lot you'd have to know before you could make such a comparison reliably. I would consider that a study of copper smelter workers in Japan might be relevant to a study of copper smelter workers in the United States provided that I knew that the exposures were comparable, that the structure of the populations were comparable, and provided that I had some understanding of -- for each of the diseases under study whether there was a relationship between the different ethnicities of those populations and risk of that disease.

In other words, if there's some other factor related to ethnicities that is a cause of the disease under study, then one would have to account for that and adjust the results before it would be appropriate to simply compare results from those two smelter populations. Now, that answer does not in any way suggest that it's appropriate to compare a working population in Japan to the general population in West

Virginia without knowing a tremendous amount more than we know, that sort of comparison is simply not reliable in the absence of additional information.

Q. Would it be appropriate in your opinion to compare a working population, a study of a working population with those results to a nonworking population in general?

A. There's no in-general answer; it depends on the issue.

Q. Okay, well, not even focusing on Japan. If you were looking at a U.S. study of smelter workers somewhere, would it be appropriate in your opinion to compare the results of the U.S. smelter workers study to a nonoccupational area but residents that live around a smelter so it would be comparing smelter workers to residents living in an area surrounding a smelter?

A. Well, it's typical in doing cohort studies to compare the cohort of interest to the general population of the county or state or region or country in which that population exists, and that's typically done by calculating a standardized mortality ratio.

However, when that calculation is done, one still has to appropriately consider whether there are meaningful differences between those two populations in terms of other risk factors for the diseases under study. I'll give you an example. When we did our

cohort mortality study of aircraft manufacturing workers in San Diego which you and I discussed yesterday, we compared those workers to the San Diego county population, and we also compared them to the U.S. general population.

We got very different SMR results for many causes of death, and the reason we got many different results is that the San Diego general population is very different in terms of its ethnicity, in terms of its risk factors for cardiovascular disease, risk factors for cancer, risk factors for many diseases than is the U.S. general population. So the use of different comparison populations or different referent populations dramatically altered the findings in that study.

That's exactly the issue that concerns me here. If you were to take copper smelter workers in Japan and calculate the SMRs using the U.S. general population or the West Virginia general population rather than the Japanese general population, you are very likely to get substantially different results, and so those comparisons are not necessarily reliable.

Q. Okay. The next sort of portion of your opinion on the Tokudome study says that it contradicts Dr. Werntz's opinions regarding stomach cancer in relation to

smelter exposures, and you indicated that this study does not support Dr. Werntz's beliefs that stomach cancers are at risk in that area; am I correct?

A. I'm just trying to -- yes, that is correct.

Q. If you'd look at Exhibit 137, the actual article, did you have any hesitation or did it concern you at all that there were actually some increased risks of cancer in this copper smelter study in Japan?

A. I didn't have any hesitation.

Q. Would you turn to page 312 of that article, the page numbers are in the top, left corner.

A. Yes.

Q. All right, under the results column on the right-hand side, the results say that among copper smelters, significantly increased SMRs -- that's standardized mortality ratios, correct?

A. Yes.

Q. -- were observed for total malignant neoplasms, and malignant neoplasms of the --

COURT REPORTER: Slow down, please, slow down. Malignant neoplasms?

BY MS. SLEVINSKI:

Q. -- of the large intestine, except rectum, abbreviated as colon cancer, malignant neoplasm of respiratory systems, and malignant neoplasm of trachea, bronchus

and lung --

COURT REPORTER: Trachea, bronchus and what was that? Trachea, bronchus, and?

MS. SLEVINSKI: Lung.

MR. DANNINGER: Lung.

BY MS. SLEVINSKI:

Q. Hereafter abbreviated as lung cancer, do you see that, Dr. Garabrant?

A. Yes.

Q. Now, it says the increase was most marked for lung cancer. How did that fact affect your opinion on this study of reliability.

A. It had no effect on my opinion about the reliability of the study. We don't typically judge the reliability of a study by its results. We judge it by its methods.

Q. Well, isn't lung cancer, in fact, one of the issues in this situation in Spelter, West Virginia?

MR. DANNINGER: Object to form.

BY MS. SLEVINSKI:

Q. Is lung cancer not one of the diseases that we're concerned about the residents seeing an increased risk of developing in Spelter, West Virginia?

MR. DANNINGER: Object to form.

A. I believe that Dr. Werntz is concerned about lung

cancer in his report.

BY MS. SLEVINSKI:

Q. So in so much as you criticize his reliance upon this study because it contradicted his opinions regarding study cancer in relation to smelter exposure, did you not find it necessary to discuss or to evaluate the fact that it did, in fact, find an increase of lung cancer?

A. Well, I could certainly have discussed each and every finding in each and every one of the 148 papers that I cited in my bibliography. My point regarding the Tokudome study is that it has nothing to do with community residents around a smelter. It has to do with people who work in the smelter and who likely had very high exposure to some hazardous materials in the smelter. That has nothing to do with living in a community where there's no evidence of excessive exposure, whatsoever, such as in Spelter.

Q. So --

A. And so it's a meaningless comparison, it's nonsense.

Q. So I understand that is your opinion but you went on to point out that it was contradictory because it didn't talk about an increased risk of stomach cancer, so why was -- why did you not mention or consider that it found increased risk of other cancers that are of

concern?
A. Well, I think the more important question is why Dr. Werntz didn't mention that his references didn't support his opinions on stomach cancer.
Q. This --
A. And Dr. Werntz seems to have missed that his point that his own references don't support his position on numerous issues. The fact that they might support his opinions on some issues, if you make inappropriate comparisons, doesn't in any way argumentative that his opinions are well-founded. His own references don't support him on issues such as stomach cancer, and he doesn't bother to explain how the Tokudome study supports his position on stomach cancer because it doesn't.
Q. Would you agree that the Tokudome study supports the positions that lung cancer is at -- at -- excuse me increased risk of lung cancer in smelter sites?
A. Well, I don't know what you mean by at a smelter site. The Tokudome study supports there's an increased risk of lung cancer in copper smelter workers in Japan, or at least in this one prefecture in Japan --
Q. Would --
A. -- I'm still speaking. It doesn't in any way support that there's a risk of lung cancer in a community

around a smelter, anywhere.

Q. Is it your understanding that Dr. Werntz cited those specifically to say that this Tokudome study, excuse me, was cited specifically for -- as meaning that residents near a smelter were at increased risk of cancers?

A. Well, let's go back and look at Dr. Werntz's exact wording and see what he said about it.

Q. Can you please answer my question?

A. Well, your question asked me for what it was my understanding Dr. Werntz said, and the best --

Q. To Dr. Werntz's report, that's what I'm asking.

A. Well, I'm going to get Dr. Werntz's report, and we'll read it.

Q. Dr. Garabrant?

A. Yes.

Q. I'm asking the questions right now, I'm not asking to go dig out Dr. Werntz's report, I'm asking what your understanding was from your review of his report because you did mention in your materials review list that was one of the ones you used in forming your opinions on this matter?

MR. DANNINGER: Amanda, Dr. Werntz -- Dr. Garabrant, excuse me, has stated that it will refresh his recollection and give him the ability to answer

your question if he turns to the report. If you refuse to allow him to turn to the report, then I'm going to object to any questions that you're asking based on the report without him being allowed to review it and that's what I think he's asking to be able to do the review of the report to adequately respond to your question.

MS. SLEVINSKI: Okay, thank you, we're not going to go through Dr. Werntz's report right now.

MR. DANNINGER: Okay, then I object to any question you asked based on the report that he's not allowed to review the report in answering.

MS. SLEVINSKI: All right, thank you.

MR. DANNINGER: Dr. Garabrant, you can attempt to answer the question if you're able.

A. Well, I don't recall exactly what Dr. Weren't said word for word in his report without looking at it.

BY MS. SLEVINSKI:

Q. Okay, the next issue that you address was Dr. Werntz' reliance upon the ATSDR public health assessment study of National Zinc Company in Bartlesville, Oklahoma.

MS. SLEVINSKI: Could you please hand Dr. Garabrant No. 6?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 6

9:28 a.m.

COURT REPORTER: All right, he has it.

MS. SLEVINSKI: Thank you.

BY MS. SLEVINSKI:

Q. In your opinion, this particular study was not reliable because it did not find that the occurrence of lung and kidney cancer was as expected from state rates; is that correct?

A. No.

Q. I'm sorry, no?

A. No, that's not my opinion.

Q. Okay, what is it then, please?

A. My opinion is that the ATSDR study of the Bartlesville plant found that the occurrence of lung and kidney cancer was virtually identical to the State rates. There was no evidence that residents in the area around the zinc smelter were at increased risk of cancer and that contradicts Dr. Werntz's opinion that residents around a smelter are at increased risk of cancer.

Q. So your belief from his study that there was no increased risk of cancer, whatsoever?

MR. DANNINGER: Object to form.

A. It's my opinion that there was no evidence in this report that the residents around the smelter were at

increased risk of cancer.

Q. Would you please, sir, turn to page 13 of 17, bottom left-hand corner where the payment numbers appear.

A. Yep, just a moment.

Q. Okay.

A. Okay.

Q. On this page, where they discuss the cancer mortality data, and in fact, there was an increased risk of cancer in this area, was it not?

A. To what are you referring?

Q. If you look under No. 2 cancer mortality rate of the third paragraph. There were -- there was an increased risk of cancer there?

A. Well, what -- what you're pointing to is an increased risk of ovarian cancer and multiple myeloma.

Q. Correct.

A. But those are not at issue in this litigation as far as I understand.

Q. Well, I'm just trying to clarify your opinions and how you stated your opinions in your report because that sentence clearly says there was no evidence that the residents in the area around the zinc smelter were at increased risk of cancer, and that is not, in fact, what this says, so I'm just trying to clarify how you formed your opinions and where you got this

information, how you processed it. I -- is there a reason why you didn't consider that there were other types of cancers or I'm just trying to figure out why there's a lack of specificity?

MR. DANNINGER: Object to form.

A. Well, yes, if you read the Bartlesville study here's what it says, of the 30 anatomical sites evaluated the number of deaths for multiple myeloma and ovarian cancer in Washington county was greater than what would be expected from the numbers for the State of Oklahoma. Now what they're talking about is they did 30 comparisons, right of the observed number of cancers to the expected number of cancers. Out of those 30, two were elevated. Now, given that we calculate 95 percent confidence limits or we calculate P values and consider those with values less than .05 to be statistically significant, we would expect 5 percent of those comparisons to be statistically significant by chance alone.

They found two out of 30. Now, 2 out of 30 is roughly 6 percent, okay? Pretty close to what you expect by chance alone, okay? And then they go on to say the available data on cadmium and lead do not identify ovarian cancer or multiple myeloma as possible health outcomes, we're not talking about

probable or known we're talking about not even possible health outcomes human I'm quoting again, human studies do not identify any cancers associated with exposure to lead. So the ATSDR holds the opinion that lead is not known to cause cancer in humans. Occupational studies indicate that cadmium may be a weak lung carcinogen, and so what they're saying is well, we had these two findings, they don't make any sense because these -- the chemicals involved had never been thought to cause these, and they simply discounted them.

My -- my additional point to you is if you take any reasonable estimate of the probability of getting significant positive associations by chance alone, 2 out of 30 is not unexpected in any way, so nobody at the ATSDR who wrote this report gave any credence to the idea that multiple myeloma or ovarian cancer was causally associated with living near the smelter, and as far as I can tell, Dr. Werntz doesn't, either, because he never cited that multiple myeloma or ovarian cancer were in any way related to living near the Spelter facility.

Q. Okay, and you said that there's -- ATSDR does not consider lead a carcinogen?

A. I read it to you.

Q. Right, well, if you would look up just a couple of paragraphs, three paragraphs down from the top of the page says cancer considered a biological plausible health outcomes because cadmium or lead are considered probable human carcinogens and because both contaminants are in completed air and soil human exposure pathways. Significant exposure --

COURT REPORTER: I'm sorry, I'm not getting you that fast.

MS. SLEVINSKI: Oh, I'm sorry, where do you want me to start from?

COURT REPORTER: Go back a sentence.

MS. SLEVINSKI: I'm sorry?

COURT REPORTER: Just go back one sentence.

MR. DANNINGER: Maybe just start the paragraph over, Amanda.

BY MS. SLEVINSKI:

Q. Cancer is considered a biologically plausible health outcome because cadmium and lead are considered probable human carcinogens and because those contaminants are in completed air and soils human exposure pathways.

Now, Dr. Garabrant, that appears to be that the ATSDR considered lead and cadmium as posing a definite risk of cancer in humans. Does it not appear

that way to you?

A. Well, that's not what it says. You just read it. Cancer is considered a biologically plausible health outcome because cadmium and lead are considered probable human carcinogens. Nowhere in that sentence does it say that these are known carcinogens and nowhere in that -- in that sentence does it say they cause cancer.

It says well, they're probably carcinogens, and it's plausible that they cause cancer and then if you drop down three or four paragraphs to what I read to you from the ATSDR report, it says human studies do not identify any cancers associated with exposure to lead, that's true. So they're saying well, it's possible, but it -- but the human studies don't identify any cancers associated with lead.

Q. All right, thank you.

A. You're welcome.

Q. The next study you mentioned, the Pershagen study.

MS. SLEVINSKI: Can you please get Dr. Garabrant No. 121?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 121

9:37 a.m.

COURT REPORTER: Okay.

BY MS. SLEVINSKI:

Q. Now, Dr. Garabrant, what about this study do you conclude made it unreliable as far as Dr. Werntz to support his opinions that people around cancer -- I mean excuse me people around smelter sites are at increased risk of cancer?

A. Well, the author, Dr. Pershagen says, quote, no firm conclusions can be drawn on the cause of excess lung cancer risk in the smelter area.

Q. All right, and that's on the front page in the abstract?

A. Right. In other words, the author, himself, is reluctant to say that the excessive lung cancer in the smelter area was caused by the smelter.

Q. Now, that sentence doesn't end where you could you read after the comma, after where you left off please?

A. Sure, then Dr. Pershagen goes on to say but it seems plausible that the very substantial emissions to air from the smelter, especially of arsenic may have played a role. So he says it's plausible it could have happened.

Q. Would you please turn to page 692 of the second -- well, no, actually -- third to the last page on the article.

A. Yes.

Q. The last paragraph in the right-hand column, where it starts in conclusion; do you see that?
A. Yes.
Q. Would you please read the first three sentences of that paragraph?
A. Sure. In conclusion, the results show that men living in the vicinity of a large copper smelter have an increased risk of lung cancer. The excess risk also remains after standardization for smoking habits and occupational background. It is plausible that the very substantial air emissions from the smelter, EG, of arsenic may have played a role, no firm conclusions can be drawn.
Q. That's --
A. Especially in view of the inadequate exposure data.
Q. Thank you. Now, focusing on the portions, the first several sentences prior to where they state no firm conclusions, what about that conclusory paragraph leads you to say that there was no clearly increased risk of lung cancer in the community?
A. Well, the authors, themselves, say it's plausible that the emissions may have played a role and no firm conclusions can be drawn.
Q. What in the study as far as the methods, the results, the meat of this study, what about it led you to say

there was no clear risk, increased risk?

MR. DANNINGER: Object to form.

A. The relative lack of exposure information precluded any analysis that showed a relationship between exposure and lung cancer risk. I agree with Dr. Pershagen in his conclusion that no firm conclusion can be drawn, particularly in light of the inadequate exposure data.

BY MS. SLEVINSKI:

Q. What does it mean to you when you read a study that uses that phrase, no firm conclusions can be drawn?

A. It means no firm conclusion can be drawn.

Q. You can't elaborate on that, frequently risks in these types of studies?

A. It speaks for itself.

MR. DANNINGER: Object to form. And foundation, belated.

BY MS. SLEVINSKI:

Q. I mean if no firm conclusions can be drawn, you can't rule out a possibility of increased risk, can you?

A. Well, there is -- there are an infinity number of things that are possible in the universe. We have to move forward, we have to base our opinions, we have to base our -- our science on authentication that are reasonably proven to be true, not on speculation that

it might be true.

Q. You would agree that if no firm conclusions can be drawn from the results of a particular study, that's not saying either way what is possible can happen?

MR. DANNINGER: Object to foundation.

A. I would agree that when the authors say no firm conclusions can be drawn, that your characterization that it might be true is nothing more than speculation --

BY MS. SLEVINSKI:

Q. -- mentioned that the exposure data in this study was inadequate; is that correct?

A. That's what the authors said.

Q. That -- does the fact that there's inadequate exposure data, does that render the entire study the results unreliable, does it make it not a piece of evidence that you would like to rely upon?

A. The lack of exposure data does not invalidate the study for what it is. The lack of exposure data means that it is unclear whether the excess risks of lung cancer has anything to do with exposure. It doesn't invalidate the study, it just says it doesn't prove up what you want it to prove up which is that the excess risk of lung cancer has to do with exposure from the smelter.

Q. All right, thank you. Now, the last sentence in that paragraph addresses the Brown study.

MR. DANNINGER: Are you in the -- his report again?

MS. SLEVINSKI: Yes, sir, I'm.

MR. DANNINGER: Okay.

BY MS. SLEVINSKI:

Q. Back to your report on page 4 of Dr. Garabrant's report.

MR. DANNINGER: Okay.

BY MS. SLEVINSKI:

Q. Top paragraph, last sentence --

A. Just a moment.

Q. -- refers to the Brown study.

MS. SLEVINSKI: Would you please hand the witness No. 18?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 18

9:44 a.m.

COURT REPORTER: Okay, he has that.

MS. SLEVINSKI: Thanks.

BY MS. SLEVINSKI:

Q. Now, Dr. Garabrant, this particular study does that found an increased risk of lung cancer in an area where a zinc smelter site; is that correct?

A. I'm just looking.
Q. Okay.
A. Okay, this study found an excess risk of lung cancer associated with residents near the zinc smelter.
Q. Thank you, and where was the zinc smelter located, it was in the United States, wasn't it?
A. It was in eastern Pennsylvania.
Q. Okay. Now, what did you find about this study that was unreliable or not good enough to compare to the situation in Spelter, West Virginia?
MR. DANNINGER: Object to form.
A. I didn't say that the study was unreliable, I said that the authors concluded that the limited size of the study precluded causal interpretation.
BY MS. SLEVINSKI:
Q. Was there anything about this when you went through and reviewed it to write your report that you could find to criticize it on except for the limited size of the report I mean of the sample?
MR. DANNINGER: Object to form.
A. My point regarding the Brown study is that the authorize, themselves, were not willing to conclude there was a causal association between living near the smelter site and lung cancer, that's all.
BY MS. SLEVINSKI:

Q. Other than them not being able to say that there was a definite causal association, you don't have any other criticisms of this particular study?

MR. DANNINGER: Object to form.

A. I mean we could -- I could go back and critique it in detail. My point in writing my report is that Dr. Werntz failed to note that the authors of the report, themselves, were unwilling to conclude a causal association existed.

BY MS. SLEVINSKI:

Q. Can you please turn to page 260, 260 of the report, second to last page.

A. Yes.

Q. Final paragraph, in conclusion, would you please read that?

A. Yes. In conclusion, our results raised the possibility of an increased lung cancer risk associated with environmental exposure to high concentrations of heavy metals including arsenic and cadmium. The small sample size and limited environmental data preclude causal interpretation, but suggest the need for further research in other polluted areas of the United States and there has been further research which I cited and which Dr. Werntz failed to cite which does not show increased cancer

risks around smelter sites.

Q. We're going to get into that in the very next paragraph in just a second. Would you please explain or elaborate what it means when a study is unable to make a causal interpretation from its results?

A. Yes, it means the authors are unwilling to conclude that there is a cause and effect relationship between exposure and the health outcome, in this case, lung cancer, in their study. That's what it means. It speaks for itself.

Q. Do you refer into science -- oh, excuse me, strike that.

Are the authors of this study, Brown, Pottern, and Blot, are they unable to draw scientific causation, or is that what they're referring to?

MR. DANNINGER: Foundation.

A. I don't know what your question is about. These authors are scientists at the national -- they were scientists at the National Cancer Institute. They work in the realm of science. I believe that their conclusions have to do with what they feel are scientifically reliable standards of evidence.

BY MS. SLEVINSKI:

Q. All right. The next paragraph section, I guess, where it starts furthermore, in your report, I'm sorry,

excuse me.

MR. DANNINGER: Thank you.

BY MS. SLEVINSKI:

Q. Page 4. Now, Dr. Garabrant, what was the reason that you researched, did your, you know, liter -- excuse me, literature search and found these?

MR. DANNINGER: Form objection.

A. Well, I think that it is appropriate when a scientist is trying to address a question in science to research the topic and to gather the relevant scientific literature. I sought to find the relevant scientific literature regarding cancer risks in communities around smelters in which soil is contaminated with arsenic, cadmium or lead. Dr. Werntz apparently didn't do that, I did. And he neglected to find or cite the studies that didn't go his way.

BY MS. SLEVINSKI:

Q. Let's discuss the ones that you've selected as not going Dr. Werntz's way.

MS. SLEVINSKI: Could you please get Dr. Garabrant No. 5?

COURT REPORTER: All right.

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 5

9:52 a.m.

BY MS. SLEVINSKI:

Q. Before we get into the instance of this particular exhibit, is it correct to say that because you offered these several studies we're about to go through in this section, these are evidence of no apparent cancer risks in communities near smelters or where there is soils contaminated with arsenic cadmium or lead; is that correct?

A. Yes.

Q. So you would have subjected these particular studies to the same risk analysis that you put to the ones to Dr. Werntz through, wouldn't you?

A. Yes.

Q. Could you look at No. 5, that's another ATSDR public health assessment.

A. Is that --

Q. Now you stated that it found no apparent public health hazard it concluded that health effects from arsenic, cadmium, or lead are unlikely due to limited exposures to these metals. The public health assessment doesn't provide a whole lot of information. What in this particular document did you rely upon that led you to make that conclusion?

A. I relied on the report from the ATSDR that they investigated a smelter site and found no evidence of

health effects in the community as a result of arsenic, cadmium or lead because there was limited exposure to those metals.

Q. Now, where in this document did you glean that information? There are some very conclusory statements in there but there's no information on exposure data which you have recently said was important in making a determination as to whether the results are something that you can rely upon or something that you can work from, so this -- I don't see anything in here that is much more conclusory statements, do you?

MR. DANNINGER: Object to form.

A. This report gives the conclusions of a public health assessment of a smelter site in Utah and says that health effects are unlikely due to limited exposure to arsenic, cadmium and lead. The point of this study is that smelter sites do not necessarily carry any health risks to the community.

BY MS. SLEVINSKI:

Q. What particular information --

A. And the --

Q. -- about this community in this smelter site do you have to compare it to any other situation?

MR. DANNINGER: Amanda?

BY MS. SLEVINSKI:

Q. The situation in West Virginia there's nothing in here that tells you what levels were present?

MR. DANNINGER: Amanda, the doctor wasn't finished.

MS. SLEVINSKI: I'm sorry.

MR. DANNINGER: He should be allowed to finish.

A. Yeah, I was still speaking, thank you. The point is this, before it is reliable to make any conclusions about health effects in communities related to industrial sites, you have to have evidence of exposure adequate to have caused health effects and you have to have evidence of health effects. There is no basis for a conclusion in the absence of such evidence that a smelter facility such as the one in salt lake county, Utah, or such as the one in Spelter West Virginia has any adverse effects in the community. You can't make that assumption.

You have to have evidence of exposure. My point in citing the public health assessment of the Murray smelter site is here's a big smelter where the government -- the Federal Government came in, they investigated and they found no apparent public health hazard. You cannot draw the conclusion as Dr. Werntz

seems to that smelters are adversely affecting the communities around them unless you have evidence of exposure and evidence of adverse effects.

Q. With respect to Exhibit No. 5 of -- dealing with the Murray smelter in Utah, this contains no information, whatsoever, about the exposure levels, no evidence of the exposure, no evidence of the extent of operations of this facility so I'm trying to figure out how you determined that this was a good example of no increase risk of cancer around the smelter sites, you have stated previously this morning that evidence of exposure is critical, that you know you can't compare, you know, two different populations or areas without having more information to rule out any other risk factors that might be affected one or the other so I'm just trying to figure out based on this exhibit how you're able to analyze this the same way you analyzed the studies we previously spoke about this morning?

A. The study is what it is. Okay? It's a public health assessment by the Federal Government, the agency for toxic substances and disease registry. It's a smelter site, they found no evidence of a public health hazards. My point is simply that you cannot conclude that smelter sites are public health hazards or are associated with adverse health effects in communities

unless you have evidence that those communities have been overexposed and evidence that there's increased risk of disease in the community, and that's the point that Dr. Werntz doesn't seem to follow.

Q. Looking at this Exhibit 5, what were the levels of exposure or the levels of contaminants at the Murray smelter in Murray salt lake county Utah?

A. The report does not give the numbers. It simply says there was limited exposure to arsenic, cadmium, and lead. So it -- you know, if -- if you want to make this into a key piece, I'll go back and get the entire public health assessment and then we can discuss it in more detail.

Q. I'm just trying to figure out where you're able to -- what apparent to -- I just don't see from this document what sort of information that you've already said is critical where -- where he found it from his document?

MR. DANNINGER: Object to form. Are you asking him where he found it in the document?

MS. SLEVINSKI: I'm just -- I'm asking Dr. Garabrant he said on numerous occasions this morning there's various aspects of studies that are important in determining whether you can compare it to another situation or just whether it's a good study in

general, example 5 noted exposure levels and said to me and does not indicate that he has any background on that sort of information that he's already said needs to be addressed in a study, a particular study to determine whether it's adequate evidence of his results.

MR. DANNINGER: So what's your question then?

MS. SLEVINSKI: I'm asking him --

MR. DANNINGER: Well, I'm aware of what you're asking him, but you're not asking a question. What's your actual question to the doctor?

BY MS. SLEVINSKI:

Q. Did you -- Dr. Garabrant, did you have any sort of outside exposure levels or documentation of lead to this Murray smelter?

A. No.

Q. Are you saying that there weren't high exposures in this area?

A. I'm saying what the ATSDR said there was limited exposure to those metals.

Q. In the first paragraph under conclusions, the last sentence beginning with therefore, can you please read that?

A. I don't see where you're -- oh, the first paragraph,

okay. Well, that -- reading just that last sentence takes it out of context. I think we have to read the paragraph in order to understand what they're saying. A sentence that starts -- a sentence that starts with therefore has a premise, and the premise isn't stated in the sentence so we have to go back and get the premise.

Q. Can you just read the sentence, please?

A. You want me to just take something out of context that's misleading?

Q. Just please -- well, please do as I ask and read the sentence.

MR. DANNINGER: Object on the basis that the doctor's already said it's out of context, but doctor, you can read the sentence.

A. Well, I'm going to give the context because reading the sentence would be misleading. The context is that the results of this investigation indicated that health effects due to arsenic, cadmium and lead were unlikely due to limited exposure to those metals. That conclusion was based on a talks logic evaluation of the worker exposures at the smelter which indicated the exposure levels were too low to result in health effects. The authorize then pointed out that if the exposure circumstances changed so that the amount of

exposure increased significantly, health effects would be possible.

Then they say, and I'll read your sentence, therefore, remediation of contaminated soil should be done based on the potential for health effects as indicated by the soil levels of these metals. In other words, if they were to find elevated levels of metals in soil, they should remediate those soils based on evidence that there would be a likelihood of adverse health effects. That's what they're saying. But if you read the sentences before it, there wasn't any. There's no evidence of excessive levels in the soil and there was no evidence of adverse health effects.

BY MS. SLEVINSKI:

Q. Are you finished?

A. Yes.

Q. I don't want to interrupt you.

MR. DANNINGER: He's finished.

MS. SLEVINSKI: All right, we've been going a little bit over an hour. Is it okay to take about a five, ten-minute break real quick?

MR. DANNINGER: Of course it is. That's just fine with us, Amanda.

MS. SLEVINSKI: Okay.

MR. DANNINGER: We'll plan on being back about 15 after?

MS. SLEVINSKI: Sounds good.

MR. DANNINGER: Okay.

MS. SLEVINSKI: Thanks.

VIDEO TECHNICIAN: We are going off the record, the time is 10:05 and 5 seconds a.m.

(Recess taken at 10:05 a.m.)

(Back on the record at 10:18 a.m.)

VIDEO TECHNICIAN: We are now back on the record. This is the beginning of tape No. 2. The time is 10:18 and 15 seconds a.m.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, we left off on page 4 of your report, the paragraph where you were discussing different studies that in your -- your conclusions that show no apparent excess cancer risk in communities with smelter sites or where there's contaminated soils. Another study you discussed was -- is study by an author Wong, An Ecologic Study of Skin Cancer and Environmental Arsenic Exposure; do you recall that study?

A. Can we get it out? I don't recall it offhand.

Q. It's No. 146.

MS. SLEVINSKI: Would you please hand that

to Dr. Garabrant?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 146

10:19 a.m.

COURT REPORTER: Okay.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, you in your report shows that skin cancer rates, well, first of all let me back up, strike that, excuse me, this is an ecologic study of skin cancer, correct, according to the title?

A. Yes.

Q. Would you describe briefly what an ecological study design is?

A. Yes, an ecological study design typically is one in which the exposures are assessed at some aggregate level, typically a population level or a community level, and then they are linked to health effects or health conditions either at the individual level or at the group or community level.

Q. All right, so part of the design of an ecologic study doesn't allow for individualized data collection for the various people that are being studied, correct?

A. Well, typically, an ecological study does not have individual level data for all variables. It may have individual level data for some.

Q. Okay. This particular study, No. 146, by Otto Wong, you refer to it in order to show that there was skin cancer rates within the range for other locations in the United States and they were comparing it to with an area with environmental arsenic exposure; is that correct?
A. Yes, the study showed that skin cancer rates in an area where the soil was contaminated with arsenic were in the range for other areas in the U.S.
Q. Now, when you were going through the study and evaluating it and -- and you decided to include it in a portion of your report, did you take into consideration the limitations of the study that are cited?
A. What limitations are you referring to?
Q. If you turn to the final page of the article, 241, starting in the left-hand column, the first full sentence starts with however, does this-- this page has several limitations discussed and described by the authors. Would those limitations affecting this study, did they come into play when you decided to use this in a portion of your report?
A. I'm not sure what limitation you're talking about. Could you clarify?
Q. Sure. On that final page, the authors start out --

well, the acknowledge the many confounding factors they couldn't account for because of the study design such as individuals', you know, tendencies for sun exposure this is looking for skin cancer, correct?

A. Yes.

MR. DANNINGER: Object to form.

MS. SLEVINSKI: I'm sorry?

MR. DANNINGER: Me or him?

MS. SLEVINSKI: Oh, no, I...going on...

BY MS. SLEVINSKI:

Q. Can you -- just one moment.

A. Are you waiting for me or --

Q. No, sir, I'm reading something.

A. Oh, okay.

Q. I apologize. The authors they discuss the details, the different factors of different varying levels of exposure to skin cancer. It's the, I guess, the second paragraph from the top where it says additional issues? Do you see that?

A. Yes.

Q. That discusses another factor that could have impacted their finding of no association with skin cancer and environmental arsenic exposure, different diagnostic procedures. The final paragraph to conclude, in that column, do you see that?

A. Yes.

MR. DANNINGER: Object to form.

BY MS. SLEVINSKI:

Q. Conclude the age adjusted annual to conclude, the age adjusted annual skin cancer incidence rates were found to be higher in the control county than in the two exposed counties. So Dr. Garabrant, do you read that to interpret saying there's no increased risk of skin cancer in arsenic exposed areas?

A. I read that to mean that the age adjusted annual skin cancer incidence rates were higher in the controlled counties than in the two exposed counties. In other words, there was not evidence that exposures in the exposed counties led to any increased risk of skin cancer.

Q. Because they were not able to account for individual sun exposures and individual diagnostic differences, does that in your opinion or in your review of this an important factor in whether this is a good example of the findings of no association between environmental arsenic and skin cancer?

MR. DANNINGER: Object to form.

A. Well, the authors point out that the issue of diagnostic criteria is not likely to be a major factor for basal cell carcinomas and squamous cell carcinomas

of the skin and I agree with that so although they raise the issue, I think they're correct in saying this -- this is unlikely to cause any substantial difference in the skin cancer incidence in these different areas.

BY MS. SLEVINSKI:

Q. Would you agree, though that arsenic is a known human carcinogen, correct?

A. Well, I agree that arsenic can cause certain types of cancer. It can cause skin cancer if you ingest arsenic typically in drinking water, that -- that is well established.

Q. So you agree, arsenic is a known human carcinogen?

A. I just answered that question. -- arsenic is known to cause skin cancer in situations where people ingest arsenic contaminated --

Q. The question, Dr. Garabrant --

MR. DANNINGER: No, Amanda, let him finish his answer.

A. Yeah. Ms. Slevinski, your question is so vague that it demands a precise answer. Arsenic can cause cancer in humans, and it's important to specify the root and circumstances of exposure and what cancers arsenic is linked to, okay? So arsenic in drinking water is linked to skin cancer in areas of the world where

there is -- where there are very high arsenic levels in drinking water. Arsenic by inhalation is not known to be linked to skin cancer.

BY MS. SLEVINSKI:

Q. Is arsenic by inhalation known to be linked to lung cancer?

A. In settings such as in arsenic smelting operations, yes.

Q. Only in arsenic smelting operations in your opinion?

A. No, the issue is dose in settings where people have high and prolonged inhalation exposures to inorganic arsenic compounds, it has been linked to increased risk of lung cancer.

MS. SLEVINSKI: Number -- could you please get Dr. Garabrant No. 60?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 60

10:29 a.m.

COURT REPORTER: Okay.

BY MS. SLEVINSKI:

Q. All right, Dr. Garabrant, this is another study that I cited and discussed briefly in your report. You said that -- well, the study also says this is a study of an environmental arsenic exposure situation in Australia, correct?

A. Yes.
Q. And why did you decide to use this article here?
MR. DANNINGER: Hay, Amanda, I don't want you to lose your point, I just want to raise something with you that I just noticed.
MS. SLEVINSKI: Okay.
MR. DANNINGER: Dr. Garabrant inadvertently highlighted on your Exhibit 146. If you'd like, I did not highlight the copy that I received. If you'd like, we can use that and insert that as the exhibit, and I'll take the highlighted version. It's up to you, I don't -- I just --
MS. SLEVINSKI: No, that's fine, use the highlighted version.
MR. DANNINGER: Okay, then I'll leave that in there, I just wanted you to be aware of that. I'm sorry to interrupt.
MS. SLEVINSKI: No, no problem.
MR. DANNINGER: The court reporter may be able to read that back to you.
BY MS. SLEVINSKI:
Q. I was just asking Dr. Garabrant the reasons for which he decided to use this particular study at this point in his report.
A. Well, because the Hinwood study is a study in which

they looked at soil and water arsenic concentrations in relation to cancer risks.

Q. And this was an ecological study design, as well, wasn't it?

A. I think that's fair to say, yes.

Q. Now, when you were reviewing this, did you take note of any of the limitations that were noted by the authors that -- to this study?

A. Could you give me some guidance on what it is you're referring to?

Q. Well, you could turn to page 139, please, first full paragraph.

A. Yes.

Q. Now, this paragraph states that this study was -- several limitations that it has small numbers to enable appropriate subanalysis. Did that affect your evaluation of this in any way?

A. Well, I don't think that that comment really applies to the cancers at issue in this litigation. That's not true for lung cancer for which there were 749 cases for bladder cancer for which there were 303 cases, for kidney cancer, where there were 134 cases, for stomach cancer where there were 228 cases, one moment. Yeah, I guess those are the ones I need to address. No, this is quite a large study for those

specific types of cancer, it's a very large study.
Q. Now, the next sentence says in discussing the limitations, it says the analysis based on postcodes is likely to be biased toward a negative result because of the inevitable misclassification of many unexposed persons in the areas as exposed. Negatives -- likely to be biased towards a negative result, does that mean likely to find no associations?
A. Yes. That is one of the -- one of the concerns in ecological study designs is that typically, people's exposures are assigned at the population level and in instances where there is variation in exposure between individuals they are classified as having the same exposure level, and that may bias toward the null, a negative result, although, it's well recognized that in some circumstances, it can bias away from the null, so you can end up creating positive associations as well.
Q. So in this particular study, though, there was no, you no he, individual exposure data available for these people, correct?
A. I believe that's correct and that's -- that's.
Q. -- more reliable or a better example of a nonassociation without having exposure, I'm -- I'm sorry, strike that.

You're citing this as supporting your position that there is no excess risk of cancer aren't smelter sites or around arsenic or lead or cadmium contaminated soils, how is it that this study's lack of exposure -- still renders it a better example than other studies you've discussed this morning that you said is one of the first things you had was lack of exposure data for the people that it wasn't an adequate or good representative study of the situation that we're discussing here in West Virginia?

A. I'm not sure --

MR. DANNINGER: Object to form.

A. I'm not sure that I understand what your question is.

BY MS. SLEVINSKI:

Q. I'm asking what makes this study better to support your position eastbound though it has several limitations including lack of exposure data which is something you criticize in the report Dr. Werntz cited so I'm trying to figure out what makes this one a better or more reliable example as opposed to another study that Dr. Werntz relied upon that you criticized that didn't have exposure data?

MR. DANNINGER: Object to form.

A. They study has exposure data, it has a lot of exposure data and it is used appropriately.

BY MS. SLEVINSKI:

Q. I believe you just said that it didn't have individual exposure data?

A. Well, it doesn't have exposure data at the individual level. In other words, they didn't test the water of each and every person in the census areas, but it does have exposure data on soil, arsenic, and water arsenic in those areas, it just doesn't have it for each and every property and each and every water source which would be an extraordinary study if such data existed, but it doesn't. The point is they do have soil arsenic and water arsenic concentrations in many communities throughout Australia where this study was done and they found no evidence of increased risk of any of the tumors at issue in this litigation.

Q. If you turn to page 138 on that study --

A. Yes.

Q. -- I guess it would be the third paragraph from the top, the last sentence, well, the second to last sentence, the authors mention that the current use in that area of contaminated water is limited to a small percentage of the population in any given area due to reliance on rainwater tanks for domestic consumption, and this is a study looking into people developing skin cancers via arsenic containment drinking water

and they acknowledge the fact that there's likely not very many people that are drinking the water that they tested that's being contaminated; is that not correct?

MR. DANNINGER: Object to form.

A. Well, they point out that current usage of contaminated water is limited, and then they point out past usage of contaminated supplies may have been greater.

BY MS. SLEVINSKI:

Q. All right. Thank you. Then the final -- looking at your report, page 4 again, the final sentence on that paragraph that we've been discussing, you also looked at a report by -- No. 50.

MS. SLEVINSKI: Would you please get Dr. Garabrant Exhibit 50?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 50

10:39 a.m.

COURT REPORTER: Okay.

BY MS. SLEVINSKI:

Q. Now, Dr. Garabrant, you state in your report that this study, the authors found there's no evidence of increased lung cancer risk in the communities exposed to the smelter's arsenic emissions. Now, is this an arsenic smelter in the United States?

A. Yes.
Q. Now, that statement in your report is that there is evidence of increased lung cancer risk is that your opinion of what the study showed or was that the author's conclusion?
A. Well, that's taken from the paper, from the authors.
Q. Could you show me where they've specified there was no evidence of increased lung cancer risks?
A. Yes, on page 150, left hand column, first paragraph under results.
Q. Sorry?
A. Okay.
Q. Page 150, sir.
A. Page 150, right-hand column.
Q. Yeah.
A. Down near the bottom, under results, reading that first paragraph starting at the second sentence, in neither the Rustin area nor the remainder of Tacoma did the total number of observed deaths exceed the expected. The relative risks for lung cancer given residence in the Rustin area is 0.82 and for the remainder of Tacoma, it is 0.98. For the total Tacoma Rustin area the relative risk is 0.94 with an upper one-sided 95 percent confidence interval of 1.08.
Q. Can I stop you right there and ask a question?

A. Yes.
Q. All right. The relative risks are below 1.0, correct, and that indicates a nonassociation?
A. It does not indicate a positive association, that's correct.
Q. My question is because the 95 percent confidence interval includes the value of 1.0, doesn't that indicate to you these results are not statistically significant?
A. That's correct.
Q. So that, in your opinion, a clear finding of no increased risk?
A. That's a finding that there is not evidence of increased risk.
Q. Okay, would you please go to the next paragraph keep reading that where you left off.
A. Okay. In residual Pierce County, lung cancer rates were significantly below expected, P less than .01. since residual Pierce County was primarily rural during this time period and since lung cancer rates in rural areas tend to be lower than in urban areas, the deficit of lung cancers in residual Pierce County is not surprising.
Q. Okay, let me stop you right there. When you -- you might want to I don't know if you recall this from

when you first reviewed this study, now, Pierce County was one of the portions -- one of the areas they studied that was the county with the lowest exposure anticipated, correct?

A. I have to look back and review the methods here.

Q. Are you ready to continue are Dr. Garabrant?

A. Yes, go ahead, what was your question?

Q. This county, this particular area where they found significantly lower lung cancer rates, that was an area from 6 to 40 miles outside away from the smelter plant, wasn't it?

A. Yes.

Q. It was a pretty large area of low exposure. Is that what you're relying upon to say there's no increased risks near a smelter? This includes people 40 miles away.

A. No, no, I'm relying on the results from the two areas close to the smelter from Tacoma and Rustin.

Q. Okay, but those are not statistical significant. Is that the fact that those results were not statistically significant that doesn't affect your opinion as to whether those are adequate results or an adequate representation of what might be the true state of the situation of the population?

MR. DANNINGER: Object to form.

A. It's difficult to interpret your question.
BY MS. SLEVINSKI:
Q. Okay.
A. There was no evidence of increased risk of lung cancer in the two areas closest to the smelter, period. There was just no evidence. I'm not sure what your understanding of statistical significance is. The point is they were not significantly elevated. In fact, they were slightly below one entirely consistent with there being no association between exposure to that arsenic smelter and increased risk of lung cancer.
Q. So generally speaking, you don't find statistical significance as an important factor in determining whether the results of a study are an adequate representation of what might be the true association between the disease and the agent in the population?
MR. DANNINGER: Object to form.
A. I have no idea what your question was. Part of it has a premise that I don't rely on statistical significance. I've certainly do rely on statistical significance or much more appropriate measures of the role of chance which are confidence intervals, I rely on them considerably. I always take them into consideration. The rest of your question, I don't

understand.

BY MS. SLEVINSKI:

Q. Okay, well, then, how -- what effects does a competent -- you said you rely on confidence levels. Here, in this particular situation, it's not statistically significant. I -- I don't see how, you know, that -- I'm trying to understand how you interpret studies that have results that are not statistically significant and use those to support a certain position because -- I want you to explain how you rely on statistical significance.

A. Well, I rely on statistical significance in the following way: When you use the term statistical significance in the scientific community, that customarily means that you have calculated a P value. The P value is a -- represents the probability that you could have gotten the data you obtained by chance alone when there is no true association between the factors under study. Okay? And I routinely look at P values and rely on them. When the P value is greater than .05, it is customary in the scientific community to conclude that there is a reasonable chance that you could have gotten the data that you got by chance alone when there is, in fact, no true association between the exposure and the outcome under study.

Okay.

Confidence intervals indicate something different than P values. Confidence intervals tell you the range within which the measure of association is likely to fall 95 percent of the time if you were to repeat the exact same study over and over and over again a very large number of times or an infinite number of times, so it gives you a sense for the role of chance and how it might cause the measure of association to vary under the assumption that the data you got was, in fact, an estimate of the true association and that it varied from the truth only because of random error in the data?

Q. Okay, are you finished?

A. Yes.

Q. Okay. Back to your report, you said that there was no evidence of increased lung cancer and we've just gone through the numbers that you relied upon in making that opinion. If we turn to the last page of this article --

A. Yes.

Q. -- the final paragraph --

MR. DANNINGER: Are you still there, Amanda?

VIDEO TECHNICIAN: You want to go off the

record? We're going off the record. The time is 10:50 and 22 seconds a.m.

(Recess taken at 10:50 a.m.)

(Back on the record at 11:01 a.m.)

VIDEO TECHNICIAN: We are now back on the record. The time is 11:01 and 15 seconds a.m.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, before the break, we were discussing Exhibit No. 50, it was a study on lung cancer among women near an arsenic emitting smelter. If you go back to the final page once again, this study-- the author said we produced mix results. What does that mean in your opinion, a study that produces mixed results?

MR. DANNINGER: Object to form.

A. Well, that phrase, mixed results, is so vague, I -- I can't interpret it without putting some context around that.

BY MS. SLEVINSKI:

Q. Okay, well, on page 151 of Exhibit 50 under discussion the first sentence says the findings of this study appear to be mixed. It goes on to say about an elevated incidence of lung cancer was not --

COURT REPORTER: Slow down.

BY MS. SLEVINSKI:

Q. An elevated incidence of lung cancer was not detected in comparing observed with expected lung cancer rates. However, the arsenic exposure indices were higher in cases than in age-matched controls. The difference is not significant at the .05 level. Several factors could explain mixed results and the inability of the study to detect an effect of arsenic exposure on lung cancer incidence.

Did I read that correctly?

A. Yes.

Q. What does the fact that this had mixed results in an overall inability to detect any effect of arsenic exposure on lung cancer, how does that factor into your decision that this was an appropriate study to cite here?

A. Okay, well, as I said earlier in this deposition, we don't judge the reliability of a study based on the findings, okay? That's circular reasoning and so that's not an appropriate way to figure out if a study is reliable. We judge the reliability of the study by reading the methods by which the study was done, and I think this is a reliably done study.

Q. Okay, well, the fact that --

A. I hadn't -- I hadn't finished.

Q. Sorry.

A. Okay. What this study shows is that when the population that lived closest to the copper smelter and the arsenic processing facility was compared to the general population of the United States, there was no excess of lung cancer in the population that lived closest to the facility and which -- and which was believed to have been exposed to arsenic from that facility.

The study then goes on to do a case control analysis within the population and that study found no significantly increased relative risk of lung cancer, and so the -- the author stated that the arsenic exposure indices were higher in cases than in matched controls but the difference was not significant at the .05 level, so what we have here is a study that fails to find statistically significant evidence of an association between arsenic exposure in a community near a smelter and arsenic refining facility and risk of lung cancer.

Q. Are you finished?

A. Yes.

Q. Okay. So you said you judge the reliability of a study on its methods, not on the actual results. Would methods include by study design, how they designed the study and actually carried out the study?

A. Yes.
Q. So here, it says the study is unable to detect an affective arsenic exposure on lung cancer incidents wouldn't that go to the reliability of the study as designed is unable to detect arsenic effect on lung cancer incidence?
A. No, no, no. No.
Q. Would you please explain then for me what that means the inability of the study to detect and effective arsenic exposure on lung cancer incidents?
A. It means the study didn't find it, it doesn't mean there's anything wrong with the study. It says we were unable to find that there was anything there. The authors aren't implying that their work is unreliable, they're saying we couldn't find anything.
Q. You couldn't find anything?
A. Right.
MR. DANNINGER: Object to form.
A. We were unable to find evidence of increased risk.
BY MS. SLEVINSKI:
Q. The --
A. Their -- they're not commenting that their study is improperly or unreliably done, they're commenting that they didn't find reliable, in other words statistically reliable evidence of increased risk.

Q. The last paragraph of the article says by the limitations, the study argued against large excess lung cancer risks for communities exposed to ambient arsenic. The results may be consistent with a small elevated lung cancer risk for people who resided close to the smelter for a period of over 20 years.

Now, does that -- did I read that correctly, first of all?

A. Yes, you did.

Q. Does that say there is no risk of lung cancer in the community near the arsenic emitting plant?

A. No, it says what it says. Let me try and explain what -- what these authors are -- are saying because this is how epidemiologists typically and correctly phrase their findings. We talked about confidence intervals a few minutes ago. Okay, so let's say just hypothetically we have a study that shows a 1.1 fold association between exposure and lung cancer risks with a confidence interval that goes from, let's say, 9 to 1.35. okay. How -- how would an epidemiologist interpret those results?

Well, the 1.1 says the data we collected, the data we observed shows a weak positive association between exposure and lung cancer. However, the confidence interval tells us that the data are

reasonably compatible with that -- the true association being somewhere between .9 and 1.35, values below .9 are really not compatible with the data we got, values above 1.35 are really not compatible with the data we got, values in between are reasonably compatible.

What we conclude from that is that the true association is likely to lie in the range of .9 to 1.35 with the most likely estimate being 1.1 which is exactly what we observed. Okay. So that means that it is possible there's no association, it's also possible that there is a weak positive association and of course our best estimate is a 1.1 fold association. It's not a statistically significant finding because it's reasonably possible or reasonably likely that the true association is really 1.0, meaning no association.

That's the way epidemiologists typically phrase their results. That's exactly what Frost and his colleagues are saying in this last paragraph. In other words, the study argues against large excess lung cancer risks. In other words, the confidence limits on their measures of relative risk tell us that it's very unlikely that there are large excess risks, there could be small ones, okay? And the next

sentence says exactly that. These -- the results may be consistent with a small elevated lung cancer risk for people who resided close to the smelter for the period of over 20 years, in other words, a small elevated risk is within the 95 percent confidence interval, that's possible. However, no association is also possible. That's really what they're saying.

Q. Have you spoken with the authors, with Dr. Frost at all about this, about what they were saying?

A. No, I haven't spoken with Dr. Frost. I'm -- I'm an epidemiologist, and this is what -- this is the way epidemiologists interpret relative risks and confidence intervals.

Q. Well, is that the way you interpret these results, these confidence intervals, relative risks?

A. Well, that's the way I interpret them based on 35 or 36 years of experience as a practicing occupational environmental epidemiologist who does studies similar to this, calculates relative risks and confidence intervals, and publishes papers interpreting them, and I believe my views are entirely consistent with textbooks in epidemiology that use very similar terminology and very similar understanding of relative risks, P values, and confidence intervals.

Q. Do you speak for all epidemiologists?

A. I don't speak for all epidemiologists, I speak for the mainstream of epidemiologists who understand these concepts and-- largely agree to what they mean.
Q. You speak for yourself direct though Dr. Garabrant yourself as an epidemiologist?
A. Well, if you would like, I would refer you to Rothman and Greenland's textbook titled Modern Epidemiology. I would refer you to Clayton and Hill's Statistical Methods In Epidemiology. I would refer you to Charles Hennekens' and Julie Buring's textbook, Clinical Epidemiology. I'd refer you to Ross Brownson's textbook on epidemiology, I would refer you to two IARC publications, one on statistical methods in cohort studies written by Nicholas Day and Norm Breslow, the other being Statistical Methods In Case Control Studies, also written by Breslow and Day. I could easily put together ten textbooks that would concur in exactly what I just told you.

MS. SLEVINSKI: I'm going to object and move to strike. That is nonresponsive. Could I have my question read back to Dr. Garabrant?

MR. DANNINGER: Dr. Garabrant's question (sic) was completely responsive. He's serving as an expert in this case and he's giving the basis for his opinions and his response as an expert in the field of

epidemiology.

COURT REPORTER: Hold on one second while I go back to the question, please.

(The requested portion of the record was read by the reporter at 11:15 a.m.)

MR. DANNINGER: Are you still there, Amanda?

MS. SLEVINSKI: I am. I'm sorry, I don't know what the feedback is. Hello?

MR. DANNINGER: Yeah, we're still here.

MS. SLEVINSKI: Okay.

MR. DANNINGER: It sounds like it's -- it's kind of going in and out. We'll let you know if we don't understand something you ask.

MS. SLEVINSKI: Okay.

MR. DANNINGER: Did you want the doctor to respond to the question that was read back by the reporter?

MS. SLEVINSKI: Yes, I would like a response.

MR. DANNINGER: Okay, and I'll object that it's been asked and answered, but go ahead, Doctor.

A. I've already answered that question, Ms. Slevinski. I don't speak for all epidemiologists. I speak for the mainstream of epidemiologists, and I believe that I am

correctly stating what is widely accepted among epidemiologists as the correct way to interpret P values, relative risks, and confidence intervals.

BY MS. SLEVINSKI:

Q. All right. We'll go ahead and move on. The conclusion of this first opinion in your report, you state that Dr. Werntz's conclusion appear to be based upon incomplete consideration of design literature, selective review of favorable articles, and occasional mischaracterizations of their contents. Did you in your preparation for your report completely consider all the available scientific literature?

MR. DANNINGER: Object to form.

A. Well, I -- completely considered a far larger body of literature than Dr. Werntz did, and I considered everything I could find. It is possible there are additional studies that I was unable to find, but I had certainly did a far more thorough job than Dr. Werntz.

BY MS. SLEVINSKI:

Q. Did you do a more thorough job than Dr. Werntz or your research assistant did a more thorough job than Dr. Werntz?

MR. DANNINGER: Object to form, that's argumentative.

A. I did a far more thorough job than Dr. Werntz.
BY MS. SLEVINSKI:
Q. You say that Dr. Werntz occasionally mischaracterized the contents of the literature. And by mischaracterization, do you mean that Dr. Werntz interpreted or reached a different opinion on the matter as you -- as opposed to you or that he asserted something that was not in fact in that study?
A. He asserted something that was wrong. He said, and this is a quote, there have been several studies documenting increased cancer risk around smelter sites where similar exposures have occurred, and he references the Brown, the Pershagen, the Bartlesville, the Tokudome studies. As we've discussed, the Tokudome study was not a study around a smelter site and in none of those studies does he have any basis for saying that similar exposures have occurred.
Q. So you --
A. I think that's a mischaracterization of the contents of those studies.
Q. So you disagree with the way he interpreted the studies or your opinion he mischaracterized the results of these studies?
MR. DANNINGER: Objection, asked and answered.

A. I've already answered that question. He mischaracterized what those studies were about, and he made statements that were factually incorrect.

MS. SLEVINSKI: Are you hearing a little bit of the crackling? It might be just from past experience, it might be a Blackberry. Mine's not on in here so I don't -- I'm not sure if someone else has one or...

MR. DANNINGER: Yeah -- all -- all the Blackberrys here are away from the table.

MS. SLEVINSKI: Okay, well, I --

MR. DANNINGER: Yeah, we'll -- we'll watch out for it.

MS. SLEVINSKI: But that might be a reason for the crackling. Sorry for the interpretation.

MR. DANNINGER: No, that's all right. Thank you for the insight.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, that's -- spoke -- I wanted to discuss with you so far about your first opinion in your report. Are there any other materials like the ones you've referenced here section in relying upon in stating your opinions?

A. To the extent I am aware of it, I cited the materials I rely upon in my report.

Q. And the reasons set out in your report formed the entirety of your opinion on this particular issue; is that correct?
A. I don't understand that question. I don't know what you mean by the reasons set out. Forgive me.
Q. Well, your explanation in the narrative portion that we just spent a couple hours going through, are those the reasons and support and basis for your entire opinions, No. 1, the first opinion we went through, the studies Dr. Werntz relied upon were not reliable.
A. Well, my -- my overall opinion No. -- opinion 1, is that Dr. Werntz does not have a reliable basis for claiming increased cancer risks around smelter sites. The basis that he cites for his opinion is those four studies we just discussed, Brown, Pershagen and Bartlesville and Tokudome, so he does not have a basis in his report for claiming increased cancer risk.

I would have to add to what I've written here is that it is my understanding that there is not reliable evidence of exposure to arsenic, lead or cadmium in the Spelter -- in the community around the smelter site that would put people at any -- any meaningfully increased risk of any type of cancer.
Q. Okay, so are there any other reasons for your first opinion that we haven't already discussed or is not

included in your report?
A. Yes, my understanding of the expert opinions by Dr. Rodericks', Dr. Valberg's, and by the scientists at Gradient who wrote a report that I -- that we discussed yesterday.
Q. How are you relying on all those reports that are listed the different defense expert...
A. I'm relying on them because they give a thorough and rigorous appraisal of plaintiff's evidence regarding exposure to arsenic, lead and cadmium in the community and they show that plaintiff's evidence is not reliable.
Q. Well, you mentioned Dr. Valberg, volume bearing, you said yesterday you viewed his report after you wrote your report in this case. Is that correct?
A. I believe that's correct.
Q. Nevertheless you're relying upon Dr. Valberg's report in forming your opinions on this report?
A. Well, I'm relying on Dr. Valberg's report in forming my opinions that I'm giving you here today.
MR. DANNINGER: Hay, Amanda, with that crackling?
MS. SLEVINSKI: Yes.
MR. DANNINGER: Just to let you know, nobody's touched anything in this room, and it's come

back, so I don't know if it might be where you are or where Clayton is.

MS. SLEVINSKI: Okay, I'm not sure. If it gets extremely interruptive, we'll figure something out.

MR. DANNINGER: Well, the videographer said that it will come through on the DVD and that he's hearing it in his headphones so just so you know.

MS. SLEVINSKI: All right. Well, Clayton, if you're on -- oh, I'm sure you are, but if you have a Blackberry on, maybe cut it off or take it further away from the speakerphone.

MR. PATTERSON: Okay, I'm listening and I have --

MS. SLEVINSKI: Okay, well, if anyone has their Blackberrys, please part with them and turn them off and take them away, so we don't get too much feedback on the video.

MR. DANNINGER: Good deal.

MS. SLEVINSKI: Thanks.

MR. DANNINGER: Thank you, Amanda.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, the next opinions in your report, No. 2, it says lead is not known to be carcinogenic, and the medical monitoring proposed by Dr. Werntz

related to lead exposure has no scientific foundation. Did I read that accurately?

A. Yes.

Q. And similarly, below which there's a narrative portion is that where you set out your reasons for this opinion?

A. Yes.

Q. And you also have set out the bases you relied upon in forming this opinion and the materials upon which you're relying; is that correct?

A. Yes.

Q. What degree or amount of evidence relating to carcinogenicity of a particular agent would you consider to be adequate to support a conclusion of causation or carcinogenicity?

MR. DANNINGER: Amanda, can you just repeat the first few words in there? I missed what you asked, what degree was that?

MS. SLEVINSKI: Sorry.

BY MS. SLEVINSKI:

Q. What degree or how much evidence relating to the carcinogenicity of a particular agent would you consider to be adequate to support a conclusion that that agent is, in fact, carcinogenic to humans?

MR. DANNINGER: Thank you, objection to

form.

A. Considerably more than there is for lead.

BY MS. SLEVINSKI:

Q. Okay. How much more?

A. Well, it's hard to quantify that. I think that Austin Bradford Hill laid out a series of considerations that give guidance on how to assess whether there's a causal association between an environmental agent and cancer risk and I follow those considerations. Lead doesn't measure up, and I am not aware of any scientific body that has concluded that lead is known to cause cancer in humans. There are none to my knowledge and I don't think Dr. Werntz found any, either.

Q. Are you finished? I'm sorry.

A. Yes.

Q. So you've mentioned it yesterday, I assume you're familiar with the IARC system of classifying agents based upon their likelihood to cause cancer in humans; are you familiar with that?

A. Yes.

Q. And is it correct that the IARC groups the agents based on their carcinogenicity of groups 1 to 4, 1 being known carcinogens and 4 being probably not carcinogenic; is that correct?

A. Yes.
Q. You mention in your report about the issue of the carcinogenicity of lead that Dr. Werntz relied upon the evaluation of the IARC for his opinion regarding the carcinogenicity of lead. IARC indicates there's limited evidence in humans for the carcinogenicity of inorganic lead compounds. Hello?
A. Yes.
Q. Okay, sorry. The fact that IARC has classified inorganic lead compounds in category 2-A means, by definition, there is not sufficient evidence of carcinogenicity of humans to classify lead as being a human carcinogen. Group 2-A is classified as probable human carcinogen, correct?
A. That's the definition.
MS. SLEVINSKI: Okay. Now, would you please get Dr. Garabrant Exhibit No. 73?
MARKED BY THE REPORTER:
DEPOSITION EXHIBIT NUMBER 73
11:28 a.m.
MR. DANNINGER: Amanda, was this one that we sent a supplemental larger one? I'm just not sure.
MS. SLEVINSKI: I'm not sure.
MR. DANNINGER: Okay, I don't think it was, actually, for some reason. Sorry to interpret you.

MS. SLEVINSKI: That's okay.

BY MS. SLEVINSKI:

Q. Do you have the exhibit, Dr. Garabrant?

A. Yes, I do.

Q. Several pages into it, I have as page No. 22 at the top, left-hand corner, that's where they discuss the different conclusions of the chemicals; could you turn to that page, please?

A. Yes.

Q. All right. Group 1, it says have used when there's sufficient evidence of carcinogenicity in humans. Does that mean they are known carcinogens?

A. It means there is sufficient evidence of carcinogenicity in humans.

Q. Now, group 2 is divided into subcategories being 2A and 2B, and that's based on different levels of evidence of carcinogenicity; is that correct?

A. Yes.

Q. Now, the first paragraph under group 2, it says this category includes agents for which at one extreme the degree of evidence of carcinogenicity in humans is almost sufficient as well as those for which at the other extreme there are no human data but for which there is evidence of cars in experiment... and it goes on to describe on who to how this probably dried them

into carcinogen group 2-A or 2 P, probably carcinogenic signifying a higher level of evidence than possibly carcinogenic. Does that application mean to you that there's -- that lead is not-- is not a carcinogenic agent?

MR. DANNINGER: Object to form.

A. What that classification means is that the evidence is not sufficient in humans to say that lead is carcinogenic to humans.

BY MS. SLEVINSKI:

Q. It does say that it's almost sufficient in humans, though, doesn't it?

A. No.

Q. It does not?

A. No.

Q. First sentence under group 2 says this category includes agents for which at one extreme the degree of evidence of carcinogenicity in humans is almost sufficient.

A. Well --

Q. That wouldn't --

A. -- you're -- you're completely missing the boat, okay? If you go to the IARC monograph, volume 87 on inorganic and organic lead compounds and you read the evaluation, here's what it says. There is limited

evidence in humans for the carcinogenicity of inorganic lead compounds. So it doesn't say almost sufficient, it says limited.

Q. What are you reading from, Dr. Garabrant?

A. I'm reading from IARC monograph volume 87 titled Inorganic And Organic Lead Compounds at page 377.

And I want to go on because what's directly relevant to this Spelter litigation is the evidence regarding different types of arsenic compounds, okay? There is inadequate evidence in experimental animals for the carcinogenicity of lead oxide and lead arsenate. So we're in a situation where for the compounds at issue, not only is there limited evidence in humans, there's inadequate evidence in animals. Okay? That is clearly woefully inadequate to say that these compounds pose a cancer risk to humans. I should add to that on page 378 of that IARC monograph there is inadequate evidence in experimental animals for the carcinogenicity of lead powder and so the forms of arsenic that are at issue in this litigation are ones where there is not even adequate evidence in animals, much less adequate evidence in humans, there is neither.

Q. Does the word probably carcinogenic, probably does that carry with it more weight than possibly

carcinogenic?

MR. DANNINGER: I just want to clarify, I believe the doctor might have misspoke and said arsenic instead of lead when we were speaking.

THE WITNESS: Oh, what -- I'm sorry. What did I say?

MR. DANNINGER: I think you might have said arsenic.

THE WITNESS: Everything I was talking about was about lead, not about arsenic. My apologies if I misspoke.

MR. DANNINGER: It could have been that I misheard you say arsenate.

THE WITNESS: Well, I said lead arsenate, but the rest of it was all about lead oxide and lead powder for which the animal evidence is inadequate regarding carcinogenicity of those compounds.

BY MS. SLEVINSKI:

Q. Regardless of that, IARC still classifies lead as a group 2 probable human carcinogen, yes or no?

A. Well, group 2 --

Q. Say --

A. -- includes agents for which at one extreme the degree of evidence is almost sufficient as well as at the other extreme, there's no human data but which there's

evidence of carcinogenicity in experimental animals, what I'm trying to point out is that for the lead compounds at issue in this case, it doesn't satisfy even that extreme where there is no human data but there is evidence of carcinogenicity in experimental animals. IARC's decision regarding classification of inorganic lead appears to be driven largely by the evidence in experimental animals for lead acetate, lubs -- lead subacetate, lead chromate, and lead phosphate, not the chemicals at issue in this case.

And so you're reliance on the IARC classification for lead compounds does not take into account and does not properly consider the difference in carcinogenicity or the difference in evidence of carcinogenicity for different lead compounds. The compounds at issue do not show adequate evidence even in animals to say that they are carcinogenic in animals, and there is not adequate evidence in humans to say that they are human carcinogens, either.

Q. Inorganic lead is at issue in this current case; isn't it Dr. Garabrant?

A. Yes, it is.

MS. SLEVINSKI: Could I ask you to please give Dr. Garabrant Exhibit 72?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 72
11:36 a.m.
COURT REPORTER: Okay.
BY MS. SLEVINSKI:
Q. Dr. Garabrant, is this the same IARC inorganic lead monograph you were reading from just now?
A. Yes.
Q. Okay, just making sure I have the same thing I dug out of my box here. If you would turn to page -- I don't have -- numbers on mine -- section 5.5, my version doesn't have page numbers, I apologize.
A. Yeah, I'm at 5.5. this is the section from which I was just reading.
Q. Where it says overall evaluation, inorganic lead compounds are probably carcinogenic to humans group 2-A, is that what it reads?
A. Yes.
Q. Thank you. The report also addresses the way the EPA classifies the carcinogenicity of lead and lead compounds. You state that the EPA considers the available human evidence to be inadequate to refute or demonstrate any potential carcinogenicity for humans for lead exposure. That's not the complete description given by the EPA, is it, Dr. Garabrant?
A. Well, we'd have to pull that reference and look. I

don't recall from memory.

MS. SLEVINSKI: Would you please hand Dr. Garabrant No. 46?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 46

11:38 a.m.

COURT REPORTER: Okay.

BY MS. SLEVINSKI:

Q. Page 5 of 11, Dr. Garabrant.

A. Yes.

Q. Would you identify what this document is before we get that to that final page, please?

A. This is the EPA IRIS document titled Lead and Compounds Inorganic, Cass Registration No. 7439-92-1.

Q. All right, and I misspoke it's page 6 of 11, please.

A. Okay.

Q. Is that the second paragraph from the top, is that where you got the first -- the last sentence of the second paragraph, is that where you got your quotation in your report?

A. I believe it is.

Q. Would you read that complete sentence, please?

A. Yes. Thus, the available human evidence is considered to be inadequate to refute or demonstrate any potential carcinogenicity for humans from lead

exposure.

Q. Now this is classified by the EPA as probably carcinogenic to humans, and when they say the evidence is inadequate to refute or demonstrate, by refute or demonstrate, that's not saying that it is not a carcinogen, is it?

MR. DANNINGER: Foundation.

A. No, it says that the evidence is inadequate to establish whether it is or is not.

BY MS. SLEVINSKI:

Q. So it's -- it's probably a human carcinogen?

A. No. No. That sentence says the human evidence is inadequate to make any conclusion. Now, I would point out that EPA is relying, as does IARC, on animal evidence, and if you look at the animal evidence, which is summarized on page 6 right below the paragraph we were reading, you will see exactly what they said. Okay?

Animal carcinogenicity data, sufficient. The carcinogenic potential of lead salts, primarily phosphates and acetates, administered via the oral root or by injection has been demonstrated in rats and mice by more than ten investigators. We're not talking about the chemicals at issue in Spelter. The chemicals at issue in Spelter are oxides. Okay? So

acetates and phosphates are not what we're talking about. So while those lead compounds may be carcinogenic in animals, what we've already discussed is that the compounds at issue here are not known to be carcinogenic in animals or in humans.

Q. The fact remains though that the EPA and IARC both consider lead to be a probable human carcinogen, do you disagree with that classification?

MR. DANNINGER: Object to form.

A. To the extent that IARC and EPA have to make classifications for broad categories of compounds, I do not disagree with it. But when you come to an issue that is pointed and important such as in Spelter where we're talking about oxides, then you have to look back at the original evidence.

The original evidence is quite clear. Lead oxides are not known to be carcinogenic in animals and they are not known to be carcinogenic in humans, so it's not appropriate to rely on an umbrella designation when you actually are talking about specific compounds, you should talk about the evidence for those specific compounds.

Q. Are lead oxides inorganic lead compounds?

A. They are. And what we see in both the IARC and the EPA documents is that the evidence is dramatically

different for different forms of inorganic lead compounds.

Q. Your report you go on to discuss that you say that unknown still whether people exposed to lead are at increased risk of cancer, consequently there's no justification for medical monitoring for lung cancer, stomach cancer, kidney cancer or any other cancer Dr. Werntz alleges is related to lead.

Is it your opinion that medical monitoring is not justified in this situation, or would it never be justified in a situation where lead was alleged to be causing cancer?

A. Well, it's my opinion that Dr. Werntz's medical monitoring program has absolutely no scientific foundation with respect to lead. He wants to monitor for cancers that are not known to be caused by lead, that's nonsense.

Q. In your opinion, are any cancers caused by lead?

A. There is not adequate human evidence to reach a conclusion that cancer is caused by lead in humans.

Q. What's the next page of your report, page 5?

A. The first paragraph, you are -- you have several a whole string of studies listed and you say that these studies failed to show consistent excessive any cancer site failed to show evidence of those response and are

potentially compounded by other concurrent exposures. What -- are those all evidence of, you know, each one of those things you listed excessive failed he to show excess cancer sites failed to show evidence of dose response or are they divided up somehow to represent different aspects of that statement.

MR. DANNINGER: Form.

A. Well, what I'm really alluding to is the Austin Bradford Hill considerations. I'm pointing out that the body of evidence regarding cancer risks in relation to lead exposure do not show associations in any consistent pattern. Austin Bradford Hill would tell us that you have to have evidence of association and that strong associations are less likely to be due to bias and confounding than are weak associations. Here we don't even have consistent evidence of associations. I'm pointing out that we don't see dose response.

Austin Bradford Hill says there ought to be, as he calls it, biological gradient. People who have greater exposure should have higher risks of cancer than those at low exposure. We don't see that in the lead literature. Austin Bradford Hill points out that before we accept the studies as showing associations, we -- we must evaluate whether the

authors have adequately considered confounding and bias as possible explanations for those associations. I'm pointing out that in some of the published studies of lead exposure, there were other exposures such as to arsenic that could have confounded those associations.

MR. DANNINGER: Amanda, just so you know, we have about five minutes left on the videographer's tape so just take that into consideration.

MS. SLEVINSKI: Okay.

BY MS. SLEVINSKI:

Q. Dr. Garabrant -- free (ph.) that not all factors -- all the Bradford Hill factors are required as present to prove causation, do they?

MR. DANNINGER: I think we might have missed the beginning of that because the noise is back, and nobody's doing anything here. So we're -- it's really bad this time.

MS. SLEVINSKI: Yeah, it's pretty loud. Let me --

MR. DANNINGER: We missed that.

MS. SLEVINSKI: It's not coming from -- we've got -- working on it. Why don't we go ahead and change the tape. Maybe y'all make sure --

MR. DANNINGER: Well, we're going to dial

back in. Why don't you and Clayton also dial back in so that we can --

MS. SLEVINSKI: Again.

MR. DANNINGER: -- try having a new -- a new line.

MS. SLEVINSKI: A ten-minute -- ten-minute break and get this resolved, okay.

MR. DANNINGER: Let's all dial back in.

MR. WICKLINE: Hey, Amanda?

VIDEO TECHNICIAN: Okay, we're -- going off the record?

MR. WICKLINE: Yes.

VIDEO TECHNICIAN: We're going off the record. The time is 11:48 and seconds a.m.

(Recess taken at 11:48 a.m.)

(Back on the record at 12:36 p.m.)

VIDEO TECHNICIAN: We are now back on the record. This is the beginning of tape No. 3, the time is 12:36 and 42 seconds p.m.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, before lunch, we had started to get into your second opinion regarding lead not being known to be carcinogenic and the medical monitoring proposed by Dr. Werntz related to lead exposure has no scientific foundation.

On page 5 of your report at the top, we had started to briefly touch on that page that you have cited there. I'd like to go through those and I've got some questions to ask on a couple of those.

MS. SLEVINSKI: So if the court reporter could please hand Dr. Garabrant Exhibit No. 2.

COURT REPORTER: Okay.

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 2

12:38 p.m.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, this particular study, the nervous system cancer among workers exposed to lead, do you recognize this as one of the studies you, in fact, cited in this paragraph that we're discussing?

A. Yes.

Q. What did you cite this particular article as the basis, what how does this support your opinion, this particular article?

A. Well, what we saw when we looked at the IARC material a few minutes ago and also the EPA material a few minutes ago was that some lead compounds and I think it was lead acetate and subacetate were associated with increased risk of brain tumors in rats and that that was part of the basis for the decision that lead

compounds show some carcinogenicity in animals, and I wanted to point out that in humans, we don't see evidence of brain cancer, so the human evidence is different than the animal evidence.

Q. So with this particular study, if you're looking at the front page of the italicized abstract the final sentence or the second to last sentence states the results suggest that there may be an association between occupational lead exposure and the risk of gliomas; is that correct?

MR. DANNINGER: Form objection.

A. I'm sorry, I wasn't following exactly where you were reading. Would you show me?

BY MS. SLEVINSKI:

Q. Okay, it's the abstract, the italicized abstract it's the second to last sentence?

A. Yes. Okay. Go ahead.

Q. And gliomas, those are -- is that a brain tumor?

A. Yes.

Q. And this would have been a study focusing on human beings being exposed to lead in the workplace?

A. That's correct.

Q. So I'm not following how this does not -- how this supports your position that there's not evidence in humans of increased risk of cancer from lead.

A. Well, the sentence you read is followed by a sentence that says no firm conclusions can be drawn because of the small number of cases and loss of material.

One of the themes that is important for you to recognize in my report and in my testimony is that I don't pick and choose, the studies that go my way, I report them all, and so whereas my criticism of Dr. Werntz is that he picks and chooses only the favorable studies, I try to do a thorough review of the literature and I include studies that show associations between exposure and cancer risks as well as those that do not, and I try to summarize them fairly, and so here's a study that suggests an association. It's not very strong and the authors, themselves, say no firm conclusion can be drawn.

Q. And just to clarify, we are -- we are not worried about any sort of brain tumors in this particular case, are we, that's not at issue?

A. Well --

MR. DANNINGER: Foundation.

A. -- to the extent I'm aware of it, your expert, Dr. Werntz, has not claimed that the people in the Spelter area or the class area are at increased risk of brain cancer. However, Dr. Werntz is relying on the IARC and EPA classification for his opinion that

lead is a carcinogen, and as I pointed out, much of that evidence comes from lead compounds that are not at issue in this case, and one of the results of the animal studies relates to brain cancer, so I felt that I had to deal with that issue, we were talking about compounds that aren't at issue and we're talking about a tumor that's not at issue and that's what Dr. Werntz is basing his opinions on.

BY MS. SLEVINSKI:

Q. All right. You also described -- well, cited a discussion of studies, No. 36, 35, and 37.

MS. SLEVINSKI: Would you please hand those three to Dr. Garabrant, and we'll talk about those briefly?

MARKED BY THE REPORTER:

DEPOSITION EXHIBITS NUMBERED 35-37

12:43 p.m.

COURT REPORTER: Okay they have them.

MS. SLEVINSKI: Great, thanks.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, just so I'm clear, these three studies were conducted by several different researchers but the main one on each one were the Clark -- W. Clark Cooper, and they, No. 36, Exhibit No. 36, from what I understand, is actually the initial study that he did;

can you confirm that for me?
A. No. 36 is the first publication of those three to the extent I'm aware, it was the initial report.
Q. Okay, that's what I'm just making sure. And then No. 35 would actually be the second -- well, the next one in that succession, correct?
A. Yes.
MR. DANNINGER: Foundation.
BY MS. SLEVINSKI:
Q. And then Exhibit 37 is the file in the succession as there -- as you have them cited in your reports, do I have that clear?
A. I believe that's correct.
Q. Okay. Now, what -- did you consider these like altogether their results or the fact that they were, you mow, a study and then several follow-up studies, how did that of an effect your opinion, in the section of your report?
MR. DANNINGER: Form objection.
A. I -- I'm not sure what you're asking. The 1985 publication in the Scandinavian Journal of Work, Environment and Health, Exhibit 37, I believe, is the most recent one.
BY MS. SLEVINSKI:
Q. Well, then focusing on No. 37, the most recent, would

you explain to me how this particular article factored into your opinion?

A. Well, I considered it with all of the other literature on lead in forming my opinion about cancer risks related to lead exposure.

Q. Did you consider the results of these three as they progressed starting from the first one to the second to the third, or did you only look at, for example, No. -- Exhibit No. 37, the final study?

MR. DANNINGER: Can you repeat that for my edification, Amanda?

MS. SLEVINSKI: Well, could you just have it read back, please?

(The requested portion of the record was read by the reporter at 12:47 p.m.)

A. I considered all three of them.

BY MS. SLEVINSKI:

Q. Do you believe that these studies either separately or when considered together show an excess risk of cancer associated with lead exposure?

A. Well, I think that the third study, the one in the Scandinavian Journal, is based on a larger number of person years at risk, and gives somewhat more stable findings than the earlier two publications, and this study provides some evidence of increased cancer risks

among men employed in lead battery plants for at least a year back in the 1940s, up through the 1960s.

Q. And among some of the cancer sites that they examined, stomach cancer, as well as lung cancer were cited as possible for having contributed to excess in cancer mortality; is that correct?

A. That's correct.

MS. SLEVINSKI: Could you please hand Dr. Garabrant 39?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 39

12:49 p.m.

COURT REPORTER: Okay.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, Exhibit No. 39, mortality among firefighters extreme northwestern United States cities was also cited in the section where you're adding the carcinogenicity of lead in humans. Could you tell me how this particular article addressed the issue of carcinogenicity of lead in human beings?

A. That article should not have been on my reference list. I think I pulled in the wrong citation number. I don't think this one has anything to do with lead. I apologize, I -- must have written the wrong number down when I prepared my bibliography.

Q. Okay, well just to confirm, this article, in fact, does not address any sort of effects from lead on -- in its cancer capabilities in people, correct?
A. To the best of my knowledge, that's correct and I apologize for having it listed it on my bibliography.
Q. Well, it wasn't just in the bibliography, it was actually also in the body of your report.
A. Well, I cited it, and I should not have cited it, it doesn't belong.
Q. Okay, and it should be taken out then of your report in the reference section, sir?
A. Yes.

MS. SLEVINSKI: Okay. Could you please hand Dr. Garabrant Exhibit No. 87?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 87

12:51 p.m.

COURT REPORTER: Okay.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, this is reference No. 87, as well as Exhibit 87, and it's the Linkage Study of Cancer Risks on Lead Exposed Workers in New Jersey. How does this study in particular contribute to your rendering an opinion in this section of your report?
A. Well, this study looks at adults who have elevated

blood leads using the ABLES program in New Jersey, and follows them over time to calculate their cancer mortality, and this study fails to show that there is any clear excess of stomach cancer, colorectal cancer, lung cancer, kidney cancer, and so in contrast to the studies we just talked about by Clark Cooper where there were some excesses of some of those cancers, this study shows a different results showing no excess of those types of cancer, so I correctly weighed this in my overall opinion.

Q. When you were assessing this particular article, again, this has several limitation mentioned by the authors real quickly in the abstract where it says conclusion, it lists various -- call numbers, large percentages of workers without age information, the short full of time, lack of vital status information, and the cancer incidents in this cohort is expected to be low due to the healthy worker effect and the young age. Would those were those limitations considered in evaluating you know whether there was a good example of a study showing no association between lead and cancer?

A. Yes.

Q. How did you -- how did you consider those factors?

A. Well, first off, it has to be noted that they're also

some important strengths of this study, one of which is that this study is of a cohort of men who had documented evidence of increased body burdens of lead, they all had blood lead levels over 25. That makes them a very important group of people to study because this is not a study where we are speculating about exposure, this is not a study where we're looking at communities of people and thinking well, perhaps they have some level of exposure to inhalation of compounds, this is a study where the body burden was actually measured, and that's a very important strength.

In this study, there was no evidence of increased risk of any of the cancers at issue in this case. Now, the principal limitation of this study is that it was relatively small and for uncommon cancers, that could reduce the potential to find statistically significant positive associations if they were present but for the more common cancers, particularly lung cancer, this study had plenty of power to find an excess risk of lung cancer if there was one and there was not, so I think it's an important study.

The -- the discussion of limited size and limited amount of follow-up is an important consideration for the uncommon cancers but it's not as

important for the more common cancers.

Q. So did you -- okay, I'm making sure I heard your answer correctly, and part of that answer, you said that there was exposure data available in the form of the blood lead levels and that they wouldn't have other confounding exposures and risk factors; did you say that?

A. No.

Q. With respect to this particular study, would you agree, though, that the study doesn't prove or disprove causation with respect to lead and cancer?

A. Well, the point this study and the point of each study individually is that it provides important evidence that must be considered in a determination of whether lead is known or is not known to cause cancer in humans. I considered this study, I would point out that I don't think that Dr. Werntz considered this study.

In fact, I don't think Dr. Werntz considered the vast majority of relevant literature that is necessary to provide a scientific foundation for his opinions, he doesn't do it. I went to the trouble of finding the literature and considering it. This is a study that's very good because we had documented blood lead levels, and it happens to show

no evidence of increased cancer risk in this cohort of men.

MS. SLEVINSKI: All right, could you please hand Dr. Garabrant Exhibit 94?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 94

12:58 p.m.

COURT REPORTER: Okay.

BY MS. SLEVINSKI:

Q. Thank you. Dr. Garabrant, do you recognize this Exhibit No. 94, Blood Lead Levels And Mortality, as one of the articles you cited and relied upon in this section of your report?

A. Yes.

Q. Generally to the other questions I've been asking, what portion of this report did you find significant in forming your opinions?

A. This study suggests that there was a nonsignificantly increased mortality due to nonlung cancers and a nonsignificantly increased mortality due to lung cancers among individuals who have blood lead levels of 20 to 29 micrograms per deciliter.

Q. So this study found an association between lead and lung cancer incidence of these individuals?

A. Well, it found an association that was positive but

compatible with chance. It was not statistically significant.

Q. And this was not an occupational exposure situation, was it? This was a different type of study?

A. This was a study based on the National Health And Nutrition Examination Survey which is a multi-stage stratified random sample of the United States population, and this was restricted to participants aged 30 to 74 years who had blood lead measurements.

MS. SLEVINSKI: Would you please hand Dr. Garabrant No. 104?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 104

13:01 p.m.

COURT REPORTER: Okay.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, Exhibit 104, the carcinogenicity of lead was this cited in support of your opinion that lead is not a human carcinogen?

MR. DANNINGER: Objection, form.

A. I cited this study as one of the articles I considered in reaching my opinions. This is a review article on the carcinogenicity of lead, and it concludes that there is not proof that lead may cause cancer in man.

BY MS. SLEVINSKI:

Q. By review article, is it fair to say that that means the authors gathered a lot of whatever evidence they could find and on the subject matter reviewed it and wrote an article on it?
A. Well, it means that they gathered the published literature relevant to the issue and reviewed it and summarized it and wrote up that summary.
Q. This article was published in 1979, correct?
A. Yes.
Q. And so this was, in your opinion, a good piece of information regarding the state of scientific knowledge of the carcinogenicity of lead?
A. Well, as of 1979, I think that would be a fair statement, yes.
Q. What about as of 2007?
A. As of 2007? There is a tremendous amount of in your scientific literature which when considered in its entirety fails to show sufficient evidence that lead is associated with increased cancer risk in humans. And I think we just reviewed that looking at the most recent IARC document which just came out, that book just came out within the past month or so, and also looking at the EPA IRIS document.

Both of those agencies made conclusions entirely consistent with mine and as we pointed out,

the evidence in animals that lead is carcinogenic is based principally on compounds that are not at issue in this case, the evidence in animals regarding lead oxides is not sufficient to conclude that those materials cause cancer in animals, much less humans.

MS. SLEVINSKI: Could you please hand Dr. Garabrant Exhibit No. 128?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 128

1:05 p.m.

COURT REPORTER: Okay.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, could you explain to me what part of this exhibit you used in forming your opinions here and how you used it? I just -- I don't understand.

A. Okay. This is part of a monograph written by Professor Siemiatycki. Dr. Siemiatycki did a very large population based case control study where he looked at ten different types of cancer, sorry, 11 different types of cancer, and essentially did a series of case control studies for each of those 11 types of cancer in which he interviewed cases and interviewed controls and reconstructed their lifetime working histories and history of exposure to many different chemical agents.

He wrote an entire book on the results, and I have Xeroxed for you in Exhibit 128 the results for the various lead exposures in his study, and so if you'd turn to page 152, you will see for all of the following cancers, esophagus, stomach, colon, rectum pancreas, prostate, bladder, kidney, skin melanoma, and non-Hodgkins lymphoma odds ratios and 90 percent confidence intervals for exposure to lead compounds right in the center, top section of page 152.

What -- and we see that he's also classified exposure into any exposure versus none and substantial exposure versus none. What you see is for the substantial exposure column, for each of those types of cancer with the exception of stomach cancer, there is no significant association between substantial lead exposure and those types of cancer, so for example, looking at lung cancer, the odds ratio is 1.2 with a 90 percent confidence interval of .9 to 1.7 so no significant association.

For bladder cancer, 1.1, not significant, for kidney cancer, 0.8, not significant. For stomach cancer, he did find a positive association odds ratio of 1.8, and his 90 percent confidence interval was 1.1 to 2.8. now -- so he found a moderate association. His use of 90 percent confidence intervals is a bit

unusual. Most scientists use 95 percent confidence intervals. I can't tell you whether that is actually statistically significant or not at the 95 percent level because he didn't calculate his results in that manner.

What this study does show, however, is that for all of the cancer sites at issue in this case, except for stomach, there's no clear association between substantial exposure to lead compounds and increased cancer risk.

If we then look at the next set of columns to the right, where he looks at basic lead carbonate, another form of inorganic lead and scan down those odds ratios under substantial exposure, there's not a single one that is statistically significant. If we look at the set of columns at the lower left, lead crow mat, there's not a single one that's statistically significant.

If we look at the next set of columns labeled lead fumes, there's not a single one that is statistically significant. And so this is a very important study because it is widely regarded in the epidemiologic community as a -- a watershed study, Jack Siemiatycki is widely respected for this work, and it really fails to show any pattern of increased

cancer risk related to exposure to lead compounds, basic lead carbonate, lead chromate, or lead fumes.

Q. Okay, is that it? Thank you.

A. We could also look at the previous page or page 149 where we are looking at the upper left soldering fumes and we see very similar findings, soldering fumes typically involves lead and we see no significant increased risk of any type of cancer with the exception of non-Hodgkins lymphoma in that table but there's no-- no clearly increased risk for stomach cancer, colon, rectum, lung, bladder, or kidney.

Q. Okay, now I understand, I didn't even understand the basis of that exhibit, thank you.

A. You're welcome.

MS. SLEVINSKI: Can you please get Dr. Garabrant Exhibit 51?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 51

1:11 p.m.

COURT REPORTER: Okay.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, Exhibit No. 51 is actually No. 51 on your reference list, and this is a meta-analysis from 1995. It's entitled Cancer And Occupational Exposures Inorganic Lead Compounds and then Analysis Of

Published Data. Now, you listed this in your reference section as something you reviewed in preparation for rendering your opinions but you did not discuss this in the body of your report. Why was this one excluded from the discussion portion of your report?

A. It was not excluded from the discussion portion of my report. I cited this with all of the other studies in my report, as the body of scientific evidence origin the carcinogenicity of lead in the human populations.

Q. Would you please show me, sir, where 51 is? I was not able to find it if the body of your report, it is in your reference section but it was not cited in your report, the body of it.

A. Well, then all that is wrong is on page 5 in the first paragraph, line 2, I should have included reference 51 in that list of studies. I apologize for not having done that.

Q. All right, so that's -- another mistake, it needs to be added to that section citing the study, correct?

MR. DANNINGER: Objection, form.

A. It would be appropriate to include that on page 5 first paragraph line 2 as part of the large body of scientific evidence on the carcinogenicity of lead in human populations, and I would note that Dr. Werntz

apparently cited none of this literature. It's not clear he had ever read any of it.

BY MS. SLEVINSKI:

Q. Would you please read just from the abstract portion of the conclusion, the first sentence of the conclusion in the abstract.

A. Yes. The findings from the workers with heavy exposure to lead provided some evidence to support the hypothesis of an association between stomach and lung cancer and exposure to lead. So what that means is almost exactly what IARC has discussed that there is some evidence but not adequate evidence, to support an association between some types of cancer and exposure to lead.

You are probably aware that Dr. Paolo Boffetta is a scientist at IARC, and he actually heads the unit of analytical epidemiology at IARC, and his work was cited in the IARC monograph in their consideration of the human evidence, and I think that IARC's conclusion that the human evidence is not adequate to support a conclusion that lead causes cancer in humans derives, in part, from Dr. Bufeta's work.

Q. Dr. Garabrant, Dr. Boffetta, who you're referring to, he is on the scientific advisory board for the Dow

Dioxin study that you are working on right now; is that correct?

A. I don't know what the Dow dioxin study is that you're referring to.

Q. The study that the University of Michigan is -- you are one of the researchers on it for the presence of dioxins in an area in Michigan through -- that have been attributed through a Dow plant up there?

A. If you're referring to the University of Michigan dioxin exposure study, yes, I -- I know what you're talking about, and Dr. Boffetta is on the scientific advisory board to that study.

Q. Thank you. That -- as far as we have spoken about the business process so far, is that the reasons of for relying upon those studies that we've talked about thus far?

MR. DANNINGER: Objection, form.

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

BY MS. SLEVINSKI:

Q. Okay, I'm sorry, I'll try and rephrase it. The articles we've just spent an hour or so discussing, are those -- do you have anything to add to why they have contributed to your opinion in this case?

MR. DANNINGER: Objection, form.

A. Well, these studies represent the published peer

reviewed literature on the carcinogenicity of lead to humans. I tried to consider the evidence, and I would point out again that there's no evidence that Dr. Werntz did anything such as this at any point in forming his opinions. He doesn't cite the literature.

BY MS. SLEVINSKI:

Q. Are there any other materials besides the ones that are cited there in your report that you've relied upon in forming this opinion?

MR. DANNINGER: Objection, form.

A. Are we talking about opinion 2 now?

BY MS. SLEVINSKI:

Q. Yes, that --

A. No, I think that they are cited in my report.

Q. And the reason -- you set forth the reasons for your opinions in the narrative portions of that section of your report?

MR. DANNINGER: Objection, form.

A. Well, I have set forth the scientific foundation for my opinion that lead is not known to be carcinogenic to humans, and I believe I have set forth that since it's unknown whether people exposed to lead are at increased risk of cancer, there's no justification for medical monitoring for lung cancer, stomach cancer, kidney cancer, or any other cancer Dr. Werntz alleges

are related to lead, yes.

BY MS. SLEVINSKI:

Q. If lead were -- if lead -- the classification of lead was changed to be a human carcinogen, would that change your opinion?

A. Well, if the evidence changes, I would certainly consider the new evidence, and I might change my opinion, of course, that's what good scientists do.

Q. Similarly, if lead were determined to be a human carcinogen, would medical monitoring be appropriate for these cancers?

MR. DANNINGER: Objection, form.

A. That's a very complicated question. If lead was a human carcinogen, and at the moment, it is not known to be one, it would be critically important to determine whether the lead compounds that provided the scientific foundation for that determination of carcinogenicity were, in fact, the lead compounds at issue in the Spelter class area. If they were not the same compounds, no, it would not provide an adequate basis for medical monitoring. If they were the same compounds and as I've already pointed out, the compounds at issue in this lawsuit are ones for which there is really not either humor animal evidence that they are carcinogens, it would then be important to

consider the circumstances of exposure of the population including exposure intensity, duration, frequency, root of exposure, bioavailability, and dose before it would be possible to calculate risks of cancer related to those potential exposures and the calculation of those risks would be a necessary foundational point in determining whether it made sense to do medical monitoring.

If it was clear that there was increased risk of some type of cancer, then it would also be important to determine whether screening tests for that cancer are sufficiently reliable to be used, what the sensitivity specificity and positive predictive value of those tests are, whether the utilization of those tests resulted in any net gain in life or any net benefit to the screened population, what the risks of those tests are to balance their benefits, and it would be important to consider many issues regarding technical feasibility as to whether those tests could, in fact, be implemented in a community setting including whether the subjects would participate, the percent participation, whether it would be feasible to follow people up, whether the necessary medical services were in place to follow-up positive findings, and considerations such as that.

Q. Is that the conclusion of your answer?
A. Yes.
Q. Okay, thank you, I didn't want to cut you off.
The next opinion in your report, No. 3, it states Dr. Werntz does not properly consider exposure pathways, dose, and latency in designing his medical monitoring program. Am I correct in stating that that is your opinion on this particular discussion?
A. Yes.
Q. Do you believe that the individuals living in the Spelter area have been or are still being exposed to arsenic, cadmium, and lead?
MR. DANNINGER: Foundation.
A. I am not aware that there is any reliable evidence that exposures in the class area around Spelter are meaningfully different than the background exposures in other areas of West Virginia.
BY MS. SLEVINSKI:
Q. What are you basing that upon?
A. I'm basing that on the reports written by Dr. Rodericks and by Gradient Corporation.
Q. Are those the two? I don't want to cut you off.
A. Yes.
Q. Are you aware that Dr. Rodericks in his report relied upon the sampling results that were taken by our

experts in the case?
A. I am aware that Dr. Rodericks considered those sampling results taken by your experts and raised grave concerns about the validity of those sampling results.
Q. Are you aware of any other sampling results that are available from the class area be it soil, dust, taken by any -- any parties?
MR. DANNINGER: Objection, form.
A. It will take me a minute.
BY MS. SLEVINSKI:
Q. All right.
A. I am aware that there was a study in 1996 that looked at blood lead measurements among children in the town of Spelter and found only 1 child out of 25 had a blood lead above 10 micrograms per deciliter, and so I think this is direct evidence of a lack of exposure to excessive amounts of lead in the pediatric population in Spelter.
Q. A sample size of 25 is an adequate size in your opinion to reach that conclusion, 25 individuals?
A. Well, it is what it is. The point is that the government of the State of West Virginia felt that that was an adequate sample size, and I guess it was -- sorry, it was ATSDR, sorry, not the government

of West Virginia. They felt it was an adequate sample size to evaluate whether there had been excessive exposure.

Q. Now, with respect to the ATSDR study we were just talking about, the blood lead levels, would you agree, though, that it's not sufficiently powered to reach a reliable conclusion?

MR. DANNINGER: What was the word there that you used? Specifically what?

BY MS. SLEVINSKI:

Q. Related to the ATSDR study we just mentioned, the blood lead levels, would you agree that it's not specifically powered to reach a reliable conclusion?

MR. DANNINGER: Objection, form.

A. No, I would not agree with that. What do you mean by sufficiently powered?

BY MS. SLEVINSKI:

Q. Was the study of a power that allows you to reach a reliable conclusion based on its results?

A. Well, when you pose a question such as that, you have to specify what you mean by -- by sufficient power.

Q. Statistically speaking, the power of a study.

A. I understand statistically speaking the power of the study, but you have to specify what power it is you think is adequate.

Q. I'm asking you if this would be adequate, 25 people would be adequate for the power of a study?
A. The answer is ATSDR felt this was adequate. I do, too. I don't know how to answer your question because it is lacking in detail adequate for me to know what it is you are asking.
Q. All right. Dr. Garabrant, what do you believe are the exposure pathways in the class area in this case?
MR. DANNINGER: Foundation.
A. I was not asked to identify the exposure pathways in the class area. I am aware that plaintiff's expert, Dr. Brown, has purported to do so, and that other defense experts have given expert opinions on the adequacy of Dr. Brown's work. I will defer to the other defense experts in the issue of which of those exposure pathways are valid and which are not.
BY MS. SLEVINSKI:
Q. Do you have an opinion on the exposure pathways in this case?
A. I have an opinion that the work done by Dr. Brown and the work done by Dr. Flowers is not sufficiently reliable to conclude that there is evidence of exposure to lead, arsenic, or cadmium from the Spelter site that is meaningfully different from the background exposures in that region of West Virginia.

Q. What are you basing that opinion on?
A. Dr. Rodericks' report and the report from Gradient Corporation.
Q. Is that all?
A. Well, and also having read Dr. Brown's report and Dr. Flowers' report, yes, that's all.
Q. Anything else?
A. Well, and my experience in the field of occupational environmental epidemiology and in doing assessments of chemical exposures to humans and exposure pathways in humans.
Q. All right, is that it?
A. Yes.
Q. Dr. Garabrant, if there are some arsenic laden dust particles about ten microns in size, if that's inhaled by a person, will travel through a person's respiratory system, is that correct, ten microns?
A. Ten microns is at the limit of what is defined as respirable. A particle of that size would stand a very good chance of simply being filtered out in the nose, and it would not be inhaled deeper into the respiratory tract.
Q. What about a particle say 15 microns?
A. 15-micron particle has a very high probability of being captured in the nose and never being inhaled any

deeper than that.
Q. How about 20 microns?
A. Even higher probability of being filtered out in the nose and not getting into the body beyond the nasal passages.
Q. What happens, say, whichever size is necessary for this dust particle to travel through the respiratory system to the lungs, can you explain where -- when it travels from the nose into the lungs the pathway it will take?
A. I'm not quite sure what you're asking. Do you want me to talk about the anatomy of the respiratory tract?
Q. Not in too much detail, just how it enters the lungs and it can travel from, you know, their lungs to other areas of their body?
MR. DANNINGER: Form.
A. So you want me to talk about the anatomy of the respiratory tract in not much detail and how particles get from the lungs to other areas of the body?
BY MS. SLEVINSKI:
Q. Yes, and you know in simple detail, you don't need a superlong information about -- just enough to understand?
MR. DANNINGER: Form.
A. Is this a test of my understanding of inhalation

toxicology? I'm happy to do that if you really want it --

BY MS. SLEVINSKI:

Q. -- a test, I'm just asking you to answer the question Dr. Garabrant?

A. Okay, well, could you give me some more focused questions? The answer to your question is the subject of numerous textbooks, and I -- I'll go through it if you want but I think perhaps more focused questions would be more productive.

Q. Thank you. I'll give you some more focused questions. Let's say, for example, an arsenic laden dust particle is inhaled and it travels to the lungs if it's sufficient in size. Once it's in the lungs, can it get caught in the mucus, and are there bodies in the lungs that helps the particle travel that will even take the particle out of the lungs and it will become embedded? What happens in there?

MR. DANNINGER: Objection, form.

A. Well, the answer to your first part of the question is yes.

BY MS. SLEVINSKI:

Q. Okay, just -- is that your answer? You're not going into detail? Don't want to cut you off.

A. Well, I'm not sure -- the question's so vague and so

comprehensive in scope, it's hard to know what you want. If you want me to recite my entire understanding of inhalation toxicology, I'll do it. I --

Q. I don't need --

A. That could go on for two hours, I teach this.

Q. Of course.

A. I could go on for six hours. In fact, I teach this material. I teach pathophysiology of the respiratory tract to graduate students, and if you want to hear it, I'll give it to you.

Q. No, I'm not really looking to hear that -- that big of an explanation, but thank you. Is it possible for a dust particle to go into the lungs, be removed from the lungs and travel, maybe, get coughed up in sputum or mucus and then swallowed, and is it possible to travel through the stomach into the digestive tract?

A. Yes.

Q. Do you have an opinion about the size of a dust particle that would travel into the lungs and not be trapped in the nose or expelled through the nose?

A. Yes, I do.

Q. What would that be, sir?

A. Typically, particles greater than ten microns in aerodynamic diameter are officially filtered out in

the nose, so particles larger than that, only a small proportion of them get beyond the nasal passages. The larger they are above ten microns, the lower is the proportion of them that get beyond the nose.

As we get down into particles less than ten microns, an increasing proportion of them can travel down through the conducting airways. Particles that are between one and ten microns are captured in the mucus that lines the conducting airways with varying efficiency, and it depends on particle size, the bigger particles tend to be captured in the mucus more efficiently than the small particles.

As we get down to particles in the range of two or three microns, we begin to see that an appreciable part of them get down into the alveoli, and we also see that an appreciable part of particles in that size range are actually exhaled without being captured by the body at all.

When we get down into particles lower -- smaller than one micron in size range, so submicron range, they very efficiently reach the alveoli, but they also very efficiently are exhaled, so in that size range, if I had to give you a ballpark number, I'd say perhaps 60 percent of submicron range particles reach the alveoli and are exhaled again.

A good illustration of that would be watching a smoker inhale deeply and then exhale. What you notice in much of cigarette smoke is in the submicron size range. What you see is that an appreciable part of the smoke they inhale, they exhale. The particles come right out again.

Of the particles that are retained, those in the submicron range, a small proportion of them are caught in the mucus, but the larger proportion of them actually impact in the alveoli where they are deposited and are eventually taken up by the alveolar macrophages.

Does that answer your question.

Q. Yes, thank you very much, Dr. Garabrant. What's your understanding of the historical source of drinking water in the class area?

BY MS. SLEVINSKI:

A. I do not know comprehensively what the historical source of drinking water is in the class area. It is my understanding that your experts, Dr. Brown, do not believe that drinking water is an exposure pathway in this litigation.

MR. DANNINGER: Amanda, when you get to a point, you don't have to do it right now, but just a break would be nice here in the next few minutes.

MS. SLEVINSKI: Okay, I'll be ready in just a minute.

MR. DANNINGER: Yeah, no problem.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, are you -- do you have any knowledge as to whether the west fork river was ever used as a source of drinking water in the class area?

A. I do not.

Q. Do you know about any impact of the site contaminants, arsenic, cadmium, and lead, have had on the West Fork River?

A. I do not.

Q. If you were told that the people in and around Spelter and the class area had consumed water contaminated with arsenic, would your opinion change on the skin cancer pathway?

A. Well, I guess if your experts don't think they drank that water, there's no reason for me to think it.

Q. That's not really what I asked.

MS. SLEVINSKI: Could you please read the question?

(The requested portion of the record was read by the reporter at 1:39 p.m.)

A. Well, if you told me something that I thought had absolutely no factual basis, I would not speculate as

to what might be true.

MS. SLEVINSKI: I'm going to move to strike as nonresponsive. Please read the question back, and Dr. Garabrant, answer the question.

MR. DANNINGER: Amanda, it's responsive. He's answering to the best of his ability. He's saying that he's not going to speculate on something that your experts say isn't factually positive, so I mean you can go through it again, and he may give you the same answer, but I'm just -- I mean this moving to strike his answers is just getting a little bit old in this.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, would you answer that question for me as posed in a hypothetical? Hypothetically speaking, if you were told that residents in the class area had consumed water contaminated with arsenic, would that change your opinion on the skin cancer pathway in this case?

A. I am happy to answer your question. If you give me a hypothetical that I believe has absolutely no relationship to the plausible facts in the case, I think that giving an answer would simply be speculation, and it would be nonsense. It is my understanding that your experts do not believe that

drinking water is an exposure pathway in this case. I am not aware of any evidence that has been presented by your experts or by defense experts that would suggest that drinking water containing arsenic or lead or cadmium is an issue in this case.

Q. So is your answer to my question no?

MR. DANNINGER: Form.

A. My answer to your question is I believe that I should not speculate regarding hypothetical questions that have no relationship to any plausible set of circumstances.

BY MS. SLEVINSKI:

Q. Okay, Dr. Garabrant, what difference does the media make in an exposure evaluation? And by media, I mean whether it's -- the contaminants are, you know, ingested via soil, air, water, what difference does that make in an exposure evaluation? Exposure pathway.

A. Well, it makes all the difference in the world. You know, it's very clear from things we've already discussed today that the evidence regarding inhalation of arsenic compounds and cancer risks is very different than the evidence regarding drinking arsenic contaminated water.

In those areas of the world such as Taiwan

where there are areas where there is very heavy arsenic contamination of drinking water, we see a pattern of cancer risks that is entirely different than the pattern of cancer risks among men who have worked in arsenic smelters in the United States or in Japan or in other areas of the world. And so inhalation of arsenic poses a completely different set of risks than ingestion of arsenic in drinking water.

Q. Are you finished?

A. Yes.

Q. Okay. In your report, I'm looking at page 5. You say that skin cancer likely to be linked to arsenic contaminated drinking water but not to soils, ingestion, or inhalation of arsenic. You cite in your report the studies relating to arsenic and -- arsenic and drinking water, but what do you base your opinion on there's never been a link to soil and inhalation of arsenic?

A. The lack of evidence that it's been linked to those pathways.

Q. Are there no art fees -- saying there's no articles that address that issue?

A. Well, if you have some in mind, I would be happy to discuss them with you.

Q. I'm just asking you.

A. Well, I'm not aware of literature that would support that but again, if you have -- if you have some that you'd like to discuss, I'd be happy to do that.

MR. DANNINGER: Just remember, Amanda, we're waiting on a break, too.

MS. SLEVINSKI: I know. Actually, yeah, this will be a good time, we can good ahead and take a break.

MR. DANNINGER: Okay, say five to ten minutes?

MS. SLEVINSKI: Sounds good.

MR. DANNINGER: Thanks.

MS. SLEVINSKI: Mm-hmm.

VIDEO TECHNICIAN: We are going off the record. The time is 1:43 and 48 seconds p.m.

(Recess taken at 1:43 p.m.)

(Back on the record at 2:00 p.m.)

VIDEO TECHNICIAN: We are now back on the record. This is the beginning of tape No. 4. The time is 2:00 and 56 seconds p.m.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, before the break, we left off, we were at the bottom of page 5, basically, on your report, going back to that section, the last paragraph on page 5, it starts out, you say, bladder cancer is not

associated with exposure to cadmium or lead. Is it your understanding that Dr. Werntz proposed or mentioned at all that cadmium and lead were, in fact, associated with an increased risk of bladder cancer?

A. No.

Q. I'm sorry, the phone cut off; did you say no?

A. I said no.

Q. Okay. You go on to mention about bladder cancer only being linked to drinking water containing excessive arsenic, and then the last sentence starts bladder cancer is not known to be linked to either inhalation or soil ingestion of arsenic; is that your opinion?

A. Yes.

Q. What do you base that on that bladder cancer is not linked to soil or inhalation of arsenic?

MR. DANNINGER: Objection, form.

A. A lack of evidence linking bladder cancer to inhalation or soil ingestion of arsenic.

BY MS. SLEVINSKI:

Q. Lack of evidence meaning articles that have actively researched that issue or you just have not looked at any?

A. I found no evidence that would suggest that bladder cancer was causally associated with arsenic inhalation or ingestion of soil containing arsenic.

Q. Okay, by no evidence I'm just trying to clarify you mean you found no articles that discuss an association between ingested or inhaled arsenic and bladder cancer?

MR. DANNINGER: Objection, form.

A. That's not what I said. The sentence stands for itself, it's quite clear what it means. There's simply no evidence to support a conclusion that bladder cancer is linked to inhalation of arsenic or linked to ingesting soil containing arsenic, and we've talked about these various environmental studies when we started today. I can't find any evidence that would support a claim that bladder cancer is exposed -- is associated with those exposure pathways, and I would point out that Dr. Werntz has not provided any evidence that would support those exposure pathways even though he claims that the people in the class area are at increased risk of bladder cancer due to their alleged soil ingestion or inhalation exposures.

Q. Dr. Werntz, you agree that -- excuse me, Dr. Garabrant, I apologize, do you agree that lung cancer has been associated with inhaled arsenic and cadmium in occupationally exposed individuals?

A. Yes.

Q. Is it your opinion in this case that lung cancer has not been reliably shown with community exposures to arsenic and cadmium?
A. Yes.
Q. What's your basis for that opinion?
A. We discussed that this morning. We went through, I don't know, eight or ten studies that examined that very issue starting with Tokudome and the Bartlesville study, the Pershagen study, Brown, ATSDR study at the Murray smelter, the study in Australia, the ASARCO smelter in Washington state, the Wong study, that's what we just went through for, I don't know, an hour and a half, two hours.
Q. In preparation of your report, did you review any literature that dealt with exposure to arsenic, cadmium, lead, and cancerous effects that were in an environmental exposure, not an occupational exposure setting?
A. Yes. We've already discussed those, that's what I just recited to you.

MS. SLEVINSKI: Well, how about -- would you please hand Dr. Garabrant Exhibit No. 56?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 56

2:06 p.m.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, do you recognize this as one of the items you have in your reference list of your report, correct?

A. Yes.

Q. However, I do not -- you referenced it you didn't discuss this in the body of your report and I want to ask you a couple of questions on some items in it. Would you turn to page 372? It's the second page, please.

A. Yes.

Q. Now, this article is looking at the carcinogenicity of metals in humans, and this is the section dealing with arsenic, and look on the right-hand column, the last paragraph. It says analysis came from the U.S., Quebec -- in Canada -- Sweden and China showed an increased lung cancer among residents near arsenic producing industrial operations; although, some investigations have been negative.

Now, it lists the United States, Canada, Sweden, and China, and it also has some other studies noted, cited there. Did you look up those studies during your research to see what they talked about, the increase in lung cancers for residents near arsenic producing industries?

A. Yes.
Q. And which ones were those?
A. Well, okay, you see in that sentence analysis from the U.S. and then they cite references 4, 33, and 34, 4 is the Brown study.
Q. Didn't you reference that because it was first you were responding to Dr. Werntz's use of it in his report?
A. No, I referenced it because it was relevant to the issue.
Q. Didn't Dr. Werntz cite that in his report as one of his studies showing an increased risk of cancer in smelter sites?
A. Yes, and so did I. The point is it was relevant to the issue. Unlike Dr. Brown, I actually got -- I'm sorry, Dr. Werntz, I went out and got a much larger body of evidence that addressed the issue so --
Q. Okay, well, let's look at, in this particular study, No. 33 in the reference list, it appears to be a Blot, W.J. Fraumeni, I didn't see that in your reference list. Did you overlook that one, Arsenical Air Pollution And Lung Cancer?
MR. DANNINGER: Objection, form.
A. I didn't cite that one. You will notice that Blot is the same Blot in the Brown study. That study came

from the environmental epidemiology group at the National Cancer Institute with Bill Blot, I think -- no, actually, Joe Fraumeni headed that, and so I think -- the blood study was published in The Lancet in 1975.

BY MS. SLEVINSKI:

A. The Brown study was published in 1984. So I didn't -- I didn't cite the Blot study.

Q. You didn't review it though either because it wasn't in your reference list?

MR. DANNINGER: Objection, form.

A. I actually have that reference, I have read it, I probably should have put it in my reference list, I may have forgotten.

BY MS. SLEVINSKI:

Q. So we have one more mistake, one more thing we need to add to your reference list?

MR. DANNINGER: Objection, form.

A. I'm not sure it's a mistake. It is by the same author on the same issue, and it's nine years earlier.

BY MS. SLEVINSKI:

Q. In a completely different journal and has a completely different title?

MR. DANNINGER: Is there a question there?

BY MS. SLEVINSKI:

Q. Is that correct?
A. It's published in The Lancet, and it's about arsenical pollution and lung cancer, whereas, the Brown study is published in environmental research and it's about lung cancer, and you will recall it's about arsenic.
Q. How about reference No. 34, Matanoski? Mat -- Matanofsky? I'm probably butchering that.
A. It's Matanoski.
Q. That also was not included in your reference list. Is this another one that you did, in fact, review and neglected to include in your reference list?
MR. DANNINGER: Objection, form.
A. I don't know the Matanoski study, I'll have to look at that one.
BY MS. SLEVINSKI:
Q. No. 35, Courtier and Toureau (ph.), that also was not included in your reference list; is that of the same caliber, forgotten but reviewed?
MR. DANNINGER: Objection, form.
A. I -- I don't recall the Courtier study. I believe I have read it in the past, it's possible that I -- I missed that one in my review.
BY MS. SLEVINSKI:
Q. And No. 36, you did actually review the Pershagen study, one of them, and that was also one that was

cited by Dr. Werntz, correct?

A. That's correct, and I reviewed the Frost study, No. 37, and --

Q. I'm not asking about that; I was just asking about those particular ones because they were related to the previous question.

MR. DANNINGER: I don't believe the doctor was finished with his answer.

MS. SLEVINSKI: Would you please hand Dr. Garabrant Exhibit No. 113?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 113

2:12 p.m.

COURT REPORTER: Okay.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, as you look at the paragraph -- well, go to page 6 of your report, the second paragraph from the top, it deals with lung cancer, and it says lung cancer has been associated with inhalation of arsenic and cadmium among workers and industries, again picked up -- not reliably associated with community arsenic to arsenic or cadmium. Exhibit 113, do you recognize this as one of the materials you reviewed in the preparation for your report?

A. Yes.

Q. This was referenced but it was not discussed in the body of your report. Can you explain why?
A. I didn't discuss each and every one of the 148 references I cited in the body of my report. The purpose of my report, among others, was to point out that Dr. Werntz had never considered the science that he needed to consider as a basis for his recommendations for medical monitoring, and so it appears that I've brought to your attention the large body of science relevant to his opinions. My opinions are that Dr. Werntz didn't do his job. He didn't find the scientific evidence, he didn't consider it, he didn't structure his medical monitoring program to reflect the scientific evidence that would have to underpin such recommendations.
Q. Are you finished?
A. Yes.
Q. Okay, well, let's take a look at Exhibit 113. Now, this is an environmental exposure to cadmium and risks of cancer a prospective population based study, did I read that correctly?
A. Yes.
Q. Now, this study, it followed a population, a group of people in Belgium who live right around the zinc smelter; isn't that correct?

A. Yes.
Q. Okay. Did that factor into your decision to omit this from the discussion portion of your report? It seems to be pretty similar to the situation at hand.
MR. DANNINGER: Objection, form.
A. Well, I should point out to you, I was the one who included this in my report. I don't see that Dr. Werntz even included it in his.
BY MS. SLEVINSKI:
Q. I'm not asking about Dr. Werntz; I'm asking you about your opinions and your reasons in support for your report. Did you --
MR. DANNINGER: So what's your question?
MS. SLEVINSKI: Could the court reporter please read my question back?
(The requested portion of the record was read by the reporter at 2:16 p.m.)
MR. DANNINGER: Objection, form.
A. I'm sorry, what's the question?
MS. SLEVINSKI: She just read it back, did you not hear it?
MR. DANNINGER: Do you want the court reporter to reread it, or do you want to ask the question again?
MS. SLEVINSKI: I would like to have her

reread it, please.

MR. DANNINGER: Okay.

(The requested portion of the record was read by the reporter at 2:16 p.m.)

MR. DANNINGER: Objection, form.

A. I included this publication in my report.

BY MS. SLEVINSKI:

Q. You included it in the reference section; you did not include it in the body of your report where you discussed other studies. Let's take a look closer. This study says we aim to discuss the association between environmental exposure for cadmium and cancer. That's the same situation -- strike that.

MR. DANNINGER: Where were you reading from? Or where are you reading from?

MS. SLEVINSKI: Okay, under -- on the first page of the article, it's the very first paragraph under the black word summary.

MR. DANNINGER: Okay.

BY MS. SLEVINSKI:

Q. The last sentence, we aim to assess the association between environmental exposure to cadmium and cancer. Is it not true, Dr. Garabrant, that there is environmental exposure to cadmium in Spelter, West Virginia.

A. I am not aware of any reliable evidence that shows there is environmental exposure to cadmium from the smelter site that is any different than the background levels in that region of West Virginia.

MR. DANNINGER: Belated foundation objection.

BY MS. SLEVINSKI:

Q. Do you agree that at issue in this case is the class residents' exposure to cadmium in and around the Spelter facility?

MR. DANNINGER: Foundation.

A. I'm sorry, I didn't understand, say -- would you repeat that or have the reporter read it back?

MS. SLEVINSKI: Would you please read my question back?

(The requested portion of the record was read by the reporter at 2:18 p.m.)

MR. DANNINGER: Foundation.

A. It is my understanding that the class of plaintiffs alleges that the smelter site has caused cadmium exposures to occur via inhalation pathways.

BY MS. SLEVINSKI:

Q. Okay, would you please turn to page 125, it's the second to last page of this article.

A. Yes.

Q. At the very bottom right-hand column, it reads in conclusion, consistent with indirect evidence currently available we have shown a significant association between risks of lung cancer and environmental exposure to cadmium. Did I read that correctly?
A. Yes.
Q. In this study that was looking into the possible association between cadmium and cancer, and the population of people that live near a zinc smelter facility did, in fact, find, this said, a significant association. Is that true?
A. That's what the authors say, and it is to their knowledge the first time such an association has been reported in an environmentally exposed population. Now, my point is that this finding -- and I should point out, I brought this reference to your attention, Dr. Werntz didn't, as far as I can tell, he never cited it, didn't -- didn't take any role in his thinking.

My point is that okay here's a positive study, you know here's the defendant's expert pulling up the positive studies, this hasn't been replicated.
Q. It also wasn't discussed in the body of your report; is that correct?

A. I'm the one who cited it in my report.
Q. I'm not asking you if you cited it. Dr. Garabrant, did you discuss it in the body of your report, yes or no?
MR. DANNINGER: Form, he's answered it.
A. I did not insert the citation after a single sentence on page 6 where I discussed the evidence. If that's what you're asking, should I have put citation No. 113 in paragraph 2, no, I didn't do that. I cited this study in my report, I brought it to your attention as relevant literature on the issue of cadmium exposure and lung cancer risk.
BY MS. SLEVINSKI:
Q. Okay, so you found the study, brought it to our attention, you read it, and you didn't discuss it in your report because it showed a positive association between cadmium and cancer, correct?
MR. DANNINGER: Objection, form.
A. I cited it because it is relevant regardless of what it showed. That's the whole point. Dr. Werntz didn't cite the literature. He's the guy that's got the opinions that medical monitoring is required, and he doesn't have any foundation for his opinions.
BY MS. SLEVINSKI:
Q. Thank you, Dr. Garabrant. You also discussed the

relationship of kidney cancer and exposure to cadmium or lead in the next paragraph down in your report. Do you see that on page 6 --

A. Yes.

Q. -- that page. Okay, and is it your opinion that kidney cancer is not associated with cadmium?

A. Yes.

Q. Is it your opinion that there's no exposure pathways in the class area that would suggest residents to an increased risk of kidney cancer from cadmium?

MR. DANNINGER: Foundation.

A. It is my understanding that plaintiff's experts have alleged that the exposure pathways of concern involve inhalation, they do not include drinking water and I am aware of no evidence that inhalation of cadmium is linked to increased risk of kidney cancer in humans.

BY MS. SLEVINSKI:

Q. And you -- one article that -- or excuse me, one reference cited, and that is No. 22, could you please actually -- no, I won't need that one, sorry, strike that.

You don't have any information in there cited as what you based your opinion on kidney cancer's association with cadmium. What -- what did you base that opinion on?

A. The lack of evidence of an association. There is a small body of literature on that that I'd be happy to discuss with you. There is a study by Kolonel in 1976, a study by Mandel in 1995, a study by Pesch, P-e-s-c-h, in 2000, a study by Armstrong in 1983, a study by Hu, H-u, in 2002. I'm still looking.

Q. Are you looking through your reference list?

A. I'm looking through my references.

Q. Okay, that's just what I was trying to establish.

A. Yeah, those would be the studies that I have looked at on that issue.

Q. For cadmium and renal cancer?

A. Yes.

Q. Any others?

A. I don't recall whether the other references in my bibliography address that. I have to look through them now to answer that.

Q. Are you --

A. I'm --

Q. Not being in front of you, are you looking for it still or --

MR. DANNINGER: Yeah, he's still looking, Amanda.

A. Hold on, it will take -- it will take a few minutes for me to do that. And you want just kidney cancer?

BY MS. SLEVINSKI:

Q. Kidney cancer and cadmium.

A. Right. Yeah, I think we would have to include the reference by Anderson. Hold on, I'll go through and give you the exhibit numbers as I do this. Exhibit No. 1. Okay. That was a mortality study among cadmium and nickel exposed workers in a Swedish battery factory. That study clearly ascertained cadmium cancer in that cohort, and the results were not of sufficient interest for them to bother reporting it. They clearly had it and they reported kidney disease other than kidney cancer, so that's a study that is relevant and provides no evidence of increased risk.

Armstrong, reference No. 3, the mortality of cadmium workers, clearly had the ability to observe kidney cancer, clearly ascertained deaths due to that cause if there were any, and did not report the results out, so that's a study that fails to show evidence of increased risk.

Q. Dr. Garabrant, in the interest of time, could we just -- you tell me which ones they are and not do the description. Just -- so which ones you relied upon --

A. Sure.

Q. -- for your opinion? Okay, just the number and the

exhibit for the references, so that will be sufficient if you wouldn't mind doing that, please.

A. Okay, just a second.

MR. DANNINGER: Well, he's not going to be able to give you the exhibit number because we don't have those exhibits, so he'll give you the number on his reference list.

MS. SLEVINSKI: That's why -- I'm sorry, I wasn't clear.

MR. DANNINGER: Yeah, no, no, no, but to the extent that it may disagree with your future exhibits, I just don't want you to think that we're giving you exhibit numbers.

MS. SLEVINSKI: Okay, no problem.

BY MS. SLEVINSKI:

Q. Just go down your reference list by number, Dr. Garabrant.

A. Okay. It takes a while.

Q. Okay.

A. Okay, reference 4 by Assaul (ph.) is one I considered. Reference 40 by Elander (ph.), reference 75, Iliasoba (ph), reference 76 by Inskip (ph.), reference 77 by Gerrup (ph.), reference 85 by Kazansas (ph.), reference 132 by Sorahan (ph.), reference 136 by Toon (ph.). I think that's it.

Q. Okay, so those are the references that you relied upon in forming your opinions on the relationship between cadmium and kidney cancer; is that correct?
A. That's correct.
Q. Okay, thank you. Okay, Dr. Garabrant, the bottom of the last paragraph, I guess, of your report on page -- you state that Dr. Werntz hasn't considered latency in designing his cancer screening program.
MR. DANNINGER: Amanda, it cut out, we lost the page number there.
MS. SLEVINSKI: Oh, I'm sorry, page 6 of his report, last paragraph.
MR. DANNINGER: Okay.
COURT REPORTER: Did she ask a question?
MR. DANNINGER: Yeah, we're -- we were kind of lost at that point. Can you repeat your question?
MS. SLEVINSKI: Oh, sure, okay, I apologize.
MR. DANNINGER: That's okay.
BY MS. SLEVINSKI:
Q. I'm just asking Dr. Garabrant to explain in more detail his statement that Dr. Werntz hasn't considered latency in designing his cancer screening program.
A. Yes, Dr. Werntz did not consider latency in designing his cancer screening program. Carcinogens or agents

that cause cancer do not cause cancer on the day of the exposure.

There is usually a lag time between the onset of exposure and the point at which there is increased risk of cancer. That lag time is commonly referred to as latency. It makes no sense to screen for cancer during time periods when there is no increased risk of cancer because you cannot possibly detect cancers related to exposure during that time period.

Dr. Werntz seems never to have considered that fact in designing his program. So his proposal to do cancer screening for a period of 40 years never takes into account for his postulated increased risk of cancer during -- at what point in these various class plaintiffs' lives they would actually be at increased risk of various cancers he believes are due to these exposures, and so what he has proposed is to do cancer screening during time periods when people are not known to be at increased risk or are not at increased risk and during which he could not detect any cancer related to these exposures.

Q. What is your understanding as to how long people have been living in the community surrounding the zinc smelter?

A. Well, I -- I don't know the entire occupational history of the population, I'm not aware that any of the plaintiff experts have actually shown what that distribution is. I do know that some individual plaintiffs have lived there for as long as 65 years. I don't know what the distribution of first years of residence is in the various class areas. I don't know the age distribution, I don't know how people have moved in and out of the area.

All of those factors have to be considered by Dr. Werntz, and he didn't. I mean if you're going to design a cancer screening program that makes sense that has a scientific basis, you have to target people who are at increased risk and you have to target them during the period when they are at increased risk. Otherwise, your program is nonsense.

Dr. Werntz did not make any effort to target people during the period he believes they would be at increased risk of cancer.

Q. When in your opinion was the residence in the class year be at an increased risk of cancer due to their exposure?

MR. DANNINGER: Foundation, form.

A. Never, they're not. There's not a this read of evidence that they're at increased risk of cancer as a

result of anything from the Spelter site.

BY MS. SLEVINSKI:

Q. What are you relying upon to establish your -- a latency period?

MR. DANNINGER: Form.

A. Your question presumes I've established a latency period. I'm not sure what you're talking about.

BY MS. SLEVINSKI:

Q. If you look at your report on page 6, I guess it would be the one, two -- third sentence, this suggests that screening for lung cancer in relation to inhaled arsenic will not reveal any arsenical cancers until at least 35 to 40 years after first exposure. Is that correct?

A. That's what my report says.

Q. Where -- what basis are you relying on for your 35 to 40 years there?

A. My report says quite clearly in the previous sentence in the Tokudome study upon which he, meaning Dr. Werntz, relies the latency from first exposure to arsenic to lung cancer was 37.6 years. I'm pointing out in that sentence that Dr. Werntz never considered latency, and that's his reference. That's a reference that Dr. Werntz relied on. He never considered latency in designing his screening program, so he

proposes to screen people during periods when based on his own references it's not clear that they have any increased risk, and that's simply not scientifically tenable. That is not a defensible cancer screening program.

Q. Do you -- in that paragraph, you go on to say that much of the cancer screening and proposals will be done during periods when the class members are at no increased risk of cancer from their alleged exposures, and, therefore, his screening cannot -- the screening programs cannot provide any benefit, whatsoever, during these periods. Did I read that correctly?

A. Yes.

Q. And confirm for me, you don't believe the residents will ever be at an increased risk of cancer from exposure; is that correct?

MR. DANNINGER: Objection, form.

A. It is my opinion that your experts have presented no reliable evidence that exposures from the Spelter site have placed people in the class at any meaningfully increased risk of cancer of any type.

BY MS. SLEVINSKI:

Q. Do you agree they've been exposed to these contaminants from the site?

MR. DANNINGER: Objection, form.

A. It's not clear that there is reliable evidence of exposure from this site. That's the whole point. That's what Dr. Rodericks' report discusses. That's what the Gradient report discusses. Dr. Valberg refers to that issue in his report. Your experts don't provide any reliable evidence of exposure.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, those are not our experts, though; am I correct? Those are defense experts you just referred to?

A. The people to which I referred are defense experts commenting on your expert's evidence which appears not to be reliable.

Q. In your opinion, are residents at no increased risk of cancer while they're still being exposed to contaminants in and around the smelter community?

MR. DANNINGER: Objection, form, foundation.

A. It depends on the latency from first exposure. I could probably illustrate it by example. We agree I think universally within the scientific community that ultraviolet from the sun is a cause of skin cancer. We do not believe that you get skin cancer on the day you get a sunburn. There is latency involved from time of first exposure to the development of skin

cancer, and I think the same is true for arsenic and cadmium.

BY MS. SLEVINSKI:

Q. So would the length of time these people have been living in this community near this Spelter -- I mean, excuse me, near this smelter, that would not factor into the latency period of diseases associated with cadmium and arsenic?

MR. DANNINGER: Foundation.

A. That's exactly the point. Of course it factors in, and Dr. Werntz didn't consider it.

MS. SLEVINSKI: Would y'all want to take a quick break here before I move on to another topic? Is this a good time? It's been about an hour.

MR. DANNINGER: That's perfectly all right if you'd like one, that's -- that's with us. It gives us a little time to stretch our legs, too.

MS. SLEVINSKI: Okay.

MR. DANNINGER: So we'll say about five or ten minutes?

MS. SLEVINSKI: Yeah.

MR. DANNINGER: Okay.

MS. SLEVINSKI: I mean closer to five if possible.

MR. DANNINGER: Okay, sounds good.

VIDEO TECHNICIAN: We're going off the record. The time is 2:47 and 5 seconds p.m.

(Recess taken at 2:47 p.m.)

(Back on the record at 2:58 p.m.)

VIDEO TECHNICIAN: We are now back on the record. The time is 2:58 and 40 seconds p.m.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, before our break, we had been discussing latency as it relates to the cancer screening program, and you mentioned that -- well, in your report, you're relying on the Tokudome study to say that there are no lung cancers associated with arsenic until at least 35 to 40 years after first exposure; is that correct?

MR. DANNINGER: Objection, form.

A. I said there were no arsenic related lung cancers.

BY MS. SLEVINSKI:

Q. Okay, and that was based on the reference to the Tokudome -- excuse me, Tokudome study?

A. Yes.

Q. Would you get -- look back at that Exhibit No. 137, please? Do you still have that handy?

A. Yes, I do.

Q. Do you have it back in front of you?

A. I do.

Q. Okay. Now, you would agree that this report, this Tokudome, the 37.6 year latency period was an average of the cases reported; is that correct?
A. I would.
Q. Can you please turn to page 315 of that article?
A. Yes.
Q. In the left-hand column, towards the top, it discusses latent period of lung cancer seen among public smelters in that column; do you agree that the average included cases, both above and below the 37.6 years from first exposure?
A. Yes.
Q. In fact, this study it shows here that the first exposure was -- excuse me, strike that.
It shows here that the first case was 13 years from first exposure; do you agree?
A. Yes.
Q. And that over 20 years below the 35 to 40-year range that was stated in your report; is that correct?
A. Well, my report simply points out that in the Tokudome study, the latency was 37.6 years. I do not believe that Tokudome study alone provides a thorough assessment of the latency between arsenic inhalation and the onset of lung cancer or any other cancer, but it's clear that Dr. Werntz's medical screening program

has not adequately considered latency.

I don't hold my report out as establishing the latency period for arsenic and lung cancer. The point of my report is to say there is information in the literature, and Dr. Werntz never considered it, and that is a failing in his basis for his medical monitoring program.

Q. Would you agree, though, that I've just asked -- the same question, that is the first case seen at 13 years over 20 years below the 35- to 40-year range that's stated in your report, correct?

A. 13 is more than 20, less than 35, that is correct.

Q. And the Tokudome study is a measurement from first exposure to death from cancer; isn't that correct?

MR. DANNINGER: Form, foundation.

A. I believe that's how they calculated latency. It should be pointed out that the average survival in lung cancer is on the range of about a year, so latency from first exposure to onset of clinical cancer is roughly the same as latency from onset of exposure to death.

BY MS. SLEVINSKI:

Q. That's not found in the Tokudome study, is it, though?

A. What's not found in --

Q. What you just said about the death of lung cancer

and...

A. No, that's from my knowledge of that disease process as a practicing physician, and that's fairly easy to find.

Q. The Tokudome study gives no data as to when people were first diagnosed; is that correct?

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

Q. In the Tokudome study, there's no data as to when the people, the cases were first diagnosed; is that correct?

MR. DANNINGER: Form.

A. Well, I'll have to look, I haven't considered that issue. It doesn't talk about when they were first diagnosed. It's a mortality study that studies deaths.

BY MS. SLEVINSKI:

Q. Thank you. Dr. Garabrant, is it also your opinion that Dr. Werntz's program does not provide for termination of the screening program he proposes?

A. He does not consider that there is a -- an end to the period at which people are at increased risk from exposure, so again, it's not part of his consideration in designing his program. The -- the window of time when people are at increased risk of cancer from some exposure to a carcinogen has a beginning and has an

end, and Dr. Werntz hasn't considered that.

Q. Would you agree, though, that the period of risk would continue as long as exposure to the contaminants continues? Would you agree with that, sir?

A. If the exposure put people at increased risk, the period of increased risk would begin after adequate latency had passed and would continue for as long as exposure continued plus whatever the latency period is.

In other words, latency is nothing more than a lag time, and so if -- if exposure begins on year 10 and latency is 20 years, then risk begins on year 30. If exposure stops on year 20 and the end of the increased risk period lags the end of exposure by 20 years, then risk would stop on year 40.

Q. Is that the end of your answer? I don't want to cut you off?

A. Yes.

Q. Okay. If you'd turn, please, sir to page 7 of your report continuing on to opinion No. 4?

A. Yes.

Q. Now, your opinion is cancer risks alleged from these exposures are too small to be detectable in relation to background cancer risks; is that accurate?

A. Yes.

Q. You -- the sentence is, Dr. Werntz failed to properly consider the risk of cancer related to the exposures he alleges. Can you explain how he failed to properly consider the risks?

A. Yes, the risks calculated by Dr. Brown and reiterated by Dr. Werntz are so small that a medical screening program could -- would -- would not uncover more than, perhaps, at most one or two cancers, and so he's going to -- Dr. Werntz proposed to screen a population of thousands of people for 40 years -- sorry, just a moment, now I'm blanking out -- yes, for 40 years past the end of exposure, and it's clear that he will discover not more than one or two cancers in that entire time related to the exposures that he alleges have occurred. He will discover in addition to those one or two cancers that might be related, perhaps, 1 or 2,000 cancers that have no relationship to the exposure.

That type of misguided medical monitoring indicates that he has not thought carefully about the magnitude of these risks and whether it is sensible to screen for cancer in this population.

Q. Okay, Dr. Garabrant, are you aware that the United States EPA considers a 1-in-10,000 risk in developing cancer due to exposure a significant risk?

A. I'm not aware that they've used those terms, and it is quite clear that the U.S. EPA has never recommended screening for a 1-in-10,000 cancer risk.
Q. What do you base that on?
A. My reading of U.S. EPA documents. You've never seen anything that suggests that screening should be done. I've never seen any guidelines for cancer screening that have suggested that screening under those circumstances is justified. And one of the federal agencies that is responsible for developing medical surveillance guidelines for populations exposed to hazardous waste, the ATSDR has developed screening guidelines, and they do not recommend screening for cancer risks as low as this.
Q. Would you agree with the EPA's classification of a 1-in-10,000 risk of developing cancer due to exposure as a significant risk?
A. You would --
MR. DANNINGER: Objection, foundation.
A. You would have to show me the document in which the EPA says that before I could comment on it.
BY MS. SLEVINSKI:
Q. Okay. Going a little further in your report, you compared the incremental lifetime cancer risk as calculated by Dr. Brown to the lifetime cancer risk in

the U.S. general population; is that correct?
A. Yes.
Q. Now, the lifetime cancer risk that you used on your calculations now, is that the risk for developing all cancers or a select few?
A. All cancers.
Q. All cancers. And what is your understanding of the cancers that Dr. Brown accounted for his incremental cancer risk calculations?
A. Hold on, I'll have to get Dr. Brown's report out.

Dr. Brown used the U.S. EPA cancer slope factor in calculating his risks. The cancer slope factors are based on all cancers caused by that agent in the opinion of the EPA. So that would include all possible cancer outcomes.

Q. Dr. Brown's model uses calculation of the 30 years of exposure for a life based on 70 years, correct?
A. Could you refer me to exactly where you're -- what you're referring to?

MS. SLEVINSKI: You -- I mean do you know that that's what Dr. Brown's 30-year calculation is based on?

MR. DANNINGER: Form.

A. Well, I don't know it exactly the way you stated it, and those things have to be stated correctly, and you

should refer me to exactly where in his report you're talking about.

BY MS. SLEVINSKI:

Q. In your calculation, the 45 percent risk for the male population, that includes people over the age of 70; is that correct?

MR. DANNINGER: Form.

A. No, I think that that actually is the cumulative lifetime cancer risk to age 70 or 72, I'd have to get that document out to remember exactly what the upper age cutoff was. It's typically 70 or in the low 70s, so it's lifetime cancer risk to that age.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, moving on to opinion No. 5 in your report --

A. Yes.

Q. -- your opinion states Dr. Werntz's proposed medical monitoring has not known to be effective for some cancers under any circumstances. Did I read that accurately?

A. Yes.

Q. In your opinion, is the only goal of medical monitoring to reduce deaths from diseases caused by harmful exposures, or would early detection of diseases be an equally important goal?

MR. DANNINGER: Form.

A. Well, you know, that's a really thorny issue. I think that early detection may, in some circumstances, be desirable to individuals. The difficulty is, I think, that few individuals would be willing to trade their longevity just to find out that they got cancer younger.

In other words, if the screening program actually incurs risks such that on average, the people screened suffer a loss of life, it is difficult for me to justify how any individual would say oh, I'm willing to have my life shortened so I can find out sooner that I've got cancer.

Q. What, in your opinion is required to make a determination that a particular medical monitoring program is effective for cancers?

A. Well, one of the things that you have to consider is whether the medical monitoring reduces mortality in the screened population. That's a very important thing to know.

Q. Is there anything else?

A. It's important to know whether screening results in earlier diagnosis that can be coupled to effective treatment. There's no benefit to screening for a disease for which there is no treatment option that is

of benefit to the person. It's important to know whether the risks attendant to screening are -- it's important to know what the risks are and to balance those against the benefits of screening.

It's quite clear that many screening activities carry substantial risks with them, either risks that are direct consequences of the screening activity or that are indirect consequences because of the medical testing and diagnostic procedures that follow positive screen results, so it's important to know what those risks are. I think those would be the major issues.

Q. Do you have an opinion, Dr. Garabrant, as to whether early detection of any of the cancers that are at issue in this lawsuit -- early detection lead to a better prognosis?

MR. DANNINGER: Form.

A. Well, I think I've laid my opinions out on that issue on page 7. For lung cancer, there is no evidence that early detection leads to a better prognosis, and that's true today in 2007 as it has been true for decades, sadly. For bladder cancer, there is no screening program that has been endorsed by the medical community as being beneficial, and so it's simply not done, even in people who are known to be at

high risk for bladder cancer such as heavy smokers, the medical community has never endorsed screening for bladder cancer in that population.

I think the same is true for kidney cancer, the medical community has never endorsed screening for kidney cancer, even in high-risk populations. Stomach cancer, the medical community does not endorse screening for stomach cancer, and so as we go through the list of cancers that Dr. Werntz wants to screen for, I'm not aware that the medical community has endorsed that screening under any circumstances much less the circumstances at issue in this class.

BY MS. SLEVINSKI:

Q. What about skin cancer, Dr. Garabrant?

A. Screening for skin cancer clearly is or can be beneficial under some circumstances, but as I pointed out, skin cancer's not an issue in this case because skin cancer is related only to arsenic exposure from contaminated drinking water which is not part of this case.

Q. Okay, Dr. Garabrant, we're going to move on to the second sort of section your report was divided into, and the general title is My Opinions Regarding Dr. Werntz's Proposed Screening for Noncancer Effects. Do you see that on page 8, sir?

A. Yes.
Q. Opinion No. 6, exposure assessment must establish that subject has been adequately exposed to be at increased risk of the disease in order to justify medical monitoring. Is that a correct statement of your opinion, sir?
A. Yes.
Q. If a precise dose of an agent that is alleged to cause harmful effects is unknown but the agent is known to have toxic effects, does that mean that medical monitoring is not appropriate under any circumstances of exposure?
MR. DANNINGER: Form.
A. Well, it leaves you in a netherworld where you have no basis for a recommendation. I would point out, for example, that we're all exposed to small amounts of cadmium, arsenic, and lead in the general environment of the United States. Those things are present in food, they're present in the air, they're -- some of them are present around roadways, some of them are present in occupational settings.
If you don't have any sense for the exposure levels, you have no basis for a decision to screen or not to screen, and so if -- if you simply say oh, if they're present, we should screen, then I

guess you should screen the whole world because we're all exposed at some level. You have to have a basis for determining that the exposure levels are adequate to put people at increased risk of some disease as a foundational concept to justify medical monitoring.

Q. Is that the end of your response?

A. Yes.

Q. Okay. ...your report you stated that exposure assessments must establish that subjects have been adequately exposed in order for them to be at increased risk to justify medical monitoring. In your opinion, what would it take to establish adequate exposure?

MR. DANNINGER: Form.

A. It would take far more than is present in this case in which you have no evidence, no reliable evidence of exposure to arsenic cadmium or lead from the Spelter site in any area of the exposure or of the litigation class.

BY MS. SLEVINSKI:

Q. What would be reliable evidence in your opinion?

A. It's entirely dependent on the circumstances of the alleged exposure. I -- you know, that's a hypothetical that's so broad, I can't answer it for this site.

Q. Well, then for this particular case, this situation?

MR. DANNINGER: Form. Foundation.

A. Well, I think the type of evidence that would be extremely valuable would be blood/lead tests, urinary cadmium, blood cadmium, urinary arsenic excretion, that would establish that the plaintiffs actually have received doses that exceed the range in the nonexposed population of comparable age and sex --

BY MS. SLEVINSKI:

Q. Establishing --

A. I wasn't finished.

Q. Okay, sorry.

A. Wasn't finished. In -- in addition to evidence that those exposures came from the smelter site that is alleged to have led to their exposure. In other words, what I would regard here is, you know, some -- some estimates or measurements, even better, of internal dose that say yes, we know these people have been overexposed, and then you have to have a -- a solid scientific foundation to say and yes, we know those exposures came from the Spelter site, and that's entirely lacking.

In fact, the single plaintiff who had a blood lead test had a lead test that is at the low end of the normal range. It was two micrograms per

deciliter, and that woman lives immediately adjacent to the tailings pile.

Q. Dr. Garabrant, would using, like you said, blood lead levels, urinary cadmium levels, are those effective measures of exposure that occurred in the past -- and I mean ten years ago for these people -- or do those more accurately reflect acute exposures?

A. Well, just a moment ago you asked me about ongoing exposures implying that these exposures are still continuing. Those -- those tests are certainly best for recent exposures. There's no question about that, so if you're looking at urinary arsenic, yes, that -- that reflects current exposure.

If you're looking at blood lead tests, those largely reflect exposure in the most recent few months, although in someone who is heavily leaded and has an appreciable bone lead burden, the blood lead tests may remain elevated for many, many years after exposure ceases.

For cadmium, the picture is a bit more complex. Blood cadmium levels typically represent recent exposure within a few months, and urine cadmium levels fluctuate depending on the amount of cadmium bound in the proximal convoluted tubule. They are most reliable in the setting of concurrent or recent

exposure. But the point is it's important to have some way of showing that the population has been overexposed.

In this setting, it is alleged that these people were overexposed to lead. If that were true, I would expect that there would be ways to assess that. Assessing bone lead burden is a technique that's available, and it looks at body stores of lead that are persistent for many, many years. I would expect that plaintiffs would have done that to show that these people were exposed.

Q. Is that the end of your response?

A. Yes.

Q. So in your opinion, you think -- you would like to see actual increased levels in the human body, and increased levels of these various contaminants from the environment would not be an adequate representation of exposure?

MR. DANNINGER: Form.

A. No, that's not what I said. What you don't have, what plaintiffs don't have in this case is any reliable evidence of environmental exposure levels that are unusual for West Virginia, and they don't have any evidence of increased body burden in the plaintiffs. Lacking both of those foundations, you have no

evidence of exposure that would in any way justify any sort of medical monitoring for adverse health effects from arsenic, lead, or cadmium.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, do you know what the half life for arsenic is in the body?

A. Well, I think I just told you about that. In the blood, it has a half life on the order of, perhaps, 60 hours.

Q. Okay. Urine?

A. In the urine, I think it's roughly comparable, I don't know the exact number, but it's -- it's typically in the matter of hours, you know, hours to a few days at most.

Q. Hair?

A. Well, hair, it -- ingested arsenic is incorporated into the hair as the hair grows, and it stays in the hair for as long as it's on the head. So for a woman who has hair down to her waist in the back, theoretically, you can get evidence of excessive exposure to arsenic going back years. For someone with a buzz cut, you're stuck with perhaps a few weeks.

Q. Okay, so what about the half life of cadmium in the human body?

A. I believe cadmium follows a two-compartment model. The blood levels typically have a short half life, typically expressed in hours, I think perhaps a hundred hours. The long-term tissue compartment, I believe, has a half life that's measured in years.

MR. DANNINGER: Hay Amanda, just to let you know, we have probably about two or three minutes left on the tape.

MS. SLEVINSKI: Okay, let's go ahead and change it real quick and just keep going.

MR. DANNINGER: Okay.

MS. SLEVINSKI: Off the record change it.

MR. DANNINGER: Yeah, it will probably take about five minutes or so.

MS. SLEVINSKI: Okay.

VIDEO TECHNICIAN: We're going off the record. This is the end of tape No. 4. The time is 3:33 and 5 seconds p.m.

(Recess taken at 3:33 p.m.)

(Back on the record at 3:38 p.m.)

VIDEO TECHNICIAN: We are now back on the record. This is the beginning of tape No. 5. The time is 3:38 and 53 seconds p.m.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, right before the break, we've been

discussing the half life of the various constituents that we were concerned with and different body fluids, body parts. We left off on cadmium. So if you could please pick up where you left off about cadmium, sir.

A. I think I had finished cadmium.

Q. Did you -- the half life of cadmium in the urine?

A. I'd have to look that up. It's complex because in the early stages of cadmium exposure, cadmium in the urine accurately reflects cadmium in the blood, so I believe it has about the same half life. So what -- what is in the blood and passes through the kidney is effectively filtered out into the urine.

As time passes, that cadmium begins to bind to the proximal convoluted tubule cells and accumulates. When you get a sufficient amount of binding, then you begin to have preclinical effects on the kidney such that some tubular proteins begin to be excreted in the urine.

At that point, urinary cadmium excretion may actually rise so that you excrete more than is -- you excrete it at a higher concentration than is present in the blood. If cadmium exposure continues, damage to the convoluted tubules increases, and you develop tubulointerstitial disease which results in damage to the glomeruli and a fall in glomerular

filtration. And at that point, cadmium excretion in the urine may actually drop and be less than what's in the blood. So it's really sort of a three-phase model. There's no simple answer to the urinary half life.

Q. Okay. What about the cadmium half life in human hair?

A. I believe that cadmium that is incorporated into the shaft of the hair as the hair is formed stays in the hair, so it's the same answer as for arsenic.

Q. Okay, thank you. Now what about for lead? What is the half life of lead, and we'll do the same different bodily, I guess, parts and fluids, starting with lead in the blood, sir.

A. Well, lead in the blood has a half life of about 30 days.

Q. What about lead in the urine?

A. It follows lead in the blood.

Q. And how about lead in human hair?

A. Same answer as for cadmium and arsenic. If lead is incorporated into the hair shaft, it persists in the hair shaft for as long as the hair is on the head.

Q. So from our discussion just now, it seems that all these chemicals have a fairly short half life in the urine and blood; is that correct?

A. With the exception of the discussion on cadmium,

certainly for arsenic and lead, that's correct.

Q. Okay. Now what ways would you use or suggest to use to assess exposure over the time period that these people have lived in the communities for these -- these heavy metals because the half life in the blood and urine, excluding cadmium, as you mentioned, is so short?

MR. DANNINGER: Form and foundation.

A. Well, you know, clearly this is a situation where cortical bone x-ray fluorescence would establish quite clearly whether these people have excessive body burdens of lead and then knowing from environmental sampling, the ratios between lead and arsenic and lead and cadmium, it might be possible to make some inferences about past exposure.

I'd been surprised that plaintiffs had done no biological monitoring with the exception of the one lead test on Ms. Perrine which showed that she was at the dramatically low end of the normal population for her blood lead in spite of living adjacent to the tailings pile. Clearly, it's not appropriate to do medical monitoring on this population in the absence of evidence of exposure as is the situation in this case.

Q. Okay, thank you. Give me one second, I'm looking at

my notes.

A. Okay, you're welcome.

Q. Dr. Garabrant, you can't say that blood and urine tests would show anything to a reasonable degree of scientific certainty, can you?

MR. DANNINGER: Form.

A. Well, here's the issue, Ms. Slevinski, if there is ongoing exposure in this class area, yes, I would think that blood in urine tests would be invaluable to show that. If there is not ongoing exposure in this community, then your experts simply need to say oh, the exposure ceased, and to give some estimate of when it ceased, and then that would have some important implications for whether medical monitoring for past exposures makes sense, but they've done neither, so here you've got Dr. Werntz proposing medical monitoring for health effects and we're talking noncancer effects now related to arsenic, cadmium, and lead whereas these exposures cease at some point in the past, this monitoring is nonsense. If these exposures are ongoing, then he ought to be asking for biological monitoring for arsenic, cadmium, and lead.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, would you agree with me that these exposures are cumulative in the exposures to arsenic,

cadmium, and lead?

A. I'm sorry, I missed one of your words because of a noise in the room here.

Q. Okay.

A. I didn't hear it.

Q. Do you agree that exposures to arsenic, cadmium, and lead are cumulative?

A. No. No, exposures to lead may accumulate in cortical bone. Arsenic is not cumulative. Arsenic is excreted with a fairly short half life, and there are no tissue stores of arsenic, and as we discussed for cadmium, cadmium can accumulate in the kidney under circumstances of excessive exposure, but there's a threshold for that, and there's a threshold for impairment of the kidney as a result of cadmium.

Q. Okay, thank you, Dr. Werntz -- I'm sorry, Dr. Garabrant. Next opinion No. 7. Before I move on, there's nothing cited in your section of opinion No. 6, no studies or articles that you have cited here as being relied upon. Can I take that to believe that you are relying upon your experience and education and your reading of Dr. Werntz's report?

A. No, you can take it to indicate exactly what it says, that Dr. Werntz's proposed plan is not grounded in consideration of the dose or duration of exposure

adequate to cause any of the conditions he allegations. The point is Dr. Werntz proposes to screen for all these diseases and he has provided no evidence that he adequately considered the dose adequate that cause those diseases. My -- my -- my comments are that his plan are nonsense, it has no scientific foundation. I don't need references to say he doesn't have any references.

Q. Okay. Let me see if I can be a little more clearer with my question. I'm just trying to establish that for your opinion No. 6, you have nothing cited as an outside resource, so you won't be showing up at trial saying that you've got this particular article or book or what have you that says, you know that Dr. Werntz is wrong I'm just establishing that you have no outside materials you're relying on for that opinion; is that correct?

MR. DANNINGER: Form.

A. Of course I have outside references. I didn't realize it would be necessary to provide references for fundamental principles of science.

Okay. I would cite to the textbook by Alice Ottoboni, The Dose Makes The Poison. I would cite to a number of basic toxicology textbooks such as Ellenhorn and Barceloux, E-l-l-e-n-h-o-r-n,

B-a-r-c-e-l-u-u-x. I would site to Casarett and Doull's Textbook of Toxicology. I would cite to Lowrey's Textbook On Biological Monitoring which has a marvelous chapters on lead, cadmium, and arsenic biological monitoring.

I would cite to the two-volume textbook on the toxicity of metals by, it has a blue cover, and I'm blocking out the first author's name. All of those -- I'll come up with it as we talk. All of those materials would substantiate my opinion that it is accepted scientific practice to quantify exposure levels from measurements of exposure, and that assessing whether people have been -- are at increased risk of disease from arsenic, cadmium, or lead has to be based in measurements that they have either been exposed via environmental pathways or biological monitoring that would establish that they had internal doses that had been adequate to put them at increased risk of disease.

Q. Is that the end of your response?

A. Yes.

MS. SLEVINSKI: Scott, can I ask you a quick question? I'm looking at the clock and realizing it's 3:50 your time. How long are you able and Dr. Garabrant to go this afternoon?

MR. DANNINGER: Well, we were going to talk to you about that because we have to get a cab set up. We were thinking that we would give you a little more time depending on how much you need over five o'clock, but --

MS. SLEVINSKI: I wouldn't need much over five o'clock. I mean I just I want to be able to gauge --

MR. DANNINGER: What do you need, you tell us what you need.

MS. SLEVINSKI: 5:30 would be sufficient and appreciate that that's --

MR. DANNINGER: 5:30's just fine. Doctor, is 5:30 okay for you?

THE WITNESS: Yes.

MR. DANNINGER: Yes, 5:30 is fine, Amanda.

MS. SLEVINSKI: Thank you, sorry for that.

MR. DANNINGER: Hey, that's all right, I'm glad you brought it up. We were going to bring it up.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, back to opinion 7, I jumped around, opinion No. 7 in your report says Dr. Werntz fails to consider dose response relationships and latency; is that correct?

A. Yes.

Q. That's your opinion on Dr. Werntz's medical monitoring program, correct?

MR. DANNINGER: Form.

BY MS. SLEVINSKI:

Q. Towards the bottom of page 8, the final paragraph, there's a sentence he has provided no scientific basis for his assumptions that such effects would persist for the remaining life times of all the plaintiffs and thereby necessitate 40 years of medical monitoring as he proposes. Can you explain that statement and your reasons behind it in a little more detail for me, please?

A. Well, Dr. Werntz proposes a medical monitoring program that will continue for 40 years, okay? And I'll -- I'll read from page 4 of his report. Medical monitoring shall continue until 40 years past the end of exposure. Generally, this would be either 40 years beyond moving out of the class area or 40 years after their residence is remediated. This is based on the usual latencies of the diseases of interest. Okay, that's the end of the quote.

So what he's saying is I'm assuming that these diseases go on for 40 years beyond the end of exposure or that these people are at increased risk of these diseases for 40 years after the end of the

exposure. He's provided no basis for that statement, there's not a single reference in his report that would substantiate that paragraph in his plan, and it has no scientific rationale.

Q. Now, Dr. Garabrant, similar to opinion 6, since there is no actual materials cited in opinion 7, you're going to base that on your education, your experience, and would there be any outside sources as -- you know, support for your opinions here, sir?

A. Ms. Slevinski, I don't -- I'm confused by your point. The point of my report is that Dr. Werntz cites to nothing, he has no basis for his opinions. He proposes a medical monitoring program that is nonsense because he doesn't know how long these diseases persist, he doesn't -- he hasn't specified the circumstances under which people at increased risk, he doesn't specify when their period of increased risk starts or ends.

There's no reference that I need to point out that he doesn't have a basis for his opinions. There's no basis for his report.

Q. I'm just --

A. I'm still speaking.

Q. I'm just trying to establish that --

A. I'm still speaking.

Q. Go ahead.
A. Okay? I read your paragraph from page 4 of his report. There is not a single footnote that a companies that part of his plan. My report simply says gee, he doesn't seem to have a basis for his opinions. There's no -- there's no textbook that's going to document that Dr. Werntz doesn't have a basis for his opinions. Dr. Werntz's report has no foundation, it's speculation.
Q. Are you finished?
A. Yes.
Q. I was just saying I don't have a point to the question, per se, except that I'm just trying to establish that as evidenced by this section of your report, you will not be coming later on at trial and say with some material that you say support your opinions in that section. That's all I was asking, just verify that.
A. Well, I can certainly provide references that establish the fundamental principals that need to be met in order to perform medical monitoring. I'm happy to do that, so the United States preventive services -- preventive health services task force report, I -- I'll certainly provide that, in fact, I cite that in my references. There are textbooks on

medical monitoring, the textbook by Alan Morrison on cancer screening, I will cite to that. A whole series of papers published in the journal of occupational meds, to complete issues of that journal some years ago that examined many, many aspects of medical monitoring of populations and screening of populations exposed to chemicals, I will cite to that set of 30 or 40 papers. There's a textbook by David Eddy that lays the foundational concepts for cancer screening that I will cite to that was published in about 1980 or 1982, and formed the foundation for the American Cancer Society's recommendations on cancer screening for years, it's still valid.

I'm blocking out the citations to two other textbooks I have on my shelves that have to do with medical monitoring and cancer screening, so yes, I will -- I've already given you a bibliography to support my opinions in section 7.

Q. Okay, thank you, Dr. Garabrant. Now, moving on in your report to No. 8, cadmium and renal disease, do you agree with me that when a person is exposed to cadmium it accumulates in the kidney; is that correct?

MR. DANNINGER: Form.

A. At some points in the period of exposure, yes, it can, depends on the amount of exposure they have.

BY MS. SLEVINSKI:

Q. So like over time if a person is continuously exposed to cadmium, it will eventually build up in the kidney?

MR. DANNINGER: Form.

A. Depends on the levels. I mean we've all been exposed to cadmium, we're all exposed daily, it's in foods.

BY MS. SLEVINSKI:

Q. In your report, you state that there's published studies according to threshold for the adverse effects of cadmium on renal function that there's a -- that second paragraph in the section; do you see that?

A. Yes.

Q. Now, I have the report that you cited in there. Would you explain how those taken together indicate there is a threshold of cadmium exposure below which no clear risk of adverse renal effects?

MR. DANNINGER: Form.

A. Yes, the first study referenced 107, which is by Nakadaira, N-a-k-a-d-a-i-r-a, shows that subject 2 had a blood cadmium level in the range of .38 to .41 micrograms per deciliter were not at increased risk of renal dysfunction than were nonexposed subjects who had blood cadmium levels were roughly half of that. That indicates that at those exposure levels, there's no increased risk of renal dysfunction, okay? Ikeda,

I-k-e-d-a, found that urine cadmium concentrations of 4 micrograms of cadmium per gram of creatinine was a threshold above which there was increased excretion of urinary beta 2 microglobulin, and below that, there was not.

Q. Wouldn't you agree, sir, that urinary B2 microglobulin is the most sensitive --

COURT REPORTER: I'm sorry, can you please start that over again?

MS. SLEVINSKI: Yes, I'm sorry.

BY MS. SLEVINSKI:

Q. And you would agree, wouldn't you, that urinary B2 microglobulin is the most sensitive indicator of renal damage?

A. Of renal dysfunction.

Q. Okay. Go on, please, with your explanation for this.

A. Okay. And then a third study, No. 81 in my references, they actually calculated the 5 percent BMDL, the benchmark dose limit, and found that that limit for renal tubular dysfunction was in the range of 3 to 4 micrograms of cadmium per gram of creatinine excretion, so a finding very similar to that from Ikeda.

So clearly, these investigators show that there are levels of cadmium exposure and cadmium

excretion below which there's simply no evidence of any adverse effect on the kidney. Now that's really important because in order for Dr. Werntz to justify screening people for evidence of renal dysfunction, he has to have evidence that these people are exposed at levels such that renal dysfunction would occur. Otherwise, there's no reason to do it.

Q. Dr. Werntz's screening program does, in fact, call for use of urinary B2 microglobulin; is that correct?

A. Yes, it does.

Q. Thank you. Now, when we were talking about cadmium accumulation in the kidneys, at what point does the cadmium start building up? Is there a specific amount of exposure that has to occur?

A. Yes.

Q. What is that?

A. Hold on, it's going to take me a minute.

Q. Okay.

A. When cadmium in the renal tubular cells exceeds a threshold in the range of about a hundred to 300 micrograms of cadmium per gram of wet weight of renal tissue, that's when cell damage begins and function -- functional impairment begins.

Q. Where did you get that information from, sir?

A. I'm reading that from the chapter on cadmium in

Rosenstock and Cullen's textbook of Clinical Occupational and Environmental Medicine.

Q. Is that on your reference list?

A. That chapter is not, although, I authored two chapters in this book that are immediately adjacent to that one. I didn't realize that you were going to ask me about the distribution and excretion of cadmium as it related to the kidney, so I didn't -- in fact, I didn't prepare a report on that, but since you've asked me about it, I'm happy to respond.

Q. Thank you, shouldn't that particular chapter of that textbook be added as a reference?

A. Well, if you're going to go into areas such as you just have, yes.

Q. Is it true that urine cadmium levels will not start to go up until the cadmium levels in the kidney have reached the point where renal dysfunction is occurring?

A. I don't know what you mean by go up.

Q. You won't start detecting cadmium in the urine until the levels of cadmium in the kidney have already reached a point where they can cause renal dysfunction and renal damage; is that correct?

A. No, that's not correct.

Q. Okay. What are you basing that on?

A. My understanding of cadmium excretion.
Q. Were you looking at something to refresh your knowledge on cadmium excretion?
A. Yes, I was. I was looking at the chapter in Rosenstock and Cullen to refresh my memory.
Q. Okay, thank you. In urinary B2 microglobulin and the urinary cadmium levels, are they essentially measuring the same thing?
MR. DANNINGER: Form.
A. No. The answer is no.
BY MS. SLEVINSKI:
Q. How -- how -- what -- what is the B2 microglobulin measuring and what is urinary cadmium, what is that level measuring?
MR. DANNINGER: Form.
A. It's beta 2, not B2, beta 2 microglobulin is a -- a protein that comes from the cells of the proximal convoluted tubule in the kidney. It is a marker of tubular dysfunction. It's telling you that the cells are being adversely affected. Urinary cadmium is a measure of cadmium. It tells you how much cadmium is being excreted in the urine.
They're not the same things. One is a marker of dysfunction in tissue, the other is a marker of excretion of a material. Other things besides

cadmium will also cause beta 2 microglobulin excretion. Basically, anything that damages or any of a number of materials that damage the proximal convoluted tubule will lead to excretion of beta 2 microglobulin, doesn't have to be cadmium.

Q. Okay. In your report, you state that lead has been linked to decreased renal function and renal failure, and you say that the disorder has been seen in industrial settings and in circumstances of prolonged, high exposure; is that correct?

MR. DANNINGER: Can you just tell us where you are in this --

MS. SLEVINSKI: Oh, I'm sorry, on page 9 of Dr. Garabrant's report, third paragraph down.

MR. DANNINGER: Okay, thank you. Form.

MS. SLEVINSKI: Sorry?

MR. DANNINGER: Form objection.

A. What you said roughly paraphrases my report.

BY MS. SLEVINSKI:

Q. Do you know what levels of lead are necessary to induce renal dysfunction?

A. I haven't gone back to look that up. Fairly high dysfunction. We don't see evidence of renal dysfunction in -- I don't know where the threshold is, I've never seen it in someone who, with a blood lead

under 40, in fact, I don't recall seeing it in people with blood leads in the 50s and 60s, so it's -- it requires a fairly high blood lead level before that is observed. Are you there?

Q. Yeah, I'm thinking. You said you don't recall seeing it personally. You mean by personally as not recall seeing it in patients or in studies or articles you've read?

A. No, no, no, I'm talking about in patients. As I mentioned to you, I -- I used to do the medical monitoring program for a couple of brass foundries.

Q. Right, okay.

A. And I saw hundreds of people who had lead exposure. Some of them with very high blood lead levels, and I don't recall ever seeing evidence of renal dysfunction in any of them. In fact, my colleagues and I did a research study in one of those foundries looking to see whether we could detect excessive excretion of beta 2 microglobulin retinol binding protein and N-acetyl glucose aminidase, or NAG, and we were unable to show there was any increased excretion of any of those proteins in that population, and these were people who routinely had blood leads in the 30s and 40s, and some of them up into the 50s.

Q. Okay, thanks, Dr. Garabrant. You also discussed the

and we have a little bit earlier today discussed buy owe monitoring. Is it your opinion that biomonitoring is the best measure or best way to quantify exposure to these metals in the class areas?

A. Well, it depends. If the exposures are still ongoing, then yes, biomonitoring for arsenic, lead, or cadmium would be a valuable way to establish whether people had evidence of internal doses that were excessive --

Q. Would --

A. I'm not done.

Q. Sorry.

A. And that biomonitoring would preclude any other type of medical testing unless it was demonstrated that these people had exposures adequate to put them at increased risk of disease and then the medical monitoring program could be fashioned that would be aimed at detecting those diseases once we knew that people were adequately exposed to be at increased risk.

Now, if the subjects -- and I should mention it would be important in addition to that monitoring to establish through environmental measurements that the source of exposure came from the Spelter site. And so if -- if the plaintiffs believe that there's ongoing exposure, I would have expected

them to have shown via biological monitoring that there was evidence of internal dose. If the exposures have ceased, I do not believe that biological monitoring for urine cadmium or arsenic or blood cadmium is likely to be useful. And I do not believe that blood lead measurements would be useful. I think -- I'm surprised in fact that the plaintiffs have not done cortical bone x-ray fluorescence studies to demonstrate that the plaintiffs have increased body burdens of lead, that's feasible to do.

If there is not evidence through biological monitoring or through environmental samples that the class in this litigation has evidence of excessive exposure from the Spelter site, then it would be my opinion that there is no medical monitoring and no biological monitoring program that makes any sense at all, and since I have not seen any reliable evidence that this class has been exposed in any manner that's unusual for that region of West Virginia, it seems to me that there's no reason for medical monitoring or for biological monitoring.

Q. Is that the end of your response?

A. Yes.

Q. So if exposure were ongoing, would biomonitoring be able to detect the degree of past exposure, by past

exposure being ten years ago, 20 years ago, something further in the past?

A. Well, I think I've answered that question. I just answered it. And I think you've asked it now three times in different ways that the urine arsenic, urine cadmium, blood cadmium and blood lead levels relate most clearly to ongoing exposure, those are not good tests for distant past exposure.

Q. That's all I was asking, that -- thank you.

A. Yes, and -- and let me point out again that if plaintiffs have a sincere interest in estimating distant past exposure, cortical lead x-ray fluorescence would clearly establish whether these people have been overexposed or not.

Q. Okay, is that the end of your response for that?

A. And that would need to be done one time only in each Pesch person to establish their body burden and I would have thought that would be a foundational test for Dr. Werntz before he could possibly give opinions that these people have been overexposed to lead and he hasn't done it.

Q. Are you finished?

A. Yes.

Q. Okay. If you flip to page 10 of your report, opinion No. 9 on bone fragility, do you see that, sir?

A. Yes.
Q. These subtitles aren't as apparent, so would you please tell me what your opinion is in this case with respect to bone fragility?
A. Well, my opinion is exactly what I wrote. Dr. Werntz alleges that lead has been linked to bone fragility. Lead is not known to be associated with this disorder and Dr. Werntz has provided no scientific basis for his claim. Moreover, he proposes no tests to screen for bone fragility. Okay, those are my opinions, so he's -- I think he's just got it wrong. Lead's not linked to bone fragility. He hasn't proposed any tests for bone fragility.
Q. Okay. Now, the second paragraph addresses cadmium. What about for cadmium and bone fragility, your --
A. Okay, Dr. Werntz alleges that cadmium has been linked to bone fragility. Cadmium can interfere with bone mineralization because of damage to the kidneys. When cadmium has accumulated in the proximal convoluted tubule to the point where it is causing clinically apparent nephropathy. It also interferes with vitamin D metabolism, and people do not make enough vitamin D. Vitamin D is important in calcification of bones, and at the point where people begin to suffer tubulointerstitial disease, they may also have defects

in bone calcification.

However, there's no scientific basis, whatsoever, for a conclusion that the exposure levels alleged to have occurred in the class area would have caused this disorder in the community. Dr. Werntz has shown no evidence that anybody in this class has kidney damage consistent with cadmium toxicity. He's shown no evidence of beta 2 microglobulin urea. He's shown no evidence of albuminuria, he's shown no evidence of increased blood creatinine levels, he's shown no evidence of any evidence of any impairment of kidney function which would be a prerequisite before it is likely that anyone has suffered bone fragility in relation to cadmium.

Q. Dr. Garabrant, do you agree, though, that Dr. Werntz did not propose in his report to conduct any sort of monitoring for bone fragility; would you agree with that?

A. Well, I would agree with that, and --

Q. Dr. Garabrant?

A. No, I'm just looking back at his report where on page 5, he mentions bone fragility as a disease considered to be related to the exposures from the Spelter site, and it strikes me as flawed reasoning to opine that that has occurred when he has failed to do the testing

that would establish whether people have evidence of renal dysfunction that would be a necessary prerequisite before they could develop bone fragility from cadmium.

Q. Thank you, sir. I just was asking for you to confirm your understanding if you do understand it, that Dr. Werntz did not, in fact, propose to monitor for bone fragility in his medical monitoring plan?

MR. DANNINGER: Form, foundation.

A. That's correct, he did not.

BY MS. SLEVINSKI:

Q. If you look -- well, in the interests of time, these last several subopinions we're talking about back here, we'll try and get through them kind of quickly. The bone fragility, is it correct that the substance in the narrative portion here is your complete opinion with respect to bone fragility in this case?

MR. DANNINGER: Form.

A. Well, I've certainly given you my opinions regarding Dr. Werntz's claim that bone fragility is related to the exposures from the Spelter site. It is my opinion that there is no evidence to support Dr. Werntz's claim, and the evidence that is readily within his grasp that would substantiate his claim he has simply failed to collect. Now, other than that, my opinions

are written down.
BY MS. SLEVINSKI:
Q. That's what I'm asking, just a sum of your opinions on this matter, No. 9.
MR. DANNINGER: Form.
A. Well, if you were to ask me additional questions related to this topic of bone fragility, I would be happy to give you more opinions.
BY MS. SLEVINSKI:
Q. Do you intend to offer any other opinions other than the ones you have written out here on bone fragility?
A. If I am asked about issues in addition to these, I will respond to the best of my ability.
Q. As of today, do you intend to offer any other opinions on bone fragility as it relates to this case?
MR. DANNINGER: Form, asked and answered at least three times.
A. I -- I have not been asked by defense counsel to prepare any additional opinions, but if they ask me to respond to some of the issues you've raised in this deposition, I may have to.
BY MS. SLEVINSKI:
Q. That's all I'm asking. Opinion No. 10, is the opinion you've written here, the sum of your opinion you plan to offer as of today in this case?

MR. DANNINGER: Form.

A. Well, what I've written in opinion 10 is self evident. It is what it is. Do you have any questions about my opinion there.

Q. I'm just asking if this is the sum of your opinions? Are you going to be adding anything else to this an as of today that you know of?

A. I haven't been asked to add any additional opinions about loss of teeth.

Q. And the materials you have cited in that paragraph, those are the materials that you relied upon in forming that opinion, correct?

A. Yes.

Q. No. 11, hypertension. The information you have, is that the paragraph that extends from page 10 onto 11, is that the sum of your opinion as of today that you plan on offering in this case?

MR. DANNINGER: Form.

A. Yes, unless I'm asked additional questions.

Q. And the reference materials in this portion that you've cited are the materials you've relied upon in forming this opinion as of today?

A. Well, the reference materials are the reference materials attached as the bibliography to my report. It is possible that I did not cite all of them under

opinion 11 that are relevant to opinion 11, so my references are the 148 references cited.

Q. No. 12, criminal activity. That portion, that paragraph the sum of your opinions that you plan on offering in this case as of today?

MR. DANNINGER: Form.

A. Unless I am -- these are my opinions. If I am asked additional questions in this area or asked to do additional work, I may well do so. But at the moment, those are my opinions.

MS. SLEVINSKI: I'm going to try and get this sped up. Can we take a ten-minute break or so, so I can make sure I've covered all my topics and reconvene, and hopefully get this wrapped up soon? Is that okay with you, Scott?

MR. DANNINGER: That's fine.

MS. SLEVINSKI: All right, we'll go ahead and take about a ten-minute break.

VIDEO TECHNICIAN: Okay. We are going off the record. The time is 4:31 and 4 seconds p.m.

(Recess taken at 4:31 p.m.)

(Back on the record at 4:43 p.m.)

VIDEO TECHNICIAN: We are now back on the record. The time is 4:43 and 50 seconds p.m.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, just kind of to go back to matters from yesterday, do you have daily time sheets that you enter your time on?
A. I don't know what you mean by daily time sheets. I write my time down on pieces of paper.
Q. Do you have a specific, you know, method of keeping track of your times so you have it all in order when you submit it to your client?
MR. DANNINGER: Form.
A. Yes, when I spend time on an issue, I write it down on a piece of paper.
BY MS. SLEVINSKI:
Q. Okay. What happens to the piece of paper you wrote it down on?
A. I throw them away after I send the bill.
Q. You had no original record of the time you spent on certain items it's just you write them on a piece of paper, then throw it away?
A. Yeah.
MR. DANNINGER: Form.
A. I -- I write them on a piece of paper and then when I get around to do billing, I put them in order on a bill, and after I've checked to be sure that I've added them up properly and got everything listed, I throw the pieces of paper away and male the bill.

BY MS. SLEVINSKI:

Q. Any additional of these pieces of paper relating to this case since the last bill you submitted?

A. Yes, yesterday, I wrote down my time on a piece of paper.

MS. SLEVINSKI: Would you please hand Dr. Garabrant Exhibit No. 162?

MARKED BY THE REPORTER:

DEPOSITION EXHIBIT NUMBER 162

4:46 p.m.

COURT REPORTER: All right.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, do you recognize Exhibit No. 162 as an e-mail sent from your e-mail account DHG 3 at Comcast?

A. Yes.

Q. And this is an e-mail you sent on Wednesday, May the 9th, 2007, to Mr. Mitch Akler; is that correct?

A. Yes.

Q. The subject reads Perrine, is that also accurate?

A. Yes.

Q. The attachments, as indicated on this e-mail, say GarabrantPerrinemedlineZ9.doc. Did you create the title of that document you attached to this e-mail?

A. Yes.

Q. What does the Z9 stand for, a Z at the end of a title?
A. Version 9.
Q. So there were eight previous versions?
A. Yes.
Q. Have you provided those to DuPont and then to us?
A. I haven't provided them to anyone, they don't exist.
Q. What happened to them?
A. Well, typically, when I work on a document, I label the first version Version 1, and when I stop working on it, I save it, and then the next time I work on it, I call it Version 2, and when I am finished, I save it, and then I delete version 1.
Q. Do you delete the version or are you renaming the file?
A. I save it with a new name, and then I delete the old one.
Q. Okay, that's all I was just trying to understand. The body of the e-mail says Michigan I've attached my report regarding Perrine, please review to be sure I've covered the issues. Best wishes. Is that --
A. Yes.
Q. Now, if you flip to the next page of this exhibit, there is attached the version of your report that was attached to that e-mail, is that correct, do you see that?

A. Yes.
Q. Now, you also have the -- the final version of your report that you've been working off of in front of you, it's Exhibit No. 151, but I know that had a messed up page, so you've been working off your personal copy. Do you have that handy, as well?
A. I do.
Q. Let's compare the version you attached to the May 9th e-mail, and the version that was actually signed on May the 10th, signed by you on May 10th and submitted in this case. The first page is the same, if you'd turn to page 2 of the report, however, on -- there is -- the changes that you made, from the May 9th version and the May 10th version, if you look, the second paragraph from the bottom on page 2, it starts with Dr. Werntz alleges, the final sentence -- well, I guess that is one long sentence, I'm going to read this to you and tell me if it's correct.

Dr. Werntz alleges that plaintiffs have been exposed to hazardous levels of the following chemicals from the zinc smelter as a result of plant emissions, soil contamination, exposure to fugitive emissions from waste piles, contaminated household dust, incidental soil and dust ingestion, consumption of contaminated vegetables and contaminated drinking

water, and there's a colon. Now, did I read that accurately?

A. Yes.

Q. Okay, and if you look over on the final version of the report you submitted on the same page, you deleted the portion starting with consumption of contaminated vegetables and contaminated drinking water; do you see that?

A. Yes.

Q. Why did you remove that final portion?

A. I think I removed that -- those two phrases because Mr. Axler reminded me that plaintiffs were making no claims about drinking water or contaminated vegetables in this case. And I looked back at my materials and realized he was right. So I deleted them.

Q. And similarly, you removed the three bullet points arsenic, cadmium, and lead; is that correct?

A. Yes.

Q. Was there a reason behind removing those?

A. I'm not sure. I think that those were redundant with page 3 where I talk about arsenic, cadmium, and lead, so I think that was -- I realized that was just a redundancy.

Q. Okay. The final paragraph on that page, the May 9th version, third line down, starting with he, he

concurred?
A. Yes.
Q. You stated he concurs with most of his recommendations but made several changes to the monitoring test. Now if you look on the final version, the -- there is several changes where you changed the pronounce to Dr. Werntz and then Dr. Kornberg, but you changed -- you -- instead of made several changes you put numerous significant changes. Why did you change the wording to reflect that?
A. Because I thought that that was a more appropriate description of the changes.
Q. Did anything prompt you to make those changes to figure out the -- was that after you spoke with Mr. Axler?
MR. DANNINGER: Form.
A. I don't recall. To the best of my recollection, the -- the issue was that I cleaned up that sentence because it was poorly constructed or the -- the part where he concurs with most of his recommendations, I realized that the reference to who he and his were was unclear, and then I felt that the changes to the monitoring tests were numerous and they were significant.
BY MS. SLEVINSKI:

Q. Okay. Moving on to the next page, page 3, May 9th version of the report states the diseases that Dr. Werntz considers to be related to exposure from the smelter sites are, there's a colon, and then it goes into the list; is that correct?
A. Yes.
Q. Okay, and if you look at the final version, you added a sentence to that which says as the following discussion demonstrates Dr. Werntz did not adhere to his own criteria for medical monitoring. Did I read that correct?
A. Yes.
Q. What was the -- what prompted you to add that sentence to this portion of the report?
A. Because as I reread it, I realized that Dr. Werntz had criteria and he wasn't even following them, so I put that in to emphasize that here's this expert who lays out his criteria I'm only going to test for diseases clearly associated with arsenic cadmium and lead and I'm going to limit testing to diseases and medical tests clearly supported by the literature or general medical practice, and as I thought back over my report, I realized, you know, he doesn't even follow his own rules.
Q. All right, go to page 5, please. You made some

changes starting in opinion No. 3, the references in your May 9th version of your report to Spelter community, Spelter population, do you see those two references in the first paragraph?

A. Yes.

Q. Similarly in the second paragraph two references to Spelter community, do you see those?

A. Yes.

Q. Now in the final version, you changed those references to class area, is that -- was there a reason behind changing it to that?

A. Yes.

Q. What was that, sir?

A. Because I discussed with Mr. Axler the issue of what was the legal issue here and he clarified for me that it was the class area, it's not the Spelter population, and so that was a distinction that hadn't been clear to me, so I went back through and edited the report to indicate uniformly that I was talking about the class area so that this report would really be focused on the group of people who were involved in the litigation, not the population of Spelter that might or might not be in the litigation.

Q. All right, if you turn to page 7, please. On the May 9th version, just below -- oh, in opinion No. 4, I'm

sorry, just below where you have the bullet point zone 1, zone 2, and zone 3, do you see the paragraph immediately below?

A. Yes.

Q. You removed a significant portion of that paragraph and the three bullet points immediately below the second paragraph. Why did you remove those?

MR. DANNINGER: Form.

A. Because they were somewhat redundant, and it just -- it -- I think that the final report was more clearly written than the draft.

BY MS. SLEVINSKI:

Q. Also, at the bottom of page 7, the final paragraph, starting with even with Dr. Werntz's assumptions, do you see that?

A. Yes.

Q. Okay. And that -- that paragraph continuing on to page 8 was deleted all the way to point No. 5.

A. Yes.

Q. For what reason did you delete that paragraph?

MR. DANNINGER: Form.

A. Again, clarity, I was able to compress my opinions down to one paragraph. I don't think -- I didn't feel that all that additional material actually added anything to the point of the paragraph that begins

with comparison of these alleged incremental lifetime cancer risks.

BY MS. SLEVINSKI:

Q. Dr. Garabrant, at the conclusion of yesterday and today, have we covered all the opinions that you intend to offer on this case of an of today?

A. I believe we've covered all of the opinions in my report. If I am asked to offer additional opinions and they're within my area of expertise, I may well do so. At the moment I have not been asked to do any additional work.

MS. SLEVINSKI: All right, thank you, I don't have any further questions at this time, Dr. Garabrant.

THE WITNESS: Thank you.

MR. DANNINGER: And we have no questions here.

MR. WICKLINE: We'll read.

MR. DANNINGER: So Dr. Garabrant will read and sign.

MS. SLEVINSKI: Scott, before we go off the record, can we ask that you get us a copy of the book chapters that he was referring to that weren't actually included on the reference list for his report?

MR. DANNINGER: I believe that you all have that book. If you'd like, we can try to arrange that, or I can give you the ISBN number.

MS. SLEVINSKI: I believe it's the cadmium chapter he was reading from and possibly the lead.

MR. DANNINGER: He didn't read from the lead, he only read from the cadmium chapter.

MS. SLEVINSKI: Okay, well, will we be able to get a copy of that chapter? Because I'm not aware that we have it. I mean if we do, we can resolve it but --

MR. DANNINGER: We will try. Yeah, I mean I don't know why we can't --

MS. SLEVINSKI: Okay.

MR. DANNINGER: -- but I just don't want to promise you the world and not be able to deliver.

MS. SLEVINSKI: Okay.

MR. DANNINGER: So we'll do our best. At the very least, we'll be able to provide you the ISBN number so that if you do want to get the book, you can.

MS. SLEVINSKI: Okay.

MR. DANNINGER: But the reason I say that is someone told me you had a copy of Rosenstock for some reason.

MS. SLEVINSKI: I'm not aware of it, but we don't have to hash it out right now, but we'll figure it out.

MR. DANNINGER: No problem.

MS. SLEVINSKI: That's it. Okay, madam court reporter, will you be able to provide a rough?

COURT REPORTER: Yes, this evening.

MS. SLEVINSKI: Thank you. Okay.

COURT REPORTER: The same format as last night?

MR. DANNINGER: Yeah.

MS. SLEVINSKI: That sounds great, thanks.

VIDEO TECHNICIAN: This concludes today's deposition. The time is 5:00 and 38 seconds p.m.

(The deposition concluded at 5:00 p.m. Signature of the witness was requested.)

LENORA PERRINE, et al.,

Plaintiffs,

vs. Case No. 04-C-296-2

E.I. DU PONT NEMOURS AND COMPANY,

et al.,

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VERIFICATION OF DEPONENT

I, having read the foregoing deposition consisting of my testimony at the aforementioned time and place, do hereby attest to the correctness and truthfulness of the transcript.

_____

DAVID GARABRANT, M.D.

Dated:

CERTIFICATE OF NOTARY

STATE OF MICHIGAN)
) SS
COUNTY OF MONROE)

I, LEISA M. PASTOR, a Notary Public in and for the above county and state, do hereby certify that the above deposition was taken before me at the time and place hereinbefore set forth; that the witness was by me first duly sworn to testify to the truth, and nothing but the truth; that the foregoing questions asked and answers made by the witness were duly recorded by me stenographically and reduced to computer transcription; that this is a true, full and correct transcript of my stenographic notes so taken; and that I am not related to, nor of counsel to either party nor interested in the event of this cause.

_____

LEISA M. PASTOR, CSR-3500, CRR
Notary Public,
Monroe County, Michigan

My Commission expires: 9/7/13

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