NO. 94-38491

JESUS VALENTIN FRIAS : IN THE DISTRICT COURT OF
VS. : HARRIS COUNTY, T E X A S
SHELL OIL COMPANY, ET AL.: 270TH JUDICIAL DISTRICT

DEPOSITION OF ETHAN A. NATELSON, M.D.
SEPTEMBER 25, 1996

Taxable Cost:
Charged to Plaintiff Mr. Jeffrey S. Thompson
Bar No. 00785101

INDEX

THE WITNESS: ETHAN A. NATELSON, M.D.

APPEARANCES:
FOR THE PLAINTIFF:
Mr. Jeffrey S. Thompson
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FOR THE DEFENDANT:
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The oral deposition of ETHAN A. NATELSON, M.D. was taken on SEPTEMBER 25, 1996, beginning at 2:00 p.m., in the offices of Gardere Wynne Sewell & Riggs, L.L.P., 333 Clay Avenue, Suite 800, Houston, Harris County, Texas, before Johnnie E. Barnhart, a Certified Shorthand Reporter and Notary Public in and for the State of Texas, pursuant to Notice, the Texas Rules of Civil Procedure, and the following stipulation of counsel for the respective parties that:

IT WAS STIPULATED AND/OR AGREED that the deposition is to be signed by the witness before any Notary Public or officer authorized to administer oaths.

(Natelson Exhibit Nos. 1 through 6 marked for identification)

ETHAN A. NATELSON, M.D.,
called as a witness and having been first
duly sworn, testified as follows:

EXAMINATION
BY MR. THOMPSON:
Q Dr. Natelson, could you state your full name
for the record, please.
A Ethan A. Natelson.
Q Dr. Natelson, it's my understanding that
you've been asked to give expert testimony in
this case. Is that your understanding as
well?
A Yes.
Q On whose behalf have you been asked to give
expert testimony?
A On behalf of Mr. Faulk, is the attorney who
has asked me to render that.
Q And do you know who the defendants are in
this case on whose behalf you've been asked
to render the opinions?
A Actually, I'm not sure.
Q Do you know the name of the plaintiff in this
case?
A Yes.

Q What is the plaintiffs name?
A A Mr. Jesus Frias.
Q And you understand that Mr. Frias' family has filed a lawsuit against the defendants in this case alleging that Mr. Frias' death was related to his occupational exposure to benzene?
A Yes.
Q My name is Jeff Thompson. I represent the plaintiffs. We haven't met until just today.
Let me show you what I've marked as Exhibit 1. It's a copy of the deposition notice for today. Attached to the notice is a subpoena. Have you had an opportunity to see that subpoena?
A No.
Q Has Mr. Faulk asked you to bring with you any documents that you created, received, intend to rely upon for purposes of the testimony you intend to give today or at trial?
A Yes.
Q Have you done that?
A Yes.
Q What I've done, just to try and save us both

the time, I've taken a look at what you've brought in. What I'd like to do just very quickly is identify on the record what we've got, and then when we proceed we can refer to it by exhibit number.
I've marked as Exhibit 2 a copy of your curriculum vitae, which you've provided dated March 10, 1996.
A Yes.
Q Is this a current copy of your CV?
A Yes.
Q I have marked as Exhibit 3, I guess a -- it looks like a billing statement. Why don't you tell me what Exhibit 3 is.
A What this is is a billing statement for reviewing the records that I was provided on this particular case.
Q All right. And when do you recall originally being retained by Mr. Faulk to review the medical records in this case?
A I really don't remember. It may be in some of the correspondence. It was several months ago.
Q I've marked as Exhibit 4 -- well, identify for me, if you would, what I've marked as

Exhibit 4.
A This is a proposed letter I drafted after I reviewed these materials.
(1 And when you say "these materials," it would be the pile of medical records that we have here today on the table?
A Minus Dr. Gardner's deposition. I don't believe I had seen that at the time I wrote this letter.
Q Do you recall -- the letter is dated September 3. Did you provide a copy of that letter to Mr. Faulk on September 3?
A I discussed it with him on the phone but did not provide a copy of it.
Q When did you first provide a copy of the report?
A I believe today.
Q Explain for me what I've marked as Exhibit 3 -- I mean Exhibit 5.
A This is a general treatise on benzene that's prepared by the United States Department of Health and Human Services. And it's updated periodically. This is a 1993 edition.
Q Exhibit 6?
A These are a series of articles concerning

aplastic anemia from the medical literature.
Q Obviously, there's a lot of things that encompass medical literature. Why have you brought with you those specific articles?
A Well, these specific articles deal with the etiology of aplastic anemia, the various etiologies of it; the frequency of it. Potential causes of it, treatment of it; and the general characteristics of the various types of aplastic anemia.
Q What does etiology mean?
A Cause of.
Q You mentioned Dr. Gardner's deposition.
A Yes.
Q There's a copy here. I think you testified that you reviewed the deposition?
A Yes.
Q Did you take any notes when you reviewed the deposition?
A No.
Q Also here is the pile of medical records that I believe you testified you reviewed. Are there any other medical records that you've reviewed in this case?
A No.

Q Among the various pages of the medical records are some tabs that are sticking out. Are those tabs something that you added as part of your review?
A Yes.
Q And what was the purpose of the tabs?
A Well, they highlighted certain things that I thought were of particular interest, such as bone marrow reports, lab values, histories, things of that nature.
Q All right. I'll give you a chance to explain those in a second.
Is there anything else, other than the things that you've brought here today that we've just identified on the record, that you have reviewed in preparation for your testimony today?
A Well, I have a large file on aplastic anemia, and I looked through it and selected certain references that I thought were appropriate; but I may well have looked at other papers, also.
Q But in terms of specific -- in the case of Exhibit 6, specific articles that you intend to point to, rely upon, quote to the jury in

this case, you have brought with you those articles.
A Primarily, but I can't anticipate what questions you might ask me; so you might ask me something that I would respond to that these articles don't give a frame of reference, which I could subsequently provide. But based on my thinking about this case, these articles are satisfactory to explain my opinions.
(a All right. Let me just ask you and maybe we can cut to the chase a little bit: Would you agree with me that Jesus Valentin Frias died of aplastic anemia?
A Of complications of aplastic anemia, yes.
(a So you agree with that.
Do you have any quarrel with the diagnosis of aplastic anemia in this case?
A No.
Q So with respect -- and one of the things, in fairness -- let me back up.
Have you had an opportunity to review any pathology or slides in this case?
A Yes.
Q So you have reviewed the slides?

A Yes, I have reviewed the slides.
Q But if I understand your previous answer, with respect to the pathologic diagnosis or whether or not Mr. Frias, in fact, had aplastic anemia, you don't have any disagreement with the doctors at MD Anderson, correct?
A That's correct.
Q Dr. Quraishi?
A Dr. Quraishi was one of the doctors who originally saw him at Pasadena Bayshore?
Q Correct.
MR. FAULK Let me lodge an objection, because I want to make sure that we're not being misleading here. If you're talking about the disease category aplastic anemia, I think the question is fine. But there are different diagnoses of different categories of aplastic anemia and different etiologies of it
MR. THOMPSON: That's fine. I am not talking about etiology. I'm trying to get the issues focused here.
Q (By Mr. Thompson) You are not going to testify nor do you intend to testify at trial

that Mr. Frias did not have the disease and die of complications from the disease aplastic anemia.
A He did have aplastic anemia and died from complications thereof.
Q Would you agree with me that his aplastic anemia was caused by his occupational exposure to benzene?
A I think it is highly unlikely.
Q What do you think caused his aplastic anemia?
A I don't know.
Q If I understand your opinion, you don't believe it was caused by occupational exposure to benzene.
A Yes.
Q But you don't know what caused it.
A I would place it in the category of idiopathic aplastic anemia. Idiopathic acquired aplastic anemia, in which there are several possible causes; but we don't know which one it was.
Q And idiopathic, if I understand, I guess, medical terminology correctly, is a term used to describe a disease when you just don't know what caused it.

A Frequently that's true. It means of itself.
Q Do you have any opinions about what else might have caused Mr. Frias' aplastic anemia?
MR. FAULK: You're asking him to speculate?
Q (By Mr. Thompson) No. I'm asking if you have any opinions based on a reasonable medical probability about what agents other than benzene might have caused Mr. Frias' aplastic anemia.
A Well, certain viral diseases might have caused his aplastic anemia.
(1 What types of viral diseases?
A Hepatitis viruses occasionally cause aplastic anemia.
Q Which virus?
A Well, frequently it's C and also the new virus G. He was tested for C. He was not tested for G.
Q Do you see anything in the medical records to indicate that there was any clinical indication that Mr. Frias had hepatitis of any subcategory?
A Yes. He had elevated transaminase values on a number of occasions before he came to the

hospital with aplastic anemia.
Q Is that lab finding diagnostic of hepatitis?
A No.
Q Is it consistent with any other possible explanations?
A Well, it's consistent with liver injury, but there could be many, many things that could cause liver injury.
Q And, in fact, would you agree with me that prolonged exposure to toxins like benzene could cause liver injury?
A Well, I think you would have to qualify the degree of exposure and the levels of exposure. Generally, people who would have liver disease from benzene would be critically ill. That would not be an early finding of benzene toxicity.
Q But assuming -- and I will get to levels of exposure. Will you agree with me that liver function could be a clinical manifestation, a liver function problem, that would be reflected in the lab reports that you've just described?
A Well, chemicals can cause abnormalities in liver function.

Q Correct.
A We certainly accept that.
Q And the tests that you just described would indicate some abnormalities in liver function.
A Yes. All it indicates there are abnormalities in liver function. It doesn't indicate the cause.
Q Okay. Is there any other indication that you have seen in the medical records you've reviewed that Mr. Frias had any form of hepatitis?
A Other than the elevated transaminase?
Q Yes.
A No.
Q Any indication from the records you reviewed that any other physician thought or expressed the opinion that he might have hepatitis?
A No.
Q What other possible causes, in your opinion, could be expressed for Mr. Frias' aplastic anemia?
A Well, in the area of viruses, there's another virus called parvo virus that we see as a cause of marrow aplasia; primarily today in

patients with AIDS. Also, occasionally in patients with sickle cell disease and other hematologic problems.
Q Any indication that Mr. Frias had AIDS?
A No.
Q Any indication that Mr. Frias had sickle cell anemia?
A No.
Q So is there any indication in the records that you reviewed that Mr. Frias was suffering from any kind of effect from the parvo virus?
A Well, he was not tested for it. So we don't know that he might or might not have it. People who have that are often entirely asymptomatic. The virus doesn't necessarily cause them to feel ill, aside from making the blood count go up.
Q Do you have any evidence that you can point to in the medical records that indicates that Mr. Frias had the parvo virus?
A No.
Q What other possible causes?
A Well, the --about 75 or 77 percent of all aplastic anemia is generally classified as

idiopathic, meaning that there likely is a cause but we don't know what that cause might be.
Q What is it that convinces you that it was not caused by benzene exposure?
A Well, I think first you have to look at the incidence of that illness. In other words, you're asking us to make a diagnosis of benzene-induced aplastic anemia. Now, Dr. Gardner has been a hematologist for many, many years. I would guess longer than 40 years.
And in his deposition, he indicates that while he's seen many cases of aplastic anemia, he doesn't have -- he hasn't taken care of a case of benzene-induced aplastic anemia in all of those years.
Q Let me interject. Have you?
A No. And I've been a hematologist about 27 years, almost 30 years.
Q All right.
A So that in about 70 years of combined experience, we haven't seen such an entity. So first, that tells me that either the two of us, who are working in an area, the Gulf

Coast area, in which there are a lot of petrochemical industries, and probably many people who have the potential to be exposed to benzene, we haven't seen this particular diagnosis.
And that suggests that either the diagnosis is exquisitely rare or we have very unusual practices, that somehow we're not getting to see these patients.
Q Okay. Well, let me ask you: What is your understanding of what the expected, you know, from an epidemiologic standpoint, incidence of aplastic anemia is in a general population?
A Well, in the United States it's thought to be about two to five cases per million population. So in a city like Houston, a couple of million people, you would see several cases a year, anyway.
Q How many patients have you treated, estimate, in your 25 years of practice?
A Oh, I would say probably in the range of 20 that I've personally treated. I may have seen others that others have treated; but personally taking care of patients, I would say about 20.

Q How many total patients can you estimate that you've treated in your 25 years of practice?
A With all hematologic problems?
Q Yes.
A Oh, I couldn't even put a number on that.
Q A million?
A Certainly not millions. I've probably done bone marrows on about seven or eight thousand people with various kinds of blood problems over the years; thousands anyway. Certainly thousands I've done marrows on. And others that I've seen that I haven't done bone marrows on. So a large number of patients.
But getting back to your original question as to why I don't think this was benzene induced, I think the first situation is that you look at the incidence of the disease; and based on Dr. Gardner's and my own experience, it suggests that it's very, very rare.
And then I've looked at papers from this decade describing patients with aplastic anemia. And as I indicated in my report, benzene was not cited as a cause in any of more than 700 patients.

So that my conclusion is that this is a very, very rare circumstance. So if I'm going to make that diagnosis, I'd like it to meet certain criteria. There are certain things I would like to see before I would come to that unusual diagnosis.
Q What are they?
A Well, not necessarily in order of importance, but there are certain things that I would like to see. For example, epidemiologic data. If, for example, I was shown that many of this person's co-workers developed aplastic anemia or that people working in his particular area had a very high incidence of aplastic anemia, many times the incidence in the general population, that would suggest that there's some kind of an agent or agents that he's exposed to that might cause that. But none of this information suggests to me that he has cohorts in the area with a lot of aplastic anemia. So epidemiologically, there's nothing that suggests to me about the locale that he's working that would predispose to aplastic anemia.

(a Okay. But let me interrupt you for a second. You do know that there was pure benzene being shipped across the barges at the refinery. You know that?
A Yes. I accept the fact that this man had the potential to be exposed to benzene. But I'm suggesting that I don't see this area that he's working in as a hotbed of aplastic anemia in terms of epidemiologic data.
(a Do you know of any specific studies that were conducted at the Houston refinery docks with regard to, you know, prospective, cohort studies, retrospective cohort -- any kind of epidemiologic study conducted by the defendants in this case at the Houston docks?
A No.
Q Are you aware of any studies that were conducted by any petrochemical company specifically at a dock operation that involved the shipment of benzene and benzene-containing products?
A Well, some years ago I looked at some statistics from the Amoco plant in the Galveston area, I believe, and they had data on illnesses that their employees had,

frequencies and so on.
And as I recall, there were no unusual incidences of either acute leukemia or aplastic anemia. So -- but that's the closest thing I could think of that has to do with what you're asking.
Q Okay.
A But in any event, getting back to my question, I don't -- nothing in what I've been shown, it may exist, but from what I've seen, I don't see any data that suggests that the incidence was unusually high of aplastic anemia where this person worked.
Q Have you seen any information provided to you by the defendants that indicate that there were a number of people who worked out at the docks that died or left the facility suffering from malignancies?
A I haven't seen any data of that nature.
Q Would malignancies -- would cancer in general and specifically leukemia be relevant to the inquiry that you're talking about?
A It would be relevant to acute leukemia but not so much other cancers. We know that probably -- it's a remarkable fact, but

probably about a third of the cancers we see are related to cigarette smoking.
But in the case of chemicals, we're specifically talking typically about things like aplastic anemia, or more commonly acute myeloblastic leukemia. So we talked a little bit about the epidemiologic data or lack thereof. So that would be one thing I would be looking for.
Then I would be looking for the fact that there was some laboratory evidence that this person had been exposed to high levels of benzene. Now, such laboratory evidence might be a low white blood cell count at times during his occupation.
It might be a very elevated urinary phenol level; something to suggest that he had gotten a blast of benzene. And there are numerous blood counts that I saw ranging over a number of years and all of them were normal.
Q How many do you recall seeing over a 20-year period?
A Perhaps ten. I don't remember the exact number. But I think in my letter I commented

over the years that I saw blood counts listed. I don't remember the numbers, but there were probably at least ten. And they all had perfectly normal white cell counts and so on. So there's nothing unusual about his blood counts.
Q What about the red blood counts? Did you notice anything unusual about the red blood counts?
A Not that would relate to benzene exposure.
Q All right.
A There were a couple urinary phenol levels that were reported, which were normal. So let's say laboratory-wise, I did not see anything that would suggest to me that he had changes in his blood counts or chemistries count with respect to benzene.
Q Did you notice any abnormal urinary phenol counts?
A No.
Q All right.
A I might say there was a urinary phenol level that was thought to be abnormal, but it's not when you look at the data.
But in any event, the -- getting

back to the things I would be looking for.
We talked about epidemiology. We talked
about the chemistry. Let's say toxicologic
data. We know that people who get white
counts from benzene typically have prolonged
exposures of about 75 to 100 parts per
million of benzene.
(a When you say "prolonged exposure," you mean
repeated exposures at that level?
A Yeah, repeated exposures at that level over
days, weeks, months. And I didn't see
anything that suggested to me that he had
levels measured in the ambient air that he
was exposed to that were high. That data may
exist, but I don't believe it's in any of
this material that I was provided.
Q If I could show you data that shows that in
his work space that he worked at on the
docks, I guess 18 years -- I almost said
20 -- but 18 years, that there were area
monitoring results that range from, you know,
one part per million to hundreds of parts per
million, would that be relevant to your
diagnosis?
MR. FAULK: I'm going to object to

the question because area monitoring results are misleading. They're not relevant to the calculation of personal exposure, and I think you know that.
MR. THOMPSON: Okay. Well, let me ask the doctor.
MR. FAULK: No. I think -
MR. THOMPSON: Let me ask the question in fairness.
(a (By Mr. Thompson) Do you believe that it would be relevant to deciding whether or not there was, in fact, exposure to examine area monitoring data that related to the workplace, the very work environment that a man worked at for 18 years?
MR. FAULK: I'm going to object because the question assumes that Mr. Frias was in the area undergoing those exposures in that particular environment at all times, and that the question doesn't quantify the duration of exposure.
Ca (By Mr. Thompson) Do you understand my question, Doctor?
A I understand your question, and I'm going to answer it this way: I've worked in

laboratories for many, many years, and I know that you can have two people working within a few feet from each other in the same laboratory and one is getting tremendous exposures to something and the other one is getting nothing.
And depending on where you measured your levels in the air, you might find low levels or high levels or intermediate levels. And unless you can put the person's head under the hood where all the chemicals are, you can't make much out of that data.
Q Okay. Well, let me ask you this: If there was monitoring data, personnel monitoring data now, something attached to human beings, that showed that tasks that Mr. Frias performed during his 18 years at the docks involved exposures as high has 750 parts per million, would that be relevant to your differential diagnosis?
MR. FAULK: I'm going to object as the question assumes that no protective gear was worn. It's an incomplete hypothetical. It is misleading as stated.
Q (By Mr. Thompson) Do you understand my

question, Doctor?
A I understand your question. And as I understand it, you're suggesting that there may be data that he personally was breathing in many hundred parts per million for some extended period of time:
Q Yes.
A Okay. If I saw such data, I would be interested in that data. As I say, what you're looking for in the case of benzene-induced aplastic anemia is that the exposure dented the bone marrow or the blood counts. And we don't have any evidence that it did in the blood counts and chemistries that we have.
So I think that data is interesting. But in looking at it in terms of the meaning of it, we don't see that he had the exposure that we would like to see to cause aplastic anemia. Because to do that, we would expect to see low white counts or other cytopenias from time to time.
Q But when you refer to the data, what data did you review that relates to exposure?
A I reviewed what was ever in this pile. And

if you have some particular sheet that you want to go over, we can look at it.
Q But the pile I think you're referring to is the medical records, correct?
A Yes.
Q And have you reviewed any industrial hygiene monitoring data in this case?
A I've reviewed only what's in this pile. Some of it has to do with his work history. There are some urinary phenol measurements in there. I don't recall if there are any air measurements of benzene.
MR. FAULK: Just to be clear, there are records in the pile that are company records. They're not just medical records from hospitals and physicians.
Q (By Mr. Thompson) But do you recall, Doctor, specifically whether you have reviewed any monitoring data, whether it be personnel monitoring data or area monitoring data, that deal with levels of benzene in the ambient air at the docks?
A I can't recall specifically that from this pile.
Q You were talking under Part 2, and I think

Part 3 as well, as things you would look for as evidence of exposure. Do you recall that?
A Yes.
Q And you talked specifically about lab testing.
A Right.
Q Wouldn't the monitoring data that was done by the refinery for the job classification that Mr. Frias worked in be relevant to your No. 2 in how you would determine the cause of his aplastic anemia?
A Well, I think it would be relevant if it was clear that this person was breathing in or getting through his skin or some other way those kinds of levels. In other words, if you could demonstrate to me that someone was sitting and breathing for an eight-hour day 300 to 500 parts per million benzene, I would think that's significant, yes.
Q What about 10 parts per million?
A No, I wouldn't think that was significant.
Q Eight hours a day every day?
A Not to cause aplastic anemia.
Q And it's your opinion that there needs to be some peaks of exposure?
A No. I think you're -- yes and no. Both

peaks and long durations of exposure.
Q So if I understand what you're saying, that you -- I mean, you would agree with me that aplastic anemia is a disease that has been and can be associated with chronic exposure to benzene?
A At high levels, yes.
Q And what do you define as high levels?
A Typically levels in the 300 range.
Q And it's your opinion that Mr. Frias would have had to have been exposed to levels at 300 parts per million continuously for 18 years for you to connect --
A No, not for 18 years.
Q Okay. How long?
A Possibly a few years. Possibly three or four or five years might do it at those kinds of levels.
Q How does peak exposures at a hundred, say, to 300 parts per million, if that's the range we're talking about, the 300, I think, is a number you used, right?
A Yes.
Q How does that relate to the development of the disease if it is superimposed upon

continual low-level exposure?
MR. FAULK: I'm going to object to the question because it doesn't define the duration of the exposures.
Q (By Mr. Thompson) Do you understand my question, Doctor?
A Yes, in general.
All I think we can say is that the most people who've written about aplastic anemia from benzene indicate that in general the illness is dose related. And the more dose you have over the longest period of time means the more material you were supposed to, and that puts you at a higher and higher risk of getting aplastic anemia.
Q And when you talk about dose over a period of years, that could be a cumulative number, correct?
A Yes.
Q So the cumulative number could be arrived at either by a long period of low to moderate exposure or a shorter period, I think as you described it, of high exposure.
MR. FAULK: I'm going to object to the use of the term "cumulative," because it

assumes that everything is building up without metaplasis. I think it's misleading in that point.
A Well, I think that what you're looking for, and, again, to specifically answer your question, I'm not sure that I can, but I think what you're asking is the relationship between high levels and duration.
And what I'm suggesting is that the higher the level and the longer you're exposed to that level, the more benzene you're exposed to. And the more benzene you're exposed to the more likely you are to get some complication from it.
(a (By Mr. Thompson) Do you -- in your opinion, is there a threshold in a cumulative number in parts per million years that somebody needs to reach before it would be your opinion that you could link aplastic anemia to established benzene exposure?
A I don't know that number.
Q Do you have a range?
A Well, as I said, generally the people with aplastic anemia have been described as having rather enormous exposures. Exposures of 300

to 500 parts per million for very long periods of time. Years. So what their cumulative dose would be, I don't know. It would be very high.
to I interrupted you when you had gotten to No. 3, which is toxicologic data.
A Okay. Next would be the characteristics of the aplastic anemia. Now, all aplastic anemia is not exactly alike. The end result may be alike, in other words, the bone marrow that has very little cellularity. But the aplastic anemia that's been described with benzene is a little different than what we call idiopathic aplastic anemia.
Q How?
A It's different because of the fact that in idiopathic aplastic anemia the bone marrow is empty, as it is with this case. In the aplastic anemia from benzene, typically the bone marrow is not empty. It may be, but that's not the characteristic finding. The bone marrow is what we call dysplastic. It may have reduced numbers of cells, but the cells that are present are very sick looking. And we refer this as a

myelodysplasia or a dysplastic syndrome.
And some people, for example one of these articles I have here, refers to it, I think, as a proliferative aplasia, meaning that there is bone marrow growing and proliferating, but it's proliferating in a sick fashion.
And actual aplasia from benzene is an unusual finding. It is not the characteristic marrow finding. That's noted, in particular, in this article from one of the textbook.
So that the bone marrow findings that he has of severe aplasia, while not - they certainly don't eliminate benzene as a cause, they are not the classical feature of benzene-induced pancytopenia and aplasia.
And in addition to the marrow morphologic findings, because of the fact that benzene is a leukemogenic agent and a myelodysplasia inducing agent, frequently chromosomes in people that have sick bone marrows from benzene poisoning are abnormal.
So that classically in idiopathic aplastic anemia the marrow chromosomes are normal.

In people that have had a period of dysplasia, as you might think from chronic exposure to benzene, frequently their marrow chromosomes are abnormal. And in this case, the chromosomes were normal, so I think that more favors idiopathic aplastic anemia, although it does not exclude completely benzene-induced aplastic anemia.
Q And you've said that a couple of times. Have you or have you -- what have you done to exclude benzene as a cause of the aplasia in Mr. Frias' case?
A Nothing.
MR. FAULK: Other than what he just told you?
A Other than what I just told you. Because of the fact that patients who walk in with aplastic anemia very rarely, if ever, have a sign on them that says "I have aplastic anemia from ," and the agent is listed. We always infer the diagnosis based on the history, the physical, the epidemiologic data, the history of drug and chemical exposure, the laboratory findings. We make an inference. We never can

prove with absolute certainty that the aplastic anemia that we're seeing came from what we think it came from.
Q (By Mr. Thompson) And what you've described is, I guess you would agree with me, that the traditional method that the medical doctors employ in diagnosing disease is a differential diagnosis?
A Yes.
Q And what you do when a patient walks in your door is you take a history, correct?
A Yes.
Q You do a physical exam?
A Yes.
Q Oftentimes, based on the history and physical you might have an impression of what you think in your medical opinion might be the possible problem, correct?
A Yes.
Q And you would then maybe note that as an impression, but note what additional things -- and that impression might create a differential diagnosis, a list of possibilities, correct?
A Yes.

Q And you would then decide whether or not you needed to do testing or something that would help rule out or move the different possibilities up or down your list.
A Yes.
Q Of that -- of those things that we've just described, the history, the physical, the lab testing or objective testing, is there any one of those three things that you can rely solely upon?
A Well, as I've said, there is no one test in any form of aplastic anemia that proves with certainty -- we're talking about acquired aplastic anemia -- there is not any one test that proves with certainty that a specific agent caused the illness in that particular person.
Q For that reason, a doctor in your position or doctor in Dr. Gardner's position or Dr. Quraishi's position necessarily must rely to a large degree on the history and physical.
A Yes.
Q Would you agree with me that the history in the case of aplastic anemia is particularly

important in trying to determine the etiology?
A Yes.
Q Can you tell whether or not anybody specifically inquired into Mr. Frias' exposure to benzene on the job?
A Well, I believe the history and physical from MD Anderson Hospital comments about the fact that he had possible exposures to benzene. It doesn't detail a work history from him. It comments about his occupation and his potential exposures.
Q Is it -- based on your professional opinion and your review of the records, is it your opinion that MD Anderson, the doctors that treated him at MD Anderson, made an attempt to decide whether or not benzene causes aplasia?
A Well, I think that they did in the sense that they took the history and physical as you commented and they talked to the patient, they examined him, they interpreted the lab data, and made a judgment as to whether or not they felt a drug or a chemical or a virus or whatever was the cause of his aplastic

anemia. And their judgment was that it was in the idiopathic category.
Q And that's your reading of their reports?
A Yes.
Q What about Dr. Quraishi?
A I don't recall with certainty what he said. I believe that they did an original bone marrow at the admitting hospital and the patient was transfused. I don't recall. We'd have to look at his history and physical to see what he commented on.
Q If Dr. Quraishi had concluded that the aplasia that he saw -- because Dr. Quraishi was the referring physician, correct?
A Yes.
Q If he had concluded after his history and physical and his review of the referral report from MD Anderson that the aplasia was caused by benzene exposure, would that be important to your evaluation in this case?
A Not necessarily.
Q Why not?
A Well, different doctors have different opinions about things. And when I see a patient with cancer, I would like to review

the slides, I would like to be certain I agree with that diagnosis. The fact that someone else has made a particular diagnosis may or may not be helpful.
Q Have you reviewed the testimony of Mr. Frias' co-workers in this case?
A As I say, I've looked through what's in that pile; and if that was included in there I probably glanced through it.
Q Do you recall reviewing any testimony about the work practices at the docks as it related to specifically to benzene?
A I don't recall that.
Q Do you remember ever being informed or seeing anything in the documents you reviewed that talked about using benzene to wash down the surface of the dock out at the dock?
A I don't recall that specifically.
Q Or washing hands and tools and clothes in benzene?
A I don't recall that.
Q In your practice, you treat, I think you said, a number of people that work in an industrial setting, correct?
A Yes.

Q And you've evaluated, I assume, people with blood disorders to try and determine whether or not benzene was a cause.
A Yes.
Q Have you ever, in your practice, concluded that benzene, in fact, caused any of the blood disorders that you've treated in patients?
A Yes.
Q What kind of work did those patients do?
A Well, I can recall one fellow -- I even, in fact, recall his name, Joel Landers -- who had worked for many years with a variety of chemicals; I believe in a Louisiana plant. And he had had a number of blood counts showing depression of his white count that would later recover over the years. And he was taken away from chemicals, put back in, taken away. And eventually he developed a severe myelodysplastic syndrome which eventuated in acute leukemia. And I felt fairly confident that based on the work records that he had and the exposures that he had that it was probably chemically related.

Q Do you know what -- specifically what kind of chemicals he worked around in his job?
A I believe that benzene was there, but that was not the predominant chemical that he worked with. And I'm just blanking on what it was, but it was not benzene.
Q. Was that a product that might have contained benzene?
A I just really don't recall. I would have to look back on his records. He worked with a lot of nickel, very high doses of nickel in some kind of chemical bonding operation. And phosphorus at very high levels. I really don't remember all the chemicals he worked with, but it was considerable numbers of chemicals.
(1 But of all of those things that you've just named, I don't think any of those have been associated with myelodysplasia.
A Well, heavy metals. Arsenic has been associated with acute leukemia; and he was exposed to a lot of heavy metals. And probably arsenic was used in the nickel production that he was involved with. So it could have been arsenic related. He may well

have worked with benzene, too, but he certainly worked with chemicals.
Q Any other that you can recall?
A I've seen a couple of people with myelofibrosis, which is another unusual disease that has been thought to be caused by benzene. And I saw one fellow, I recall, who for about 30 years had driven trucks that contained benzene and would commonly lift the lids to sniff to see if it was really in there.
And he developed myelofibrosis; and I thought many, many years of exposure at probably high levels. It was high risk that that caused it. We don't know what causes most myelofibrosis, but I thought in that particular case it was suggestive that benzene would be the cause.
Q In your example of myelofibrosis --
A Yes.
Q -- rare disease, relatively rare disease, correct?
A Well --
Q I think that's what you said.
A Well, it is rare; but it depends on who

you're talking to. In other words, to a hematologist, it isn't rare. I might see a case a year. But to a general practitioner, they might see a case in their whole lifetime of practice.
Q What I mean, and what I'm getting at, is that is a disease not unlike aplastic anemia that in the general population is a rare thing to see.
A It's not as rare as aplastic anemia, but it is an infrequently seen disease, yes.
Q And I think your other comment about myelofibrosis was that it was a disease for which they commonly don't have an explanation.
A That's correct. In most cases we don't have any exposure history to chemicals, and we call it idiopathic.
Q In this particular instance, you believe that it was not idiopathic and could be caused by the chemical exposure because of the information you received about the job this man performed.
A Yes, in part.
Q How many years did he perform the job you've described?

A It's a fuzzy recollection, but I would guess it was almost 30 years.
Q If I understood your description correctly, he drove a tanker truck of some sort and got involved in sampling or looking at the product in his truck.
A That's correct. On a regular basis.
Q And that would be the kind of job that, based on your basic understanding of, you know, the industry in general, would potentially involve high levels of exposure.
A From his description, yes.
MR. THOMPSON: Do you need to take a break?
MR. FAULK: I've got a couple things I have to do. Can we take about five minutes?
MR. THOMPSON: Yes. That's fine.
(A recess was taken)
Q (By Mr. Thompson) Doctor, we had kind of been, in outline form, going through the steps that you were describing as -- you were describing to me how you had determined that you believe that Mr. Frias' aplasia was not related to benzene exposure.

A Yes.
Q And as we went through, the first point you made was to review available epidemiology.
A Yes.
Q Right? No. 2 was to look for evidence of exposure, and you specifically referred to the lab testing, correct?
A Yes.
Q No. 3 was reviewing toxicological data that was available.
A Yes.
Q And with regard to that, what specifically did you -- I assume you're talking about what's out there in terms of the medical literature and articles.
A Yes.
Q Studies and things that have been done.
A Yes.
Q How is that different from the epidemiology, in particular?
A Well, epidemiology might give you clues as to an etiology. Perhaps I can give an analogy. You might find, let's say, that a farmer or farmers have a very high incidence of some particular problem. Well, that would be

found on an epidemiologic basis. Let's say all your farmers in Utah are dying at age 50. So there must be something that's killing them.
Well, then you have to go and look, Well, was it the pesticides they sprayed? Is it the fact they're exposed to certain viruses that their animals have? Is it the fact that they're exposed to certain soil bacteria?
In other words, the epidemiology doesn't prove what the agent was; it simply gives you a general idea of hot spots of disease or areas that you might want to focus down on to try to look at causes. Whereas specific chemical data gets into the fact, Well, okay, now we accept that a particular chemical causes a particular problem. Well, how much of that chemical does it take to cause that problem? So when you're looking at chemical data, it's a little different than epidemiologic data. There is some crossovers.
Q It's more specific and more chemical specific.
A Yes.

(a Whereas epidemiology is population specific.
A If you will, yes, sir.
(a I guess in an ideal world in this case you would be looking for an epidemiologic study that addresses only, you know, I guess dock workers who worked at the Houston refinery between the years 1976 and 1994.
A Well, if you wanted to focus that carefully. But I would simply be looking for something that, let's say, Gulf Coast industry people, for example. You could get either cone down with the microscope or go up on low power, depending on how much you wanted to do. Or people in Texas or people in southern United States.
In other words, are there hot spots of aplastic anemia? And then you might focus down and see why are those hot spots there. But I don't know of any evidence that we have that we have hot spots of that in this environment. In fact, Dr. Gardner's and my experience would certainly suggest that we don't.
Q Are there any specific epidemiological studies that address aplasias that you have

reviewed and based, in part, your opinions that you are expressing today?
A Well, some of these studies I believe have to do with epidemiology in terms of you asked earlier what's the incidence. That's in a sense an epidemiologic study. How many patients per particular population. Then you look at what was the age, what was the sex, what differences do you see. And certain things do stand out in epidemiologic studies.
For example, in aplastic anemia there's some suggestion that, like Hodgkin's disease, there are a younger group of people that catch it and an older group that catch it. And there are also certain sex differences that appear. But I don't know that any of that data was pertinent to this case.
Q If I understand your process correctly, you're saying you should look to the available epidemiology. You're not suggesting that you would go out and conduct a study.
A No, certainly not.

Q You look to the available epidemiology and see if it points you in a direction.
A That's correct.
Q Is it your opinion that the epidemiology out there with respect to industry in general, benzene in general, whatever, however you want to characterize it, does not point in the direction of benzene as a possible cause of aplastic anemia?
A Well, the information that's out there suggests that in the past, when industries were unregulated, benzene was a significant cause of aplastic anemia. But that for many years, benzene-induced aplastic anemia is negligible.
Q Why is that? If you can draw a correlation between those two facts, I would think that it had something to do with the fact that the industries now are more tightly regulated as to benzene.
A That may be so.
Q So to the extent that you've got a worker in an environment that for whatever reason is not being closely monitored or regulated, of what value is that data?

MR. FAULK: I'm going to object that the question is vague and ambiguous.
A I'm not exactly sure what you're asking me.
Q (By Mr. Thompson) I guess, if I understood your testimony correct, is that the epidemiology that is out there, that you are familiar with, indicates that historically benzene exposure has been associated with aplastic anemia.
A Yes.
Q But that in more recent epidemiology, that the correlation or, in fact, the incidence of aplasias are going down in an industrial context.
A Have gone down, yes.
Q Have gone down. And I think that we agree that a possible explanation for that could be the fact that industry, in fact, over the last 20 years has had to reduce the levels of benzene exposure.
A Yes, that would be a reasonable assumption.
Q But you would agree with me that historically that the studies done during the years when the levels of exposure were, I guess in your words, high, that the studies show a

relationship between benzene and aplastic anemia?
A Yes.
Q Then when we get to Step 3, because we're trying to differentiate between the two, the toxicological data would be looking at what's been published, what's out there as to the specific poison benzene and how it affects the body.
A Yes.
Q The fourth thing I think we talked about I think was really pathology, which is looking at the disease process itself. And I think that you characterized or pointed out the difference between aplasia and dysplasia.
A Yes.
Q And if I understand your opinion correctly, it's that aplasia is rarer and doesn't -- hasn't tended to be as associated with benzene?
A That's correct. In benzene, while aplasia can certainly occur, it's been primarily dysplasia, which may eventually lead to aplasia. But that aplasia itself is considered to be certainly less common than

dysplasia.
Q. And when you say that the dysplasia may eventually develop into aplasia, what does that mean?
A Well, when you see sick bone marrows, for example, in people that we give chemotherapy to, like benzene that may cause a dysplastic syndrome. And as you follow such patients, what you find is that the bone marrow may become aplastic, the cells may disappear from it.
The sick cells, the few sick cells that are there, may become air. They may be gone. Or the sick cells may get so sick they convert into a leukemia. So you can see various changes that occur in dysplastic marrow. They can go different directions.
(a Based on your review of the medical records in this case, it's your opinion that Mr. Frias' disease process never passed through a dysplastic state?
A Correct. Because it appeared that his illness occurred quite suddenly. One day he noticed red spots on his feet and the next day he noticed bleeding from a tooth, and

then he came into the hospital and was found not to have any blood. So his disease appeared to occur very abruptly.
Q No clinical indication in your review of the medical records that there might have been something wrong with him prior to?
A Not that I saw.
Q But at any rate, it's not your testimony that because -- assuming that he was first diagnosed, in the first manifestation of his disease was, in fact, an aplastic state, if I understand you correctly, you are not testifying that that means that benzene couldn't have caused it.
A That's correct.
Q Is there a next step after the pathologic differences?
A Well, I think the pathology, I suppose you could divide that into really two areas. One is morphology. In other words, what does the bone marrow look like.
And the second would be, let's say, other tests such as cytogenetics, the chromosomal analysis that he had. And his chromosome analysis was normal, as we

commented, which certainly does not exclude benzene or other toxins, but it makes it less likely.
Q When we were talking about exposure, cumulative doses and things like that, you used the terminology that there needed to be an exposure sufficient to dent the marrow. Do you remember using that word?
A Yes.
Q Tell me what you mean by that.
A Well, in general, when we look, for example, at chemotherapy-induced myelodysplasia or leukemia, what we find is that low levels of chemotherapy is not frequently associated. It's typically very high levels of chemotherapy which result in significant suppression of bone marrow function for a period of time.
And what presumably is happening is that you are damaging stem cells by producing various changes in the DNA. And you may not get that by low-level exposure, but you may more easily get it by very high level or intense exposure.
Q In use, let's say, with your analogy of

chemotherapy. If the chemotherapy is successful and doesn't cause the death of the patient, do the dents remain in place or do they -- do the processes of the human body repair those dents?
A Well, generally they're repaired. We generally feel, and I believe the literature supports that if a person, for example, gets high doses of chemotherapy, there is a risk period during which leukemia or bad things may happen. And that peaks around 3 to 7 years.
But typically by about 11 or 12 years, the risk is gone and the bone marrow has either gone bad during that period or it has repaired itself.
Q. So in using the paradigm that we're talking about of a very acute injury, short period of time, high level, big dent.
A Yes.
Q That the extent to which that trauma, that insult, that injury to the marrow is going to develop aplasia, let's say, it would be a relatively short period of time? I think you said what? Seven to --

A Well, from chemotherapy, I was talking about acute leukemia, not aplasia. Aplastic anemia from chemotherapy is not common. Like in the benzene situation, we can induce leukemia all right; but it's actually quite uncommon to get aplastic anemia. We more likely get dysplasias.
Q And why -- do you have an opinion or a theory about why that is true?
A Well, it would be complete speculation. I think that most people feel that in true aplastic anemia, when the bone marrow disappears entirely, what usually is happening is there's some kind of an immunologic set up such that the body is starting to destroy its own cells. That you didn't just kill them off with your drug. You've done something to jolt their immune system such that the body perpetuates destruction.
Q And so now we're talking as opposed to etiology, which would be the connection between the agent and the disease, now you're talking about the process, I guess, that effectuates the disease or causes the

disease.
A Yes. Perhaps, yes.
Q What about benzene? How does benzene cause the damage to the marrow?
A Well, I think that benzene is really very, very close to the chemotherapy drugs we use. The breakdown products of benzene, the quinones, are inhibitors of an enzyme system we call topoisomerase. And it's a DNA remodeling enzyme system.
Q It does the repair.
A That does the repair. Well, it doesn't exactly do the repair. What it does is this: DNA is very tightly coiled. And in order for the DNA to duplicate itself it has to uncoil. And the topoisomerases allow the DNA to uncoil.
Well, if you poison the topoisomerases, you've now got the DNA with its pants down; it can't get back together properly, and defects occur. And depending on how many of those defects occur, the body can fix it. The body has an enormous capacity to fix those things. But sometimes you can overwhelm it.

So all of our drugs, even though they're very diverse chemically, those that are topoisomerase inhibitors are often associated with what we call therapy-related leukemia or secondary leukemia or chemical-induced leukemia, whatever you might call it. I think benzene is simply another chemical that does that same thing.
Q In a general sense, would it be fair to characterize what you're describing as a bone marrow toxicity, a reaction in the bone marrow just to the insult of the chemical?
A Yes. I think the chemical is interfering with the normal maturation of cells; and in so doing occasionally can cause a persistent defect that gets you into trouble.
Q How is the aplasia different in this paradigm that you and I are talking? How is the aplasia different from leukemia?
A Well, by aplasia, what you have is simply a lack of cells. In the case of leukemia, what's happened is the bone marrow has replaced the cell with blanks. Cells that don't have any function. We call them blasts. And those cells fill up the bone

marrow but they don't work.
And so you're prevented from making normal cells. And you may have a situation where the bone marrow is totally empty or a situation where the bone marrow is full, but to the body it makes no difference. There's no blood production. In one case, it's replaced by a cell that's not working and we call it leukemia; and the other case it's replaced by air or fat.
Q In both cases, though, the disease process is a result of an insult to the marrow itself.
A Yes.
Q Do you have an opinion as to why in one case or another the insult ultimately leads to the fat or to the blanks?
A Well, I suppose in part it depends what particular chromosomes are damaged, where the damage occurs in the chromosome, how many of the, what we call stem cells, which are the cells that give rise to new blood, how many of the stem cells are damaged.
It's probably a multifactorial process. And I don't know that we know what makes one person become, let's say,

myelodysplastic and another one become acute leukemic.
Q In the long process that begins at the first insult and ends with either aplasia or leukemia, where along the line, you know, does the decision tree? I mean, where do you know whether you've got one or the other?
A I see. Well, here you make certain arbitrary definitions. For example, we know that when you look at a normal bone marrow only about 1 to 2 percent of the cells are what we call blasts, very immature cells. They're good blasts. Sometimes it's very hard to tell a good blast from a bad one because they look the same. But, anyway, there are very few in a normal marrow.
Now, we say by definition that a person with acute leukemia has greater than 25 percent blasts. But what about the fellow who's got 15 percent blasts? He certainly isn't normal, because that should only be 1 or 2. But, yet, he doesn't qualify for acute leukemia; he doesn't have 25 percent.
So some people would use terms like refractory anemia with increased blasts, and

various euphemisms for, Well, he's on the road to leukemia. He hasn't quite got there yet. So we make an arbitrary decision that when there's so much blast population we can make that diagnosis. And sometimes it isn't exactly clear; it's not always easy.
Q What about with aplasia?
A With aplasia it's a little more clear, because there what we're looking for are bone marrows that have less than 20 percent of normal total cellularity. With the cells looking fairly normal, in the case of classical aplastic anemia, in the case of myelodysplasia-aplasia, even though the few marrow cells that are there, they may look very sick looking, very dysplastic.
Q Correct me if I'm wrong. It was my impression that aplasias are often preceded by a -- at some period of time by a -- I don't know what term we're going to use today to do it, but maybe not dysplasia but a hyperplasia, where you've got bone marrow function that is not really working right; maybe your numbers are too high in some cases clinically, and then you see the dropoffs.

A Well, that's more typical of the chemical-induced type of aplastic anemia, the drug -- the chemotherapy drug or benzene. It's not typical of what we consider to be drug-induced aplastic anemia.
(a Which is just -- you just see the drop.
A It drops immediately. Typically you get a drug like Chloramphenicol, which is an antibiotic. Your bone marrow is normal, you get a very small amount of Chloramphenicol, within two months time your bone marrow is empty. And you've never gone through a dysplastic phase. It just empties out. Hepatitis is the same way. You catch hepatitis; and as your jaundice is fading away, suddenly your white cells disappear. And within a matter of a month or two you've got aplastic anemia. It occurs very acutely. And that's the case of what we've termed idiopathic aplastic anemia II. Where we don't have drug; we don't have hepatitis; we don't know why, but we know the person had pretty good blood counts a few months earlier and suddenly they're gone. And we assume that something happened

in the preceding two or three months that did it, but what that something was we don't know.
Q Do you have an opinion about why the chemical induced dysplasias are preceded by the hyperplastic state?
A Yes. I think that their etiology is totally different than what we call idiopathic aplastic anemia. I think they're really different diseases. I think in the case of chemicals, chemotherapy agents, your cause and development of a clone or a cohort of cells in the bone marrow that are very sick and eventually either become leukemic or die out.
I think in the case of the so-called idiopathic type or the hepatitis type or the drug type, it has much more to do with immunologic changes, and something that's happened in your system. So your own body is turning off the production as opposed to having it turned off by a chemical that you introduced.
Q And I want to make sure I'm clear so I understand it. Do you believe that benzene

falls into that latter category or the first category of chemicals that we discussed?
A I think the benzene falls into the chemotherapy-type chemical that typically acts by causing, as you put it, sometimes increased cellularity. We call that ineffective bone marrow or dysplastic bone marrow. And then as that bone marrow gets sicker and sicker, it may die out; it may die out completely. So the bone marrow looks totally aplastic. Or it may eventuate into leukemia or it may sit and smolder with 10, 15 percent cellularity and very little blood in the peripheral.
I think that's a very different situation than what we call idiopathic aplastic anemia, where there isn't this slow development of aplastic anemia. It occurs very abruptly. But the end stage is indistinguishable.
Q The cytogenetics you referred to just is the presence or absence of genetic aberrations or abnormalities?
A Yes.
Q And if I understand what you're telling me,

in the idiopathic-type aplasias where the bone marrow just in effect melts away, you wouldn't expect to see genetic aberrations.
A That's correct.
Q But in the other types, chemotherapy, benzene, chemical-type-induced aplasias, that because your paradigm sees it as being an insult that creates either -- to the stem cells, it either makes the stem cell stop functioning altogether or create clones that you would expect to see genetic aberrations.
A Well, it wouldn't be 100 percent, but frequently you would; I think would be the term.
Q We went -- we were breaking down Step 4 into A and B, morphology --
A And then the chromosome study.
Q And the chromosome study. Is there a next step? Is there a Step 5?
A Well, the laboratory -- there are other laboratory tests that are occasionally important. For example, one illness that they tested this patient for was called PNH, or paroxysmal nocturnal hemoglobinuria. And that, like chromosomal

abnormalities, suggests that a clone of abnormal cells has been developed in the bone marrow. And the PNH cells are very susceptible to breakdown by certain agents. And they usually imply that somehow an abnormal clone is growing in the bone marrow of cells.
So that would be additional evidence that there's been some, let's say, preceding damage going on before you've suddenly recognized that aplasia. And the tests for PNH were negative in this particular case.
(a And that's similar to the cytogenetic tests.
A Similar. It's the same concept, but a different marker, you could say, that you're looking at.
fl Anything else?
A I think that generally covers it. I think the response to treatment is hard to gauge in this case because the patient didn't live long enough. I think that in the case of chemical-induced defects in the bone marrow, they don't really respond to treatment as well as someone who has idiopathic aplastic

anemia.
But in this case, that's not
helpful because the patient really died
before the therapy had a chance to influence
the course of the illness.
Q You mentioned in the course of the discussion
we just had a couple of agents; the
chemotherapeutic agents we've been
discussing.
Do you see anything, any indication
in the records that Mr. Frias received any
chemotherapy?
A No.
Q You also mentioned a drug called
Chloramphenicol.
A Chloramphenicol or Chloromycetin is the trade
name. That's an antibiotic. It's still in
use around the world -- and in the United
States, rarely -- that can cause aplastic
anemia.
Q Any indication that Mr. Frias had taken that
drug?
A No.
Q In our discussion of other agents, are there
any other specific agents that you have seen

any indication of in the medical records that Mr. Frias might have been exposed to or been taking his medication that you believe might have caused his aplasia?
A No. There are many drugs that have been associated with aplastic anemia, but we don't have a history that he took any of those compounds.
Q Let's talk about dents again. If I understand the paradigm that we're talking about, in a successful chemotherapeutic treatment, we're going to dent the marrow but we hope the marrow repairs itself.
A Correct.
Q And in the course of treatment over maybe a number of years, a cancer patient might receive a number of different treatments over the years, correct?
A Yes.
Q And the hope is that they will each -- in each instance be able to recover, I guess with the possibility they might have to receive treatment again later.
A Yes.
Q In chemotherapy, are there different

strengths,--levels of exposure, I guess, if we're using the terminology that we're using today?
A Well, yes and no. For example, in chemotherapy for the most part, we're giving these drugs to tolerance. So if I gave you a treatment with chemotherapy and your white cell count didn't drop, I'd say: Gee, I didn't give you enough. Next time around I'm going to give you more.
And so we design our programs to make certain that we do reduce the counts. So they're given to tolerance. So when we say high dose, we may be talking about different drugs, but they all are given at a dose that could, as I put it, dent the bone marrow.
Q And that's the whole point.
A That's the point. You're giving a drug to tolerance.
Q In the example of benzene, chronic exposure to benzene over a 20-year period, assuming with me that you, in fact, get high levels of exposure, as you've defined it, I think, 300 parts per million, at some point you get a

dent, right? Is that what we're talking about?
A Yes.
Q Would you expect, then, over a period of time as these dents occur, as in the model of chemotherapy for, at least initially, the body to respond and repair the dents?
A Yes. Frequently in benzene-induced cytopenias, the cytopenia recovers after you take the patient away from benzene; and frequently the bone marrow will recover. The white cell count, which is low, may come back up to normal.
Q How quickly?
A Well, in general, as with most chemotherapy drugs, it's about two weeks.
Q So let me pose a hypothetical for you. And we're talking about a single dent now. I walk out the door and somebody sprays me in the face with benzene; 300 parts per million I get zapped.
A Yes.
Q My bone marrow gets zapped.
A Yes.
Q If you tested me that day, did a full blood

workup, would you expect to see a change in my peripheral blood counts?
A I would not expect to see a change in your peripheral blood counts. I might see a change in your urinary excretion of metabolites, but not in the peripheral blood counts.
Q When would you expect the change in peripheral blood counts from that dent to be evident clinically?
A Oh, anywhere from depending on how high the dent was or how hard it was, anywhere from about 8 days to about 21 days out.
Q That's when it would appear?
A That's when you might be able to detect the low level, yes.
Q Then in the paradigm --
MR. FAULK: I'm going to object because this whole line of questioning assumes -- and I think it's misleading to the doctor -- that you're walking out getting sprayed in the face with benzene can somehow suppress your bone marrow in 8 to 21 days. I don't think it's a fair question. I don't quite understand what you're trying to get

at. How long did the spray take?
MR. THOMPSON: Well, I'm not asking you, Rick. Is that an objection?
MR. FAULK: Yes, it's an objection; because you're confusing the witness and you're confusing me.
MR. THOMPSON: I don't think the doctor is confused.
Q (By Mr. Thompson) This is a hypothetical, Doctor. You understand that.
A Yes.
Q And the reason I picked the hypothetical I did is because I don't want to spend five minutes quarreling about, you know, some example that would be sufficient to cause a dent.
So maybe the easy thing to do is to say you and I agree -- we'll agree that an event occurs that you believe is sufficient to cause the dent that we're referring to.
A Let's say a large amount of the compound in question, in this case benzene, is introduced in the body. Enough compound to interfere with bone marrow function so the white cell count will go down.

Q Got it.
A That count is going to go down probably about 8 to 21 days after the major exposure.
Q Understood. And then the second part of my hypothetical is: Looking at benzene now as opposed to chemotherapy, when would you expect the counts to rebound if the body responds and repairs the marrow?
A Well, that's somewhat variable in person to person. But in general, in trying to relate it to chemotherapy, which, of course, we have exquisite data on, we don't have that good a data on benzene. But in the case of chemotherapy, typically our protocols are set up so they're given every three to four weeks. So we know that in about three or four weeks those low white cell counts will have recovered.
Q And I'm purposely asking you to try and apply the chemotherapy model that we've discussed to benzene.
A Yes.
Q Just so we understand that. So if we look at a window from 8 to 21 days, when you would first expect to see the blood -- peripheral

blood counts affected, and then I think you said from what was it, three weeks?
A Usually by about three weeks they're back up.
Q So you've got a window that you would -- if a dent occurred that you would expect to see changes in the blood that would begin, let's say, around eight days after this dent occurred; and would close, say, three weeks after the dent occurred.
A Yes. It would depend on the dose, what kind of dent occurred, how severe the temporary aplasia was, and so on. But as a general rule, within three or four weeks, unless the dose of chemotherapy was overwhelming, the bone marrow would recover.
Q And so even if we have this hypothetical dent, and I understand we're talking hypothetically, before that time, before around eight days and after the three-week period, even though you know that that dent has occurred, you would expect to see the peripheral blood counts basically normal.
A Typically, yes.
Q Over a period of life, you know, whether we're talking -- I guess on the one hand

we've talked about chemotherapy, repeated therapy. Let's look at benzene for a second. How many dents can a body repair?
A Well, I don't know the number, but it would be a very large number.
Q What is it -- I mean, if I understand the analogy, at some point the body just can't fix the dents anymore?
A Well, I don't think that occurs. I think what happens is you're presenting a certain number of dents, and the body has the ability to fix those. And at some point you may statistically overwhelm the fixing mechanism. And you will have a personal defect. It's not necessarily cumulative. It may be, but it's not necessarily cumulative. But you may, by bad luck, that day you got a defect that you couldn't fix. You had a bad day.
Q So at some point, whether it's because of the sheer number of dents or the combination of the number of dents with how big the dents were or how many dents you had in the last two weeks, your body just can't respond.
A That's correct. And there may be genetic

variability with that. We think that some people -- and we find that some people are much more sensitive to chemotherapy than others. And in some patients a dose that wouldn't bother the next fellow makes their blood counts disappear. So there's a lot of variability.
Q Would you agree with me that that general principle of variability is true also of chemical exposure?
A I would think so, yes.
(1 Do you know or do you have any knowledge of whether or not that was a medical, I guess, piece of medical information or fact that was taken into account in why the levels of benzene -- occupational levels for benzene exposure in fact were set very low?
MR. FAULK: If you know.
A Well, I don't know the reasoning. These levels weren't set abruptly. They've been changing over time. They were at one time ten and now they're one in terms of parts per million. It's been a state of gradual change over the years.
Q (By Mr. Thompson) Do you have an opinion as

to what level of benzene exposure is safe?
A Well, one can say that smokers, for example, get a substantial amount of benzene but at low levels. The claim is they have about ten times the exposure that nonsmokers do. And yet, if we try to look for illnesses like aplastic anemia, we can't identify that smokers are higher risk than nonsmokers. So therefore, very low levels or moderate levels, at least in the case of aplastic anemia, don't appear to be harmful or operative. But exactly how low a level is bad, I can't give you a number.
(a In your opinion, is there any safe level of a substance like benzene?
A Well, probably, yes. Levels in which the body can detoxify it and not have any adverse effect, yes.
Q But you just don't have an opinion as to what that level is?
A I don't have an opinion as to what that level might be.
Q. I tried to get down to kind of the important issues, and we've already talked about two things. One is your opinion that Mr. Frias'

aplasia was idiopathic.
A Yes.
Q And the second is -- and it really is related -- that it was not caused by benzene.
A That's correct.
Q And we spent some time talking about that.
A Yes.
Q Other than those two specific issues, are there any other specific issues that you have been asked to formulate or give testimony or opinions in this case about?
A No.
MR. FAULK: Does that mean we're done?
MR. THOMPSON: Not far from it.
Let's go off the record for a second.
(Discussion off the Record)
Q (By Mr. Thompson) Dr. Natelson, when we started, we described the different documents that you brought with you today, and one of the documents or the pile of documents that you've brought with you we have not marked but we've identified as medical records.
For the record, though, let's just make sure what else is in this pile. Could

you real quickly kind of flip through it with me so that we can make sure we know what is in -- and I'm going to cover over here, if you don't mind just for a second.
A This first batch has to do with Mr. Frias' on-the-job evaluations. There are certain letters in here about his performance on the job and whether he meets his various criteria. There's a death certificate, various funeral home arrangements. There are financial records of capital accumulation of various --
Q Is any of this stuff that you have looked at and relied upon with respect to the opinions in this case?
A No, not in this particular material. There are membership data. Weeks of absence and so on. They primarily relate to evaluation of this person on the job.
Q If you'll just kind of go on to the bottom of the pile and make sure there's nothing in there that's important.
A On the bottom of the pile are some medical records from Kelsey-Seybold Clinic, I believe. Yes, from Kelsey-Seybold Clinic.

And these are vaccination records. They look like outpatient office visit records, predominantly.
Q Is it your -- are you aware of whether Kelsey-Seybold Clinic provided occupational medicine services for Arco or Lyondell?
A I don't know for a fact. Apparently they did, based on what's here. But I don't know their arrangements.
Q In the rest of the records that we've got here, you've got some tabs that we've previously referred to. Can you tell me what the tabs are and why you put them on there?
A Yes.
Q Not specifically, but in general.
A In general.
Q These are things that are important that you've tabbed because they're significant or you want to be able to refer to them?
A Yes. The first one --
Q Just for the record, other than in the bound files, it doesn't appear that there are any tabs anyplace else. I don't see any tabs anyplace else.
A That's correct.

Q Now, in order to speed this along, here's what I would like to do, Doctor. These have got -- they're identified on the cover. So the first binder are records from -- medical records from Memorial Health Network at Lyondell. All right? Do you see that?
A Yes.
Q If you will, just flip through and describe for me on the record the tabs that you've got and why you tabbed that particular page.
A This first tab has to do with a urinary phenol measurement that was done on May 10, 1990 that was negative.
The second tab is chemistry work from 1987, 4/16/1987, indicating that the blood count is -- the white cell count is normal but that the SGPT, which is a liver enzyme, is elevated.
(a Let me back up. I'm sorry. I don't mean to interrupt.
On the 4/90 tab that you've got, you note that the urinary phenol test is within normal range, correct?
A Yes.
Q What is the normal range? What is your

understanding of the normal range for a urinary phenol test?
A Well, the normal range can vary. For purposes of benzene exposure, what you're looking for are levels of 50 milligrams per liter or in excess of that. And that is suggestive that a person has had exposure: It's claimed that you have to have had at least 10 parts per million exposure to see elevated levels. But if you see elevated levels, a significant elevation is considered to be 50 milligrams per liter.
Q Are there different ways to test urinary phenol?
A I imagine there are.
Q Would the normal ranges vary depending on the type of lab test actually employed?
A Well, I don't know that the normal range would vary, but the chemistry of the analysis might vary.
Q But isn't it -- I mean, it's my understanding, from kind of reviewing medical generally, that even from lab to lab normal ranges might change depending on the test kit they use.

A Well, perhaps. A person's blood sugar is a person's blood sugar. It may be measured by many, many different techniques; but a normal value is a normal value.
Q What I'm getting to is: For you as a physician to make a determination as to whether a particular lab test is normal or abnormal has got to be made with reference to that lab's reference for that test.
A Well, I think that's important. In other words, for example, on this particular slip we're not given a number. We're simply told that it's normal. So I have to assume it's normal.
Now, if they gave me a particular number, and that number was 5 milligrams per liter, and I know that you have to have at least 50 to be significant, I would know that that's not a significant value. But here we're not given a number. We're just told that it's normal.
Q And so you're relying upon the reporting of the --
A The reporting agency to -- that they really did a correct job and, in fact, reported a

correct value.
Q In your opinion, does a negative urinary phenol test prove that somebody was not exposed to benzene?
A No. Because it has a lot -- a lot of it has to do with timing as to when the phenol was collected relative to the exposure. And even a high level doesn't prove exposure, because there are foods that can contribute to that. A level that's low would suggest that within the 24 or 48-hour period prior to the time the level was collected there was not a high exposure. As we're getting into the second tab, it had to do an elevated liver function test in 1987.
Q 3/2 of 1987?
A 4/16/1987.
Q I'm sorry. Got it.
A Then the second -- third tab had to do with a May 16, 1985. And again, the transaminase values were elevated; the liver function test.
The next tab was from 4/12/85, and it's a history from, I guess you would call it a history, from the Kelsey-Seybold

Clinic. And it's a reference for them as to what chemicals the person might have been exposed to. And under this list, it's listed benzene, orthoxylene, toluene, perhexiline, xylene, dripolene, and gasoline. So I assume that these are all chemicals that Mr. Frias is alleging that he might have been exposed to.
Q And you're assuming that Mr. Frias is reporting that?
A Well, that is an assumption. It may not be true, but he has signed this. So I'm assuming that he reported that, or agreed with it, since he signed it.
Q Now, earlier we talked about the importance of the history and physical --
A Yes.
Q -- in diagnosing clinical disease. In your review of these medical records when you see multiple entries like this that say: Here are the things that I'm exposed to during the day, benzene, toluene, perhexiline, xylene, dripolene and gasoline, is that something that as a treating physician, diagnosing physician, that you

would take into account?
A Well, you would always -- you would take into account everything that you have from the history and physical. It may not be valid history. In other words, you don't know the validity of looking at something like this, but you put it into the computer along with everything else.
Q What if that came from -- not from Mr. Frias but came from his employer, from the doctor --
A The same thing. In other words, you wouldn't know to what degree the exposure was. It would be of interest, just as you would any list of drugs the patient might be taking.
Q All right.
A The next tab is from 8/27/82; and here is another phenol level, and it was zero.
Q 8/27?
A 8/27/82.
Q Okay. I'm sorry. Let me interrupt for a second.
If Mr. Frias, hypothetically, was exposed to a high level of benzene -- and I'll let you -- high to your satisfaction --

five days earlier, would you expect for that urinary phenol to show elevated levels?
A Probably not.
The next tab is from 11/19/81, and that's a blood count, which was normal.
The next tab is from 8/31/78, and it's a combination of a blood count, which is all right; but the liver enzyme again, the SGOT is elevated.
The next one is from 7/21/77, and it's a blood count, which is normal.
(a Now, in either of those two, do you see any abnormalities in the red blood characteristics?
A Well, the numbers are normal. In other words, this man's hemoglobin is 15.9, which is a certainly normal value for the red blood cell count. Now, the MCV, which is a figure for the mean corpuscular volume, in other words the diameter of the red cells, that is at the upper limits of normal according to the range here that's given. It's 99, and they have their normal as 83 to 99. I wouldn't make much out of that.
(d All right. Next tab.

A The next one is 11/24/76. And, again, it's a blood count, which is normal.
Here from 11/22/76 is a urinary phenol, which is normal.
Q. Is there a note there about benzene on the medical record itself?
A No.
The next note is from 6- -- wait.
Let's see. This is a note from 6/4/81, and it says victim was accidentally showered with some perhexiline. And it's an incident report, I guess, is the best way to describe it.
(a Do you know whether or not perhexiline has benzene as a component?
A I don't.
Those are all the tabs from this.
(a And this being the medical records from Memorial Health Care. All right.
Go to the next one. And if you would, just look at the cover so we can identify it.
A I'm sorry. This one is from MD Anderson Hospital. It's medical records.
Q Volume 2 of 5. As we go through MD Anderson,

if I could, Doctor, there should be numbers at the bottom. Will you refer to the number of the page on which your tab appears?
A Yes.
Q Thank you, sir.
A The first one is page 314, and what it is is a result of a white cell transfusion that was done on 7/31/94.
(a And what is significant about that?
A Well, it was interesting to me because we don't normally do white cell transfusions anymore. And I was interested that they did that in this patient.
The next is page 369. And it indicates that the patient was placed on corticosteroid therapy on 6/20/94.
Q And what's significant about that?
A Well, I have tabs in here that have to do with the treatment that was rendered. Some people feel that steroids are of some limited benefit in aplastic anemia, and he was placed on steroids at that time.
Q What would steroids do? What kind of benefit?
A Well, they reduce inflammation. Sometimes -- this patient was requiring blood

transfusions, which often cause allergic reactions; and the steroids may blunt those allergic reactions. They cover a wide range of evils, steroids do.
Q Okay.
A The next is on page 392, and it's the treatment with antithymocyte globulin, or ATHGAM that was given to the patient, which began on 6/9/94.
Q And what's significant about that?
A Well, ATHGAM is our standard therapy for aplastic anemia. And I was interested in the dose and the duration that they used.
The next note is from page 400. It has to do with the fact that the patient was . . administered Dilantin. I was interested in that because occasionally Dilantin can cause aplastic anemia, and in this case they were giving it to the patient to prevent seizures.
Q But it's not your opinion that the Dilantin that he received at MD Anderson caused his aplasia?
A No. No. Certainly he had the aplasia long before that.
The final note in this group is on

page 402. And it's the fact that they administered what we call colony stimulating factor or G-CSF to the patient.
Q And that's trying to get some cells to start?
A Trying to stimulate his bone marrow.
Q All right. Let's go to the next volume.
A The next volume has-no entries. That's Volume 3 of 5 from MD Anderson.
Q The next volume.
A The next volume has no entries. It's Volume 5 of 5 from MD Anderson.
Q Great.
A The next volume, which is the Bayshore Medical Center records, and it's page 3, and indicates -- it's a discharge summary from that hospital, and indicates that the patient's white blood cell count was 900, platelet count 4,000 and hemoglobin 9.
Q And what is the significance of those numbers?
A Those numbers are what we call pancytopenia, meaning all three cell lines are reduced. That's the only entry from this file.
Q Why is it important to you to note that on discharge from Bayshore he was pancytopenic?

A Well, pancytopenic is the hallmark of aplastic anemia. It certainly can be caused by many other illnesses, but one typically has a pancytopenia in severe aplastic anemia.
Q All right. Do you recall -- when Dr. Quraishi referred Mr. Frias over to MD Anderson, from your review of the records, do you recall what he specifically asked MD Anderson to do? What the priority was?
A I believe he was referred there for consideration for a bone marrow transplantation.
Q And, in fact, in your review of the medical records, what they were about at MD Anderson was trying to figure out whether they could treat this man's aplasia with a bone marrow transplant?
A Well, that was part of what they did, yes. They referred this patient to treat his aplastic anemia. That might or might not involve a marrow transplant.
Q Okay. Next volume.
A The next volume is Volume 1 of 5 from MD Anderson Hospital. And it is page 30 from 6/28/94. And it's a discharge summary that's

labeled Bone Marrow Transplant. I assume that's their bone marrow transplant team. And I've marked this because it contains the statement: The remainder of the workup for aplastic anemia was completed and no specific etiology was noted.
Q Now, is that the statement upon which you base your opinion that MD Anderson diagnosed it as idiopathic?
A No, not entirely. There are more statements that say the same thing in that chart.
Q And here they just say that no specific etiology was noted.
A In this particular -- in this particular page they say that, yes.
Q All right. Go on. And that was page 30, right?
A Yes.
This is page 36. And it indicates that the patient received cyclosporin on 7/14/94, which is another drug we use for aplastic anemia.
(a So again, you're just noting the treatment.
A Yes.
The next is page 37, and it has to

do with the death summary.
Q And what is significant about the death summary?
A Just the time of death and what happened at the time of his death.
Q Based on your review of the medical records, and I guess your understanding of the disease aplastic anemia, in general, how is it that Mr. Frias actually died? What caused him to die?
A Well, he was administered the drug antithymocyte globulin, and the drug cyclosporin and the colony stimulating factor. Those are three things that have helped patients with aplastic anemia. But generally what you find is those drugs are very slow acting. And to really get a good response from those drugs often requires months. And he didn't live long enough to get that kind of response. And so what happened was he sustained a series of infections and also got bleeding from the low platelet count.
So his death was related to infection and bleeding, and indirectly

related to the aplastic anemia, which caused the infection and bleeding.
Q What kind of infections did he have?
A He was thought to have a disseminated fungal infection.
Q In his chest?
A If he had it in his chest he probably had it in many other places.
Q I think there's some notation of pleural fusion someplace?
A Yes.
Q That would relate to what?
A It could be any one of a number of things.
Q Could it have been blood in his lung?
A It could have been blood in his lungs. It could have been infection that causes fluid. It could have been heart failure. It could have been any one of a number of things.
Q Specifically, what kind of bleeding do you recall?
A Well, he had intracerebral bleeding. He had bleeding in his head.
Q In his brain?
A Yes.
Q I mean, what does that do to -- where does

the blood go if you're bleeding in the brain?
A Well, it can't go very far. The skull is fairly rigid, and the brain is very soft. And it's all packaged very tightly in there. And if you put just a small amount of blood into the brain it gets squashed, and you die very quickly.
Q Why does aplastic anemia lead to this bleeding that you've described?
A Well, for a number of reasons. One, the platelet count is very low; and platelets sustain blood vessels. One of the functions of the platelet is to migrate into the blood vessel each day and keep it from being too porous. And if you take the platelets away, the blood vessels start to leak.
In addition, when you get infections, particularly fungal infections, that seems to damage the wall of the blood vessel, make it leak even more easily. So the combination of a bad infection and no platelets often leads to bleeding.
Q And so in Mr. Frias' case, he clearly had bleeding inside of his brain and perhaps bleeding actually in his lungs and in his

chest.
A Yes.
Q The next tab.
A The next tab is page 44, and it indicates that HLA testing was done on the patient's family. There's a comment that his siblings did not match.
Q What does that mean?
A Well, generally, marrow transplants can be done from a variety of sources; that is to say, that the donor cells can come from a variety of sources. But the best source is a brother or sister who is a close match, and they didn't find that.
Q Does the failure to have a match in the family have any impact upon your previous opinions about the etiology of the aplastic anemia?
A No.
Q We've talked a little bit about similarities between -- and differences between aplasia and leukemia.
A Yes.
Q And I guess one of the fundamental differences, maybe the fundamental

difference, is one is I guess technically a malignancy, leukemia; and the other is not.
A That's true.
Q But in our earlier discussions, we kind of talked about the disease process in the blood itself as being in many ways a continuum that starts with insult and may end up in either of those type of disease states.
A Yes.
Q Leukemia, even though it's cancer, can be treated, correct?
A Yes.
Q And we've talked at some length about chemotherapy, and that's one of the treatments that is commonly used for leukemia.
A That's correct.
Q Is there -- what are the chances of survival if somebody, say, Mr. Frias' age -- I think he was, what, 52, 53? I can't remember.
A Something like that.
Q Middle-aged.
A Yes.
Q -- is diagnosed with leukemia and you're able to treat it? Is there some chance of

survival?
A Yes.
Q But in his case, his aplasia was so acute and so severe that I think your testimony is there really wasn't even a chance to treat him.
A Well, I suppose you would have to say this: In today's world, if you have two patients, one with aplastic anemia and one with acute leukemia, statistically the patient with the aplastic anemia is going to do better than the acute leukemia patient.
In this -- and one might have expected this patient to do better than someone with acute leukemia, but unfortunately he got badly infected and the treatment just didn't get a chance to gel. He just didn't survive long enough for the treatment to do its work; so that he died.
And that is the case in many patients with aplastic anemia. The general date of these days from various series is that probably anywhere from 50 to 60 percent of people with aplastic anemia get over their illness with treatment. Some series even

higher.
Q 50 to 60 percent?
A In most cases. A lot depends on whether or not you have a match in the case of a transplant. But I would say 60 percent would be a reasonable figure that would do well with treatment.
Q And is this true of the aplasia that like Mr. Frias' that end up with literally no cells, with just fat?
A Well, in general, that's true. Some people -- we generally call severe aplastic anemia something that has lower than 500 granulocytes a type of white cell. And some people call unusually severe aplastic anemia if they only have 200 granulocytes.
I believe he was in the 500 granulocyte variety. And so he had severe disease, but a very significant chance of doing better. And I've certainly treated people who have had just as abnormal blood counts as he has that have done quite well.
Q But, again, the fundamental difference, I guess, that we've discussed already is that in aplasia you end up really with no cells

being produced in the marrow as opposed to a leukemia where you've got cells being produced but they're bad cells, blanks, as you described.
A They're blanks, yes.
!1 In some ways would you agree with me that aplastic anemia can be worse than leukemia in terms of the clinical presentation?
A Well, of course, there are many kinds of leukemia. Let's assume you're talking about acute myeloblastic leukemia. In certain cases, like in this fellow's case, he was certainly in a bad spot. I mean, in his case he was sicker than most people we see with acute leukemia. But that's usually not the case.
In other words, as a general rule, you would have to say that an aplastic anemia patient today would have a better chance of long-term survival than a typical acute leukemia patient.
Q But in Mr. Frias' specific case, that wasn't the case.
A That's true.
(1 All right. Let's go on.

A Next is page 185, and it's an admission note. And it's commented that he was referred to the MD Anderson center for evaluation for possible bone marrow transplant patient due to suspected aplastic anemia.
Q You just noted that because that was the admission reports?
A I just noted it because that was the admission data.
And page 188 comments that the bone marrow carrier type or the bone marrow chromosomes were normal.
Q That's the genetic -- cryogenetic testing that you referred to earlier.
A Yes.
The next note is page 196, and it says: Workup negative for secondary causes of aplastic.
Q And what does that mean to you?
A Well, let me finish the sentence. It says: Workup negative for secondary causes of aplastic -- I guess they left out the anemia -- and most consistent with primary aplastic anemia; which I would consider to be

idiopathic.
Q And so that specifically when you were referring to MD Anderson's conclusion that it was idiopathic, these are the reports you were referring to?
A These are the reports. That and that other discharge summary, I think, we commented about.
Q Okay.
A The next is page 212. And it comments again that his cytogenetics are normal, and also comments that -- it states: I have reviewed his HLA typing. His HLA typing shows that for the three siblings tested to date none of them match.
Then on page 223, there's a comment in here somewhere. Let me see if I can find it. There's a comment in here that his hepatitis B Surface Antigen was negative. Hepatitis C Core Antigen was negative. His HIV test was negative. His transaminases were a little elevated.
Q Those are the liver function tests you referred to?
A Yes.

The last one is on page 226, and is another -- Primary Medical Evaluation is the title of this page. And it comments about his history of bleeding from dental extractions. It also comments that he was taking no medications at the time of admission. It claims that he has been exposed to benzene during his work at a refinery. That's the only thing I noted on that group of records.
Q And in that last report, was there a specific conclusion about etiology made?
A I think it comments they're going to pursue the workup. I think that was a preliminary -- it was an admission history and physical, so there wasn't a conclusion.
The next is records from Dr. Arturo Gonzales. I have no marks there. Records from the McGregor Dental Center, no marks there. Records from Dr. Quraishi, I have no marks there. Additional records from MD Anderson Hospital, I have no marks there. This mark is a test that they did for cytotoxic antibodies.
Q What's the page number?

A I'm sorry. Page 850 under MD Anderson Volume 4 of 5. This has to do with part of the HLA testing.
There's a note on page 869. It's a test for PNH, which was negative.
Q What's PNH?
A PNH is paroxysmal nocturnal hemoglobinuria, and it's sort of a clonal disease of the bone marrow that you might see in myelodysplastic patients.
Q And we referred to that as kind of a -- not quite the same as the cytogenetic testing but similar?
A Similar kind of thing.
Q All right.
A The next is page 907, and it's the official chromosome report indicating that it was normal.
Next is page 911, and it's testing for hepatitis. For hepatitis B and C, and these were negative.
Q But I believe you commented earlier they didn't test for hepatitis G?
A That's correct.
Q And do you commonly test for hepatitis G?

A Well, we do now, because it's a newly derived test. And it's only recently been shown that this virus exists, No. 1. And it's also been surprisingly found in several people with aplastic anemia.
So today, if I had a patient with aplastic anemia, I would make the effort to get that test. Five years ago I wouldn't have heard of it.
Q But you wouldn't have expected MD Anderson to have run that test?
A Not in 1994.
Q Is there a specific article in here that refers to hepatitis G?
A Yes.
Q Why don't we talk about that when we get there.
A The last is a chest x-ray report indicating that he's got terrible looking lungs. That's page 1119.
Q Is that towards the end?
A That's the last entry.
Q And again, terrible looking. Does that refer to the effusions and spots that we talked about?

A And that's called consolidation, meaning that there's -- the lungs are dense on the x-rays. Not necessarily with fluid; it may be pus or fungus or something in there. But it probably isn't fluid. That's the last of these notes. I think we've already looked at these notes.
fl That's that. All right. I want to make sure I understand. Your statement in your report, which is Exhibit 4, that states the physicians at MD Anderson determined that he had no potentially significant recent drug or toxic exposures, and their test for hepatitis markers gave negative results.
You are -- I mean, it is your opinion that the MD Anderson people decided that his benzene exposure was not significant.
A They concluded that.
Q And it's based on the report that you referred to.
A Yes.
(a And so it is also your opinion that they concluded that it was idiopathic.
A Yes.
(1 Why don't you take a minute and look through

your report real quickly and see if there are any general issues that we've just not touched on yet.
MR. FAULK: It's been two and a half hours. I don't know that that's a fair question. I object to that for that purpose.
MR. THOMPSON: So noted.
MR. FAULK: There are probably a number of issues.
A I'm not sure what you're referring to. I'm familiar with the letter since I wrote it. But what specifically are you asking me?
(A recess was taken)
Q (By Mr. Thompson) Dr. Natelson, we have previously marked your copy of the Toxicological Profile for Benzene, Exhibit 5. I flipped through it. There are some handwritten notes in there. Are all the handwritten notes on that document yours?
A Yes.
Q If I go through and if there's underlining or exclamation marks or stars or whatever, those are made by you, Dr. Natelson?
A That is correct.
Q And you just did that as you read through the

document?
A Uh-huh.
Q At the tab that I stuck on there -- open that, if you would -- there's a section that addresses urinary phenol testing.
A Yes.
Q And you've, I think, put a line beside it over there on the right-hand margin. Why did you do that?
A Well, I was interested to know the value of urinary phenol testing and what might influence it; and this paragraph has to do with that.
Q What in that paragraph, in the ATSDR document, do they indicate as the range for elevated urinary phenol test results?
A That's not on this page.
Q Maybe it is the next page.
A The next page. It says the ACGIH has established 50 milligrams of phenol per liter as what they call the BEI for benzene exposure.
Q Any reference in there to a range that begins at 5 milligrams per liter in that section of the document?

A Not that I can see.
Q We talked a little bit about whether you had reviewed any industrial hygiene monitoring data, and I just want to make sure it is clear. Everything that's here today that we've gone through is what you've reviewed?
A That's correct.
Q You've reviewed nothing else?
A Nothing else.
Q So you did not review -- you don't recall reviewing any MSDS documents with respect to the products that were shipped at the docks?
A I don't recall that.
Q In your report, Exhibit 4, you note that Mr. Frias was a smoker.
A Yes.
Q On what basis do you make that report?
A I believe in these work records it is commented on that he smokes. I think in the MD Anderson history and physical that it said that he didn't, but the work records claim that he was a smoker.
Q Do you know what his smoking history was?
A I may have at one time. I don't recall it today.

Q Was it significant, in your opinion?
A In terms of causation of aplastic anemia?
Q True.
A No.
Q What's macrocytosis?
A Macrocytosis means large blood cells.
Q Is macrocytosis a manifestation that is related in any way to -- insult to the blood by chemical toxins?
A It can be.
Q And is it a -- when we talked earlier about lab tests and indicators in lab tests and possible insult to the marrow, is that one of those indicators?
A Well, it conceivably could be. It is not -- typically when we're talking about insult by chemicals, we more commonly look at the white blood cell count and platelet count. But chemicals -- marrow toxin could certainly alter the MCV.
Q You are familiar with a phrase called "latency period," correct?
A Yes.
Q Most commonly we talk about latency in the context of cancers and malignancies.

A Yes.
Q Is it your opinion that in examining a patient with aplastic anemia, a nonmalignant state, that the concept of latency is also significant?
A Well, it may be.
Q How?
A Well, if you could demonstrate that the patient had a dysplastic marrow; in other words, that they had abnormal blood counts that were progressively getting worse and eventuated into aplastic anemia, then I think that would be significant.
Q In your opinion, does there need to be -- is there some accepted relationship between the insults that we've talk about, kind of in general, the dents over a series of years to the marrow and the manifestation of disease with respect to aplastic anemia?
A Well, in the case of chemical exposure, there might be. There doesn't necessarily have to be.
Q So there's no hard and fast rule as to when -- you know, what window you would look to to say the disease would have to develop

or you would expect the disease to develop in this time frame?
A No. The general, when we look at a drug-induced aplastic anemia or hepatitis-induced aplastic anemia, we're looking at a relatively short time between the onset of the drug. I suppose drugs are best -- are most -- best characterized because we know when the person took the drug and we know when the aplastic anemia was evident by blood counts, and that typically is a relatively short interval.
Q Is that also true in chronic exposure situations, like the benzene model we've looked at?
A Well, in chronic exposures, as we've said before, you often go through a phase where you don't have a normal marrow but you don't have aplastic anemia either. You have a dysplastic phase, and that phase could last for some years.
Q You don't have -- you are not going to express an opinion in this case that one of the ways you've ruled out benzene as a cause is that somehow Mr. Frias' disease doesn't

fit a latency model of some sort?
A Well, I don't see that we have any evidence that he had myelodysplasia preceding the development of acute -- of aplastic anemia, and that that combination is frequently seen in benzene-induced aplastic anemia.
(a Is it your opinion that for the aplastic anemia to be -- to have been caused by benzene exposure, that it would necessarily have to be preceded by myelodysplasia?
A No. I don't think it would have to be.
fl Assuming that levels of exposure reached the levels that you have discussed about where you would be comfortable that there are damages to the marrow, dents to the marrow, over a period of time, say 18, 20 years, how long -- if the process is a continual process -- would you expect for it to take for the damage to be so severe that you would become aplastic or see a manifestation of disease?
A I don't know that I could put a number on that. As I commented before, we know that in chemotherapy-induced myelodysplasia and leukemias that typically we look at peak

windows around three to seven years. It might occur as early as a year and a half; it might occur as late as 11 years or so. But by 12 years, the window is typically closed and the effect doesn't occur.
Q When you talk about, you know, any period of time, twelve years, three years, seven years, what are you using to measure that window? From what? From the exposure?
A From -- usually it's from the last exposure. Some people look at it from the first exposure. Typically with chemotherapy we're not giving these drugs for an indefinite period. We're typically giving them for, let's say, six months or occasionally as long as eight months. And so you could look at it from the beginning of that treatment program or the end of the treatment program. There's not a great deal of difference to the time of the onset of the chemo.
Q In the context of a chronic exposure situation, how does that model that you've just described, the chemotherapeutic model, you know, inform you in any way as to how to look at a chronic exposure situation where

you have, say, continual or repeated exposures over a long period of time?
A Well, in the chemotherapy model we generally -- in people who have taken drugs for a long period of time, we typically use the time they took the last dose of drug to the onset of whatever the illness is we're looking at.
Q But in the case of somebody who -- again, chronic exposure, occupational setting - assuming that there's a continual exposure going on, you're not saying, I don't think, that you wouldn't expect disease to manifest itself until somehow you stopped being exposed so that you could -- I mean, if the exposure was continual, you would expect at some point disease to develop?
MR. FAULK: Exposure continual, assuming the dose that you've previously mentioned? Continual exposure without a dose doesn't mean anything.
A Well, it's hard to answer that because you might -- your situation in many forms, let's say of chemotherapy-induced leukemia, is that the drugs are given in very high dosages and

the blood counts may look fairly normal for a couple of years, and then all of a sudden the leukemia appears.
There may be changes in the marrow that you have trouble recognizing. They haven't dropped the blood counts a great deal, or the changes may suddenly abruptly develop six years out. So I don't know if I've answered your question.
(a (By Mr. Thompson) Probably not.
A I think that's a difficult question to answer.
(a It was a bad question.
MR. FAULK: I agree.
(a (By Mr. Thompson) Assume with me for a minute that Mr. Frias was exposed to benzene from the day he walked on to the property of the refinery in 1974, at some level, until the day he was diagnosed with aplastic anemia -- or the day he left the plant before he was diagnosed with aplastic anemia in 1994, 20 years. And that during that time period there were intermittent but repeated high-level doses.
Is his development of aplastic

anemia in 1994 any way inconsistent with that exposure model?
MR. FAULK: I'm going to object to the form of the question.
A Well, I would say that you've made a hypothetical model for him; but you have to say that he is not the only person in the world or in his company that might have these kinds of exposures.
Q (By Mr. Thompson) And I understand that. I want only for you to focus on the hypothetical Mr. Frias.
A Well, I would say to my way of thinking about the situation is that I don't believe that chronic low-level exposures, what I would consider low-level exposures, albeit they may be higher than the one milligram per liter or the one part per million that we have regulations. I don't believe that chronic low-level exposure would likely give you aplastic anemia.
Q You've already said that you believe that it requires some high-level exposure sufficient to dent the marrow.
A Yes.

Q How many-times?
A I don't know.
Q One?
A I would say it is doubtful that one. But whether it would be two or three, I couldn't give you a number.
Q But one, doubtful; two more likely?
A You could kill a person with one exposure. So -- if it's high enough.
Q Well, at one level -- one exposure, what level would be high enough to sufficiently damage the marrow?
A I don't know on a single exposure. It would be the level high enough to lower the white cell count. I would expect to see, if you've given -- it's like when we talked about giving chemotherapy. If I don't dent your white count with chemotherapy, I didn't give you enough. If you didn't get your white count dented by benzene, you didn't get enough that gives you aplastic anemia.
Q Got it. I understand.
What about two? If you've got two, does the level that you are talking about now become lower? Two dents?

MR. FAULK: I'm going to object to the question. You are not separating it by time or chronology. The question is vague and ambiguous and impossible to answer.
Q (By Mr. Thompson) Do you understand the question, Doctor?
A I understand the question, and I don't know if I could answer that.
Q Well, you said low-level chronic exposure, in your opinion, is not enough.
A That's correct.
Q We have agreed that it is your opinion that in addition to that you would require some, quote, high-level exposure; and I think you have said in your opinion that is at least, what, around 300 parts per million?
A Generally, the cases -- for example, it's commented on in this text -- those kinds of levels that have been associated with aplastic anemia, and I believe they quote in here, persist in exposures around 3 to 500 parts per million.
Q But can we use 3?
A Say 300. All right.
Q It is my understanding it is your opinion

that you would require some high level of exposure during this chronic period.
A Yes.
Q And my question to you is we're trying to figure out at what point do you draw the line, Dr. Natelson? You said one, probably not, right?
A Well, if I said that, I'm not certain that I meant that in the case that -- one that did what? One that didn't affect the blood counts or one that did?
MR. FAULK: I'm going to object to that.
Q (By Mr. Thompson) How do you know?
A Well --
MR. FAULK: Just a minute. Just a minute. I'm going to object to the whole line of questioning because you're saying one and you are not defining how long, how intense. You are simplifying it beyond the possibility of answering, and it is misleading. It is unfair to the doctor. If you are going to ask him a hypothetical question, give him the courtesy of giving him a reasonable question that's

defined and specific.
Q (By Mr. Thompson) Doctor, do you understand my question?
A Well, I'm not certain; but I think that I have the idea.
MR. FAULK: Wait. I'm going to instruct you not to answer a question that you are not certain you understand.
THE WITNESS: All right.
Q (By Mr. Thompson) What don't you understand about my question?
MR. FAULK: I'm going to ask -- I'm going to instruct you not to answer that question. You are entitled to a good question from Mr. Thompson, not one that you have to explain to him.
Q (By Mr. Thompson) How many times, in your opinion, does somebody need to be exposed to high levels of benzene before you are comfortable that it can cause aplastic anemia?
A Well, it can be one time if that time is sustained. In other words, if a person is exposed to high levels chronically, perhaps for months, that might well be enough.

(1 What if the exposure is just a matter of hours?
A Probably not.
(a How many exposures that last only a matter of hours would you require?
MR. FAULK: I'll again object as not quantifying the dose. The question is vague and ambiguous. The entire line of questioning is misleading.
A Well, I would say that it would have to be enough to damage the bone marrow; and the way you would assess that damage would be reductions in the white blood cell count that were substantial and measurable.
(a (By Mr. Thompson) But it's your opinion that a high dose of benzene doesn't necessarily mean it damaged the bone marrow?
A Well, there are different susceptibilities people have, probably on a genetic basis. So a single dose that didn't affect the blood count might well not affect the bone marrow either.
Q So you just aren't -- you can't make a determination -- you don't have an opinion about how many times somebody needs to be

exposed to 300 parts per million or higher in order to develop aplastic anemia?
MR. FAULK: I'm objecting because that mischaracterizes his testimony. The question has been asked and answered. He stated that he doesn't have an opinion with respect to any of the unreasonable hypotheticals that you've given him.
A In other words -- if the question is: If this room were filled with benzene at 300 parts per million and you walked into this room a number of times during the day, how many times would you have to walk into this room to get sick? I have no idea.
(a (By Mr. Thompson) So how do you know? How do you -- how would you make a determination? If I asked you to look at Mr. Frias' records and say -- and determine whether or not benzene was the cause of his aplastic anemia, what would you be looking for in his records to satisfy yourself that he had sufficient exposure?
MR. FAULK: Objection; asked and answered. That's what the last three hours of his deposition have been about.

MR. THOMPSON: Rick, we can get out of here --
MR. FAULK: I'm tired of sitting here and having you replow old ground. He has given you five separate items that you went through in some detail as to why he thinks this aplastic anemia clinically is not caused by benzene.
MR. THOMPSON: I understand.
MR. FAULK: I don't see the point in going on. I'm giving you some leeway.
MR. THOMPSON: Are you instructing him not to answer?
MR. FAULK: No. I'm giving you some leeway, but let's get it over with.
A Well, what I would have liked to have seen in these records as we went through these various blood counts that he had, and I didn't see that he ever had a low white blood cell count, and I would have liked to have seen, at least on one occasion, that he had an abnormal blood count, abnormal white blood cell count.
Q (By Mr. Thompson) In your opinion, that would indicate an exposure sufficient to have

caused marrow damage?
A It might have. It might not be sufficient.
But at least it might be suggestive, if he had enough exposure, to lower a white cell count.
Q Let's assume for a second that in our hypothetical that the exposure is sufficient to cause a change in the peripheral blood count. White blood cells, in your example. How many times would you require that before you would be willing to say the aplastic anemia was caused by these?
A I don't know that you could pick a number and say that. It is just that if you could show me in these records that at one time he had an exposure and the white cell count dropped to 2,000 and perhaps stayed there for a week or two and then recovered, I would say: Well, that doesn't prove his aplasia is from benzene, but that increases the likelihood that it is.
It puts him in a higher risk group because he has had evidence of a dent in his bone marrow by the benzene, but I don't see any evidence of that in these records.

Q Remember when we talked earlier about your patient who had myelodysplasia that you thought might be related to benzene?
A Yes.
Q Did you see any medical testing, any medical monitoring, that was done during his work experience that you saw that indicated abnormal blood tests?
A I really can't answer that. I did have some records on him, and I just don't recall. I kind of think that he did, in fact, have abnormal blood counts; but I can't really recall that -- those numbers.
Q On your report, you've got footnotes for, I think, ten articles.
A Yes.
Q They're not all here. The last two are not here, which were the two that deal with hepatitis G?
A I believe they're all there. You've got them right there. There's only one page. These two articles right here, Aplastic Anemia and Hepatitis G Infection.
Q They're both on one page?
A Yeah. Because there are two articles, one on

the other side; Hepatitis G Associated Aplastic Anemia.
Q I see. So are these -- are these studies?
A These are recent reports.
Q Case reports.
A These are case reports. That's correct.
Q As opposed -- what's the difference between a case report and, say, an article?
A Well, you have a single patient with a problem; it is a case report. If you have two, it is a series. That's the difference.
Q Are your case reports there peer-reviewed?
A Yes. This is a peer-reviewed journal? This is from the Lancet which is sort of the British equivalent of the New England Journal of Medicine.
Q How are case reports peer-reviewed?
A Well, you provide data to the -- to the editor. And typically what the editor does is looks through that, sends it to an expert in the field. The expert in the field looks at it and says: Well, this is not right. That's not right. Shorten this, take out that. This shouldn't even be a paper. It needs to be a case report. This shouldn't

even be a case report. It needs to be a letter. And eventually something gets published.
Now, the editor doesn't go to the hospital and say: Was this fellow's hemoglobin really three? They're not checked on to that degree. You assume honesty on the part of the reporting physician.
Q I see. Have you done any kind of a Medline search or anything to determine whether there are any other case reports or articles about hepatitis G?
A Oh, there are because some of these reference other reports. If you look at the end of those articles, they'll have footnotes; and they are referencing other cases. The first -- in other words, the first case of hepatitis G was discovered in a patient with aplastic anemia, and that's not either one of these case reports here. That's a third one.
Q So there are three case reports?
A There may be more. I don't know how many there are, but they're starting to accumulate because this is a recently recognized phenomenon. So we suddenly are now starting

to do the testing; and this may be the first three cases we'll find, and the only three cases in this century. Or it may be that this will turn out to be a major cause of aplastic anemia.
Q And just so I understand, each case report reports on one patient?
A Generally speaking. I'll have to look at that again and see if they are commenting about one or more patients.
This first one on this side talks about a 26-year-old man. So that's a single case. And the one on the other side is a 19-year-old. They reference other articles and I don't have the other articles. But, you see, this virus was first isolated in 1995. So we're not going to have a lot of articles for a few years on this treatment.
Q Just so I'm clear, it's not your opinion that Mr. Frias had hepatitis G?
A Oh, I have no idea if he did have it. He wasn't tested for it, and I have no idea whether he did or didn't.
Q Can you tell me what the other clinical manifestations of somebody suffering from

hepatitis G would be?
A Well, they're described, at least in those couple of patients, their clinical presentation is described. But as in any person with hepatitis, the infection may be subchnical and you may have no symptoms whatsoever or you might be quite jaundiced and quite ill.
(a With respect to idiosyncratic -- idiopathic aplastic anemia, is it true that idiopathic -- cases reported as idiopathic tend to be those cases reported in younger and older patients?
A I'm sorry. Who else are there besides younger and older people?
MR. FAULK: Object to the form.
Q. (By Mr. Thompson) The people in the middle-age, you know.
A Okay. Well, as you look at -- any age can be affected by aplastic anemia. As you look at some of these studies, there is some suggestion that there is a younger group and an older group; but there are also plenty in the middle. They are not two well-defined categories.

Q So you knew what I meant when I asked about younger and older, notwithstanding Mr. Faulk's --
A Yes. I didn't initially; but I realized what you said afterwards, yes.
Q In fact, there are studies that report on that phenomena, aren't there?
A Yes.
Q And studies report that of the large percentage of aplastic anemia cases that are reported as idiopathic, they tend to occur in people who are young, young people, preadolescent people, or in people that are older than, say, 60?
A Some haven't found that relationship, but there is mention in the literature and some of these cases, case reports or studies that I have here, deal with that. There is some suggestion that there's a bimodal pattern, but it's not very well defined.
Q But it is something that is in the literature and that you would take into account in trying to go through the decision tree that you and I discussed earlier today. Your differential diagnosis.

A I really don't know that age would affect me too much in terms of a differential diagnosis. You take everything into consideration, but that would be one fact that I don't know that I would lend great store by.
Q Do you know Dr. Quraishi?
A No.
(a Are you familiar with his practice at all?
A No.
Q Do you have any reason to believe that --and I know you've already expressed your opinion that each doctor has to look at the record and decide for himself, but you have no reason to believe that he is not a competent hematologist?
A No.
(1 Do you know Dr. Gardner?
A Yes.
Q Have you ever worked with Dr. Gardner?
A Well, we've had some patients that we worked together with. I can recall one just about a year ago that the two of us saw together. I don't know that I've ever worked directly with him on any projects that I can think

of. From time to time, he's requested slides from me on patients with aplastic anemia. So I've had dealings with him; and I usually see him about every other month at one of our hematology meetings.
Q But your experience with Dr. Gardner has been generally that he is -- you know, knows what he is doing and is competent?
A He is a very experienced hematologist. He's the former chairman of the department at the medical school in Galveston.
Q And you've had a chance to review Dr. Gardner's deposition?
A Yes, I have.
Q I don't want to go through line-by-line. I don't want to take the time. Are there any very specific things after reviewing his deposition that you -- you know, critiques, comments, criticisms of Dr. Gardner, what he said about specifically this case?
A Well, I might comment -- and you've alluded to it, too, this question of the mean corpuscular volume and the significance of that. In some of the studies, in fact they're referenced in here, a few patients

with benzene-induced problems have had elevated mean corpuscular volume levels. And I believe Dr. Gardner commented something to the effect that that might be an early manifestation of benzene toxicity.
But elevated mean corpuscular volume levels are generally the rule in people with liver disease. And the next hundred people I see with an elevated mean corpuscular volume, at least 50 are going to have some form of liver disease; and none of them are going to have benzene poisoning.
So that in this particular case, the fact that we know that on a routine basis virtually every time he had chemistries done, his liver function tests were abnormal. There's a ready explanation for any elevated mean corpuscular volume; and, in fact, the elevations that he had are trivial and generally within the normal range on the lab slips reported there. So that I would say to attach any significance to the mean corpuscular volume, I can't think that that's of any usefulness.
In terms of other things that he

commented on, I don't remember any specific detail what he said that I might make comment on. We've already commented on the fact that he mentioned that he has not cared for people with benzene-induced aplastic anemia. That would speak to the rarity of the problem. I don't think there's anything else I could comment on in that deposition.
Q Let me take a minute and go through your CV that we've identified as Exhibit 2.
You list your present title as director of medical education and director of transitional -- of the transitional internship program at St. Joseph's Hospital, correct?
A Yes.
Q How long have you been in that position?
A Well, I've been director of the transitional internship program since about 1975, and the director of medical education in the hospital for probably the last nine or ten years.
Q Sometime in the eighties? Mid-eighties?
A Yes.
Q So currently you've got a full-time position at St. Joseph's?

A Well, no. I split my time between private practice and the hospital. I have two offices, one in the hospital and one in a professional building.
(1 Prior to -- tell me just briefly what you do in your duties as a director of the medical education program.
A Well, with respect to the transitional internship program, we have 12 transitional interns that spend a year at the hospital and then go off on various residency programs; and I'm in charge -- I'm a committee of one that selects all of these interns and, if you will, hires them.
And I'm in charge of their education during the course of the year. They rotate on various services and end up going into glamour specialties like ophthalmology, things like that; and they end up driving Mercedes.
The other aspects of my duties are that we have five residency programs, four in additional to the transitional program; and I am in charge in a titular way of those programs. In other words, each program has a

subdirector. We have a director of our surgery program, but theoretically I'm that person's boss. So we review the data from our surgery residents and so on.
So there are a lot of administrative things, numerous meetings to attend, that have to do with maintaining our residency programs at the hospital.
Q Do you do any specific teaching?
A Yes.
Q What do you teach?
A Well, I teach hematology. In other words, these residents will rotate on hematology; and for that month, all they do is see our patients and work them up, do bone marrows, do whatever all we're doing. So they're getting, let's say, on-the-job teaching.
Q It's in a clinical context?
A It is in a clinical context, yes.
Q Do you do any lecturing?
A Yes. We give lectures at grand rounds, and we present conferences. From time to time, I give didactic lectures at the two medical schools. So that within our hospital, I function as what is a usual function for a

director of medical education.
Q And the lectures at grand rounds or the lectures that you've referred to, do any of those specifically involve discussing aplastic anemia and the causes of that disease?
A I have discussed that in the past and presented cases with aplastic anemia. I'm trying to -- it would have to be not in the last two or three years. I don't recall presenting that subject, but I have in the past.
Q When did you first have any association with the hospital? You said 1975?
A 1975. Because prior to that, I was on the faculty at Baylor College of Medicine. And then in 1975, I defected to the University of Texas and I was stationed --
Q Made you popular?
A Made it popular. And I was stationed down at St. Joseph's Hospital.
Q You also have a private practice?
A Yes.
Q You've had a private practice during this whole time you've practiced medicine?

A Yes.
(1 Tell me about your private practice today.
What kind of practice?
A What does it consist of? Well, I'm officed with a group of cancer physicians. We have three surgeons, one dermatologist and another internist like myself. And our group primarily specializes in cancer work, although my particular practice, probably about 60 percent of the patients have some form of cancer and about 40 percent don't. So I do standard classical hematology.
Q Mostly care and treatment of people who were referred to you with blood disorders?
A Yes. Leukemia patients, multiple myeloma, lymphomas, in the case of malignancies; and in the hematology side, people with bleeding disorders, anemias, that kind of thing.
(a How many patients -- do you go to your clinical practice every day?
A No. Sometimes it's necessary because people drag into the clinic. But what I try to do is see patients on Tuesdays and Thursdays. And I'll typically see in the outpatient clinic, oh, 15 patients on each one of those

days. So I might see, let's say, 30 patients a day in our clinic; and then I also have some inpatients in the hospital that I round on, see consults in the hospital and so on.
(a Have you ever performed services as -- I guess that would be described as relating to industrial medicine or occupational medicine?
A No.
Q Have you ever been part of a team who was designated by an employer to do work on their employees?
A No.
(1 Of the patients you see, do you have a feel for how many of your patients come from, you know, blue-collar or working-class type environment?
A Well, these days, much of our patients come through various managed care plans, and they can really come from anywhere. I would say we see people from all walks of life. It would be pretty hard to put a number on that -- blue collar. We certainly see industrial workers and mechanics, and then we also see white-collar patients.

Q In your practice today, when a patient presents as part of your history and physical, do you routinely go into their work history?
A Generally. Particularly if they have any sort of a malignancy, or let's say a suppressed bone marrow for any particular reason. We ask them if they have any unusual hobbies. Do-they work with any chemicals. What do they do for a living. Do they smoke. Do they drink alcohol. What drugs are they taking. Those are the kind of things we ask. What the family history is. Are there other people in the family with that diagnosis or something similar.
(a All of those things to help in your differential diagnosis?
A Yes.
(1 Have you always been that careful during your whole medical practice of asking about occupational background?
A Well, I must admit that when I first went into medicine in some respects I was more thorough than I am today; but then I think I know a little more today. So I can have the

luxury of being a little less thorough.
So that we still do ask them about
all of these exposures, but I think at this
stage of my career I have a feel for which
particular exposures I'm interested in and
which I'm not.
(a With respect to blood disorders, which are
the exposures that you are most interested
in?
A Well, I can give you an example. I saw a
lady the other day with abnormal blood
counts, which she wanted to relate to an
episode of dysentery when she was a
stewardess and went to Panama in 1950.
So I decided that that wasn't very
important information. I wasn't interested
in what happened in 1950 when she was a
stewardess. But I was interested in the fact
that she's been an alcoholic for about the
last ten years. So that it just depends on
the patient.
(a If you would, take a second and look through
the publications on your resume.
A Yes.
(1 Are there any -- there's quite a few, but

what I'm mostly interested in is articles that you, based on your best recollection, have discussed specifically aplastic anemia and/or benzene-related blood disorders.
A Well, in reference No. 38, I talked about treatment of iron overload in patients with chronic anemias. Several of those patients had aplastic anemia, which is -- an iron overload is a problem in those that have to get lots of blood transfusions, and that article dealt with how to treat that.
No. 52 was an article on current therapy of aplastic anemia. That was written in 1985. That article cited several cases that I was following.
No. 55 had to do with marrow aplasia from allopurinol.
Q What kind of -- is it a drug?
A That's a drug, yes.
Q What kind of drug?
A It's a drug that reduces the uric acid level. It's used for gout and occasionally can cause aplastic anemia.
I have an article, No. 59, that has to do with PNH, or paroxysmal nocturnal

hemoglobinuria, which is a subject you mentioned, which is frequently seen in patients with aplastic anemia.
Q That was a test that we discussed that was negative?
A Yes, the PIH test.
Those are -- those would be the ones I would cite specifically to do with aplastic anemia. I've not written anything specific to benzene.
Q Have you done any research or special study in the area of benzene-induced aplastic anemia?
A No.
Q And I think you testified earlier, but I want to make sure, that it's your recollection that none of the aplastic anemias you treated did you attribute to benzene exposure.
A That's correct.
Q How many aplastic anemias was it that you estimate?
A Estimate. I think I said 20, because I can think that I've treated about 10 people with aplastic anemia with antithymocyte globulin, as they did this case, and 2 with marrow

transplants, and then a number with neither one of those modalities before either one was available. So I would have to guess at least 20 patients, I'd say, with aplastic anemia.
(a You also do some consulting work.
A Yes.
(1 Tell me how much consulting work you do. Is that part of your clinical practice or part of your work at St. Joseph's or neither?
A Probably neither, depending on how you look at it. I look at it as continuing medical education. So like I said, that's part of my St. Joseph's practice.
(1 What percentage of your time do you spend doing your consulting work?
A A very small percentage. I would say less than 5 percent.
(a Do you know what percentage of your income you derive from consulting work?
A Very little. I would say certainly less than 5 percent.
Q What are your rates for your consulting work?
A Oh, I would say $200 an hour.
(a No matter what you are doing?
A Generally no matter what I'm doing.

Q And do you have any -- do you have an estimate of how many hours you've spent on this case so far?
A Oh, it would be more a guesstimate than an estimate. But it could be four or five hours.
Q And that would have been spent reviewing the records?
A Reviewing some records, pulling things out of my files, reviewing some slides, discussing the situation with the attorney, a couple of phone calls, those sorts of things.
Q How many times have you met with Mr. Faulk?
A We met either once or twice. I know we met recently, perhaps a month ago. We must have met before that; probably twice.
Q In your consulting practice, what I'm obviously most concerned with is litigation-related consulting. How many cases have you been involved in performing consulting services for?
A You are including malpractice cases?
Q Any kind of litigation-related consulting.
A Any kind of litigation? Gee, it would be hard to put a number on that. I would say --

oh, I might review perhaps at a maximum of about six cases a year. Six to eight cases a year. And many of those I don't give testimony because they seem to vaporize. And perhaps two or three times a year I've given a deposition. And perhaps on average once a year I might testify in some kind of a court setting.
(1 So -- and this is over your entire career?
A Oh, probably over the last 15 years anyway.
Q So 15 years, about six per year, what --
A I would say that would be a maximum. In the early of those 15 years, it might be once or twice a year; but I would say -- in the last couple of years, I would say I've probably reviewed about six to eight cases a year.
Q Of those cases, can you give me an idea of how often you were engaged by the defendant and how often you were engaged by a plaintiff?
A Well, more are often the defendant; but I can think of several where it was the plaintiff. It's been, I would guess, probably 75 percent for the defendant and 25 percent for the plaintiff, something in that ballpark.

Q. Of this whole pool of cases, how many cases involved, I guess, allegations of exposure to chemicals?
A Well, several. I wouldn't say it would be the majority, but I could think of several. I mean, I would have to say it is probably perhaps ten. That's just a rough guess.
Q And of those, how many involved benzene-related allegations?
A Many of those. I would have to say probably about 80 percent of those.
Q. In any of the benzene-related cases, have you been asked to consult by the plaintiffs?
A No. Not that I can recall.
(1 Can you give -- can you tell me who your clients have been on the benzene-related cases? What companies?
A Well, I testified on one occasion for Amoco. Actually, it was a patient that I had taken care of who had chronic granulocytic leukemia and claimed that it was a consequent to benzene exposure.
I testified concerning a patient with multiple myeloma; and I can't remember at all who his family was suing, but the

allegation was that the benzene had caused him to have multiple myeloma.
Q Do you remember the law firm?
A The first one was a firm out of Austin, Flahive, Flahive and something. The second one I seem to think was Baker & Botts, but I wouldn't swear to that. I think that's right.
Then I testified on a case of acute lymphoblastic leukemia that was alleged to be caused by benzene, and I remember the attorney was Mr. Shoebotham. I think that's Baker & Botts. I'm not certain about that.
Let's see, I reviewed other cases where lymphomas have been alleged to be caused by benzene; but I don't think I've been asked to give any testimony in those cases.
Q Do you remember who you were engaged by?
A I really can't.
Q Let's focus on deposition testimony then.
A Yes.
(1 How many times have you given deposition testimony in cases that involve allegations of benzene-related diseases?

A Well, I gave a deposition on the myeloma patient case that I -mentioned.
Q Do you remember the name of the case or how long ago it was?
A Poston, P-o-s-t-o-n.
Q P-o-s-t-o-n?
A Yes, Poston.
Q Where was the case pending?
A I assume here in Houston.
fl You gave a deposition?
A I'm quite certain that I did.
Q Did you testify at trial?
A There was no trial. The case was resolved before trial.
Q That was multiple myeloma?
A That was multiple myeloma.
Q And you think Baker & Botts was the person -- the law firm that hired you?
A I think so. It could have been Woodard, Hall & Primm, but I -- it was probably one of those two.
Q You don't remember a lawyer's name on that one?
A No.
Q What other depositions have you given?

A On any subject?
Q On benzene.
A Benzene.
Q Allegations of benzene-related disease.
A I gave a deposition, I believe, on this case with Mr. Shoebotham that had to do with acute lymphoblastic leukemia and benzene.
Q Do you remember the case name?
A No.
Q Was that herein Harris County?
A Yes. The patient was seen at Methodist Hospital, but I don't remember what the name was.
Q Do you in your office, or anywhere, keep a list of your depositions or copies of your depositions?
A No. I do have a list of firms that I've consulted for and the lawyers within those firms that I've worked with, but I don't have any -- if I give a deposition, I may review it and then throw it away. I don't retain any files of those.
Q That's very smart of you because you would have to drag them to all of these things.
A What I look forward to is when I get a

railroad car full of this material, is to find out that the case has been settled and then I get to throw it all away.
Q If I could, I'd like to ask you to -- if you could forward to Mr. Faulk that list.
A Yes.
Q That might help us a little bit here.
MR. FAULK: Let's go off the record just a minute.
(Discussion off the Record)
Q (By Mr. Thompson) What I need to do is try and determine in what cases you've given testimony or written reports about benzene-related diseases. So I'm trying to find the quickest way to get down to that. With respect to the ALL case you refer to, you recall giving deposition testimony but you don't know really the name of the case?
A No. I gave deposition testimony and also testified at a hearing on that case. And I remember the judge, whose name was Green; but that's about as close as I can get.
Q That was in Austin?
A No, that was here in Houston.

Q Houston.
A Actually, I've testified in front of Judge Green twice, once in Galveston and once here in Houston. Once on the chronic granulocytic leukemia case I mentioned and once on this acute lymphoblastic leukemia case.
Q Do you recall how long ago?
A Well, the one in Galveston I'm guessing about five years ago. The one -- the acute lymphoblastic leukemia probably two years ago.
Q Any other testimony?
A Well, with respect to benzene, I can't recall that I have given other testimony.
Q So three depositions?
A As best I can recall, I -- that's about as best as I can recall, yes.
(1 And in each of those cases, was it your conclusion that the benzene exposure did not cause the disease in question?
A Yes.
Q In any of those cases, did you review exposure monitoring data or anything like that?
A There may well have been some of that data in

there.
Q Have you been asked to prepare any demonstrative exhibits or aids for your testimony at trial?
A No.
Q And it's my understanding you've brought with you everything that you have prepared or reviewed in preparation for your testimony in this case?
A Yes. As I mentioned early on, there might be something that we haven't discussed. Like if you want to suddenly decide you want an article on mean corpuscular volume, I could find one in my files; but I don't have it here today.
Q I understand. What I mean is to date, stuff that you have specifically pulled out, reviewed and referred to in preparing your report making your notes and the various things we've discussed today.
A Yes. That is correct.
MR. THOMPSON: I have no further questions.

MR. FAULK: We'll reserve ours until time of trial.
(Deposition concluded 5:36 p.m.)

THE STATE OF COUNTY OF

I, ETHAN A. NATELSON, M.D., hereby certify that I have read the foregoing transcript of my testimony given in the foregoing numbered and styled case and that same is true and correct to the best of my knowledge and belief.
I further certify that any and all corrections have been made on a separate page and initialed by me.
This the day of 1996.

ETHAN A. NATELSON, M.D.
SUBSCRIBED AND SWORN TO BEFORE ME, this the day of , 1996.

Notary Public in and for the State of
My Commission Expires

Job No. 1-25247

THE STATE OF TEXAS

I, JOHNNIE E. BARNHART, Certified Shorthand Reporter in and for the State of Texas, hereby certify that this deposition transcript is a true record of the testimony given by the witness named herein, after said witness was duly sworn or affirmed by me.

I further certify that I am neither attorney nor counsel for, related to, nor employed by any of the parties to the action in which this testimony was taken. Further, I am not a relative or employee of any attorney of record in this cause, nor do I have a financial interest in the action.

Further certification requirements, if any, pursuant to the Rules will be certified to in the Supplemental Certificate after they have occurred.

Subscribed and sworn to on this, the day of , 1996.

JOHNNIE E. BARNHART, CSR
Certificate No. 976
Expires December 31, 1996

NO. 94-38491

JESUS VALENTIN FRIAS : IN THE DISTRICT COURT OF
VS. : HARRIS COUNTY, T E X A S
SHELL OIL COMPANY,
ET AL. :270TH JUDICIAL DISTRICT

REPORTER'S SUPPLEMENTAL CERTIFICATE
TO DEPOSITION OF ETHAN A. NATELSON, M.D.
TAKEN ON SEPTEMBER 25, 1995

I, JOHNNIE E. BARNHART, Certified Shorthand Reporter, hereby certify pursuant to the Rules and/or agreement of the parties present to the following:

That $ is the charge for the preparation of the completed deposition transcript and any copies of exhibits, charged to

State Bar No.

That the deposition transcript:
was submitted to the witness on
for the witness to examine, sign and return to CONTINENTAL COURT REPORTERS, INC., by

was not submitted to the witness for examination and signature, same having been waived by the witness and all parties present.

That the deposition transcript:
was returned, properly executed by the witness, to the deposition officer.
was returned unsigned because of
illness
refusal to sign
absence of witness
failure to accept delivery