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JUDGE SWEENEY: Back on the record.

Who will be next?

MR. ECKERT: Next I would like to call Mr. W. B. Papageorge.

Whereupon,

W. B. PAPAGEORGE

was called as a witness by the Environmental Protection Agency and, having been first duly sworn, was examined and testified as follows:

JUDGE SWEENEY: Mr. Papageorge's affidavit will be identified as Exhibit 83.

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(The document referred to was marked Exhibit 83-1 thru 4 for identification.)

JUDGE SWEENEY: How many attachments are there? They are not identified in any way.

MR. PARK: They are listed on the last three pages of the affidavit. They're identified by number.

JUDGE SWEENEY: I see. So we can put our own numbers on there. They would be 83 and then subnumbered 1 through 43; is that correct?

MR. PARK: Yes, sir.

JUDGE SWEENEY: Mr. Eckert.

MR. ECKERT: Thank you.

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CROSS-EXAMINATION

BY MR. ECKERT:

Q Good afternoon, Mr. Papageorge.

In your first paragraph you list your credentials. You're a chemical engineer. Is that correct?

A That is correct.

Q Have you ever performed any bioassay work?

A No, sir.

Q Have you any training in biology, toxicology, or related fields?

A No, sir.

Q Has Monsanto done any work to ascertain the toxicity of PCB's?

A Yes, we have.

Q Could you briefly describe the work that has been done, and by whom it has been carried out?

A We have sponsored work dealing with laboratory mammals, more specifically the white rat, beagle dogs, and worked with leghorn chickens. This work ~~is being~~ was performed in the Industrial Biotest Laboratories in Chicago, Illinois.

We have also sponsored some fish toxicity studies by that same laboratory, and also by Bionomics Laboratory in Wareham, Massachusetts.

That's all I can recall at the present.

Q Were the fish toxicity studies 96-hour tests or

eb3

were they or were any of them of longer duration?

A No, they were the short-term.

Q Have you cited the results of these tests at any point in your affidavit or in the exhibits?

A I don't-- No, sir.

Q Now on page 2, number 3, you propose a definition of PCB's, and you propose to restrict it to those which have been shown to persist and rapidly bioaccumulate in the aquatic environment.

Why is it necessary to restrict PCB's to those which persist and rapidly bioaccumulate?

A From my personal long exposure to the PCB environmental problem there is no question in my mind that what we're all talking about in the final essence are those isomers which appear to resist degradation and the problem seems to be one primarily of presence in the vast majority of the recorded literature.

And if true then we should concentrate our attention to those isomers that are identified in the environment.

Q Now on page 3, you describe PCB's in general and there, at aboutthe third paragraph you state the properties of PCB's, and you list inertness as one of the properties.

Now a material is inert because generally it resists decomposition and degradation; isn't that correct?

A That is correct.

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Q And you have not distinguished in your statement between various isomers of PCB's.

Would it be a fair statement that all of them are relatively inert chemicals?

A No, it would not be.

Q Which ones are not inert?

A The lower chlorinated isomers of chlorinated biphenyls are fairly active, reactive.

Q What is an isomer?

A I don't know if I can come up with the correct scientific definition but it is a chemical entity which contains the -- in this instance the same biphenyl configuration and the location of the chlorine at a specific point in this configuration.

And as I say that, I recognize it is not very clear.

Q Well, I would like to define our terms early. If we are talking about two PCB's that have three chlorine atoms apiece but at different points, are those isomers?

A Each one is an isomer.

Q Each one is an isomer.

A Together they are referred to as homologs.

Q Now, is a PCB which contains three chlorine atoms and a PCB which contains four chlorine atoms, is one an isomer of the other?

A No.

eb5

Q So that these are referred to a homologs, are they not?

A They are not isomers of each other; they are isomers of chlorinated biphenyls.

Q So that you use isomer to refer to any particular chlorinated biphenyl?

A I use isomers to refer to the chlorinated biphenyl which contains a given number of chlorine atoms which are fixed to the biphenyl grouping in a fixed position.

Q Well, perhaps we can clarify this as we go along.

Have you figures on the total production of PCB's for the years -- for approximately the last four years?

A I don't have the exact figures with me, but they range-- The last four years?

One of my attachments is a copy, though I don't know if I even attached it. The PCB Task Force, the interdepartmental task force report on PCB's had, in the early part of that report, a two-page table of the production of polychlorinated biphenols by Monsanto in the years 19 -- I forget, the 1950's on.

Q Is that Exhibit No. 33 to your affidavit?

A Yes.

Q Would you identify where in this exhibit the figures appear?

A This is the exhibit we are talking about.

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(Witness displaying document.)

On pages 6 and 7-- I think I may have misled you, sir. Just a moment, please.

(Pause.)

I did mislead you. 33 is not the reference. It's reference No. 1. My apologies.

Q I see.

I'm not sure I have a copy of reference No. 1. In fact I don't think I do.

In any event,--

MR. RICHEL: Would you like to see my copy?

MR. ECKERT: Yes, I would.

JUDGE SWEENEY: I don't believe that the official record has a copy of it.

MR. PARK: Judge Sweeney, it was not included because this of course was sent out by the Task Force of which I believe EPA was a member. Would it be possible for you to include it by judicial notice or by reference?

JUDGE SWEENEY: Well, just so the record is straight and has everything in it it should have.

You stated at the beginning that there were 43 attachments and if there are not 43 we ought to correct it.

MR. PARK: Yes, that is an error.

JUDGE SWEENEY: I think there are considerably less than 43.

eb7

Do you have a copy to give to the reporter so at least the official record will be correct?

MR. PARK: We don't have one here. We could certainly obtain one. It being a government publication, we didn't include it. We felt every party already had a copy.

JUDGE SWEENEY: Well, but there's a difference between references cited and exhibits of record.

MR. PARK: Yes, sir.

JUDGE SWEENEY: Now if you just want to refer to it, Mr. Eckert, as a government record rather than an exhibit of record, then we won't get the transcript fouled up and in error.

BY MR. ECKERT:

Q Well, if we look at the figures for sales of Arcclor 1254 for the period roughly 1968 through '72, we find that it ranges from a low of 5800 -- that is say 5,800,000 pounds in 1971 -- Is that figure correct?

A Yes.

Q -- to a high of 12,421,000 pounds in 1970. Is that correct?

A That's correct.

Q And the prospect for 1972 was six million pounds.

Do you know what the actual figure was for 1972?

A I don't have that with me, no, sir.

Q Well, in Monsanto's original objection which was

eb8

filed on January 18th-- Do you have a copy of that that you can refer to?

A I believe you're referring to the November 29th presentation to the Effluent Standards and Water Quality Information Committee?

Q Yes, that's correct.

A I have that.

Q Now on page -- I believe it is page 6, there's a bar chart. Do you have that bar chart?

A Yes.

Q Now that appears to show that in 1972-- Am I reading the chart correctly -- between nine and ten million pounds of Aroclor 1254 were produced.

A That is correct. Yes, sir.

Q And roughly the same level for 1973?

A That is the projected for '73.

Q Are actual data available for 1973?

A I just received that this past week. I don't have it with me.

Q Do you recall what the figure was for total production?

A Not exactly; about 40 million pounds total production but I don't remember the breakdown as to type of Aroclor.

Q Now this chart is labelled "Aroclor Production at the William G. Krummrich Plant." Are there other plants at

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which Aroclors are produced?

A Not in Monsanto.

Q Not in Monsanto.

Would these data, in your opinion, tend to show that Aroclor production has been relatively steady over the last three or four years?

If you can't answer that question, I rephrase it:

These data do not confirm to date that Aroclor 1254 production is decreasing?

A That is correct.

Q Now Monsanto's concern is amply documented here about PCB's. Has this concern led Monsanto to work on the development of substitutes for PCB's?

A Yes, it has.

Q And what is the status of the research which has been carried out?

A Research of course continues. We have succeeded in finding some alternatives with some trade-off in some properties, some sacrifice in some properties.

Examples include the reformulation of hydraulic fluids for industrial purposes.

Q Well, PCB's are not now used for hydraulic fluids, are they?

DSW 311826

A That is correct.

Q I'm referring to the capacitor and transformer

ebl0

applications which are alleged to be non-substitute.

A Oh, I thought you meant the total market.

Research continues in finding alternatives for dielectric fluids. So far we have not succeeded in finding any material that possesses the properties we are told by our customers are essential to the application, primarily those properties of resistance to fire and resistance to formation of explosive gases when these fluids undergo stresses in service.

Q On page 6 of your affidavit you state that, "We object to this definition. . ." that is, the EPA-proposed definition of PCB's, "because it implies that all polychlorinated biphenyl isomers are of equal environmental concern; i.e., that they all persist and bioaccumulate in the same manner in our environment. It has been well established by academic, government and industrial researchers that this is simply not true."

Now, with respect to this statement, is this supported entirely by the exhibits which you have attached to your affidavit?

A The exhibits I have attached and this particular reference, Nos. 2 through 13, were intended only as typical examples of the kind of reports that are available. I did not intend to imply that I have access to all possible reports generated throughout the world relating to this subject.

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I just cannot get my hands on all reports.

Q Well, let's take a look then at Exhibit 2.

Now as I understand it, it is your position that the lower chlorinated homologs are selectively degraded. Is that correct?

A That is correct.

Q The author of Exhibit 2 states on page 353 and 354 that:

"It might be expected, therefore, that biphenols with fewer chlorine atoms would predominate in planktonic samples unless these compounds were selectively degraded."

And that, I understand it, is the position of Monsanto. Is that correct?

A That's correct.

Q But in the next sentence the author states:

"Alternatively, since the solubilities and partition coefficients with organisms of the individual PCB compounds in a complex mixture present in an aqueous system can be expected to show considerable variation, the compounds detected in plankton would preferentially be those with lower solubilities in water and higher partition coefficients."

Could this not account for the lack of detection of

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lower chlorinated homologs in the environment?

A Will you give me some time to think about that?

(Pause.)

Q Well, let me ask the question differently.

Do you know what the solubility of Aroclor 1016 is?

A I can give you an approximation.

Q Approximately?

A About 200 parts per billion in tap water at 25 degrees Centigrade.

Q And the solubility of Aroclor 1254, approximately?

A Approximately 50 parts per billion.

Q And the solubility of 1260?

A About 25 parts per billion.

Q So is it a fair statement that the more chlorine atoms, the lower the solubility?

A Yes, that is correct.

Q So that you would expect, if what the author here states is true, to find more of the higher chlorinated homologs because their solubilities are lower. Is that not correct?

A I don't quite understand your question. It would seem to me that the more soluble the material, the more easily it would get into the water systems of the world, and therefore more easily detected.

Q Well, the author here states that:

". . .the compounds detected in plankton

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would preferentially be those with lower solubilities in water and higher partition coefficients."

Do you agree or disagree with that statement?

A I know nothing about plankton, so I cannot comment.

Q To your knowledge, have the lower chlorinated homologs been detected in the environment?

A My answer to your question specifically is yes, but I'm wondering if we're talking about the same thing.

Q Well, perhaps you had better explain your answer in somewhat more detail.

A There have been many reports of a material identified as Aroclor 1254 being identified in environmental samples In this material referred to as Aroclor 1254 there are chlorinated biphenyls which properly are referred to as the lower chlorinated homologs.

So in answer to your question, have the lower chlorinated homologs been identified in nature, the answer has to be Yes.

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Q. Well, you have stated here on page 6 that:

"Environmental monitoring programs have clearly demonstrated that with the exception of direct high-level controllable release near points of manufacture or use, the PCB's found in our environment are the more highly chlorinated ones, i.e., those containing predominantly five or more chlorine atoms per biphenyl molecule."

Do I understand the statement you just made to be a modification of this statement?

A. No, sir.

Q. In other words, the only time that lower chlorinated homologues are found are where they can be associated with direct, high-level controllable release.

Is that correct?

A. Not the only times, no.

There are situations in which living creatures have been found to contain the lower chlorinated mixtures and in those cases it can be demonstrated that the source of the lower chlorinated material was known, identifiable, and of a given type.

Q. Do you know what a partition coefficient is?

A. I believe I do, yes.

DSW 311831

Q. Could you tell me what it means?

A. I believe it's a measure of the ratio of the abilit

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of a material to be present in one medium as compared to another.

Q. Would it be a measure of the rate of uptake in animal fatty tissue?

A. It could be one of them, yes.

Q. Do you know what the rate of uptake in animal tissue is for the various -- how the rate of uptake for, for example, Aroclor 1254 relates to the uptake for Aroclor 1016?

A. No, I do not.

Q. How are PCB's measured in the parts-per-billion range? What analytical technique is used?

A. Electron capture gas chromotography.

Q. Does the sensitivity -- or is the sensitivity of that technique higher for higher chlorinated homologues?

A. I have never heard that. I do not know.

Q. Does the technique depend upon the detection of chlorine atoms?

DSW 311832

A. No.

Q. How does it work?

A. As I understand it, it is based on the characteristi of many materials in which their ability to adsorb on certain kinds of surfaces or materials varies with their chemical structure.

And there are devices that have been developed

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in which the material being studied is introduced under certain conditions -- of temperature, primarily.

This material is then, under these conditions of temperature involved, ~~is~~ ant trapped on this adsorbed material and these other devices are there to help us identify and quantify this material.

Q How precisely is the material quantified?

A I'm not an analytical chemist, so I can't answer.

Q Is salicylic acid cleanup used in the GLC process?

A Mr. Eckert, not being an analytical chemist, I cannot comment.

However, I have with me Dr. Scott Tucker, and if you wish we can consult with him to provide appropriate answers.

MR. PARK: Is that all right?

MR. ECKERT: I would rather, if Dr. Tucker is capable of answering this question and Mr. Papageorge is not, I would prefer to question Dr. Tucker directly. But we can do that later.

BY MR. ECKERT:

Q You have referred in the next paragraph to the lower polychlorinated biphenyls degrading rapidly enough to prevent bioaccumulation.

What is degradation? What do you mean by "They degrade"? What happens to them?

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A. As I understand your question, it consists of two parts: what do I mean by degradation?

To me, degradation means that the material has lost its initial chemical identity after undergoing changes brought about by any one of several influences.

Now, what happens: I don't quite know how to answer that except that the chemistry of the final material differs from the chemistry of the initial material.

Q. And your statement, with respect to degradation, is based upon papers 17 through 21, and 37.

Is that correct?

A. Yes, sir.

Q. Do any of those papers deal with PCB's having more than three chlorine atoms?

A. Oh, yes.

Q. Which ones?

A. They all do.

Q. Well, let's take a look, first, at 17: that's Evans and Lunt.

How many chlorine atoms are in the PCB's that were involved in this experiment?

A. We are looking here at a summary of a paper, and as I read this summary it refers in the last paragraph to chlorinated biphenyls. That is the only reference I see to the chlorinated biphenyls, so I have no way of knowing from this

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summary the scope of this work.

Q How about the next one: "Metabolism of Biphenyl by Psuedomonas Putida"?

In this paper there are no chlorine atoms in the biphenyls.

Isn't that correct?

A I see no reference to the chlorobiphenyls: that is correct.

Q Now, reference 19 is --

MR. PARK: Could I raise one question here?

I have a feeling, just as in Dr. Thompson's original testimony that was presented some time ago where we found out that he did not put it all together himself, Mr. Papageorge has done the same thing here.

A great deal of this -- or certainly some of it -- was provided by our Dr. Tucker, who is here. Is it possible, or would there be any objection to letting Dr. Tucker and Mr. Papageorge confer on the questions that you're asking?

MR. ECKERT: Yes, I think there would be an objection.

I don't see any point in having Mr. Papageorge testify to something that he knows nothing about. Now, if that's your position, that Mr. Papageorge is not competent to answer this question we will hold it for Dr. Tucker later on.

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MR. PARK: That's not the point I thought I was making here.

Again, assuming we're after the truth, let's keep in mind that Monsanto is not directly affected by the toxic pollutants regulations that are the subject of the hearing. We're here simply to try to provide what we feel is some reason to the standards that will be promulgated by the EPA.

We are a manufacturer of a product. We have some experience in dealing with it. We're trying to assist in finding the truth.

I thought that I -- at least, I certainly received the impression in the early days of the hearings, when the EPA witness was on the stand, that he made clear that a number of people came together to put forth and to prepare and develop the documentation that the EPA had relied on at that time.

I fail to see why you would object to allowing two people here to respond to the question.

MR. ECKERT: I'm just trying to keep the proceeding from getting confused. I would like to talk to people who are knowledgeable on the subject matter, that's all.

MR. PARK: Well, let's let the record indicate that we have another man here who might well be able to answer the questions raised.

MR. ECKERT: I will pass over this for the ti[illegible]

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being.

BY MR. ECKERT:

Q. I would like to turn to reference 4.

That, I believe, is the Jensen paper.

On page 248, the authors state:

"We found that the principle PCB components were PCB numbers 7 through 14 (low number is equal to a low chlorination degree), but the mussels also contained the lower numbers."

Does this not lead to the conclusion that PCB's with lower numbers also accumulate in aquatic organisms?

A. Yes.

But it tells us nothing about the source of that PCB and the proximity of the mussels, in this instance, to that source.

Q. That's true; it doesn't.

Does it tell us anything about whether the PCB's degrade?

A. Not in this instance.

Q. In reference 17 -- and I'm going to be referring now to your statement that the chlorinated biphenyl isomers readily undergo bacterial degradation; the rate is dependent on the number of chlorines per biphenyl molecule.

The first exhibit to substantiate this is Exhibit 17.

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Now, Exhibit 17, as we have already established -- I believe we were going to hold this for later questioning.

Exhibit 18, as I recall, is unchlorinated biphenyls, so we come to Exhibit 19, "Degradation of Polychlorinated Biphenyls".

I think on this one I had better hold that for Dr. Tucker.

What I would really like to ask you about is the study that was carried out by Monsanto -- Oh, this is another study by Dr. Tucker. I really think all of these questions had better be held for Dr. Tucker.

In the next paragraph it's stated that:

"The rapid metabolism of these chlorinated isomers, and their lack of importance as contributors to the chlorinated biphenyl tissue is evidenced in the results of numerous studies."

Now, to your knowledge, have metabolites of PCB's ever been identified?

A. I do recall reading reports in which some attempts have been made to identify the metabolites of chlorinated biphenyls.

Q. Which reports?

A. I do not remember. I don't recall them now.

Q. Nothing you have supplied us here?

A. I don't believe so.

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Q. Can you state with any certainty that metabolism has occurred, unless you have identified a metabolite?

A. No.

Q. In other words, you would agree that the data which you have provided us here don't support the rapid metabolism set forth in the bottom paragraph on page 6?

A. I note, in that one paragraph, when I start the paragraph I do refer to rapid metabolism. Later, if you will read further, I also use the expression "and/or excretion", as I remember.

Q. Rapid metabolism or excetion?

A. Or excretion.

My intent here was to show that there was a disappearance of that material.

Q. Where does the material go? Has that been identified?

A. In this instance here?

Q. Yes.

A. I do not know.

Q. In Exhibit 28 -- this is the study by Mr. Ryter at Woods Hole -- on page 9 a series of concentration factors are given.

Do you have that before you?

A. Yes, sir.

Q. There it says that for isomers with two chlorines

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the concentration factor is 1000.

Is that right?

A. Yes.

Q. And for three chlorines it was 7500?

A. Yes.

Q. And for four chlorines, symmetrical, 8000?

A. Yes.

Q. And four chlorines, asymmetrical, would be 12,000?

A. Correct.

Q. Do these data, in your opinion, support a conclusion that the lower-chlorinated homologues cannot accumulate?

A. I sense here some confusion, either in my understanding or in your understanding, Mr. Eckert, and I don't quite know at the moment how to clarify it.

Q. Well, why don't you answer my question first, and then you can clarify the misunderstanding?

A. Your question, as I understand it, says that I made a contention that the lower-chlorinated isomers do not accumulate, and I don't know that I ever said that.

Q. It states here on page 6, and I am quoting you now, sir:

"The lower polychlorinated biphenyls degrade rapidly enough to prevent bioaccumulation."

A. Again, we've got to look at this with the proper perspective. Are we talking about the oyster that's exposed

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to this material at the source of discharge, or are we talking about a creature in the environment remote from any immediate discharge of these materials and eventually exposed to these materials we call chlorinated biphenyls?

Q Well, let's talk about the latter type for the time being, since that seems to be what you're stating won't accumulate any biphenyls.

Is it your position that organisms which are not directly at the point of discharge will not accumulate lower-chlorinated homologues?

A My position is that the creatures in the environment are not apt to accumulate lower-chlorinated isomers of chlorinated biphenyls to a degree that would be expected from the amount of chlorinated biphenyls that have been introduced into the environment, which would indicate that some of these isomers have been made inactive or have been chemically changed to the point where they are no longer identifiable in these creatures as isomers with low chlorine content of chlorinated biphenyls.

Q Well, couldn't the lack of finding of the lower-chlorinated homologues in the environment be equally attributable to the difference in concentration factors between lower chlorinated and higher chlorinated homologues?

For example, in this Ryter paper it appears that isomers with six chlorine atoms accumulated at a rate 48 times

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as much as those with two atoms.

Couldn't that account for the lower incidence in the environment of tissues containing PCB's of lower chlorinated homologues?

A. I don't understand your question.

Q. Do you have any evidence that degradation of the PCB's is responsible for the lower residues of lower-chlorinat homologues, as opposed to simple differences in the bioconcentration factors between the homologues?

A. What's the question?

Q. Do you have any data to show that degradation is responsible for the lower incidence of lower chlorinated homologues, as opposed to the differences in concentration factors between higher chlorinated and lower chlorinated homologues?

A. There are some exhibits which I suspect you wish to talk to Dr. Tucker about, or question Dr. Tucker about, in which there is evidence that the lower chlorinated isomers of biphenyls, chlorinated biphenyls, degrade.

There's also other evidence in the exhibits attache I believe it is reference number 33 -- there's a section in that presentation to the task force in May of 1972 in which we compiled some information that we had in terms of what we know about the amount of chlorinated biphenyl we have sold through the years and the amount that appears to be identified

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in samples from the environment.

There is an inconsistency in terms of the amounts represented in that information of the higher-chlorinated isomers as compared to the lower-chlorinated isomers.

Q. Are the environmental samples ambient samples or tissue samples?

A. What is your definition of ambient, sir?

Q. Samples from the water or the sediments, analyzed directly.

A. The samples I have referred to were primarily tissue samples.

Q. So I ask once again: couldn't that difference be accounted for by the difference in the degree to which these homologues accumulate?

A. I don't know.

Q. You don't know.

MR. PARK: Do you understand the question?

THE WITNESS: I don't understand the question.

MR. PARK: I think the witness is looking at a table here that shows there are fewer lower chlorine isomers concentrating in the environment, and is thinking that that indicates that they degrade, since more are manufactured than the higher chlorine isomers.

MR. ECKERT: Well, perhaps the witness can direct me to the table he's looking at.

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THE WITNESS: This is the article by John Ryther which I have listed as Exhibit 28. On page 9 there is a table and let me refresh my memory again on this.

(Pause.)

As I understand his work, Ryther's work refers goes to Aroclor 1254 and the investigator then determined the amount of dichloro, trichloro, pentachloro, and so on, diphenyl that they found in the tissues of these mussels and from that he calculated a concentration factor.

I don't know that that tells me anything about degradation.

MR. ECKERT: Well, I think that's what we wanted to say, too. I'm glad to hear you say that.

THE WITNESS: This does not tell us anything about the elimination of the material without degrading it. That's the point I'm trying to make.

BY MR. ECKERT:

Q Now on page 7 you state that:

"Similar findings in fresh water and marine fishes were reported by Zitko and Jensen. . ."

When you say "similar findings" what do you mean?

A By using the word "similar" I'm referring to the previous reference, Risebrough No. 2, in which Dr. Risebrough referred to the fact that more Aroclor 1232 had been produced than Aroclor 1254, yet invariably samples taken in the

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environment, other than these taken near an outfall, ~~or~~ the material identified in tissue, is referred to as being most similar to Aroclor 1254.

Q The Jensen paper you cite is entitled "DDT and PCB in Marine Animals in Swedish Waters." Is that correct?

A That is correct.

Q Do you have any data on the relative discharges of high and low chlorinated biphenols into Swedish waters?

A No, sir.

Q So that there is no basis for concluding then that the levels which were found are higher than would have been predicted because you don't know what to predict, based on the quantity discharged. Isn't that correct?

A That is correct.

Q Now you stated in the next sentence:

"The disappearance of the lower chlorinated homologs in extracts of tissues from birds and mammals indicate rapid metabolism or excretion of the lower chlorinated homologs."

Are there any data on aquatic organisms as opposed to birds on such excretions?

A I'm not aware of any.

Q Even if materials are excreted, can they not exert direct toxicity?

A I'm not qualified to answer.

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Q I'd like to refer now to the Bagley and Reichel, et al. paper, Exhibit 12, I believe.

Now on page 254 of that paper there are some mass spectrographs.

Am I getting into an area where I should ask Dr. Tucker about the interpretation of these charts?

A I would suggest that, yes.

Q Very well. We'll hold these questions.

On page 8 you state:

". . .there is a definite difference in the toxicity and availability for bioaccumulation of dissolved and adsorbed chlorinated hydrocarbons."

And you cite three exhibits.

I'd like to turn first to Exhibit 24. There it states that-- The authors state in the second sentence of the article that:

"Both organochlorine insecticides and --"

A Let me find it first.

Q Greichus, Greichus, and Emerick.

A All right.

And page which?

Q The first page of the article.

The authors state that:

"Both organochlorine insecticides and polychlorinated biphenyls are stored in the fat

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eb4

of birds and are difficult to eliminate from the body. Therefore, it could be expected that PCB's would also be concentrated in the food chain of carnivorous birds."

Do you agree with that statement?

A I find no quarrel with it.

Q Does this lead to the conclusion that PCB's are rapidly eliminated or excreted?

A This does't tell me which PCB's he's referring to.

Q Now you cited this paper on the difference in toxicity and availability for bioaccumulation of dissolved and adsorbed chlorinated hydrocarbons. Could you point out to me where in this paper the difference in availability of dissolved and adsorbed PCB's is discussed?

A Let me refresh my memory. I haven't read it for some time.

(Pause.)

MR. PARK: Judge Sweeney, would it be permissible to let the record show, in deference to the witness, that these materials were submitted just about two months ago, and at that time the witness was much more familiar with all of the attachments and citations than now.

MR. ECKERT: Well, I would expect your witness, just as our witnesses, to be ready to be cross-examined on any of the materials they have submitted. I certainly would

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not expect any less from our witnesses when they are on the stand, Mr. Park.

MR. PARK: Well, Mr. Eckert, let the record indicate that some of the materials that I understand are coming from your witnesses have yet to be received by us.

MR. ECKERT: That's not the issue. The issue is whether or not our witnesses will be prepared to answer questions from industry Counsel.

MR. PARK: I was just pointing out that the time period between preparation of your witnesses' testimony and their cross-examination and that between our witnesses' preparation and his cross-examination is widely different.

BY MR. ECKERT:

Q With all due deference I think we should try to move along here and not delay any longer. If you come up with something--

A I can't find it. When it was initially put in I thought it was relevant. At this moment I just can't find the specific paragraph or statement which at the time I thought was relevant.

Q When PCB's appear in sediments, in your opinion are they then removed from availability for uptake into organisms or do they remain available?

A The availability of the PCB's to adsorb on particulate matter to organisms will vary on many conditions such

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as the type of organism, its proximity to the sediment, its ability to -- let's call it digest the sediment if you will, or extract the PCB from the sediments.

Q Could you not have a situation in which the sediments in the ambient water were in equilibrium and in fact there was an interchange, an exchange of PCB's between the two media?

A Yes. The answer to your question is Yes.

Q You also cited Exhibit 35 for this same proposition and I would like to ask you to turn to Exhibit 35.

Exhibit 35 deals with Endrin. Isn't that correct? And isn't it true that Exhibit 35 does not directly deal with PCB's at all?

A That is right, but the reference is to chlorinated hydrocarbons and this was introduced as an example of the types of things that investigators are finding with chlorinate hydrocarbons.

Q Well, now, this paper-- Let's take it on its own merits. Does it say anything with respect to the difference in the toxicity and availability for bioaccumulation of dissolved and adsorbed chlorinated hydrocarbons?

A As I understand this paper, it attempts to demonstrate that a chlorinated hydrocarbon is available to the particular species of fish referred to there, primarily through its gills rather than through the digestive system.

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Q Does that have anything to do with the difference between dissolved and adsorbed chlorinated hydrocarbons with respect to their bioaccumulation potential?

A I would think so.

Q What conclusion do you think can be drawn from this paper?

A The conclusion I drew from this paper is that this particular material, Endrin, accumulated in the fish that were studied to a high degree, primarily through the gill.

Q But does the paper specify whether the accumulation was through the taking in of dissolved or adsorbed material?

A I assumed it was dissolved material.

Q But the paper doesn't say that?

A It doesn't say it is on particulate matter either.

Q It doesn't say either one so there is no basis for a conclusion; isn't that right?

A Okay.

MR. LORANT: Mr. Eckert, before you leave that, could you give me the citation of that paper since I don't have a copy of it here?

MR. ECKERT: The paper I'm referring to here is "The Pathway of Endrin, Entry in Black Bullheads, Ictalurus melas," and it's by Ferguson and Goodyear and Copeia, 1967, pages 467 to 468.

BY MR. ECKERT:

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Q Finally, we come to Exhibit 36, Polychlorinated Biphenyls Adsorbed from Sediments by Fiddler Crabs and Pink Shrimp."

Is there any data here with respect to the difference between dissolved and adsorbed chlorinated hydrocarbons?

A If I recall the question, you said "Is there any data" in this article that refers to the availability of dissolved or adsorbed chlorinated hydrocarbons.

Q The difference in availability between the two forms.

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No, this article just shows that fiddler crabs were found to contain Aroclor 1254 after being exposed to sediments containing Aroclor 1254, it does not attempt to show difference between that and any other type of exposure.

Q This paper does show that even after Arocolor 1254 is -- has entered the sediments, it still remains available for biological uptake, does it not?

A That's right.

Q Further up on page 8, you have stated, "We have found if waste water streams are not sampled properly, the PCB levels found depend on the sampling procedure employed and bear no relationship to the amount of PCBs discharged."

Now what would be the effect upon the levels detected of improper sampling procedures? If your procedures were improper, would you expect to find more or less PCBs than are actually there?

A It could go either way.

Q What would be the effect of an improper sampling procedure? What are the improper sampling procedures? Could you describe the difference between a proper and an improper sampling procedure?

MR. PARK: Mr. Eckert, let him go ahead and answer the question, but I just wanted to say that this is something Dr. Tucker could answer much more ably, if you would wish.

MR. ECKERT: All right. We could hold that.

Is the same true of the discussion on page 9, testing by other laboratories?

MR. PARK: Yes.

BY MR. ECKERT:

Q On page 10, you state in the last paragraph on the page that cumulative sales of PCBs have been estimated to be about 500,000 tons.

Has anyone, or has Monsanto made an attempt to ascertain where those PCBs are today? How much of those PCBs can be accounted for?

A The only attempt to answer that question was made by Dr. Serafim from the Massachusetts Institute of Technology and he included a summary of his thoughts in that Exhibit No. 1 that we were looking for earlier.

Q And I hope we will be provided with a copy of that, too.

MR. ECKERT: Will we be provided a copy of that before the close of today?

MR. PARK: It's an EPA publication, Mr. Eckert.

THE WITNESS: No, it is not.

MR. PARK: I'm sorry.

THE WITNESS: We assumed something, that everybody interested in PCBs had this. It has become the bible.

MR. PARK: It's a governmental publication. I recognize it's our responsibility to bring the thing in.

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JUDGE SWEENEY: Well, could he borrow your copy overnight?

MR. ECKERT: My consultant has a copy which he has just handed to me, so I think the problem is solved.

THE WITNESS: We apologize.

JUDGE SWEENEY: You will supply one for the Reporter

MR. PARK: Yes, sir.

BY MR. ECKERT:

Q About one-half of the PCB's, you state, were used in an application where containment was difficult and losses into the environment were common.

Is it your opinion that all of these PCB's were lost to the environment, or are some of them still out of the environment uncontained?

A When you say "all", do you mean the half?

Q The half, yes.

A It's my opinion that they went out to the environment fairly rapidly.

Q It states that:

"Extensive harm predicted by some theories has not been found and documented."

Can you tell me what theories you are referring to here?

A I can give you some examples that come to mind. The demise of bird populations due to thin eggshells: that

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has been disproven following the initial emotions that arose in the late '60s and the early '70s.

Q. Who predicted this would happen due to PCB's?

A. I'm trying to remember some of the articles.

Dr. Risebrough was one of the proponents of the theory covered very emotionally in the San Francisco Chronicle in '69.

I don't have all of those articles with me. There was, I believe an article in the Environmental Reporter. I don't recall all of them.

Q. Are you familiar with the work done by Platonow on minks?

A. I have read the reference to the Platonow work; I have not been able to get a copy of that paper.

Q. That would be an example where some harm evidently did result.

Isn't that correct?

A. Not having seen the paper, I do not know.

Q. Are you familiar with the term "Yusho disease"?
A. Yes.
Q. To what does it refer?

A. It's the expression used to describe an epidemic that occurred -- at least, it was referred to as an epidemic: symptoms that occurred among a group of about 1000 people in Japan and is attributed to the presence of PCB's in rice ~~oil~~ oil used for human consumption.

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Q Do you recall what symptoms these people experienced?

A Yes.

I recall such symptoms as headaches, dizziness, and running of the eyes, nausea, loss of appetite, skin eruptions, infants born with pigmentation problems that cleared after three months, as I recall.

Q Of the adults who were afflicted: did the problem go away quickly or did it seem to linger on for a long time?

A I believe it varied from person to person; ~~at~~ the last I read there were still some of those people that exhibited some of the symptoms.

Q And how long ago was their exposure?

A The late '60s, about 1968.

Q Are you familiar with any data on damage to cows in England that was attributed to PCB's?

A No.

Q On page 11, you state that the lack of extensive harm, or the lack of evidence of extensive harm, indicates that -- and I am paraphrasing you; correct me if I do so incorrectly --

A Would you give me the paragraph? I find when I'm looking for it I can't listen to you.

Q The top of the page, page 11.

A All right.

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Q "This lack of evidence indicates that all of the PCB's do not persist in the environment as a result of factors such as the biodegradation we have discussed previously."

Isn't it equally possible that the total amount which has been discharged has not yet, on a world-wide basis, reached harmful quantities?

A No, I can't accept that.

From my understanding of the uses of polychlorinated biphenyls, the amounts introduced into commerce, I find it very difficult to conceive that this material has not been introduced into the environment by now.

Q Not that it has not been introduced, but if you spread all of the PCB's that have been introduced into the environment evenly over the world, what sort of concentrations would you expect to find, for example, in the aquatic environment?

A Very low.

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Q In fact it might well be below the limit of detection, might it not?

A Yes.

Q And so the fact that you do not find them doesn't necessarily mean that they are not there. Isn't that also true?

A That's true, but when I say lack of evidence I'm talking about effects rather than presence. It would seem to me that the effects, if any, were to be--

Q It seems to me this sentence does not talk about effects. It talks about persistence. Can you draw any inferences at all with respect to persistence from the lack of effects?

A Did you say resistance or persistence?

Q Persistence.

A Well, when I worded this, the word "evidence"-- I had intended it to refer to the last sentence on page 10. I was referring to evidence of extensive harm.

Q Well, the evidence of extensive harm-- Let me ask you this:

Just because harm has not been found has nothing to do with persistence or non-persistence; true or false?

A I can't answer that.

Q You stated that the lack of evidence of harm, as I understand your testimony, indicates that PCB's do not

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persist. But couldn't it just as easily indicate that PCB's world-wide have not reached quantities -- and I'm talking of the lower chlorinated homologs -- have not yet reached harmful quantities?

A You're talking about reaching harmful quantities world-wide--

Q That's right.

A -- but before they reach harmful quantities world-wide they must have reached harmful quantities locally, and since nothing happened locally, how could we expect it to happen world-wide later?

Q Well, I think we've established that some local harm has occurred or perhaps we haven't established that with you, but even passing that on, can you draw any inferences at all with respect to persistence from evidence of harm?

A Would the Reporter repeat the question?

(Whereupon, the Reporter read from the record as requested.)

THE WITNESS: No.

BY MR. ECKERT:

Q Now on page 11 you state:

"The PCB's that do persist may not be available because of some factors not clearly understood at present."

Do you see that?

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A Yes, sir.

Q Do you have any data to substantiate this statement?

A Well, there is this evidence that I referred to earlier in Exhibit 33, in which we attempted to show that the amount of material that was sold and presumably introduced eventually into the environment differs from the kind of material being identified.

Q But in fact you don't know why this is; isn't that correct? There could be any number of--

A That was the intent of that sentence. There are factors that you and I -- or let me say that I don't quite understand that could conceivably affect the availability of these materials and subsequent effects if any.

MR. ECKERT: Your Honor, we have come to 4:30 and I have a good deal more examination. I would like to read Exhibit 1 before I go any further, and I would also like to examine Dr. Tucker. I think it is going to take considerable more time. Could we adjourn until tomorrow?

JUDGE SWEENEY: All right. We'll adjourn until nine o'clock tomorrow.

MR. RICHEL: Your Honor, before you adjourn, one or two brief comments.

Dr. Lauer is to be available. Do you now perceive any difficulty in cross-examining him tomorrow as opposed

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to some future date?

MR. ECKERT: Not at all. I'll be through with him tomorrow.

MR. RICHEL: Second of all, earlier in the day I addressed myself to the problem of EPA's introduction of new materials upon which we did not base -- upon which our witnesses did not base their initial response.

I indicated earlier that I would discuss with EPA Counsel whether or not EPA is considering authorizing or countenancing introduction of new materials by industrial objectors.

I had a very brief discussion on the subject and Mr. Eckert indicated he would take no position. I am asking for your ruling, your Honor, that industrial objectors be allowed additional time to respond to new issues raised by EPA's rebuttal testimony.

JUDGE SWEENEY: I don't think there is time for that.

MR. RICHEL: Is there any requirement, your Honor, that there be cross-examination? If we found the time to submit the evidence, is there any requirement that anything further be done on your part?

I recognize the problems inherent with that. I recognize that material such as that is not ordinarily entitled the weight of materials submitted and subjected to

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cross-examination, but I submit that that approach would not in any way affect your ability to give the Administrator his record so that three or four days later he could make a decision.

JUDGE SWEENEY: He's going to need more than three or four days I think.

MR. RICHEL: I would think so.

MR. LORANT: Your Honor, extending that comment just a bit, the rebuttal affidavits of EPA, to the extent that they are not truly rebuttal but in fact reflect new matter, are they, in your view, admissible? I think this is another way of saying what Counsel has just said. I find it difficult to consider adequate response merely by cross-examining EPA's witnesses on new matter not necessarily raised in the original objections and support thereof.

JUDGE SWEENEY: You can object to it when the time arises.

MR. LORANT: Okay. Thank you, sir.

MR. RICHEL: Do I have a negative ruling on my motion?

JUDGE SWEENEY: Yes. There is no time for further receipt of evidence from the objectors and it is their position that they don't have the burden of proof, so they don't have any right to answer the rebuttal of EPA.

MR. WILLS: Your Honor, are you saying the time

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that EPA has to finally submit all these documents in rebuttal to the evidence with respect to my motion this morning?

It was my understanding we would get copies of the unpublished data of Dr. Veigh and a few other individuals.

JUDGE SWEENEY: I thought that was to be given to you at noontime.

MR. ECKERT: That data is here right now. It's available for you right now.

MR. RICHEL: If an exception to your negative ruling is needed it's done.

JUDGE SWEENEY: All right.

Well, there is no rebuttal to rebuttal.

MR. LORANT: Well, when there's new matter there is no way of responding to it.

JUDGE SWEENEY: Well, they call it rebuttal. I haven't seen it myself.

We will recess until nine o'clock tomorrow.

(Whereupon, at 4:37 p.m., the hearing in the above-entitled matter was recessed to reconvene at 9:00 a.m. the following day.)