COPY

IN THE CIRCUIT COURT OF THE CITY OF ST. LOUIS

STATE OF MISSOURI

annotated per errata sheet

JUDITH and STEPHEN BECHTOLD,	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	Cause No. 862-00694
	)	
MONSANTO COMPANY and WESTINGHOUSE ELECTRIC CORPORATION,	)	Division No. 1
	)	
	)	
Defendants.	)	

DEPOSITION OF WILLIAM B. PAPAGEORGE, P.E.
Taken on behalf of the Plaintiffs
May 18, 1994

L.A.I. REPORTING
45 GAMLIN DRIVE
FAIRVIEW HEIGHTS, ILLINOIS 62208
1-800-289-7812

IN THE CIRCUIT COURT OF THE CITY OF ST. LOUIS

STATE OF MISSOURI

JUDITH and STEPHEN BECHTOLD,	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	Cause No. 862-00694
	)	
MONSANTO COMPANY and WESTINGHOUSE ELECTRIC CORPORATION,	)	Division No. 1
	)	
	)	
Defendants.	)	

DEPOSITION OF WILLIAM B. PAPAGEORGE, P.E., produced, sworn, and examined on behalf of the Plaintiffs, May 18, 1994, between the hours of eight o'clock in the forenoon and six o'clock in the afternoon of that day, at the offices of Wilburn, Suggs & Watkins, 1221 Locust Street, St. Louis, Missouri 63103, before VICTORIA MENAUGH FAUSER, a Certified Shorthand Reporter and a Notary Public within and for the State of Missouri.

A P P E A R A N C E S

The Plaintiffs was represented by Joseph A. Race and C. Joseph Murray of the Muray Law Firm, 650 Poydras Street, New Orleans, Louisiana 70130.

The Defendant Monsanto Company was represented by Carol A. Rutter of the law offices of Husch & Eppenberger, 100 North Broadway, St. Louis, Missouri 63102.

The Defendant Westinghouse Electric Corporation was represented by Richard A. Wunderlich of the law offices of Lewis, Rice & Fingersh, 8182 Maryland Avenue, St. Louis, Missouri 63105.

IT IS HEREBY STIPULATED AND AGREED by and between Counsel for the Plaintiffs and Counsel for the Defendants, that this deposition may be taken in shorthand by VICTORIA MENAUGH FAUSER, a Certified Shorthand Reporter and Notary Public, and afterwards transcribed into typewriting and signed by the witness.

oOo

WILLIAM B. PAPAGEORGE, P.E.,

of lawful age, being produced, sworn and examined on the part of Plaintiffs, deposes and says:

DIRECT EXAMINATION

QUESTIONS BY MR. RACE:

Q. Could you state your name for the record, please?

A. William B. Papageorge.

MR. RACE: For purposes of this deposition, I want the record to reflect that we had originally scheduled a corporate deposition of Monsanto. Counsel for Monsanto indicated that he would file and did in fact file a protective order. In an attempt to circumvent that impasse we agreed to go forward with the deposition of Mr. Papageorge with the hope

that subsequent to this deposition we can reformulate a corporate deposition premised on perhaps Mr. Papageorge's independent recollection of events, how much he'll need documentation, whether he can answer this without documentation and if we can explore his background which may provide us with an opportunity to reformulate a notice of deposition which would be mutually agreeable to the parties without requiring intervention of court. Okay?

MS. SUTTER: For the record, I would state that there has been a lot of correspondence that has been exchanged between counsel on this topic. It is true that a very broad corporate designation notice was filed by Plaintiffs, that a motion for protective order was filed by Monsanto, an argument date was set and then Counsel discussed the matter and as a result of that discussion Mr. Papageorge is here in his personal capacity and it is my understanding that Counsel intends to take this deposition and then perhaps reformulate and narrow the deposition notice as you deem fit.

MR. RACE: Okay.

MS. SUTTER: Within the parameters permitted by the Case Management Order in this case.

Q. (BY MR. RACE) Mr. Papageorge, by whom are you employed presently?

A. Presently I consider myself self-employed.

Q. Okay. And you do consulting work; correct?

A. Yes.

Q. And you're consulting for Monsanto?

A. That's one of the clients.

Q. Do you consult for anyone other than Monsanto?

A. On occasion, yes.

Q. In what capacity do you consult for Monsanto?

A. I consult with Monsanto on matters pertaining to PCBs as they occurred in the period of time prior to 1976.

Q. And your consultation with Monsanto is in the context of PCB litigation; is that correct?

A. Primarily, yes.

Q. Is there any non-PCB litigation?

A. No.

Q. Okay. Just a couple of ground rules here. I known you've given a multitude of depositions, but if you do not understand any of my questions, please ask me to repeat them or rephrase them, because I will assume that your responses are answering my questions. Okay?

A. I'll try.

Q. Okay. Secondly, and occasionally this occurs where the witness attempts to answer the question before the question is completed, conversely attorneys try to ask the questions before answers are completed. Why don't we give ourselves a fair shake on this one and you wait until I'm finished and I'll wait until you're finished. Okay?

A. Fine.

Q. Now, you said you're a consultant. In what capacity -- excuse me. What do you charge per hour?

A. A hundred twenty-five dollars an hour.

Q. Okay. When working at -- let's go back to this. How long have you been a consultant for Monsanto?

A. Since the beginning of 1987.

Q. And that's continuously through present?

A. Yes.

Q. How much do you derive on an annual basis from your consulting work with Monsanto?

A. A hundred two thousand dollars.

Q. That's $102,000 from the period 1987 to present or is that annual?

A. That's annual.

Q. Okay. Now, how many hours per week or per year, can you give me an idea of how often you're doing the consulting?

A. I've never kept score. It varies.

Q. Let me ask you this way: Does your income or does your salary with Monsanto vary based on the work you do or is that a flat rate?

A. Our agreement consists of two features: There is the hourly rate I mentioned and then there is a retainer per month and if the hours I devote to this activity exceed the

multiplication of the 125 times the hour, if they exceed the monthly retainer I am paid the difference.

Q. Okay.

A. And that 125 is really the retaining amount.

Q. Okay. Have you exceeded that hourly rate then?

A. I did one year. I can't recall just which year it was.

Q. Can you give me an idea of how many litigations you have testified in?

A. In trials or --

Q. Yes. Or how many --

A. Depositions?

Q. Let me rephrase the question. How many cases have you been involved in since your retention by Monsanto in the capacity as a consultant?

A. I have not kept a record. It's going to be a best guess.

Q. Fine.

A. About a dozen.

Q. Okay. And each of those 12 cases involved PCBs?

A. Yes.

Q. During any of those cases have you been designated as a corporate representative for purposes of deposition or trial?

A. Yes.

Q. With respect to purposes of the deposition, have you been assigned any area with respect to corporate depositions?

MS. SUTTER: Objection to the overbroad and vague form of the question.

Q. (BY MR. RACE) Subject to the objection, do you understand the question?

A. I believe I do.

Q. Okay.

A. I don't know any specific area that I was assigned. It seemed to ~~be~~ me we covered topics that in my mind or my understanding involve different kinds of activities.

Q. Okay. Then let's go to -- back to when you were last employed by Monsanto, and that was 1980 what?

A. The end of 1986 was my last working day.

Q. So you started as a consultant immediately upon your retirement?

A. I think I had a three- or four-month period there before I heard from Monsanto.

Q. Okay. What was your capacity at the time PCBs were manufactured by Monsanto?

MS. SUTTER: I would object to the overbroad form of the question, but you may answer if you understand.

A. It would be all the positions I held within Monsanto from the year 1951 until I retired in 1986.

Q. Okay. How many of those are there?

A. Ten, twelve.

Q. Okay. Can you give me an idea of -- first of all, what's your educational background?

A. I have a Bachelor of Science Degree in chemical engineering from Washington University in St. Louis which I received in 1943. I have --

Q. And a Master's of Science in chemical engineering; correct?

A. I was going to add that. I mentioned the Bachelor's and I have a Master's of Science from the same institution in 1947.

Q. And when originally employed by Monsanto that was in what capacity?

A. I was a process engineer in the plant engineering department.

Q. Can you generally describe the areas to which you were assigned?

A. Yes, I can. It involved -- half of my career involved work in plants that manufactured chemicals. In those plants I held positions in engineering departments, in maintenance departments and in production departments.

Q. When did you first become involved with PCBs?

A. In about 1957 or so I was in charge of a group of maintenance personnel that in turn were involved with the

occasional installation of electrical equipment which included PCBs.

Q. Okay. Can you describe in broad terms, and I cut you off, perhaps I did, what your involvement with PCB was from the maintenance supervisor through your retirement?

A. All right. I was a superintendent at a plant to which the utilities department reported. Now, utilities is that department that concerned itself with electricity, steam, water and the like, and there I was involved with PCBs in their use in the electrical equipment in the electrical distribution system of the plant. Also when I held that superintendency I had a unit that blended chemicals and some of the blending involved the use of PCBs in the mixture that ended up in the product. That was about 1963. In 1964 as a general manufacturing superintendent I was involved with PCBs in that they were present in equipment used in the manufacturing process, such as in air compressors and in heat transfer systems that were operated by the people reporting to my group. I forgot to mention that there was a period of time in about 1957, '58 when I was a superintendent of maintenance to which the mechanics in the plant, the maintenance people reported and they of course were involved with all matters of equipment that contained PCBs, whether they are in electrical equipment, heat transfer systems, machinery like compressors. Then in 1965 I was appointed the manager at the plant in

Anniston, Alabama where PCBs were manufactured, so there of course I had a broader involvement; manufactured the packaging, the distribution. That I think describes my involvement with PCBs in the physical sense.

Q. Okay.

A. Following that I was involved with PCBs in sort of the information gathering, communications, regulatory sense.

Q. And that started approximately the late sixties, early seventies?

A. That was started January 1st, 1970 when I got involved with the PCBs as an environmental issue.

Q. Now, I'm going to ask you about some general areas, we can get into them more specifically later, but I'm trying to decide where you have previously testified and in what areas you feel you have expertise to testify or in the past on behalf of Monsanto. Okay?

A. Fine.

Q. The chemical composition of PCBs in the products sold by Monsanto, to include Inerteen, have you previously testified and have knowledge about that area?

A. I have testified. I believe I have some knowledge.

Q. Some knowledge. Is there somebody in Monsanto who has more knowledge?

MS. SUTTER: Objection. Calls for speculation and conjecture.

A. I was trying to think. I just can't put myself in the heads of other people.

Q. (BY MR. RACE) That's true.

A. I think I'm conversant with the kinds of things that would be described in talking of these chemicals.

Q. Okay. So you have addressed the areas of, as a represent -- now, all these questions I'm asking you now is when you have testified on behalf of Monsanto in the capacity of a designated corporate representative. Okay?

A. Yes, I understand.

MS. SUTTER: Well, for the record, that was not made clear previously. You're now saying that that is what you're doing.

Q. (BY MR. RACE) If I have not made that clear I'm glad I'm doing so. Okay. The chemical compositions of PCBs and related products, have you testified about that area?

MS. SUTTER: As a corporate designee?

MR. RACE: I said all these questions until I say they do not do, otherwise I'm going to have to repeat that. So does that create a problem for you, Carol?

MS. SUTTER: I think that's a confusing way to do it, but you've said what you are doing.

A. I am having some difficulty because of the many

times I've testified distinguishing or recalling when the -- the situations when I was asked to describe the chemical compositions of these materials as the corporate representative - as distinguished from my personal involvement.

Q. Okay. That would be the case in any question I would phrase in that way; correct?

MS. SUTTER: Objection. Calls for speculation.

Q. (BY MR. RACE) Subject to the objection.

A. I believe so, yes.

Q. Let's make it easy on both of us: When you testified in this PCB litigation -- let's broaden the question. Have you testified concerning the chemical composition?

A. I have.

Q. Okay. Have you testified about the toxicity of PCBs?

A. I have -- yes, I have been involved with questions and attempted to respond to those questions relating to toxicity, yes.

Q. Would you defer to anybody else at Monsanto for answering those types of questions on toxicity?

A. Certainly.

Q. Who would that be? Dr. Kelly, for example?

A. Dr. Kelly.

Q. With respect to the chemical compositions, you feel as though you could accurately represent Monsanto as to what are contained in the products?

A. It depends on the detail of the explanation that you're looking for. If you want someone to describe exactly which of the isomers are present and what other materials are present in this Inerteen mixture, for example, that would take someone who has analytical chemistry expertise that I personally do not have.

Q. That would be someone like Dr. Kaley?

A. Dr. Keller is certainly one of those individuals.

MS. SUTTER: I think he said Kaley and he responded with Keller, just so --

A. Well, Dr. Kaley is also knowledgeable.

Q. (BY MR. RACE) With respect to -- Strike that. Have you testified with respect to the animal and human studies conducted on behalf of Monsanto?

MS. SUTTER: Object to the compound form of the question.

A. I have responded to questions with answers that I would call a layman's understanding of the situation as coached by medical experts and toxicologists.

Q. Do you have knowledge concerning which tests were done on behalf of Monsanto?

A. I understand the studies -- that some studies

were made using animals.

Q. Okay.

A. I have no information whatever relating to human studies.

Q. Okay. Have you ever reviewed records by -- Monsanto records regarding the number of studies that were conducted and the types of studies that were conducted?

A. I have been privileged to review documents that reflected the results of studies.

Q. Okay.

A. Which speak of records. I -- I don't know exactly what you mean by that.

Q. Records or documents. I'm just saying documents. Excuse me.

A. I have seen reports from laboratories describing the tests and the results of the tests.

Q. Okay. And those documents help refresh your mind as you sit here today?

A. Certainly.

Q. Okay. And you have not had the benefit of reviewing any documents prior to this deposition in preparation for this deposition; is that correct?

A. I have reviewed a few documents.

Q. You have?

A. Uh-huh. (Yes)

Q. What documents have you reviewed for this deposition; do you recall?

A. I'm trying to remember. About a dozen at the most.

Q. What are the nature of those documents?

A. I've seen these documents so often I can't place them in time and to which case they involve. I recall some Monsanto memoranda. I recall some correspondence between Monsanto and Westinghouse. I recall excerpts of minutes of meetings of Monsanto corporate committees. I recall a summary of minutes of a meeting of a committee that I chaired relating to the proper use of PCBs in electrical equipment. That's all that comes to mind at the moment.

Q. When did you review those documents?

A. I'm trying to recall when we -- certainly last Monday.

Q. Okay.

A. And there was a day prior to that, we looked at a couple, three. It was a week before that. I don't remember which day. And this morning a couple of them.

Q. Had you previously prepared to give a deposition as a corporate representative in this case, this being the Bechtold case?

A. Not that I was aware of.

Q. Okay. And those documents helped refresh your

recollection of events that occurred over the past 30 years?

MS. SUTTER: Objection.

A. That's always the way, sir.

MR. RACE: I called for the production of those documents.

MS. SUTTER: Counsel, for the record, you produced a stack of documents to our office and I -- he's testified to a dozen. I don't know if the dozen can be windowed out of that set, but we will attempt to do so.

MR. RACE: I would appreciate that, if I could. Were there any documents that he reviewed that were not contained in that set?

MS. SUTTER: I don't know.

MR. RACE: Who would know?

MS. SUTTER: No. (Shakes Head)

MR. RACE: You don't know what your witness reviewed?

MS. SUTTER: He reviewed documents that you produced.

MR. RACE: Okay. And my question was did he review any documents that I did not produce and you said you don't know. That's fine. I mean, I'm not going to fight you on this. That's fine.

MS. SUTTER: It's not my deposition. I'm not being deposed, Joseph. I will cooperate with you in the

manner in which I said I would cooperate with you before.

MR. WUNDERLICH: When were these documents produced?

MR. RACE: These were my response to interrogatories that were Fed Ex'd to you.

Q. (BY MR. RACE) Have you testified with respect to indemnity agreements specifically between Monsanto and Westinghouse?

A. I have answered to questions raised in that area, yes.

Q. Once again, would you defer to anybody else with respect to that from Monsanto?

MS. SUTTER: Objection to the vague form of the question.

A. Yes, I would suggest that a person like Mr. Gossage was a lot closer to it than I certainly was.

Q. Let me back up again. With respect to toxicity, it was -- Strike that. With respect to the chemical composition, it was Dr. Keller or Dr. Kaley, is that correct, who you would defer to?

A. Yes, Dr. Keller is Dr. Kaley's supervisor so they both belong to the same team.

Q. With respect to toxicity?

A. Toxicity, I would go to Dr. Kelly.

Q. Kelly?

A. Kelly.

Q. Okay. The tests performed by Monsanto, which tests were performed by Monsanto, once again that would be Dr. Kelly?

A. Yes.

Q. Indemnity, you have knowledge about the indemnity agreements; is that correct?

A. I do.

Q. And you have testified as a corporate representative with respect to indemnity agreements?

A. Yes, I believe I have.

Q. With respect to lawsuits, you have previously testified, as you have today, in lawsuits in which Monsanto was involved in; correct?

A. Yes, sir.

Q. Okay. With respect to contamination in dioxin?

MS. SUTTER: In dioxin?

Q. (BY MR. RACE) Excuse me. With respect to contaminates in PCB.

MS. SUTTER: Just so your question is clear, your questions relate to has he ever testified --

MR. RACE: On behalf of Monsanto.

MS. SUTTER: You're not limiting this as to corporate designee?

MR. RACE: No.

A. I don't recall testifying relating to contaminates in PCBs as a corporate representative.

Q. (BY MR. RACE) Have you done so in any deposition?

A. In deposition regarding my personal knowledge, yes, I have tried to respond to the questions.

Q. Have you testified with respect to warnings provided by Monsanto with respect to the use and potential dangers of PCBs?

A. I've testified many times on that subject. I believe I testified as a corporate representative.

Q. With respect to warnings, is that an area in which you require or would benefit from having documentation in front of you before testifying or is it --

A. That's always the case, sir.

Q. So with each of these areas you feel more comfortable -- is it a fair statement you feel more comfortable having documentation in front of you while testifying?

MS. SUTTER: Objection. I object to the incredibly overbroad and vague form of the question. We've been in the deposition now for 40 minutes and I think the question is far too broad.

Q. (BY MR. RACE) Can you answer?

A. Generally a document that's appropriate to the

subject being discussed does help recall some details that my memory may have failed me on.

Q. Okay. Are there any areas in which you feel comfortable testifying that would not require or be assisted by having a document in front of you?

MS. SUTTER: Objection. That's incredibly broad and over vague. It's far too broad and over vague. As phrased I don't see how it's capable of being responded to.

A. I don't quite know how to respond to your question. I can respond to questions as best my memory can help me.

Q. Okay.

A. Sometimes it's very, very vivid. The use of a document is just a -- an additional assistance in recalling the specifics that -- the detail that might or might not be significant.

Q. Okay. You have testified with respect to Monsanto's involvement with government regulations of PCB?

A. I have.

Q. You've testified with respect to the IBT studies?

A. I have responded to questions concerning IBT studies, yes.

Q. Have you testified with respect to the precautions installed by Monsanto with respect to their own personnel and safety of their own personnel?

A. Yes.

Q. Okay. Have you testified about alternatives to PCBs, the development of alternatives?

A. The development? To a limited degree, yes, sir.

Q. Okay. Have you testified as to comparison of European versus American PCBs?

A. Yes, in a limited area relating to those materials, yes.

Q. Okay. Do you have any knowledge or -- Strike that. Have you testified with respect to any threats of lawsuits by Westinghouse, General Electric or any other purchaser of PCBs which may result from -- which could have resulted from Monsanto's unilateral decision to stop supplying PCBs prior to the date upon -- prior to 1977?

A. I believe I've testified on that, but as a personal piece of information, not with the corporate representation, no.

MS. SUTTER: Mr. Papageorge, it's my understanding, and Joseph, please correct me if I'm not correct, when you're asking him these questions you're asking him if he's testified ever on the topic, you're not limiting it to a corporate designee.

A. I misunderstood. I thought we were still on the corporate designee on all of these.

Q. (BY MR. RACE) No. Does it change -- well,

you've just testified that you have in fact given testimony in each of these areas?

A. Yes, I have.

Q. And now you're telling me each area that you've responded that you've given testimony in these areas that when you've responded yes you're indicating that you have done so as a corporate representative; is that correct?

MS. SUTTER: Objection to the form of the question. I think you're mischaracterizing his testimony.

A. When the question was asked of me I assumed going back where we talked about as a corporate representative I tried to respond with a definite yes as a corporate representative. If I didn't answer as a corporate representative I tried to make that distinction in my response.

Q. Okay. So I can assume reading this transcript that any time you said "yes, I testified," that would be as a corporate representative unless you specifically denote that I did so from a personal capacity; is that correct?

MS. SUTTER: Objection to the form of the question. It is unfair based on the prior exchanges that have gone on. You made one set of rules, Mr. Race, and then you changed them in midstream. I objected at the outset that this was a very confusing manner to conduct this questioning. The transcript will reflect at one point in time you made one set

of rules and at one point you made a set second set of rules and at one point in time you asked about corporate representatives when you stopped asking about that, so to try to get a generalization is grossly unfair.

Q. (BY MR. RACE) Can you give me a general?

A. At this time I find myself somewhat confused.

Q. I apologize. I wasn't sure how to do it at the outset. But the areas that we have talked about you have testified either as a personal capacity or as a corporate representative; is that a fair statement?

A. Yes, and I also mentioned others were better qualified to respond than I am.

Q. Just for the completeness of the record, each of the areas which we mentioned that you have testified on, records would assist you in the accuracy and completeness of your testimony; is that correct?

MS. SUTTER: Objection. Asked and answered and mischaracterizes prior testimony.

A. Documents on occasion are helpful depending on the amount of detail that's suggested in the question. There are many areas where my recall is quite good and I can respond without the document. There are areas where some points of that question I just -- it doesn't come to mind quickly and a document helps.

Q. Okay.

(WHEREUPON A BRIEF RECESS WAS HELD)

Q. (BY MR. RACE) At what point did Monsanto first know that PCBs were contaminated with furans?

MS. SUTTER: Objection to the overbroad form of the question.

A. Early -- well, at --

MR. RACE: Counsel, for the record, what is wrong with overbroad that is to form? Just take note that every deposition I've given you or Tom are on every page and it must be because my questions are all overbroad or poorly phrased. Maybe you can enlighten me or maybe you want to be on every page, I'm not sure.

MS. SUTTER: I am attempting -- let me attempt to respond to make my objection as to form more specific, yet I am trying very hard not to give -- make speeches and to keep my objections succinct. I think that stating PCBs without qualifying whose PCBs they are make the question overbroad as to form.

Q. (BY MR. RACE) Okay. The question stands. Can you give me an answer, please?

A. Would you --

Q. At what time did Monsanto know that PCBs were contaminated with furans?

A. In early 1970 Monsanto was informed by research scientists in Europe.

Q. Holland in specific, and it was Dr. Vos; is that correct?

A. That's correct.

MS. SUTTER: Could you allow the witness to finish his answer, please?

A. That group under direction of Dr. Vos had determined the presence of furans in PCB industrial materials manufactured by European companies but he did not find it in samples of material obtained from Monsanto's unit out of the United Kingdom.

Q. Okay. Did Monsanto U.S. send Dr. Vos any samples of PCBs manufactured here in the United States?

A. Eventually, yes.

Q. And eventually is when?

A. Oh, between the period 1970 and 1974 or so.

Q. Somewhere between -- as early as 1970 or as late as 1974?

A. Yes.

Q. Do you recall specifically when, more specifically when?

A. No, I don't.

Q. Do you know anybody at Monsanto that does?

A. I certainly can't put myself in somebody else's head as to what they recall, but Dr. Keller would have been the person that I would consult with.

Q. In fact, Dr. Keller conversed -- conveyed the findings to you; is that correct? The Vos findings?

A. Well, the initial findings came out of Monsanto's European representatives and these findings were not specific in terms of amounts and which manufacturer's product was tested and so on until Monsanto people, including me, went to the laboratory in the Netherlands and talked with Dr. Vos and his team, and that's when to the best of my knowledge we got more specific numbers as to amounts of the furans found.

Q. Okay. And do you recall what the contamination levels were?

A. No, I don't. It's been over two decades.

Q. When Monsanto sent the furans to Dr. Vos -- excuse me. Strike that. When Monsanto sent the PCBs, the U.S. PCBs to Dr. Vos in Holland and they were examined, did Dr. Vos substantiate that there were furan contamination in Monsanto U.S. PCBs?

A. He did not.

Q. When was it first learned that contamination was in Monsanto's U.S.-produced PCBs?

A. The initial report that Monsanto received came from the Food and Drug Administration laboratories in the United States, but that initial report was one of skepticism on the part of the FDA chemists as to were they really seeing the furans or were they misinterpreting their results. This

was in 1975, as best I recall, early '75.

Q. Okay. Did they suspect that -- Strike that. So in 1975 it was established that furans were in Monsanto PCBs; correct?

A. In 1975 at a national meeting held on PCBs in Chicago the Food and Drug Administration went on record as having identified the furans in Monsanto-produced PCBs but only as I recall two of the commercial mixtures that were sold, not the third one.

Q. Do you know -- do you recall which two mixtures?

A. The mixture referred to by Monsanto is Aroclor 1242 and Aroclor 1254.

Q. When did Monsanto start making Aroclor 1242?

A. Well, Monsanto purchased a company that made the 1242 type of PCB in 1935, so that's Monsanto's first involvement.

Q. Okay. Was the manufacturing process altered from 1935 to 1970?

A. Not significantly.

Q. Okay. Did Monsanto suspect by any means that furans were in PCBs prior to 1970?

A. No.

Q. Okay. If furans were found in polychlorinated naphthalenes, would that lead you to suspect that furans may also be present in polychlorinated biphenyls?

MS. SUTTER: Objection to the overbroad and vague form of the question.

A. Oh, that's -- that would amount to scientific speculation. There are chlorinations of the processes, but not knowing -- I don't know the process ~~of~~ by which chlorinated naphthalene is made so I really don't know.

Q. Does the manufacturing process of trichlorophenol parallel the chemistry of polychlorinated biphenyl?

MS. SUTTER: Objection to the confusing form of the question.

A. I'm having difficulty with your use of the word parallel. I don't know quite how to define that in my own thinking. There are of course organic chemicals involved and then there is chlorine involved. Other than that I don't know of any other parallelism.

Q. Is Dr. Keller still alive, to your knowledge?

A. Keller?

Q. Keller.

A. As far as I know, yes, sir.

Q. Okay. Wheeler is now deceased?

A. Yes.

Q. Prior to 1970 was Monsanto aware that furans and dioxins could be produced during the manufacture of trichlorophenols?

A. I don't know that.

Q. Is it not true that dioxin can be produced with partial oxidation of chlorobenzenes?

MS. SUTTER: Could you repeat that, please, Counsel?

Q. (BY MR. RACE) Is it true that dioxins can be produced by partial oxidation of chlorobenzenes?

A. That is my understanding.

Q. Okay. And chlorobenzenes are added to PCBs in transformer application; correct?

A. Some transformer applications, yes.

Q. And that's the Aroclor 1254; correct?

A. Well, that's one of the PCB mixtures used. There ~~is~~ are others as well.

Q. Okay. Are there -- is there any chlorobenzene added to Inerteen?

A. Some of Westinghouse's Inerteens contain chlorobenzene.

Q. And that would be designated Inerteen PPO?

A. That's certainly one of the designations.

Q. Was the chlorobenzene added by -- added to Inerteen added -- well, strike that. Was the chlorobenzene added by Monsanto to the Inerteen?

MS. SUTTER: Objection. Calls for speculation and conjecture.

A. You'll have to help me with the point in time.

Q. (BY MR. RACE) Okay. Between 1965 and 1970 was it added -- was chlorobenzene added to Inerteen by Monsanto?

MS. SUTTER: Objection to the overbroad form of the question, contains undefined terms.

A. In the period of time you mentioned Monsanto did blend its PCB materials with chlorobenzene for some of Westinghouse's Inerteen formulations.

Q. (BY MR. RACE) Okay. And that was blended at the Monsanto facility and then shipped to Westinghouse; correct?

A. Yes.

Q. Under what circumstances is dioxin derived from chlorobenzene?

A. I don't pose to be the chemical expert on these chemical reactions, but I have an understanding that it takes -- of course the presence of the benzene ring has to be present and oxygen of course has to be present to give the dioxin combination. The chlorine is of course there because it's present initially with the chlorobenzene and then a high temperature must be achieved, and it's my understanding that temperature has to be -- these are not the exact numbers, 300 to 600 degrees Centigrade, something like that.

Q. (BY MR. RACE) And that would be the temperature that would be produced or result from welding?

A. I don't know the temperature of welding so I cannot relate that.

Q. Was chlorobenzene added to any other Inerteens other than Inerteen PPO?

A. At this point in time I don't recall all of the Inerteens prepared for Westinghouse. I just -- I just can't recall. But there were -- as best I recall there is certainly more than just PPO. I don't recall all of them. And through the period of time, as I recall, there were some changes made with different Inerteen designations and different recipes, if you will, for making them.

Q. Okay. Now, the FDA found furan contamination in Aroclor 1242; correct?

A. Yes.

Q. Okay. Did Monsanto -- Strike that. And Monsanto confirmed it with their own independent studies after 1975?

A. Yes.

Q. Okay. And at no time did Dr. Vos ever find furans in Monsanto's American PCBs?

A. I believe he did, yes, in about the '75, '76 time frame.

Q. Okay. It was true that naphthalenes were found in biphenyl?

A. Yes.

Q. And that was known back in 1970; correct?

A. Yes.

Q. Mr. Papageorge, do you recognize -- why don't we

mark this. Let me call your attention to the first paragraph. That which I've handed the Doctor is a letter from Papageorge to J.R. Savage dated October 26, 1970.

A. It looks like a copy of a memorandum that I authored back in October of 1970.

Q. It indicates that dibenzylfuran is in Santowax R.

A. It does say that, yes.

Q. And the inference that we can assume is that since dibenzylfuran is in Santowax, and Santowax is manufactured -- is used in the manufacture of Aroclor, therefore dibenzylfurans may be in Aroclors?

A. Santawax R is terphenyl, not biphenyl. The Aroclors referred to here are the chlorinated terphenyls which is the Aroclor 5,000 series, not the Aroclor 1200 series.

Q. Okay.

A. This is a different group of products.

Q. So it's not that furans were not in the 1242 but Monsanto was recognizing that they were in an Aroclor; correct?

A. No. They were recognizing the presence of dibenzylfuran along with these other materials listed in the starting material for the chlorinated terphenyls sold under the trademark Aroclor.

Q. Okay.

A. 5,000 with some other numbers. That's to

distinguish from the use of biphenyl in the manufacture of the Aroclor 1200 series. It's two different starting materials.

Q. It does recognize the presence of dibenzylfuran in a product manufactured by Monsanto?

A. True, yes.

Q. Okay.

A. It's a different product from biphenyl.

Q. What was the application of that Aroclor referred to?

A. The Aroclor 5,000 series?

Q. Yeah.

A. They were solid materials used in such things as plastic for fire retardancy, they were used in adhesives, they were used in some paints.

Q. Okay. When did Monsanto commence chronic toxic studies with respect to Aroclor 1242?

MS. SUTTER: Objection to the form of the question, contains an undefined term.

Q. (BY MR. RACE) Do you understand the question?

A. I believe I do. Chronic studies with laboratory test animals were begun on Aroclor 1242 as best I remember in 1969.

Q. Okay. And that was all the chronic toxicity studies were done by IBT?

A. Yes.

Q. Do you recognize this document dated November 3rd, 1970? I call your attention to No. 6: "No chronic (two-year studies) would be anticipated." First of all, do you recognize that document?

A. I recall the document, yes, sir. I'm reading to help me refresh my memory on the considerable detail that's in this document.

Q. Okay. Well, I would like you to --

A. Well, I've quickly perused it.

Q. My question is with regard to --

MS. SUTTER: Just a second. I would like an opportunity to look at the document.

Q. (BY MR. RACE) Okay. With respect to No. 6, could you explain why -- what was meant, or your understanding of "no chronic (two-year studies) would be anticipated?"

A. This document is primarily put together for budgetary purposes. That statement indicates that the monies mentioned on Page 2 do not include any costs that might be associated with longer studies. The decision regarding the two-year studies would depend on what was found with the shorter studies that were proposed.

Q. Okay. But the two year-study had in fact been initiated in 1969?

A. No, no, no. This reference to two-year study has to do with the materials listed on the pages attached to the

memorandum, and you will note that they refer to products that are not studied as yet, like Aroclor 1221, MCS 1016, HB-40 and so on. There are chemicals here that were being considered as substitutes for the PCBs and they were being put into a program to get some better understanding of their toxicity and depending on those results either feel comfortable with what the results show or do some more studies to determine their overall toxicity. So this document does not refer to the studies that were already in place in 1969.

Q. Okay. Was it -- while you were employed by Monsanto was it Monsanto's position to freely disseminate information that it had gathered with respect to animal studies?

A. Yes.

Q. Do you recognize this document?

A. I have read the document.

Q. Okay. I draw your attention to the second paragraph: "Although Kanegafuchi is asking, they also are testing to see how far Monsanto will go in giving away information." What is your appreciation of that statement as directed to you?

A. That just tells me a little bit about how Kanegafuchi representatives might be thinking. There was nothing there that we were refusing to tell them, as far as I know.

Q. Okay. Did in fact Monsanto -- Strike that. So it's your testimony that Monsanto freely provided all information that was requested with respect to the animal studies?

A. By Kanegafuchi representatives?

Q. To anybody.

A. As far as I know, yes, sir.

Q. The FDA was studying Aroclor 1242 as well as other Aroclors for carcinogenicity; is that correct?

A. I -- I need some help with your use of the word study. Do you mean were they placing animal studies and so on?

Q. Yes.

A. I don't recall the FDA having such a program. I know that they were interested in any health effects, including carcinogenicity. I don't recall any studies placed by FDA with any laboratory to help get information.

Q. Isn't it true that you were informed that 1242 was more toxic to chickens than the higher chlorinated Aroclors?

MS. SUTTER: Objection to the overbroad and vague form of the question.

A. The test results from Monsanto's studies being conducted by IBT did indicate that the chickens in the tests were more sensitive to Aroclor 1242 than they were to Aroclor

1254 or to Aroclor 1260 which were the other two Aroclors being tested.

Q. (BY MR. RACE) So it's a safe statement that not all animal studies indicated that the higher chlorinated Aroclors were more toxic, in some cases the lower chlorinated Aroclors were more toxic?

A. There were effects noted in the different test animals and they did vary depending on the material that they were exposed to and the type of animal, yes, there were differences.

Q. Is George Levinskas still living?

A. As far as I know, yes, sir.

Q. And he lives in the Monsanto area -- I mean, excuse me, the St. Louis area?

A. The last I heard he was, yes.

Q. Is he still employed by Monsanto or is he retired?

A. He retired.

Q. There was no analysis done of the PCBs provided to IBT with respect to contamination; was there?

A. At what point in time?

Q. From 1970 to 1975.

A. I can't answer that. I do know that the laboratory went back to the research samples of material produced in that period of time and even prior to that. I

personally do not know if they got any of the 1969 material and tested it for the furans.

Q. Okay.

A. I can't speak to that.

Q. During some of the animal studies conducted, particularly those of birds, is it not true that unusually high levels of PCBs were found in brain tissues?

A. I don't remember that detail.

Q. Okay.

A. I would have to see the reports.

Q. I'm going to show you a report dated October 10th, 1972. Do you recognize that, the one in which you were cc'd?

A. Yes. (Nods Head)

Q. And I draw your attention to Toxicity, Section No. III in which it is I believe underlined.

MS. SUTTER: Not on the --

A. I recall the essence of this memo.

Q. (BY MR. RACE) And do you recall being informed or having read that unusually high levels of PCB were found in the brain tissue of birds?

A. I'm trying to recall. It's not too vivid in my thinking but -- see, what I don't recall is what birds are they referring to here. These are not the test birds that Monsanto used. These -- the reference to mink and birds

indicates studies by other than Monsanto.

Q. Who is M. -- W.M. Mees, being the author of this report?

A. Mr. Mees was a member of Monsanto's analytical chemistry research group who reported to Dr. Tucker, the addressee of this report, who in return reported to Dr. Keller, one of the recipients of the copy.

Q. Okay. You do recall this document?

A. Yes.

Q. Okay. I'm going to mark for identification No. 4. What is the relative toxicity of furans?

MS. SUTTER: Object to the overbroad and vague form of the question.

Q. (BY MR. RACE) Strike the question. Is it not -- would you agree that chlorinated dibenzylfurans are very highly toxic?

A. That's my understanding as tutored by individuals that are more knowledgeable in the area of toxicity.

Q. Do you recall this document dated December 6, 1974? I draw your attention to the handwritten note of which you appear to be the author. Is that your note at the bottom of that?

A. Yes, it is. I recall this document.

Q. And it does in fact state that chlorinated dibenzylfurans are very highly toxic; correct?

A. It does.

Q. Then you continue to write: "Many effects on birds and animals noted and originally attributed to PCBs were later found to be due to furan --" What's the last word there?

A. "Content."

Q. "Content." Which birds and animals are you referring to; test birds or wild birds?

A. Wild birds.

Q. These are wild birds in the United States; correct?

A. No, not necessarily. It's my recollection at the time that all that I had read in a several-year period leading to this particular time, December '74.

Q. So you don't know whether these birds and animals were in the U.S. or whether they were abroad; is that what you're telling me?

A. Some of them were abroad. For example, Dr. Vos' group did some studies in Europe and attributed the effects they saw or observed were due to furan content.

Q. The same furans that were noted later established to be contained in PCBs in the United States; correct?

A. Chemically the same. The amounts were different.

Q. I'm marking for identification Plaintiffs' Identification No. 5. What were the differences in the

amounts?

A. I don't recall the numbers, but they were significantly different.

Q. Was it higher abroad or lower abroad?

A. I don't mean to indicate that this higher level of furans to which the animals and birds were exposed existed only in the European work. It appeared to be general.

Q. So you had higher levels of furans in the birds in the United States as well; correct?

A. I don't -- when you say higher, higher than what? I don't know what to compare it to. It's a significant amount that was fairly easily detectable; therefore, it had to be above the very low levels that the analytical method could detect.

Q. So there were high levels of furans found in American birds and animals; correct?

MS. SUTTER: Objection. Mischaracterizes prior testimony.

A. There were detectable levels found. I don't know how to compare it in terms of higher or lower.

Q. (BY MR. RACE) Okay.

A. I don't have a base.

Q. And these levels were detected prior to 1974, furan levels?

A. Yes. Keep in mind that isn't -- the source of

furans is not known.

Q. Judging from what -- I came here trying to make a good-faith effort to go through this, and unfortunately it's a little lengthy because of the documents I brought with me. And I'll try to go as quickly as I can.

Doctor, you would be available for another date if we -- you have to break at 4:00, I'm given to understand today; correct?

A. That's my understanding.

Q. You would be available, as opposed to inconveniencing you and trying to keep you on today and not breaking for lunch, you have no personal problem with that; do you?

A. It depends on the day. I do have some commitments in the future.

Q. You are not totally booked for the next two weeks or three weeks?

A. Not totally, but spotty. I don't have my calendar with me.

Q. With that caveat, why don't we break for a half hour lunch or 45 minutes.

(WHEREUPON A LUNCH RECESS WAS HELD)

MR. RACE: For the record, it's 1:30. The documents are taking fairly long. Mr. Papageorge has outlined certain areas and named expertise, I provided you with a list

of areas, and perhaps for the remainder of this afternoon I'll finish going through these documents and then talk to Tom about how to formulate a corporate deposition; does that appear reasonable to you?

MS. SUTTER: Based on our discussion off the record where you gave me the number of paragraphs that you were thinking of reducing your corporate deposition notice to, it certainly sounds to me more reasonable than the original document. I am concerned about the time frame in which we are dealing under the Case Management Order to deal with all this last-minute discovery that's being conducted, but the paragraphs you mentioned to me sounded like an effort to narrow the scope, we're appreciative of that, and Tom Carney and I are both willing to meet with you and see what can be worked out during the remaining time that we have under the parameters of the Case Management Order.

MR. RACE: It's been expanded to June 8th by agreement.

MR. RACE: Rick, I would like to do the same with you.

MR. WUNDERLICH: You know, I suggested that earlier.

MR. RACE: It takes time. You know, it's like Mark Twain said, "If I had more time this letter would be shorter."

MR. WUNDERLICH: My only additional comment, Joe, as I've told you, I have more difficulty in locating someone -- we have to respond to certain areas and because of the lack of people that are still employed with Westinghouse who may have had knowledge concerning PCBs, you know, so the quicker the better would be my response in terms of telling me exactly -- if we can reach some sort of agreement on it.

MR. RACE: Part of the exercise is to take a look at the documents and that's -- has been true in both cases. And so that's being done and it will be done when I get back to the office.

MR. WUNDERLICH: Okay.

Q. (BY MR. RACE) Okay. Do you recognize this correspondence of June 16th, 1975, previously marked as 1505?

A. I have read the document.

Q. Do you recognize that document?

A. Yes, sir, I do.

Q. Okay.

A. I don't --

Q. You were in fact cc'd on this document; correct?

A. Yes. To clarify, I do not recognize the handwritten notes on the document.

Q. Okay. With respect to the document, this indicates that, as you've previously testified, that Vos had substantiated that there was furans in chlorinated biphenyls;

correct?

A. It does refer to Dr. Vos' study. He misses it by a year or so in terms of time, what had happened.

Q. Who is D. Wood?

A. David Wood, a Monsanto employee.

Q. What capacity?

A. 1975, I don't recall his formal title. He was the individual that was involved with the marketing back at the home office of PCBs used in the electrical industry.

Q. And J.N. Haggart?

A. Haggart is his counterpart in the United Kingdom.

Q. Okay. Now, Wood is writing saying: "We need to develop our own methods to determine if indeed chlorinated dibenzylfurans are present and what is the potential hazard."

A. Uh-huh. (Yes)

Q. One, when did you know that furans were toxic?

A. I had a personal I'm going to call it inkling that furans were potential health hazards, health problems not only to humans but to wildlife about the middle of 1970, but Emmett Kelly would be the one to --

Q. Emmett Kelly would be the one to address that?

A. Yes.

Q. And he said "we need to develop our own method;" from that am I correct in stating that at the time of this correspondence Monsanto did not have a method similar to Vos?

A. No, that is not correct.

Q. Okay. Tell me why Monsanto could not simply use Vos' method of determining furan contamination.

A. We did. We were using it. It appears that David Wood wasn't tuned in to what the research analytical chemists were up to.

Q. Do you know why Vos' method was not successful in determining contamination in American PCBs?

A. Vos' method was able to detect PCB -- furans in PCBs down to a certain low level. The presence of furans in Monsanto-produced PCBs was below that level so the instrument couldn't see it no matter how much the fine-tune knob was turned, so to speak, literally.

Q. Do you know what the level of furan contamination, I think I've asked this, in the Vos studies were, parts per million?

A. I don't remember now, no.

Q. And what level were the furan -- what was the contamination level of furans in Monsanto PCBs ultimately established in the seventies?

MS. SUTTER: Objection to the vague form of the question.

A. I don't pretend to remember the exact numbers, but it seems to me I recall a range like five, ten parts per million, something like that, but those are not exact numbers.

Q. (BY MR. RACE) Do you recognize that which is dated August 15th, 1975? Actually, Doctor, I'm going to address the first page of that. Do you recognize the first page?

A. Yes, I do.

Q. Okay. This establishes that in 1975 dibenzylfurans were identified in PCBs, in Monsanto PCBs in specific; is that correct?

A. That's the reference to Dr. Risebrough's work, yes.

Q. We're going to mark that as Exhibit No. 7. I call your attention to September -- internal memo September 25th, 1975. Do you recognize that?

A. Yes, I recognize it.

Q. I'll mark this now as Plaintiffs' Exhibit No. 8. This is written by Mr. Levinskas?

A. Yes.

MS. SUTTER: Are you referring to the front page of Exhibit 8 or the entire Exhibit 8?

Q. (BY MR. RACE) The front page. Do you know who prepared the toxicity statement which is attached to that memo?

A. I do not.

Q. Okay. Had you -- you've seen that toxicity statement in -- as reflected in the memo on September 25th,

1975?

A. On or about that period of time, yes.

Q. Okay. How many versions were written prior to the final?

A. I have no way of knowing. I don't know.

Q. Okay. Down on the last page of the memo -- statement, excuse me, the last page of the statement it says: "Aroclors" and then penciled in above that is 1242 and 1254. Do you know who was responsible for that?

A. I do not.

Q. To whom was this statement issued?

A. I just am having difficulty recalling exactly who received copies of this. I just don't remember.

Q. Okay. Well, my question was who penciled in the 1254 and the 1254?

A. I answered that. I don't know.

Q. Excuse me. Do you agree with the statement that "Not withstanding the furan contamination the 1242 and 1254 do not present any unreasonable human health hazards?"

MS. SUTTER: Where are you finding that statement?

A. The reference to furans, I don't see that here.

MS. SUTTER: Nor do I.

Q. (BY MR. RACE) At that point in September of 1975 it was known that Monsanto -- Monsanto's PCB contained furans;

correct?

A. It was known that the Food and Drug Administration laboratory had found what they noted as being furans, chlorinated furans in Monsanto's Aroclors, yes.

Q. Did the existence of those furans ever change Monsanto's position with respect to the health hazards associated with PCBs?

A. No. There was no new -- no new toxicity ~~dated~~ data to indicate a need to ~~in the~~ change.

Q. Was there any discussion as to the level of contamination that would have to be reached before furans posed a threat to human health?

Go to 59

A. I personally don't know. You have to ask Dr. Kelly.

Q. I call your attention to an internal memo November 20th, 1975. Do you recognize that?

A. I recall this memo, yes.

Q. Okay. This memo reflects studies of Dr. Kimbrough in which carcinogens were found in rats exposed to Aroclor 1260. It doesn't say in this study. The setting -- do you recall the setting in which this --

A. This memo pertains to another memo in which the two studies were reviewed and discussed.

Q. Okay. Now, Dr. Kimbrough's studies, you would agree, found lesions or precancer tumors in rats exposed to

PCB; correct?

A. That is correct.

Q. Now, do you recall -- Strike that. Monsanto's response was to have the slides analyzed by pathologists employed at IBT; is that correct? As well as the Eppley Institute; is that correct?

A. That is correct.

Q. Now, how many Monsanto -- excuse me. Strike that. How many pathologists in total reviewed those slides on behalf of Monsanto?

A. I don't know the number.

Q. It was more than Dr. Pour; is that correct? More than just Dr. Pour?

A. Certainly there were the pathologists at IBT and there is at least two or three there.

Q. There is a Dr. Richter?

A. Dr. Richter, Dr. Gordon and others.

Q. Have you had discussions with any of those pathologists personally?

A. At what time?

Q. Concerning Dr. Kimbrough's findings.

A. Not me personally, no.

Q. Were you aware that Dr. Richter and Dr. Gordon actually concurred with Dr. Kimbrough's findings?

A. Yes.

Q. And it was only Dr. Pour who contested Dr. Kimbrough's findings; is that not correct?

A. That's my understanding, yes.

Q. And Monsanto did not request Dr. Kimbrough or Dr. Richter or Dr. Gordon to publish any statements concerning their review of Dr. Kimbrough's slides; is that correct?

MS. SUTTER: Could I hear that question again, please?

MR. RACE: Would you read it back?

(PENDING QUESTION READ BACK BY THE REPORTER)

A. If I understand the question correctly, Dr. Kimbrough did publish her findings and --

Q. (BY MR. RACE) But -- go ahead.

A. Now, in terms of whether Dr. Richter or Dr. Gordon published findings, as I recall, a document was prepared and issued by Dr. Callandra who was the top individual at IBT to whom Drs. Richter and Gordon reported, so IBT is represented by that document regarding these observations, these findings.

Q. The statement issued by Dr. Callandra indicated that Dr. Kimbrough's slides -- Dr. Kimbrough's interpretation of the slides was correct?

A. Yes. It also indicated that the findings of the two studies were different.

Q. Okay. Now, you say the findings of the two

studies; did Dr. Pour actually conduct a study or did he just review the Kimbrough -- Dr. Kimbrough's slides?

A. He reviewed both the IBT slides and the Kimbrough slides.

Q. Okay. And Dr. Pour took the position that both the Kimbrough slides and the IBT slides were negative insofar as relationship between PCBs and cancer?

MS. SUTTER: Objection to the form of the question.

Q. (BY MR. RACE) Is that correct?

A. Yes.

Q. Let me mark that as Exhibit 9. Okay. I call your attention to the January 29th, 1970 memo from Wheeler which you are cc'd. Do you recognize that?

A. I do.

Q. Okay. I mark that as Exhibit 10. Which chronic studies is Wheeler referring to?

A. He's referring to the lifetime studies with rats.

Q. Okay.

A. To which were exposed to Aroclors 1242, 1254 and 1260. He's also referring to long-term studies with Beagle dogs and also with leg horn chickens.

Q. Now, these are studies that were conducted by IBT?

A. That's correct.

Q. Once again, all the chronic studies that Monsanto directed were conducted by IBT; is that correct?

A. That is correct.

Q. Those studies commenced in 1969?

A. The chronic studies, yes.

Q. Is it true that even before the study was completed it was recognized that PCBs are exhibiting a greater degree of toxicity than anticipated?

A. That is true.

Q. Okay. But ultimately the IBT studies held that PCBs were non toxic; correct?

A. No, no, no.

Q. Excuse me. Not non toxic, non carcinogenic?

A. Correct.

Q. You concur with the statement that PCBs are about the same with respect to toxicity as DDT?

A. That's my understanding, yes.

MS. SUTTER: I would object in that Counsel didn't complete the whole sentence. It says "about the same as DDT in mammals."

Q. (BY MR. RACE) Are humans mammals?

A. Yes, it's my understanding.

Q. Mr. Papageorge, are you aware of a bate stamp method, have you come into that --

A. I'm sorry?

Q. Bate stamp, are you familiar with that?
A. Bate stamp?
Q. Yes.
A. I'm not familiar with that expression.
Q. Do you recognize any of the numbers on the bottom of this page? Now I'm referring to -- I'm specifically referring to SCM and then a series of numbers. Can you draw any conclusions from looking at that number?
A. No, I'm sorry, I can't.
Q. Okay. Did you give testimony in the Scott case in Beaumont, Texas?
A. Yes, I did.
Q. Had you seen or reviewed this document that I'm now referring to?
MR. WUNDERLICH: What's the date of that document?
MS. SUTTER: The date of the document is December 17, 1951. I do have an objection to the form of question. Are you asking him whether he ever saw it or whether he saw it in connection with Scott?
MR. RACE: If he's ever seen it.
MS. SUTTER: If he's ever seen it. All right.
A. I don't recall this document at all.
Q. (BY MR. RACE) Are any of the names of the individuals there familiar to you?

A. Mr. Mather and Dr. Weddell and Mr. Marshall are Monsanto employees in Monsanto's research department.

Q. Okay. This appears to be an internal Monsanto memo?

A. It appears to be so, yes, sir.

Q. Okay. Chlorinated diphenyl is the same as a chlorinated biphenyl; is it not?

A. Yes.

Q. Okay. And are you aware that literature back in 1951 revealed a history of skin trouble or liver trouble including some fatal cases attributed to heavy exposures to chlorinated diphenyls?

A. I'm aware of literature that referred to those kinds of symptoms and ailments as it related to commercial mixtures of chlorinated naphthalenes with some chlorinated diphenyls present, yes.

Q. Okay. Was chlorinated naphthalene a contaminant in Aroclors?

A. I don't believe I ever saw a report that reported the presence of chlorinated naphthalenes in Aroclors.

Q. Is -- chlorinated naphthalene is a hydrocarbon; correct; chlorinated hydrocarbon?

A. Yes.

Q. As PCB is a chlorinated hydrocarbon?

A. Yes.

Q. Within the family of chlorinated hydrocarbons you can break them into smaller categories; can you not?

A. I don't know what you mean by category. You mean solids and liquids and gases?

Q. Is there not a category of chlorinated aromatic hydrocarbon?

A. Yes.

Q. Okay. And both PCBs and the naphthalenes fall into that category?

A. Yes, anything that has the hexagon formation reflecting the benzene ring is called an aromatic.

Q. Okay. And there are recognized similarities of substances within that I'm going to call it family; is that correct?

A. Well, that's true of so many chemicals; there are similarities and there are dissimilarities. I don't know how to answer that.

Q. Okay. If you -- okay. Is it also true that the chlorinated aromatic hydrocarbons tend to be the more toxic chlorinated hydrocarbons?

MS. SUTTER: Objection to the form of the question.

A. You'll have to ask Dr. Kelly how that compares to other chlorinated hydrocarbons like chloroform and carbon tet. and literally hundreds of chlorinated hydrocarbons.

MR. RACE: Premised on Mr. Papageorge recognizing this as being a Monsanto internal memo, although he doesn't have personal knowledge of the memo itself, but recognizing the people mentioned in the memo I will attach it as Plaintiffs' Exhibit No. 11.

Q. (BY MR. RACE) Doctor, is it true that the chlorinated aromatic hydrocarbons have in common the fact that they produce an odor? I don't know, I'm just guessing.

A. All chemicals have a distinctive odor.

Q. Do you know what the aromatic specifically refers to, what common property?

A. I'm not aware of any such description.

Q. PCB has an odor; does it not?

A. Yes.

Q. Can you describe that odor?

A. I can describe what I sense, and I would suggest that this is quite subjective; different people smell different odors. To me it reminds me of a mild disinfectant type odor.

Q. And your ability to smell that odor indicates the chemical is in the air?

A. Oh, yes. Otherwise I wouldn't smell it.

Q. Okay. And the stronger the smell the greater the volume the chemical would be in the air; is that correct?

A. That's generally the way with materials.

Q. Okay. Now, do you recognize the document dated 8th September, 1955 and attached thereto I believe is a letter dated September 20th, 1955?

MS. SUTTER: I would like a moment to take a look at these documents, please.

A. I do not recall seeing any of these three --

Q. (BY MR. RACE) Three documents?

A. -- documents.

Q. Could you tell me in the first document who is Dr. H.R. Newman?

A. He was the -- I don't know the official designation. He was the head medical person in Monsanto in the United Kingdom.

Q. And the author of the letter on the first one is J.W. Barrett?

A. Dr. Barrett was -- again, I don't recall his official designated title, but he was a principle individual in the research activities of Monsanto Europe.

Q. Okay. And the second document is authored by Dr. Kelly and we can ask Dr. Kelly about that, I suppose?

A. I would suggest that, yes.

Q. When you started with Monsanto in '57; was it?

A. '51.

Q. Excuse me. '51, until 1955 did you have concern -- Strike that. Was it -- to the best of your

knowledge did Monsanto have concern prior to 1955 concerning the toxicology of Aroclors?

A. Well, the -- there were guidelines as to the kinds of things to avoid doing to limit exposure. There were, for example, guidelines regarding the amount of PCBs that could be in the breathing air or the working environment. There were of course concerns regarding getting it on the skin. There were concerns about getting too much on your clothing and not changing it as appropriate. Yeah, there were concerns of that kind.

Q. Do you know what Monsanto's policy was with respect to advising client -- customers of the relevant -- not relevant, various toxicity of the different Aroclors?

MS. SUTTER: Mr. Race, I apologize, I didn't understand that question.

Q. (BY MR. RACE) Let me strike the question and try again. It's true that back in the early fifties Monsanto was of the opinion that higher chlorinated Aroclors were more toxic than the lower chlorinated Aroclors?

A. Yes, they got that from the animal studies that were made up to that time.

Q. Okay. And did -- let me direct your attention to the September 20th, 1955 letter, the last paragraph. Will you agree with MCC's position, that's Monsanto Chemical Company; correct? The last paragraph of the -- the last paragraph on

Page 1 of that correspondence.

A. Page 1. Yeah, MCC was commonly used to describe Monsanto Chemical Company.

Q. Okay. I -- are you -- do you concur with the statement in the last paragraph indicating Monsanto's position can be summarized up in this fashion: "We know Aroclors are toxic but the actual limit has not been precisely defined. It does not make too much difference, it seems to me, because our main worry is what will happen if an individual develops any type of liver disease and gives a history of Aroclor exposure. I am sure the juries would not pay a great deal of attention to MACs."

A. I'm sorry, I missed the question.

Q. Would you agree with that statement?

A. Well, in essence I agree with it. Of course, it doesn't describe what is meant by history of Aroclor exposure and I would like -- a person would have preferred seeing some level of exposure, time, how long an exposure, but in my viewpoint, yes, overexposure to these materials can lead to health problems, that's well-known.

Q. MACs refer to what?

A. Maximum Allowable Concentrations. I believe that's -- it had to do with exposure levels in the workplace.

Q. Does this appear to be communications, the first one, the letter from Monsanto U.K. to Monsanto U.S. and then

the response by Dr. Kelly to the U.K.?

A. Well, as I see it, there are two responses that Dr. Kelly made; he made the initial one on September 20 and then apparently had some additional thoughts that he sent two days later.

Q. Okay. I'll mark that as Plaintiffs' Exhibit 12. I call your attention to the correspondence dated December 6, 1955. The first correspondence was written by D.V. Hardy.

MS. SUTTER: The witness is still reviewing the document. Do you want to interrupt his review to ask one question?

Q. (BY MR. RACE) Do you need to review the entire document to ascertain whether you're familiar with it, if you've ever seen it before?

A. No. I can say that I don't recall ever seeing this document.

Q. Well, then I'm not trying to make you read it now. That saves us time. You don't have to read the entire thing.

A. I didn't know what kind of questions to expect.

Q. If -- let me try it this way. The -- this first letter was written, it appears to be authored by D.V.N. Hardy; correct?

A. Yes.

Q. It's marked confidential. Do you know who Mr.

Hardy is?

A. Dr. Hardy was a medical doctor in Monsanto Europe reporting to Dr. Newman.

Q. Okay. And this appears to be a Monsanto correspondence; is that correct?

A. Yes.

Q. Okay. Is it true that the lower chlorinated Aroclors are more vaporous?

A. I guess you could use that term. They are -- they can form vapors at lower temperatures.

Q. Okay. So at a given temperature you may have more of the lower chlorinated PCBs in the air than the higher chlorinated PCBs; correct?

A. That is generally true, yes.

Q. Okay. And the toxicity is directly proportionate to -- Strike that. A harmful effect would be directly proportionate to an equation of toxicity and concentration; correct?

MS. SUTTER: Objection to the vague and confusing form of the question.

Q. (BY MR. RACE) In other words, Dr. --

A. Yes.

Q. Would you agree with that statement?

A. I'm trying to recall your first words.

Q. Let me try to ask it this way: If you get more

of a less toxic substance it may be equally harmful as if you got less of a more toxic substance?

A. It's a combination of the type of material, how much of the material, and of course, time.

Q. Okay. Now, if you will, could I call your attention to last sentence of the second paragraph on Page 2.

MS. SUTTER: Just a minute. This is the document that you said you weren't going to ask him questions about so now the witness is going to complete his review of the document that you're about to start asking him questions about.

Q. (BY MR. RACE) Either that, or I'll ask you this question: Do you agree or do you disagree: "It is now clear that toxicity increases with degree of chlorination and that this effect may cancel or even outweigh the advantage due to decreased vapor pressure?"

MS. SUTTER: I object to the form of the question in that you've picked one sentence out of a whole-page document after encouraging the witness not to read the entire document. I think he has a right to do that.

Q. I don't think it's necessary. Can you agree with that statement or do you have to read the entire document?

A. No, I -- I heard some words you read off here and I haven't found the words yet.

Q. The last sentence, right there.

A. Well, I -- from what I understand of these PCB materials, the reference to toxicity increasing with degree of chlorination is not necessarily true. It depends on the creature -- I'm looking for a word. That is exposed to it. An example that we found out is that the chickens were susceptible to the lower chlorinated materials, so that contradicts this statement here. And then the second part of that sentence when it says "may cancel or even outweigh," that's speculative. There is no way to really equate that with accuracy.

Q. Now, you recognize this as being a Monsanto correspondence; correct?

A. Yes. It is a collection of documents from Monsanto.

Q. What is the similarities between Pydraul 150 and Aroclor 1242?

A. Pydraul 150 is a mixture of chemicals. As best I recall one of the ingredients in that mixture is Aroclor 1242.

Q. Do you recall any of the other chemicals in Pydraul 150?

A. Not in specific detail.

Q. Who would know about that from Monsanto?

A. I'm trying to recall an individual in Monsanto's research department that developed these mixtures. I would suggest -- I don't know how available this person is. Dr.

Roger Hatton, H-A-T-T-O-N, was an individual familiar with Monsanto's hydraulic fluids.

Q. Are -- do you know whether any of the other substances in the Pydraul 150 were of equivalent toxicity of 1242 or greater?

A. Not -- since I don't remember what they were I can't answer.

Q. Okay.

MR. RACE: Off the record.

(WHEREUPON AN OFF THE RECORD DISCUSSION WAS HELD)

MR. RACE: Let me just say, just quickly, we're going to agree -- I'll go through a few documents that I have here and we have agreed to meet to try to work out some type of corporate deposition as well as some stipulation as to documents. Is that everybody's agreement?

MS. SUTTER: All counsel for all parties have agreed that we will meet and attempt to stipulate to documents.

MR. RACE: And work out something for the corporate deposition.

Q. (BY MR. RACE) Do you recognize this memo dated July 30th, 1975? Have you previously seen that document?

A. I recall the document, yes, sir.

Q. Okay. We'll mark this as 14. Okay. This document reflects that Monsanto acknowledged that --

acknowledged evidence of Aroclor 1260 being carcinogenic; is that correct?

A. No. It acknowledges that a study which used a strain of rats of one sex did show some liver effects that could be construed as being carcinogenic in nature, but it also points out that there are other studies that do not show the same results.

Q. What is a carcinogenic effect -- or the carcinogenicity of DDT?

A. I don't know. You'll have to ask Dr. Kelly.

Q. Do you have an opinion one way or another as to whether Aroclor 1260 has a potency comparable to that of DDT?

A. I do not.

Q. I draw your attention to that which has previously been marked Plaintiffs' Exhibit 817. Do you recognize this document?

MR. WUNDERLICH: What's the date on that?

MS. SUTTER: April 17, 1970.

Q. (BY MR. RACE) I'm not going to ask you about the attached documents, but only the first page.

A. I recall the document.

Q. Okay. I'll mark it as 15. Now, what is meant by the paragraph "Please do not present any Teach-In "visitors" with prepared handouts on PCBs. You may use this information in verbal conversation should the occasion arise?"

A. Well, just like it says; in other words, don't give this to any individuals.

Q. What was your reasoning for not wishing to give the question and answer sheet on PCBs to individuals?

A. Primarily because I personally saw this as a highly technical kind of subject that could be misunderstood by individuals who didn't have the -- what I felt was the appropriate background and would be best to have someone talking to them and finding out what the concerns if any might be and then attempt to answer them and if the Monsanto person couldn't answer them he could come back to people like me or Dr. Kelly and get a -- and get an answer.

Q. Okay. You testified before concerning Dr. Pour's evaluation of Dr. Kimbrough's study. Do you recall that?

A. Yes.

Q. Okay. I'm going to call your attention to a letter dated November 17th, 1975. A memo, excuse me. In which you were cc'd. Do you recognize that?

A. As I read it I recall it, yes.

Q. Okay. Do you know who scribbled the handwritten note on the bottom?

A. I do not.

Q. Now, the Eppley Institute was an institute that had -- Strike that. Dr. Pour was employed by the Eppley Institute; correct?

A. Correct.

Q. Do you know why the Eppley Institute did not want to be associated with Dr. Pour's position on PCBs?

A. I don't think that's a correct interpretation of the positions of the two. The Eppley Institute supported Dr. Pour's position regarding the -- his findings, but they didn't want his name, as well as Dr. Pour didn't want his name, in the public press. Dr. Pour and the institute preferred to deal with scientists on a scientist-to-scientist basis rather than work through the public media.

Q. Do you know if Dr. Pour had made a statement that he did not want his interpretation of Dr. Kimbrough's slides subjected to peer review?

A. That I don't know anything about. I never heard that before.

Q. Had you seen previously that handwritten note at all?

A. I don't recall the handwritten note.

Q. Do you recall the memo?

A. I do.

Q. I call your attention to a handwritten note, the top of which is written "charges against Monsanto products in 5-13-83 Wall Street Journal, WSJ." Do you recognize the handwriting on this?

A. No. This is the first time I've seen this

document.

Q. Were you aware that Levinskas caused Callandra -- I call your attention to the second category, Callandra at IBT to change language from mildly tumorigenic to does not appear to be carcinogenic in an IBT report on toxicity of PCBs.

A. I'm aware of the proposed change in wording that Dr. Levinskas made and it's based on the fact that there were three studies run simultaneously. The data was similar so that the conclusions were identical really. Two of the reports had the expression "does not appear to be carcinogenic," the third one had the phrase "mildly tumorigenic," and Dr. Levinskas suggested that since the data does not indicate otherwise why not have the same conclusion for all three reports, and that's the basis for his recommendation.

Q. Are the other two reports -- the other two studies were also conducted by IBT?

A. Yes.

Q. When did Monsanto first insist on indemnity contracts with their purchasers of PCBs?

A. The program was initiated in December of '71 to become effective starting in 1972.

Q. Okay. Had there been any indemnity agreements prior to that date?

A. Not to my knowledge.

Q. Do you have knowledge concerning those indemnity agreements?

A. I have some knowledge.

Q. Who is primarily responsible for those?

A. I can give you my understanding. The director of the product group, Howard Bergen was the person who came up with this idea.

Q. And the understanding was if there was any harm that was caused by the use or exposure to PCBs then Monsanto's customers would pay rather than Monsanto if the PCB had been resold or used by Monsanto customers; is that correct?

MS. SUTTER: I object to the relevance of the inquiry.

A. I would suggest that the documents that were prepared kind of speak for themselves. The wording is there about Monsanto's role and the customer's role should a situation arise.

Q. (BY MR. RACE) Did Monsanto have indemnity agreements concerning any other products other than PCB?

A. I don't know.

Q. I call your attention to that which has previously been marked as Exhibit 1536.

A. I'm having trouble locating it.

Q. Do you recognize that document?

A. I recognize the document.

Q. Okay. I'll mark it as Exhibit 16. Now, this document is talking about --

MR. WUNDERLICH: What is the date on that document, please?

MR. RACE: January 24th, 1977.

MR. WUNDERLICH: Okay.

Q. (BY MR. RACE) Do you recall the conversations that you had in connection with this document, in connection with the production of this document?

A. Yes, I do.

Q. Okay. What was Mobil's belief with respect to PCB as being a possible carcinogen?

A. Well, more correctly it was the belief of an investigator, and I don't at the moment remember whether she was a -- an employee of Mobil Oil or Mobil Chemical or some outside scientist, but she conducted a study that indicated that cases of melanoma were due to exposure to PCBs. At a meeting in Cincinatti with representatives of NIOSH, the Mobil representative, and I must confess, I've forgotten his name, I believe it was a Dr. Harbison, but I could be wrong, he was a member of a committee of which I was a member, commenting on a document that NIOSH was preparing for publication on PCBs and he told the group that the study was incomplete, that he preferred that any reference to that study be qualified and that the study would be continued, as far as Mobil was

concerned.

Q. Do you know who authored the study?

A. Her name starts with a B. B-A-H-N. I'm not positive of that.

Q. Bahn?

A. The Bahn study, that's it.

Q. That was a study of Bloomington workers?

A. No, Mobil laboratory employees. With that discussion I was speaking with the representative of NIOSH who is mentioned in the document and he understood the comments the way I did and that's what triggered this particular document.

Q. Do you know of any other studies that have shown positive association between PCB exposure and melanomas?

MS. SUTTER: I object to the form of the question in that I think it mischaracterizes the studies and contains undefined technical epidemiological terms, namely "positive." Subject to that, you may answer.

A. I'm not aware of any studies that relate PCBs to melanoma other than this initial work that we discussed here regarding Mobil Chemical laboratory workers.

MR. RACE: Okay. I would like to -- I tell you what I'm going to do for the record, although it's only 3:00, what I would like to do is I think in order to expedite this matter, the easiest way to handle it at this juncture is to

continue your deposition and hopefully in lieu of continuing this one we will do a corporate deposition which will forego any of this in the future, subject to working out some terms with counsel here.

MS. SUTTER: I certainly don't control when you conclude a deposition or what you ask. This is a knowledgeable -- you know, Mr. Papageorge, you mentioned some areas I think out in the hall, and it was my understanding that you were going to ask him a number of questions here today. You're now saying that you prefer to depose him as a corporate designee rather than in his personal capacity. I think he has a lot of knowledge that you haven't started to cover here yet today. You've mentioned --

MR. RACE: Well, he's got to go by 4:00 and I can't cover everything by 4:00.

MS. SUTTER: I understand that, Counsel, and it's now five after three, and I'm not trying to tell you what you should or should not be doing, I am just -- it's difficult for me to comment on the corporate designee notice that you're anticipating when I haven't seen it yet and --

(WHEREUPON AN OFF THE RECORD DISCUSSION WAS HELD)

MR. RACE: So for purposes of the record, I'm going to say that my intent is if I have to continue this deposition, if we can't agree on the parameters of a corporate deposition, that's my position, for the record, so you know

what it is.

MS. SUTTER: He will read it.

(SIGNATURE OF THE WITNESS NOT WAIVED)

ORIGINAL

I, WILLIAM B. PAPAGEORGE, P.E., do hereby state that I have read the foregoing questions and answers appearing in this transcript of my deposition, Page 3 through and including Page 73; that this is a true and accurate (corrected) record of said answers given in response to the questions appearing herein.

William B Papageorge

WILLIAM B. PAPAGEORGE, P.E.

C E R T I F I C A T E

STATE OF MISSOURI)
) SS
COUNTY OF ST. LOUIS)

Before me personally appeared WILLIAM B. PAPAGEORGE, P.E., to me known to be the person described in and who executed the foregoing instrument and acknowledged to and before me that WILLIAM B. PAPAGEORGE, P.E. executed the said instrument in the capacity and for the purpose therein expressed.

Subscribed to before me this 1st day of August, 1994.

My Notary commission expires: JOSEPHINE B. NIBLOCK NOTARY PUBLIC STATE OF MISSOURI ST. LOUIS COUNTY MY COMMISSION EXP. JAN. 15,1995.

Josephine B Niblock

[NOTARY PUBLIC]

JUDITH and STEPHEN BECHTOLD VS. MONSANTO COMPANY and WESTINGHOUSE
Cause No. 862-00694

CASE NAME: Bechtold v. Monsanto, Case # 922-00911

WITNESS NAME: William B. Papageorge **DATE:** May 18, 1994

DEPOSITION CORRECTION SHEET

Upon reading the deposition and before subscribing thereto, the deponent indicated the following changes should be made:

Page 8, Line 11

Should read: assigned. It seemed to me we covered topics that in my mind

Reason for change: Incorrect word.

Page 29, Line 5

Should read: not knowing -- I don't know the process by which chlorinated

Reason for change: Incorrect word

Page 30, Line 13

Should read: are others as well.

Incorrect word.

Reason for change:

Page 50, Line 8

Should read: No. There was no new toxicity data to

Reason for change: clarification

Page 50, Line 9

Should read: indicate a need to change.

Reason for change: clarification

William B Papageorge
Signature of Witness

ORIGINAL

I, WILLIAM B. PAPAGEORGE, P.E., do hereby state that I have read the foregoing questions and answers appearing in this transcript of my deposition, Page 3 through and including Page 73; that this is a true and accurate (corrected) record of said answers given in response to the questions appearing herein.

William B Papageorge

WILLIAM B. PAPAGEORGE, P.E.

C E R T I F I C A T E

STATE OF MISSOURI)
) SS
COUNTY OF ST. LOUIS)

Before me personally appeared WILLIAM B. PAPAGEORGE, P.E., to me known to be the person described in and who executed the foregoing instrument and acknowledged to and before me that WILLIAM B. PAPAGEORGE, P.E. executed the said instrument in the capacity and for the purpose therein expressed.

Subscribed to before me this 1st day of August, 1994.

My Notary commission expires: JOSEPHINE S. NIBLOCK NOTARY PUBLIC STATE OF MISSOURI ST. LOUIS COUNTY MY COMMISSION EXP. JAN. 15,1995.

Josephine S. Niblock
[NOTARY PUBLIC]

JUDITH and STEPHEN BECHTOLD VS. MONSANTO COMPANY and WESTINGHOUSE
Cause No. 862-00694

CASE NAME: Bechtold v. Monsanto, Case # 922-00911

WITNESS NAME: William B. Papageorge **DATE:** May 18, 1994

DEPOSITION CORRECTION SHEET

Upon reading the deposition and before subscribing thereto, the deponent indicated the following changes should be made:

Page 8, Line 11

Should read: assigned. It seemed to me we covered topics that in my mind

Reason for change: Incorrect word.

Page 29, Line 5

Should read: not knowing -- I don't know the process by which chlorinated

Reason for change: Incorrect word

Page 30, Line 13

Should read: are others as well. Incorrect word.

Reason for change:

Page 50, Line 8

Should read: No. There was no new toxicity data to

Reason for change: clarification

Page 50, Line 9

Should read: indicate a need to change.

Reason for change: clarification

William B Papageorge
Signature of Witness

I, WILLIAM B. PAPAGEORGE, P.E., do hereby state that I have read the foregoing questions and answers appearing in this transcript of my deposition, Page 3 through and including Page 73; that this is a true and accurate (corrected) record of said answers given in response to the questions appearing herein.

_____

WILLIAM B. PAPAGEORGE, P.E.

C E R T I F I C A T E

STATE OF MISSOURI)
) SS
COUNTY OF ST. LOUIS)

Before me personally appeared WILLIAM B. PAPAGEORGE, P.E., to me known to be the person described in and who executed the foregoing instrument and acknowledged to and before me that WILLIAM B. PAPAGEORGE, P.E. executed the said instrument in the capacity and for the purpose therein expressed.

Subscribed to before me this _____ day of _____, 19___.

My Notary commission expires:_____.

_____

[NOTARY PUBLIC]

JUDITH and STEPHEN BECHTOLD VS. MONSANTO COMPANY and WESTINGHOUSE
Cause No. 862-00694

NOTARIAL CERTIFICATE

STATE OF MISSOURI)
)
CITY OF ST. LOUIS)

I, VICTORIA MENAUGH FAUSER, a Certified Shorthand Reporter and a duly commissioned Notary Public within and for the State of Missouri, do hereby certify that there came before me at the offices of Wilburn, Suggs & Watkins, 1221 Locust Street, St. Louis, Missouri 63103,

WILLIAM B. PAPAGEORGE, P.E.,

who was by me first duly sworn to testify to the truth and nothing but the truth of all knowledge touching and concerning the matters in controversy in this cause; that the witness was thereupon examined under oath and said examination was reduced to writing by me; that the signature of the witness was not waived by agreement of all parties; and that this deposition is a true and correct record of the testimony given by the witness.

I further certify that I am neither attorney for, counsel for, nor related, nor employed by any of the parties to the action in which this deposition is taken; further, that I am not a relative or employee of any attorney or counsel employed by the parties hereto or financially interested in this action.

IN WITNESS WHEREOF, I have hereunto set my hand and seal May 24, 1994.

My commission expires March 4, 1997.

_____

NOTARY PUBLIC

W. B. PAPAGEORGE

October 26, 1970

H. S. Bergen
W. R. Richard
R. E. Keller
E. P. Wheeler

J. R. Savage

Recent data from Dr. J. P. Mieure's work indicates the presence of naphthalene in biphenyl and anthracene or phenanthrene and dibenzofuran in Santowax R used in the manufacture of Aroclors.

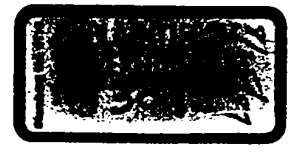
The naphthalene, anthracene or phenanthrene could be present in the benzene used in the diphenyl unit or could be co-produced with the biphenyl, terphenyl and quaterphenyl.

The dibenzofuran could result from oxygen containing contaminants in the benzene or, more likely, be formed because of the presence of the promoter, acetone.

The Anniston Plant should design and execute a program for determining the source or sources of these contaminants.

W. B. PAPAGEORGE

ms



W. B. PAPAGEORGE

October 26, 1970

H. S. Bergen
W. R. Richard
R. E. Keller
E. P. Wheeler

J. R. Savage

Recent data from Dr. J. P. Mieure's work indicates the presence of naphthalene in biphenyl and anthracene or phenanthrene and dibenzofuran in Santowax R used in the manufacture of Aroclors.

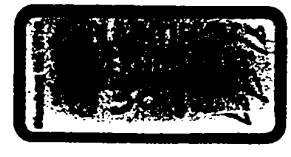
The naphthalene, anthracene or phenanthrene could be present in the benzene used in the diphenyl unit or could be co-produced with the biphenyl, terphenyl and quaterphenyl.

The dibenzofuran could result from oxygen containing contaminants in the benzene or, more likely, be formed because of the presence of the promoter, acetone.

The Anniston Plant should design and execute a program for determining the source or sources of these contaminants.

W. B. PAPAGEORGE

ms



Monsanto

FROM (NAME & LOCATION) Medical Department

DATE: November 3, 1970

SUBJECT: Status of Toxicity Studies and Needs--Aroclors and Substitutes

REFERENCE:

cc: H. S. Bergen, HBERG
M. W. Farrar, Queeny
R. E. Keller, S. Second St.
W. R. Richard, WRICH
J. E. Springgate, JSPRI

TO : W. B. Papageorge
WPAPA

Confirming our discussions, I have attached copies of tables showing the information available and what we we may need if the current plan for continued sales for some members of the Aroclor family and substitutes for others is to be implemented. The enclosed may not be a complete listing and will have to be reviewed and updated occasionally. Particularly lacking may be references to non chlorinated plasticizer materials.

Premises on which the "needs" are based include:

1. The determination that the chlorinated terphenyls can and will be found in environmental samples.

2. Biodegradation of the chlorinated terphenyls is virtually impossible.

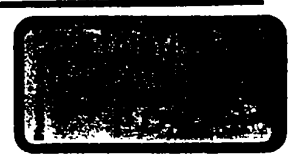
3. Escape to the environment cannot be prevented in all proposed applications (including disposal of products containing them).

4. The lower chlorinated biphenyls may be biodegradable (metabolized in the mammalian species) with more toxic effects than the higher chlorinated PCB's--or at least at lower levels of insult.

5. Nothing more than acute data would be obtained for mixtures of the lower chlorinated biphenyls and the chlorinated terphenyls.

6. No chronic (two year studies) would be anticipated.

7. No sub-acute or chronic data would be obtained on non-halogenated substitute products such as phosphate esters, glycols, etc.



For budgetary purposes fairly definite costs are indicated. The total of the costs are as follows:

I. Those studies I feel we cannot avoid--$191,300

II. Studies to be deferred for the time being--$287,000

In the case of Item I, we can make arrangements to pre-pay Industrial Bio-Test prior to the end of 1970.for any amount you have available. The remainder can be paid whenever you wish in 1971. We can also include next year any portion of the costs for the studies to be deferred as time and circumstances dictate.

Elmer P. Wheeler

EPW:ju

Enclosure

11/3/70
Page 1

AROCLOR TOXICITY DATA

Toxicity Data	Cost	AROCLOR 1221 Have	AROCLOR 1221 Need	AROCLOR 1221 Date Begin	AROCLOR 1221 Date End	MCS 1016 Have	MCS 1016 Need	MCS 1016 Date Begin	MCS 1016 Date End	AROCLOR 5432 Have	AROCLOR 5432 Need	AROCLOR 5432 Date Begin	AROCLOR 5432 Date End	AROCLOR 5442 Have	AROCLOR 5442 Need	AROCLOR 5442 Date Begin	AROCLOR 5442 Date End
Acute																	
Rat-LD_{50}	$ 200	X	$ (200)*	11/15/1970	12/31/1970		$ 200	11/15/1970	12/31/'70	X	$	11/15/1970	12/31/'70	X	$ (200)*	11/15/1970	12/31/'70
Rabbits-MLD (dermal)	250	X	(250)*	"	"		250	"	"	X		"	"	X	(250)*	"	"
Skin Irr. (rabbit)	100		100	"	"		100	"	"	X		"	"		100	"	"
Eye Irr. (rabbit)	125		125	"	"		125	"	"	X		"	"		125	"	"
Vapor Inhalation (Rats)	200		200	"	"		200	"	"			"	"			"	"
Fish (2 species)	600		600	"	"		600	"	"		600	"	"		600	"	"
Sub-acute																	
90-day rat **	6,000		6,000	1/2/71	6/1/'71		6,000	1/2/71	6/1/'71		6,000	1/2/71	6/1/'71		6,000	1/2/'71	6/1/'71
90-day dog	10,000		10,000	"	"		10,000	"	"		10,000	"	"		10,000	"	"
Fish (30-90 day)	3,000 (est.)		3,000				3,000				3,000				3,000		
Reproduction																	
Rats	17,000		Defer				Defer				Defer				Defer		
Chickens	8,000		Defer				Defer				Defer				Defer		
Teratology																	
Rabbits	4,500		Defer				Defer				Defer				Defer		
TOTAL:	$49,975																
NEED NOW:			$20,475				$20,475				$19,600				$20,275		
DEFERRED:			$29,500				$29,500				$29,500				$29,500		

* (Repeat)
** Control group cost $2,100

SCM 044586

AROCLOR TOXICITY DATA

Toxicity Data	Cost	AROCLOR 1254 Have	AROCLOR 1254 Need	AROCLOR 1254 Date Begin	AROCLOR 1254 Date End	AROCLOR 5460 Have	AROCLOR 5460 Need	AROCLOR 5460 Date Begin	AROCLOR 5460 Date End	HB-40 Have	HB-40 Need	HB-40 Date Begin	HB-40 Date End	MIPB Have	MIPB Need	MIPB Date Begin	MIPB Date End
Acute																	
Rat-LD50	$ 200	X				X				X				X			
Rabbits-MLD (dermal)	250	X				X				X				X			
Skin Irr. (rabbit)	100	X				X				X				X			
Eye Irr. (rabbit)	125	X				X				X				X			
Vapor Inhalation (Rats)	200	X				X											
Fish (2 species)	600	X					$ 600	12/15 1970	1/31 '71		$ 600#	12/15 1970	1/31 '71		$ 600#	12/15 1970	1/31 '71
Sub-acute																	
90-day rat **	6,000										6,000#	11/2/70	2/15 '71		6,000#	11/2 '70	2/15 '71
90-day dog	10,000																
Fish (30-90 day)	3,000 (est.)		$ 3,000														
Reproduction																	
Rats	17,000	X					Defer										
Chickens	8,000	X				X											
Teratology																	
Rabbits	4,500		4,500	11/15 1970	2/15 '71		Defer										
TOTAL:	$49,975																
NEED NOW:			$ 7,500				$ 600				$ 6,600#				$ 6,600#		
DEFERRED:							21,500										

(Repeat)

* Control group cost $2,100

\# Already paid

SCM 044587

027

AROCLOR TOXICITY DATA

Toxicity Data	Cost	MCB 1043 Mono-Chloro Mono-Bromo Biphenyl Have	Need	Date Begin	Date End	Dichloro Diphenyl Have	Need	Date Begin	Date End	Mono-Bromo Dichloro Diphenyl Have	Need	Date Begin	Date End	AROCLOR 6062 Have	Need	Date Begin	Date End
Acute																	
Rat-LD50	$ 200		$ 200	3rd qtr. '71	1st qtr. '72		$ 200	3rd qtr. '71	1st qtr. '72		$ 200	3rd qtr. '71	1st qtr. '72	X			
Rabbits-MLD (dermal)	250		250	"	"		250	"	"		250	"	"	X			
Skin Irr. (rabbit)	100		100	"	"		100	"	"		100	"	"	X			
Eye Irr. (rabbit)	125		125	"	"		125	"	"		125	"	"	X			
Vapor Inhalation (Rats)	200		200	"	"		200	"	"		200	"	"				
Fish (2 species)	600		600	"	"		600	"	"		600	"	"				
Sub-acute																	
90-day rat **	6,000		6,000	"	"		6,000	"	"		6,000	"	"				
90-day dog	10,000		10,000	"	"		10,000	"	"		10,000	"	"				
Fish (30-90 day)	3,000 (est)		3,000	"	"		3,000	"	"		3,000	"	"				
Reproduction																	
Rats	17,000		Defer				Defer				Defer						
Chickens	8,000		Defer				Defer				Defer						
Teratology																	
Rabbits	4,500		Defer				Defer				Defer						
TOTAL:	$49,975																
NEED NOW:			$20,475				$20,475				$20,475						
DEFERRED:			$29,500				$29,500				$29,500						

* (Repeat)
** Control group cost $2,100

SCM 044588

027163

AROCLOR TOXICITY DATA
2,2 Prime Dichloro Diphenyl Ether

Toxicity Data	Cost	Bromo-Chlorobenzene Have	Need	Date Begin	Date End	Have	Need	Date Begin	Date End	Have	Need	Date Begin	Date End	Have	Need	Date Begin	Date End
Acute																	
Rat-LD50	$ 200		$ 800	3rd qtr '71	1st qtr. '72		$ 200	3rd qtr '71	1st qtr '72								
Ratbite-MLD (dermal)	250		250	"	"		250	"	"								
Skin Irr. (rabbit)	100		100	"	"		100	"	"								
Eye Irr. (rabbit)	125		125	"	"		125	"	"								
Vapor Inhalation (Rats)	200		200	"	"		200	"	"								
Fish (2 species)	600		600	"	"		600	"	"								
Sub-acute																	
90-day rat **	6,000		6,000	"	"		6,000	"	"								
90-day dog	10,000		10,000	"	"		10,000	"	"								
Fish (30-90 day)	3,000 (est.)		3,000	"	"		3,000	"	"								
Reproduction																	
Rats	17,000		Defer				Defer										
Chickens	8,000		Defer				Defer										
Teratology																	
Rabbits	4,500		Defer				Defer										
TOTAL:	$49,975																
NEED NOW:			$20,475				$20,475										
DEFERRED:			$29,500				$29,500										

(Repeat)

* Control group cost $2,100

SCM 044589

027

PCB-Japan

MITSUBISHI MONSANTO CHEMICAL COMANY

FROM LOCATION Tokyo

DATE December 28, 1970

SUBJECT

REFERENCE Your Memo Dec. 21, 1970

TO Mr. W. B. Papageorge
St. Louis, Mo.

c Messrs.
J. Mason
H. Bergen
E. Wheeler

Animal feeding studies sponsored and paid for by Monsanto are the property of Monsanto, obviously.

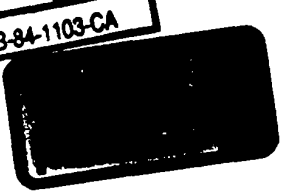
Although Kanegafuchi is asking, they also are testing to see how far Monsanto will go in giving away information. Refusal to give them details will have no real effect on our relationships with Kanegafuchi here in Japan. If Monsanto files any of its data, with FDA or other governmental agencies, Kanegafuchi will try that route too.

MMK will work closely with Kanegafuchi to try to establish a PCB marketing plan in Japan that is consistent.

In the absence of limitations on use by country in the form of regulations or laws, it will be impossible to prevent exports. We can persuade them to limit applications in Japan from self interest, but cannot significantly influence exports to a country which has no regulations. I'm afraid this includes the U.S.A. until formal regulations issue.

J. R. Durland

JRD:fu



PCB - Japan

MITSUBISHI MONSANTO CHEMICAL COMANY

FROM LOCATION Tokyo

DATE December 28, 1970

SUBJECT

REFERENCE Your Memo Dec. 21, 1970

TO Mr. W. B. Papageorge
St. Louis, Mo.

c Messrs.
J. Mason
H. Bergen
E. Wheeler

Animal feeding studies sponsored and paid for by Monsanto are the property of Monsanto, obviously.

Although Kanegafuchi is asking, they also are testing to see how far Monsanto will go in giving away information. Refusal to give them details will have no real effect on our relationships with Kanegafuchi here in Japan. If Monsanto files any of its data, with FDA or other governmental agencies, Kanegafuchi will try that route too.

MMK will work closely with Kanegafuchi to try to establish a PCB marketing plan in Japan that is consistent.

In the absence of limitations on use by country in the form of regulations or laws, it will be impossible to prevent exports. We can persuade them to limit applications in Japan from self interest, but cannot significantly influence exports to a country which has no regulations. I'm afraid this includes the U.S.A. until formal regulations issue.

J. R. Durland

JRD:fu

027254

SCM 044851

C.A. No. B-84-1103-CA

PLAINTIFF'S DEPOSITION EXHIBIT
3
5-18-94 VMF

Monsanto INDUSTRIAL CHEMICALS CO.

FROM (NAME & LOCATION) W. M. Mees - T2F

DATE October 10, 1972

SUBJECT TRIP REPORT

REFERENCE

TO : E. S. Tucker
T2F

cc: R. E. Keller - T1B
R. H. Munch - T1B
W. B. Papageorge - B2NA
W. R. Richard - T3A
J. F. Stapleton - B2SA
R. A. Stohr - A3SB
E. P. Wheeler - A2SA

Meeting: Symposium on PCBs - 164th ACS National Meeting, New York

Date: August 29 and 30, 1972

For Monsanto: W. M. Mees

Purpose of Trip: To keep abreast of the research being carried out on the environmental aspects of PCBs. To identify future problems with PCBs for Monsanto.

Summary:

The twenty-six papers presented were divided into three categories: ubiquity (6), analysis and degradation (7), and toxicity (13).

I. Ubiquity

Researchers continue to document the presence of PCBs in the environment and the transport of these materials to the higher members of the various food chains. The papers dealt primarily with aquatic systems, and in several cases significant decreases in the PCB levels were noted. Decreased PCB levels were observed; by Dr. Y. A. Greichus in the Lake Poinsett, South Dakota ecosystem (~50%, '70 vs '71), by Dr. O. W. Berg in sediments from lakes and rivers in Ontario, and by Dr. D. R. Nimmo in samples from Escambia Bay, Florida (10 fold, '70 vs '71).

Dr. Hans J. Crump - Weisner reported on the U.S. Geological Survey's monitoring of surface waters for PCB contamination (10 states). The levels found ranged between 0.1 and 4 ppb. Confirmation was accomplished by gas chromatography-mass spectrometry.

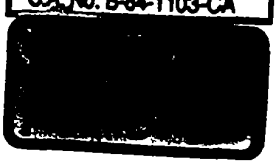
Dr. A. R. Yobs of the EPA who has been monitoring human adipose samples, reported the results of a larger sampling.

PCB in Human Adipose Tissues

Negative	1001	45.7%
Trace - <1 ppm	370	16.9%
1-2 ppm	651	29.8%
>2 ppm	167	7.6%
	2189	100.0%

SCM 054138

No comment was made regarding the significance of the PCB levels found in humans.



IN-10 REV. 11-69

027824

II. Analytical and Degradation

The papers dealing with analytical techniques, often quite exotic, netted very little useful information.

Dr. D. L. Stallings, using GC/MS, has verified a significant decrease in the penta isomer content of Aroclor 1016 vs Aroclor 1242. He is planning to publish his data in JAOAC soon.

Dr. O. Hutzinger discussed his photochemical degradation experiments with pure isomers. Using both lab and natural conditions he has observed isomerization, condensation, polymers, polar materials, higher PCB formation and terphenyls. Experiments were carried out with thin films in the presence of water. Alteration of the 2,2',5,5' tetrachloro homolog was complete in 80 hours. No alteration was observed with the 2,2',4,4',5,5' hexachloro homolog.

III. Toxicity

One day was devoted to papers on toxicity studies with the Aroclors. The feeding studies discussed involved Aroclor 1016, Aroclor 1242, Aroclor 1248, Aroclor 1254, and Aroclor 5460 with invertebrates - fish, birds, and mammals. The data presented was at times confusing and occasionally contradictory. Considerable effort was directed toward detailing the various changes occurring in animal systems upon exposure to the Aroclors. Much less effort was spent on detailing the reversal of the toxic effects observed. Metabolism of the Aroclors in birds and mammals appears to proceed as expected via hydroxylation without the loss of chlorine. No hydroxylated metabolites were observed in excretions of rats and pigeons exposed to the 2,2',4,4',5,5' hexachloro biphenyl. No hydroxylated metabolites were detected in any of the studies with trout. Somewhat surprising were the unusually high levels of PCB found in the brain tissues of birds and mink. The significance of this observation was not discussed.

Dr. D. Nimmo reported Aroclor 1016 was as toxic as Aroclor 1242 to shrimp, oysters and fish in chronic dynamic bioassays.

Dr. R. Ringer reported on the growth and reproduction problems of mink apparently caused by PCB contamination of Lake Michigan coho salmon. All of the animals orally exposed to the Aroclor died during the test. A total of 45 mink were divided into 3 groups (12 females and 3 males per dietary treatment group). The treatments were a basal diet containing ocean fish, substitution of coho salmon for the ocean fish, and the basal diet supplemented with 10 ppm each of Aroclors 1242, 1248, and 1254. Additional feeding studies are being carried out with Aroclor 1254.

A discussion on directions for future PCB research was led by Dr. J. C. Street. Perhaps the most significant comment was to the effect that researchers should look for impurities, specifically dibenzofurans, in the Aroclors to explain the erratic toxicity data.

Dr. A. C. Kolbye discussed FDA regulation of PCBs as well as the prospects regarding future PCB tolerance limits. His presentation amounted to a justification of the FDA's proposed guidelines on the basis of available animal and human toxicity data.

Dr. Kolbye made favorable comments about Monsanto's restrictions on sales and uses. He indicated that, in his opinion, Monsanto has acted responsibly and the restrictions should minimize the levels of PCB in the environment.

Dr. Kolbye alluded to the fact that consumption of sport fish could be potentially hazardous to humans, primarily because at this point, it is an unregulated area.

In summary, the academic community appears anxious to initiate more research on the PCBs and to use the PCB problem as a source of research funds. The regulatory agencies, notably the FDA, seem to view the PCB situation as a problem which currently is under control.

W. M. Mees

db

Monsanto

FROM (NAME & LOCATION): W. B. Papageorge B2SK

DATE: December 6, 1974

SUBJECT: PCBs - CHLORINATED DIBENZOFURANS

REFERENCE:

TO : J. P. Mieure - T2B

CC: H. S. Bergen
R. E. Keller
G. J. Levinskas
W. R. Richard
J. R. Savage
P. L. Wright
E. P. Wheeler

Attached is a copy of a paper which is being offered for publication in the "Bulletin of Environmental Contamination and Toxicology." Dr. Kimbrough has solicited our comments. If you or any of the recipients of copies of this memo have any comments to offer, please submit them to me by December 16.

W. B. Papageorge

W. B. Papageorge

DEC 12 1974

Bill briefly - what is significance of Chlorodibenzofurans when material was found in beyer/hodge found exist was pressure to reduce

D. Wood.

Chlorodibenzo furans are very highly toxic. Many effects on birds and animals noted and originally attributed to PCBs where later found to be due to furan content. There is currently no legal or regulatory pressure to reduce. Subject, however, is very emotional and could result in further pressure to eliminate PCBs from all uses. WBPapageorge

028331

SCM 068595

[redacted]

[redacted]

D. Wood - St. Louis

June 16, 1975

(2) CHLORINATED DIBENZYLFURANS

H. S. Bergen - B2SL
W. B. Papageorge - B2SK
J. Mieure - T2F
R. H. Munch - T1B
C. Paton - B2SC

J. N. Haggart
5040

John,

You will recall that Dutch researchers (Voss et al) found furans in chlorinated biphenyls produced by Prodelec and Bayer some four years ago.

Recently FDA has claimed to have detected these products in Aroclor and we will possibly see increased publication about these toxic contaminants develop.

It would be appropriate to establish a technical dialogue with Bayer if they have carried out "in house" work in this area and Ralph Much will be writing to Dick Baxter about this.

We need to develop our own methods to determine if indeed the chlorinated dibenzylfurans are present and what is the potential hazard. I am asking Ralph to send copies to you when he contacts Dick in case there are any business implications in establishing such a technical contact of which we are not aware.

Regards,

D. Wood

/pep

Ref. - As I recall Ralph or Ralph and myself (Dave) were going to follow up on my advice to Bayer's product group

I suggest you write to Baxter referencing my advice.

Monsanto INDUSTRIAL CHEMICALS CO.

FROM (NAME & LOCATION) R. E. Keller - T1B - St. Louis

DATE August 15, 1975

SUBJECT CHLORINATED DIBENZOFURANS

REFERENCE

TO : R. Baxter
LLN - 5045

cc H. S. Bergen - B2SL
R. A. Lidgett - LLN - 5045
J. P. Moeure - T2F
R. H. Munch - T1B
W. B. Papageorge - B2SK
W. R. Richard - T3A
D. Wood - B2SD

Dick,

In June this year a plan was developed with Bill Papageorge and others to learn more about chlorinated dibenzofurans in our Aroclor products. As a part of this plan it was decided that furans standards should be prepared and analytical methodology developed for the detection of at least 0.1 ppm for each furan homolog. Laboratory mixtures of monochloro- through hexachlorodibenzofurans have been prepared and characterization for homolog distribution is underway. Also, we have about one-man continuous effort on the method development work.

As part of the plan it was decided that we should determine if Bayer has carried out "in-house" work of this type. The attached June 16 memo from Dave Wood to J. N. Haggart covers a request for this information. We have had no reply to this correspondence to our knowledge. Any information or assistance you can provide on this point will be appreciated.

During the past week a publication has appeared in the literature entitled "Identification of Chlorinated Dibenzofurans in American Polychlorinated Biphenyls" by R. W. Risebrough et al. of the University of California. A copy of this paper is attached. It shows the identification of chlorinated dibenzofurans in our Aroclor products except Aroclor 1016. We are now anxious to develop our own data for comparison with this publication.

Regards,

R. E. Keller

ss
Attachments(2)

SCM 068698

D. Wood - St. Louis

June 16, 1975

CHLORINATED DIBENZYLFURANS

H. S. Bergen - B2SL
W. B. Papageorge - B2SK
J. Mieure - T2F
R. H. Munch - T1B
C. Paton - B2SC

J. N. Haggart
5040

John,

You will recall that Dutch researchers (Voss et al) found furans in chlorinated biphenyls produced by Prodelec and Bayer some four years ago.

Recently FDA has claimed to have detected these products in Aroclor and we will possibly see increased publication about these toxic contaminants develop.

It would be appropriate to establish a technical dialogue with Bayer if they have carried out "in house" work in this area and Ralph Much will be writing to Dick Baxter about this.

We need to develop our own methods to determine if indeed the chlorinated dibenzylfurans are present and what is the potential hazard. I am asking Ralph to send copies to you when he contacts Dick in case there are any business implications in establishing such a technical contact of which we are not aware.

Regards,

D. Wood

/pep

P.S. - As I recall Ralph or Ralph and yourself formally were going to follow up on my advice to Bruno's product group.

I suggest you write to Baxter referencing my Hazard Report to

SCM 068699

(2)

tion
and-
core
t:

(3)

data
at a
ually
tion
dry

west
slow
inny
in
ard-
the
the
onic

Francisco. These conditions would lead to increased tree growth during the following growing season (Fig. 4).

Autumn and winter climatic anomaly features, combined with spring climate and the year-to-year autocorrelation of tree-ring widths, produce the other ring-width anomaly features in Fig. 4 for the following growing season. Narrow ring widths south of San Francisco, for example, imply below normal precipitation—an expected feature since winter precipitation in the Pacific North-west is negatively correlated with winter precipitation in southern California[6].

The reconstructed values of albacore catch distribution data (Fig. 3) and inferred population distribution also seem to exhibit long term changes over intervals of 100 yr or more, which suggest the possibility that long term fluctuations in the ocean–atmosphere system may be involved.

The success of the calibration of tree rings with albacore catch indicates the possibility of relating tree-ring variations to any type of biological variations which are affected by large scale climatic fluctuations. Such relationships may be quantified and used to reconstruct objectively other climatically-caused biotic variations in the past.

N. E. Clark

National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Center, La Jolla, California 92037

T. J. Blasing
H. C. Fritts

Laboratory of Tree-Ring Research, University of Arizona, Tucson, Arizona 85721

Received December 5, 1974; accepted May 6, 1975.

1 LaMarche, V. C., *Science*, **183**, 1043–1048 (1974).
2 Norton, J., *Mon. Weath. Rev., U.S. Dept. Agric.*, **97**, 173–192 (1969).
3 Lewis, R. M., *et al.*, *Report of Joint National Marine Fisheries Service–American Fisherman's Research Foundation Albacore Tagging Conducted During 1971* (National Marine Fisheries Service, Southwest Fisheries Center, La Jolla, 1971).
4 Clemens, H. B., and Craig, W. L., *Calif. Dept. Fish and Game, Fish Bull.*, **128** (1965).
5 Serra, R. I., *Calif. Coop. Oceanic Fish. Invest. Rept.*, **7**, 101–104 (1960).
6 Pyke, C. B., *An Investigation of Some Precipitation Patterns in California and Adjacent Regions* (Unpublished) (California Water Resources Center, 1966).

Oats may grow better in water depleted in oxygen 18 and deuterium

While growing oats at different temperatures in water of different ^{18}O and deuterium (D) abundances, we noticed that oats grown in Antarctic water in which is depleted in ^{18}O and D by $-49‰$ and $-400‰$ relative to standard mean ocean water (SMOW used as a comparative reference in hydrogen and oxygen isotope studies), showed initial growth 1–2 weeks sooner than did oats grown in water containing greater ^{18}O and D concentrations. The oats seemed to grow better in water which was most depleted in the stable isotopes throughout the growth period.

The oats were grown from the same batch of seeds in two sealed glass-covered glass jars (approximately 10 l). Twenty-five oat seeds were added to each jar, containing the same amount of vermiculite and 500 ml water to which 5.0 g Rapid-Gro, a commercial fertiliser, had been added. One jar contained melted glacial ice from the Antarctic with isotope concentrations of $-49‰$ $\delta^{18}O$ (SMOW) and $-400‰$ δD (SMOW). The other jar contained distilled ocean water with $+1.0‰$ $\delta^{18}O$ (SMOW) and $+17‰$ δD (SMOW). Both jars were placed in the chamber at the same time.

The experiment was repeated three times with new materials: once the growth chamber was maintained between 1.7 and 3.3 °C; once between 24 and 26.6 °C; and once the temperature fluctuated between 1.7 and 26.6 °C. Each time the oats in the jar containing water depleted in the heavy isotopes showed germination 1–2 weeks earlier and seemed to grow better throughout the growth period, than oats grown in distilled ocean water.

Using oats grown at 15 °C, the first sign of germination in the jar containing water depleted in the heavy isotopes was 4 d after planting. On the day 6, eight plants (out of 25) had attained a height of 6 cm. The first sign of germination in the jar with water containing the heavier isotope concentration, was after 17 d. By the time five plants had attained a height of 6 cm in this jar, in that with water depleted in the isotopes, 23 plants that had reached the top of the jar (approximately 25 cm).

Kashutin[1] observed that snow-water depleted in D increases the yield of cucumbers, radishes and spring wheat compared with controls grown in ordinary water of unspecified isotopic composition. He cites experiments on the egg productivity of hens and the weight gain of suckling pigs. In both cases water depleted in D was especially efficient in promoting productivity.

Although much has been done on the effect of D-enriched water on biological systems, we suggest that research on the effect D-depleted water on plant and animal growth may prove fruitful. A major source of water depleted in D by over $-400‰$ ($-40°_{00}$) compared with SMOW is snow and ice from the Antarctic polar plateau. Water depleted by -150 to $-180‰$ is readily available in the USA from Rocky Mountain snow precipitating above 10,000 feet elevation.

Jim D. Gleason
Irving Friedman

US Geological Survey, Denver, Colorado 80225

Received February 10; accepted June 3, 1975.

1 Kashutin, K., *Priroda (USSR)*, **58**, 107 (1969).

Identification of chlorinated dibenzofurans in American polychlorinated biphenyls

Mortality of embryos has contributed to the reproductive failures of several bird species, including the sparrow hawks (*Accipiter nisus*) of southern Scotland[1], the white-tailed eagles (*Haliaeetus albicilla*) of Schleswig Holstein[2], and the herring

gulls (*Larus argentatus*) of Lake Ontario[1]. Suspected contaminants include *p,p'*-DDE (2,2-bis(*p*-chlorophenyl)-1,1-dichloroethylene), other chlorinated biocides and/or their derivatives, and the polychlorinated biphenyls (PCBs), all of which are present as contaminants in the eggs[1-3]. PCBs are present in high concentrations in the bird populations which suffer embryonic mortality[4-6]. Other organochlorine compounds which may be present in food webs include the chlorinated dibenzodioxins and the chlorinated dibenzofurans (Fig. 1), which are toxic to embryos in amounts[6-9] less than 1 μg. They are therefore among the most toxic substances known and are possible causes of the observed mortality.

The chlorinated dibenzodioxins and chlorinated dibenzofurans, however, have proved exceedingly difficult to detect in environmental samples in the concentrations at which they are expected to be embryotoxic[6-10]. The chlorinated dibenzodioxins enter the environment as contaminants in preparations of the herbicide 2,4,5-T (refs 5 and 11) and the fungicide pentachlorophenol[10,12]. Chlorinated dibenzofurans have been found in a French (Phenoclor DP6) and a German (Clophen A60) PCB and were shown to be the active embryotoxic agent in these preparations[6]. The techniques used, however, did not detect chlorinated dibenzofurans in an American PCB, Aroclor 1260. We report here the presence of chlorinated dibenzofurans in Aroclor PCB, widely used in North America and Great Britain, and in the same Aroclor 1260 preparation examined previously with negative findings[6].

Samples of PCB examined include: Aroclor 1248, 1254, and 1260 (1969); Aroclor 1254 (1970); Aroclor 1016 (1972); and the same three preparations studied by Vos *et al.*[6]: Aroclor 1260, lot No. AK-3; Clophen A-60, lot No. 912434; and Phenoclor DP-6, lot not specified. The latter three PCBs were obtained from Dr Vos, the others from the Monsanto Company in the years indicated in parentheses.

PCBs extracted from environmental samples most often have gas chromatographic profiles similar to those of PCB formulations containing approximately 48, 54 or 60% chlorine. In the Aroclor series, the former two PCBs are equivalent to Aroclor 1248 and Aroclor 1254, respectively. Aroclor 1260, Phenoclor DP6, and Clophen A60 all contain approximately 60% chlorine.

Chlorinated dibenzofurans were identified in all Aroclor preparations except Aroclor 1016, as well as in Clophen A60 and Phenoclor DP6. Aroclor 1016 is a PCB mixture containing approximately 42% chlorine and has replaced Aroclor 1242 in many applications, principally as the dielectric fluid in capacitors[16]. Values reported in Table 1 represent the total of those compounds found in 400 ml Florisil fractions 2-6. A total of 10–12 isomers was identified in each PCB. Two chlorinated dibenzofuran contaminants have been reported for the Clophen and Phenoclor previously[6]; our first analyses of the Clophen revealed an additional five chlorinated dibenzofurans[9]. The structures contained four to six chlorine atoms. Other dibenzofurans including those chlorinated to a lesser extent may have been present in the first 400 ml fraction but this was not examined in detail as it contained substantial PCB interference. Recently synthesised 2,3,7,8-tetra-, 2,3,4,7,8-penta- and 2,3,4,6,7,8-hexachlorodibenzofuran were used to quantify tetra-, penta-, and hexachlorodibenzofurans, respectively. The former two authentic standards had retention times on the OV1 column the same as those of two dibenzofurans isolated from the PCB.

Vos *et al.*[6] detected no chlorinated dibenzofurans in an Aroclor 1260 preparation at a detection limit of 1 p.p.m. Fractionation and examination of the identical Aroclor 1260 in our study confirm their findings based on the stated limit, but reveal the presence of 11 chlorinated dibenzofurans in the preparation, having a total concentration of 0.2 μg g^{-1} PCB (Table 1). The same workers also found diethyl ether extracts of the Clophen A60 and Phenoclor DP6 to be much more toxic to chick embryos than diethyl ether extracts of Aroclor 1260. Our study confirms those findings on the basis of chlorinated

Fig. 1 Skeletal structures of: *a*, chlorinated biphenyl, $x+y = 1$–10; *b*, chlorinated dibenzofurans, $x+y = 1$–8; *c*, chlorinated dibenzodioxins, $x+y = 1$–8.

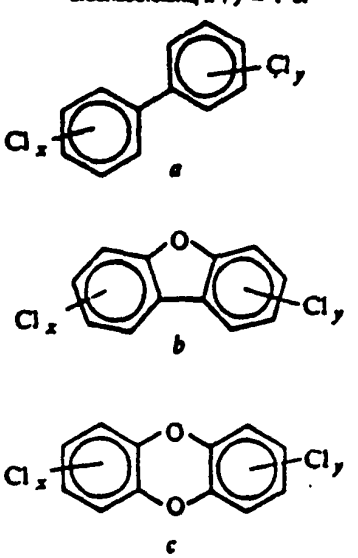


Table 1 Chlorinated dibenzofuran concentrations* in Aroclor, Clophen and Phenoclor

PCB	4-Cl	5-Cl	6-Cl	Total
Aroclor 1248 (1969)	0.5 (25)	1.2 (60)	0.3 (15)	2.0
Aroclor 1254 (1969)	0.1 (6)	0.2 (12)	1.4 (82)	1.7
Aroclor 1254 (1970)	0.2 (13)	0.4 (27)	0.9 (60)	1.5
Aroclor 1260 (1969)	0.1 (10)	0.4 (40)	0.5 (50)	1.0
Aroclor 1260 (lot. AK3)	0.2 (25)	0.3 (38)	0.3 (38)	0.8
Aroclor 1016 (1972)	ND	ND	ND	—
Clophen A-60	1.4 (17)	5.0 (59)	2.2 (26)	8.4
Phenoclor DP-6	0.7 (5)	10.9 (74)	2.9 (21)	13.6

*Expressed as μg g^{-1} PCB. Values in parentheses represent quantity as percentage total dibenzofuran.
ND, not detected (< 0.001 μg g^{-1}).

Amounts of PCB ranging from 1.0 to 2.0 g were dissolved in 400 ml hexane, placed on a Florisil column (130 g, internal diameter 31.5 mm), and eluted with: an additional 1,600 ml hexane, and successive 800 ml volumes each of 5% diethyl-ether–hexane, 25% diethyl-ether–hexane and acetone, at a rate of approximately 7 ml min^{-1}. The major portion of the PCB was eluted in the hexane fraction, which was discarded. On addition of the 5% mixture, the eluates were collected in six successive 400 ml volumes. To eliminate the polar solvents, each eluate was evaporated twice just to dryness and taken up each time in a minimal amount of hexane. Each fraction, in 1 ml hexane, was placed on a microalumina column[15] and eluted with 10 ml each of 1% and 20% methylene chloride in hexane. These were also taken twice just to dryness and made to up a volume of 1 ml in hexane to eliminate the methylene chloride before gas chromatographic analysis. Aliquots of all fractions obtained before and after partitioning on alumina were injected into a six foot glass column containing 3% OV1 on 100–120 mesh Supelcoport in Tracor MT220 and Hewlett-Packard 5700 gas chromatographs equipped with ^{63}Ni electron-capture detectors. PCBs were found to be present in each fraction eluted from the Florisil column in amounts sufficient to interfere with the detection of trace contaminants. Partitioning on the alumina columns separated most of the PCB interference into the 1% methylene chloride fractions. On removal of this interference, different peak patterns appeared in the chromatograms of the 20% methylene chloride fractions. Compounds eluting in the 20% methylene chloride fraction were collected for mass spectrometric analysis using a 20:1 effluent splitter, and a trap consisting of a capillary tube (1 mm internal diameter, 100 mm long) bent to a U shape, immersed in a liquid nitrogen bath. Methylene chloride (20%; 4 μl) in hexane was injected into the capillary as a rinse, removed with a 10 μl micropipette, and placed directly on the mass spectrometer probe. The probe was inserted into a GEC AEI MS902 high resolution mass spectrometer and the solvent removed by the force pump. The probe was rapidly inserted into the ion source and multiple scans were recorded in the on-line high resolution mode[16].

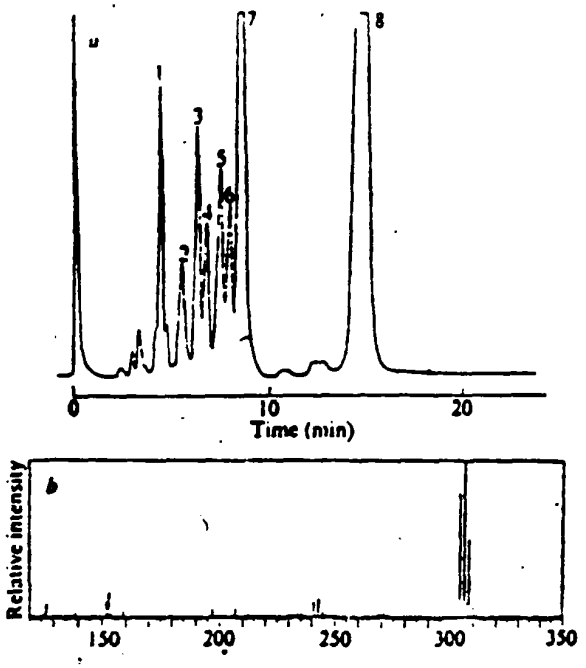


Fig. 2 *a*, Gas chromatogram of a fraction of Aroclor 1254 containing a mixture of chlorinated biphenyls, dibenzofurans, and naphthalenes. Identities of peaks are given in the text. *b*, Mass spectrum of peak 2, a tetrachlorodibenzofuran.

dibenzofuran content: the identical Clophen and Phenoclor contain 11 and 17 times more total chlorinated dibenzofurans, respectively, than the Aroclor 1260.

A gas chromatogram showing components derived from the Aroclor 1254 obtained in 1969 is represented in Fig. 2. The components were eluted in the second 400 ml Florisil fraction and recovered from the alumina column in 20% methylene chloride–hexane. Each of the numbered peaks was trapped as described here, and identified by mass spectrometric analysis. A nominal mass plot of the high resolution mass spectrum of peak 2 is shown in Fig. 2. The plot includes all the ions with elemental compositions ranging to the maximum empirical formula $C_{12}H_6O^{35}Cl_3^{37}Cl^{13}C$. The molecular ion cluster at nominal *m/e* 304–310 fragments by successive losses of Cl to yield the ions at *m/e* 269–275 and CO to the ions at *m/e* 241–245. A minor loss of Cl from the peaks at *m/e* 269–275 also occurs to yield the ions at *m/e* 234–238, followed by CO elimination to *m/e* 206–210.

The group of peaks at *m/e* 152–154 are the doubly charged molecular ions. An identical spectrum was obtained from an authentic standard of 2,3,7,8-tetrachlorodibenzofuran. This latter compound has a retention time identical to that of peak 4. Peak 2 is, therefore, a positional isomer. The accurate mass measurements for the characteristic ions are within 2 p.p.m. of the calculated exact masses. Peaks identified on this chromatogram and their retention times relative to dieldrin are as follows: a mixture of tetra- and pentachlorobiphenyl (1.02); tetrachlorodibenzofuran (1.30); pentachlorobiphenyl (1.46); tetrachlorodibenzofuran (1.57); hexachloronaphthalene (1.75); pentachlorobiphenyl (1.86); hexachloronaphthalene (2.00); and heptachloronaphthalene (3.46). An aliquot of combined fractions derived from the same Aroclor 1254 was treated with diazomethane to assess whether any chlorinated ortho-hydroxybiphenyls (pre-furans) were present. Gas chromatographic analysis of the sample before and after treatment resulted in identical chromatograms.

As large quantities of PCBs have entered the global environment[17–20], it may be assumed that the contaminant dibenzofurans also have been [illegible]ed in proportional amounts. Their persistence, effects, [illegible] significance remain to be determined.

We thank J. A. Burke, M. L. Porter and J. G. Vos for discussions; A. S. Kende for standards of chlorinated dibenzofurans; and F. C. Walls for assistance with the mass spectrometry. This work was supported by the Canadian Wildlife Service, National Science Foundation, and NASA.

GERALD W. BOWES*
MICHAEL J. MULVIHILL

Canadian Wildlife Service, Toxic Chemicals Section, Ottawa, Canada K1A 0H3

BERND R. T. SIMONEIT
A. L. BURLINGAME

Space Sciences Laboratory, University of California, Berkeley, California 94720

R. W. RISEBROUGH

Bodega Marine Laboratory, University of California, Bodega Bay, California 94923

Received February 13; accepted May 28, 1973.

*Present address: California Water Resources Control Board, Division of Planning and Research, 1416 Ninth Street, Sacramento, California 95814.

1 Newton, I., and Bogan, J., *Nature*, **240**, 582–583 (1974).
2 Koeman, J. H., Haddersingh, R. H., and Bokveld, M. P. L. J., *Bull. Environ. Contam. Toxicol.*, **4**, 373–377 (1972).
3 Gilbertson, M., and Hale, R., *Can. Field Nat.*, **88**, 354–356 (1974).
4 Hunt, G. S., Bunyan, P. J., *et al.*, *Nature*, **220**, 702–703 (1968).
5 Searcy, G. L., Dustin, F. L., and Rowe, V. K., *Food Cosmet. Toxicol.*, **9**, 405–412 (1971).
6 Vos, J. G., Koeman, J. H., Van der Maas, H. L., ten Noever de Brauw, M. C., and de Vos, R. H., *Food Cosmet. Toxicol.*, **8**, 625–633 (1970).
7 Vos, J. G., *Environ. Hlth Perspect.*, **1**, 105–117 (1972).
8 Brown, G. W., Simmons, B. R., Burlingame, A. L., de Lappe, B. W., and Risebrough, R. W., *Environ. Hlth Perspect.*, **5**, 191–199 (1973).
9 Baughman, R., and Meselson, M., *Environ. Hlth Perspect.*, **5**, 27–35 (1973).
10 Baughman, R., and Meselson, M., *Adv. Chem.*, **120**, 92–104 (1973).
11 Report on 2,4,5-T (Executive Office of the President, Science Advisory Committee, Office of Science and Technology, March, 1971).
12 Jensen, S., and Renberg, L., *Ambio*, **1**, 62–63 (1972).
13 Firestone, D., Reve, L., Brown, N. L., Barron, R. P., and Damico, J. N., *J. Ass. Off. Analyt. Chem.*, **55**, 85–92 (1972).
14 Porter, M. L., and Burke, J. A., *J. Ass. Off. Analyt. Chem.*, **54**, 1456–1463 (1971).
15 Burlingame, A. L., Olsen, R. W., and McPherron, R. V., *Adv. Mass Spectrom.*, **6**, 1053–1059 (1974).
16 Neubert, J. C. T., and Sarodian, A. V., *Environ. Hlth Perspect.*, **1**, 21–35 (1972).
17 Brown, G. W., and Jenkel, C. J., *J. Fish. Res. Bd Can.* (in the press).
18 Jensen, S., Johnels, A. G., Olsson, M., and Otterlind, G., *Nature*, **224**, 247–250 (1969).
19 Koeman, J. H., ten Noever de Brauw, M. C., and de Vos, R. H., *Nature*, **221**, 1126–1128 (1969).
20 Risebrough, R. W., Reiche, P., Peakall, D. B., Herman, S. G., and Kirven, M. N., *Nature*, **220**, 1098–1102 (1968).

Niche breadth in Bryozoa as a test of competition theory

COMPETITION theory predicts that intraspecific and interspecific competition should often have opposite effects on the use of resources by a population, the former increasing, the latter decreasing, the range of resource actually used[1–3]. Field data supporting these predictions are well known for the interspecific case[3–6] but are scarce for the intraspecific condition, and we have been unable to find any reference demonstrating both effects within a single species. We therefore report here the verification of both predictions in respect of competition for space by the epiphytic bryozoan *Alcyonidium hirsutum*; less extensive data suggesting the same effects within other bryozoans are also reported.

Intraspecific competition should result in an increase in the range of a resource spectrum used by a species, as at high population levels the advantages to any individual of being at the competition-free optimum of a resource gradient are offset by the intense intraspecific competition found there (Fig. 1*a*); this is the 'principle of equal opportunity' of MacArthur[1]. Interspecific competition, on the other hand, should tend to restrict the range of the resource spectrum used by a species, as individuals attempting to exploit marginal resources cannot do so as efficiently as

Monsanto

FROM (NAME & LOCATION): G. J. Levinskas - A2SC

DATE: September 25, 1975

SUBJECT: PCBs

REFERENCE:

cc H. S. Bergen - B2SL
D. R. Bishop - B1ND
W. B. Papageorge - B2SK
R. G. Potter - B3SA
W.W. Withers - B2SA

TO:

G. Roush, Jr.
A2SA

The attached represents a final (?) version of the toxicity statement on PCBs. This takes note of all the comments which have been received since the version mailed to you on August 29, 1975.

This was discussed on the phone with Wayne Withers, and he agreed that it was acceptable. Since Wayne was the only one who had comments regarding the August 29 version, this should be satisfactory to all concerned.

G.J.L

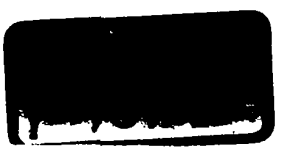
George J. Levinskas

/bkp

att.

C.A. No. B-84-1103-CA

SCM 019716



PCBs

Recently, we were informed that liver carcinomas were observed in female Sherman strain rats fed AROCLOR 1260 for 20½ months. This prompted us to re-examine livers from male and female rats of the Charles River strain which had been fed AROCLOR 1242, AROCLOR 1254 or AROCLOR 1260 for 2 years in earlier studies conducted for Monsanto Company.

There are 4 elements which are closely interwoven in this matter: (1) differences in test procedures, (2) differences in results obtained by various investigators, (3) definition of what is a cancer, and (4) evaluation of potential risks, if any, to man. These will be summarized briefly.

(1) Several animal studies have been conducted with various brands of PCBs. In some studies, the test material has been identified by trade name (AROCLOR, KANECLOR). In others, there was just a general reference to PCB. Consequently, the quality of test material with respect to the amounts and nature of contaminating impurities or by-products cannot be determined in [redacted] case. In addition, several strains of test animals were used, the duration of the experimental periods varied, and there was a wide range in the depth of detail with which the observations were reported. Consequently, it is difficult to make comparisons between these studies.

(2) In general, studies have shown mice to be more susceptible than rats and females to be more sensitive than males to the liver effects of PCBs. Beyond these generalizations, the results have not been consistent. Some investigators have

reported liver carcinomas. Others have observed only benign tumors. Several have noted changes in liver tissue without detecting tumor formation. For the reasons just cited, it is difficult to determine the bases for these different results. The most direct comparison can be made between the 2 studies on AROCLOR 1260 since the same high dosage level of the same lot of AROCLOR 1260 was employed in both experiments. In the studies reported to us, liver carcinomas occurred in approximately 8% of female rats of the Sherman strain (the only sex used), In Monsanto's study, none of the liver lesions had progressed beyond the stage of benign tumors (hepatomas) despite a slightly longer duration of feeding of AROCLOR 1260 to rats of Sprague Dawley, Charles River strain. The Monsanto study employed rats of both sex and it did confirm the previously noted greater sensitivity of female rats to liver effects of PCBs.

(3) A review of the liver alterations seen in all 3 AROCLORS in Monsanto's studies shows that the lesions were benign in character in the traditional pathologic sense. An evaluation of all information available to us, including the contradiction between the recent data showing AROCLOR 1260 to be a carcinogen and our earlier negative results on the same product, leads to a conclusion that AROCLOR 1260 is not carcinogenic to all commonly used strains of laboratory test animals.

(4) In 1972, the manufacture of AROCLOR 1260 was discontinued in the United States and the sale of AROCLORs was restricted to a single use, i.e., as dielectric fluids. As such they are used in closed systems which will at least minimize additional environmental contamination. Considering the

high degree of fire risk associated with this use, and recognizing that AROCLOR 1260 may have a weak carcinogenic potency which has not been fully proven and that AROCLORS 1242 and 1254 have not been shown to be carcinogens, it is concluded that the continued use of AROCLORS 1242 + 1254 as dielectric fluids will not present an unreasonable human health hazard.

Elmer P. Wheeler, Medical Department

January 29, 1970

J. S. Barrett, London
[redacted]
W. B. Papageorge, WPAPA

Status of Aroclor Toxicological Studies

D. S. Cameron
Brussels

Enclosed is a copy of the reports from our consulting laboratory indicating the status of the animal toxicity studies. I have summarized the pertinent findings separately and as indicated in the table.

We have given copies of these data to one U. S. customer, the U. S. FDA and one or two other state agencies. I don't see why this information cannot be released with discretion in Britain or Europe.

Our interpretation is that the PCB's are exhibiting a greater degree of toxicity in this chronic study than we had anticipated. Secondly, although there are variations depending on species of animals, the PCB's are about the same as DDT in mammals.

We have additional interim data which will perhaps be more discouraging. We are repeating some of the experiments to confirm or deny the earlier findings and are not distributing the early results at this time.

Elmer P. Wheeler

EPW:ju

Enclosure

(Airmail) Mr.W.E.Hamer, Ruabon
Mr.W.H.Ritchie, Ruabon
Dr.H.R.Newman, Ruabon
Mr.S.M.Kulifay, Krumeich
Dr.D.S.Weddell, St.Louis
Mr.P.T.Marshall, St.Louis

St. Louis

December 17/51

Mr. P. J. C. Haywood HR

Newport (Airmail)

F ⇒ AROCLORS: TOXICITY

Since writing my note of Dec.11/51 I have chanced to learn that Anniston people had quite serious skin troubles: boils, blackheads and the like, among workers in Aroclors, especially 1269, around 1933.

A little browsing into the literature reveals quite a history of skin troubles and liver troubles (including some fatal cases) attributed to heavy exposure to chlorinated diphenyls.

The chlorinated diphenyls are stated to be worse than chlornaphthalenes, and to be more harmful the more chlorine they contain. I still think, however, that the exposure in ordinary analytical work should not cause any trouble.

E. Mather

tm

[redacted]

[redacted]

Blcc: Dr. D.V.N. Hardy

MR. H.K. MASON, St.Louis (2) 8th September, 1955.

JWB:VEH AROCLOR TOXICOLOGY

cc: Dr. H.R. Newman.

Dear Howard,

You will readily appreciate that we are very much concerned with the toxicology of Aroclors, particularly as our development sales efforts in this field of Monsanto products have, in the last six months or so, really begun to pay off.

Recently we received through Dr. Kelly the findings of the Kettering Laboratory which as far as we were concerned included entirely new data. In particular, the toxicity of Aroclor 1254 was demonstrated with a range of animals at a level of 1.5 mgrm./cu.m. At the same time there was no toxicity found for 1242 at concentration of 1.9 mgrm./cu.m. This in itself might be said to be surprising and perhaps indicate some specific differences between the toxicities of various grades of Aroclor. We would be most anxious to learn from you whether you accept the Kettering results as fully significant in a broad way, and whether this data is going to be made available to all.

Fortunately, our Chief Medical Officer, Dr. H.R. Newman, is visiting St.Louis and will be discussing the significance of this Kettering work with Dr. Kelly. Here there is a convention that a factor of 10 is used in translating animal toxicities to human toxicities. In other words there would be an interpretation that Aroclor 1254 should not be used where atmospheres containing a quantity something less than 0.15 mgrm./cu.m. results.

Both Sales and Development here are very anxious to handle this awkward problem in the right way and to remain in complete liaison with you on actions which might be necessary. Perhaps it is particularly important to us as a very large proportion of our present sales do go to surface coating uses.

[redacted]

We had been giving consideration to getting some toxicological data established for us on the Aroclors by Battelle in Germany who have good facilities for this type of work. However, we would certainly not do this without full discussion with you. To us there seems the necessity of establishing quite a lot more data and we would be willing to arrange for some of this to be obtained if you think that this is a reasonable suggestion. Dr.Newman's visit is particularly appropriate at this stage and of course it would be possible for me to discuss the matter broadly during my visit in late October. However, meanwhile we would be most grateful to gain as much of the M.C.C. point of view as possible.

J.W. BARRETT.

COPY

Dr. D.V.N. Hardy
Dr. H.R. Newman.

Monsanto Chemical Company

St. Louis, Missouri

September 20, 1955

Dr. J.W. Barrett

London

Your memo September 8 to Mr. Nason

AROCLOR TOXICITY

Howard Nason has given me your memo of September 8. I will be happy to discuss this with Dr. Newman during his visit here. I think, however, there are several points that I can answer you now.

You comment upon the difference in toxicity between Aroclor 1254 and 1242. This is not particularly surprising because in the earlier work it was found that toxicity increased with chlorination. Of course, from the standpoint of volatility in the case of inhalation or absorption from the gut from the point of view of ingestion are important. Frankly, there was not too great a difference between the two compounds, however. As you know, the maximum allowable concentrate is 0.1 ml/cubic meter in the case of 1254, and as high as 10.0 mgm in the case of 1268. I think the former is too low and the latter is too high. In this country they don't use the MACs very routinely, but certainly in England I think it would be alright to consider 0.2 mgm/cubic meter as perfectly safe.

I don't know how you would get any particular advantage in doing more work. What is it that you want to prove? I believe your work should be directed towards finding out what the concentrations are of Aroclor during different operations whether it is industrial or painting. The reports you have seen from Kettering Laboratory are the result of approximately $15,000 to $20,000 expenditure by MCC.

MCC's position can be summarized in this fashion. We know Aroclors are toxic but the actual limit has not been precisely defined. It does not make too much difference, it seems to me, because our main worry is what will happen if an individual developes any type of liver disease and gives a history of Aroclor exposure. I am sure the juries would not pay a great deal of attention to MACs.

SCM 048759

COPY

We, therefore, review every new Aroclor use from this point of view. If it is an industrial application where we can get air concentrations and have some reasonable expectation that the air concentrations will stay the same, we are much more liberal in the use of Aroclor. If, however, it is distributed to householders where it can be used in almost any shape and form and we are never able to know how much of the concentration they are exposed to, we are much more strict. No amount of toxicity testing will obviate this last dilemma and therefore I do not believe any more testing would be justified.

Let's see what our discussions with Dr. Newman and yourself bring out.

R. Emmet Kelly, M.D.

REK:k

SCM 048760

COPY

Dr. D.V.N. Hardy
Dr. H.R. Newman

Monsanto Chemical Company

St. Louis, Missouri.

September 22, 1955

Dr. J.W. Barrett

London Office

AROCLOR TOXICITY

On rereading my memo of September 20 to you I noticed an error in the second paragraph. I feel that this correspondence is sufficiently important to correct this paragraph.

This paragraph should read:

> You commented in your letter about the difference in toxicity between Aroclor 1254 and 1242. These differences are not surprising because in the earlier work it was found that toxicity increased with degree of chlorination. Of course, the volatility is important in the case of inhalation toxicity, and absorption into the intestinal tract is important from the point of oral toxicity. Frankly, there was not a great deal of difference between the two subject compounds. As you know, the maximum allowable concentration is 0.1 mg/cubic meter in the case of 1254 and is as high as 10.0 mg/cubic meter in the case of 1268. I think the former is too low and the latter is too high. In the United States they don't use maximum allowable concentrations (MAC) very routinely but certainly in England I think it would be alright to consider 0.2 mg/cubic meter as perfectly safe.

R. Emmet Kelly, M.D.

REK:k

SCM 048761

CONFIDENTIAL

TO: DR. J.W. BARRETT.

6th December 1955

DVHH/MEB

AROCLORS - TOXICOLOGICAL EXAMINATION

c.c. Dr. J.A. Gardner.
Dr. W.McG. Morgan.
Mr. W.E. Hamer.
Mr. C.G. Wickham
Dr. H.R. Newman
Dr. D.S.P. Roebuck
Mr. J.S. Hunter
Mr. E.L. Pixton
Mr. E.G.H. Thomas.
Mr. J.A. Brindle.

Since my communication of 19th August 1955, when I summed up the position confronting us following the receipt of the reports of the Kettering Laboratory, Dr. Newman has discussed with Dr. Kelly the significance of the Kettering results in relation to M.C.C. thought and policy.

M.C.C.'s immediate action is to submit the reports to the American Conference of Governmental Industrial Hygienists in support of a claim that the official table of maximum permissible vapours concentrations should include the items:-

42%	Chlorinated Diphenyl (Aroclor 1242)	2 mgms./m^3
54%	" " (Aroclor 1254)	1 mgm./m^3

The Kettering results indicated in brief that prolonged exposure to Aroclor 1242 vapour at 1.9 mgm./m^3 gave no sign of damage to the test animals but that Aroclor 1254 at 1.5 mgm./m^3 caused slight but positive signs of injury. You will note that M.C.C. do not introduce a safety factor in translating these animal test results to human beings, and in fact regard such a factor as unnecessary in animal tests of such thoroughness as those carried out at Kettering.

It will be sometime before we know the decision. In my view it would not be unrealistic to assign a value of 2 mgm./m^3 to Aroclor 1242 but the case for setting the limit at 1 mgm./m^3 for Aroclor 1254 is not so logical. After all 1254 can cause slight but perceptible damage at 1.6 mgm./m^3 and who can say whether it would be harmless at

[redacted]

[redacted]

1 agrm./m^3. However, if the M.C.C. recommendations are accepted there will be an implication that Aroclor toxicity increases with chlorine content, a reversal of the position suggested in M.C.C. technical literature. M.C.C. Application Data Bulletin No. P-115 states "If Aroclors are used at elevated temperatures such as 200° or 300°C. in open systems methods must be designed to exhaust any vapours arising from these open systems. This applies especially to lower chlorinated Aroclors where experimental work on animals indicates that the maximum safe concentration in workrooms is in the range of 0.5 - 1.0 milligrams per cubic meter of air. In the case of more highly chlorinated Aroclors such as Aroclor 1268 the allowable limit is about 10 milligrams per cubic meter of air and accordingly. Aroclors of this type are believed to be of a much lower order of toxicity.

Whatever the outcome, there will be no impact on M.C.C. policy regarding the use of Aroclors in paints since M.C.C. have long ceased to recommend the use of Aroclors for this purpose. However, M.C.L. has continued to offer Aroclors for use in paints on the basis that the evidence for rejection was slim, and that the risk is reduced by resorting to the use of more highly chlorinated Aroclors. This was thought to have the dual advantage of using a material of (a) lower intrinsic toxicity (b) lower vapour pressure. It is now clear that toxicity increases with degree of chlorination and that this effect may cancel or even outweigh the advantage due to decreased vapour pressure.

We have tended to draw a distinction between the use of Aroclors in latex paints on the one hand and in conventional paints on the other, the concensus of opinion being that the rate of volatilisation from the former is greater than from the latter, and as a result we are no longer recommending Aroclors for latex paints. The decision now before us is whether we should continue to sell Aroclors for use in conventional paints.

On this issue, the recent decision by I.C.I. to discontinue their usage of Aroclors in ordinary paints is considered to be an indication of the line that may well be taken by our other customers. Broadly speaking the main objections are that the paint manufacturer cannot control the paint user who may apply in the form of spray, and may use on hot surfaces. In either case a degree of risk must be admitted. As to how serious the risk may be it depends naturally on the total time for which any individual is exposed during his life time. There must clearly be circumstances under which the use of Aroclor containing paints will constitute a health hazard, particularly to individuals who for one reason or another are constitutionally less resistant than the norm. The I.C.I. decision must have been influenced quite materially by a letter from Dr. Kelly to Mr. Roy Mitterschein (dated 15.7.55.), a copy of which reached them through Canadian Industries Ltd. The relevant passages are as follows:-

"Aroclor should not be sprayed on the job in an industrial plant where there are plant personnel who can breathe the vapours. There is no danger at all if the material is brushed on, and there is no danger in spraying it if the workers use a booth or use an approved respirator and no one inhales the spray.

"Aroclor fumes at room temperature very probably would not present any hazards. Mist or spray, however, is another problem entirely and that is the reason for the above recommendation. After all, the toxicity of Aroclor must take into consideration how much can get into the air. It is our belief that at room temperature not enough can get into the air to cause any trouble. At elevated temperatures and if the material is dispersed as a mist or aerosol a different interpretation has to be placed on its toxicity".

The passages of particular significance to I.C.I. Paints are underlined and may be considered to be reflected in their conclusions which I now quote below:-

"In brief

(a) The spraying of Aroclor paints appears to involve precautions which would be so inconvenient as to limit unduly their application by this method.

(b) Apart from questions of spraying there appear to be cases where Aroclor-containing paints would involve toxic hazards either during application or subsequently, and where cautionary advice would be appropriate. The need for special precautions would limit the use of Aroclor paints in these cases.

(c) As far as the paints in question are concerned it is impossible to know how any particular can may be eventually used, so every can would need to show the warnings and precautions for all foreseeable eventualities. The presence of these warnings would tend to deter people from using the paints even in cases where no special precautions were needed."

With reference to the impression generally given that cold Aroclors are safe, recent determinations of vapour pressure (Southern Research Institute Final Report to M.C.C. on Project 526 by W.M. Nolan) permit the saturated vapour concentrations to be calculated as follows:-

	Vapour Concentration (mgrm./m^3)	
	20°C.	25°C.
Aroclor 1242	4.7	8.2
Aroclor 1248	2.1	3.0
Aroclor 1254	0.8	1.1

Hence air saturated with cold Aroclor is at or above the maximum permissible concentration.

In general we have to accept Dr. Kelly's leading remarks and the conclusions of I.C.I. Paints, but any consideration of the risk under a given set of conditions must involve the total exposure factor as well as the concentration. It is in this area that constructive answers could be made if the necessary background of data were available. However, the issue before us is whether M.C.L. should align its policy on the use of Aroclors in paint with that of M.C.C., and as I see it we have little alternative when M.C.C. can be quoted against us.

The use of Aroclors in paints based on chlorinated rubber warrants special consideration in view of the following circumstances (a) Aroclors are of such value for the purpose that the manufacturers might well be embarrassed if we withdraw our recommendation (b) they are not used for ordinary decorative and protective purposes in domestic and industrial premises, but to protect metals from corrosion, (c) they are not applied to hot surfaces under conditions which would constitute a hazard to nearby personnel.

My recommendations are accordingly as follows:-

1. M.C.L. continues to sell Aroclors for use in the manufacture of paints based on chlorinated rubber.

2. M.C.L. continues to sell Aroclors for production of paints intended for exterior application.

3. M.C.L. discontinues the sale of Aroclors for use in the manufacture of all other paints.

D.V.N. HARDY

DR. J. W. BARRETT - London. 27.2.54.

WEH/GK.

ARCLOR TOXICITY.
Your memo of February 23rd.

c.c. Dr. D.V.N. Hardy.
Dr. W.McG. Morgan.
Dr. H.R. Newman.

After going through our files at Ruabon and Newport we have only been able to find one Arcolor report containing data on Arcolor Toxicity.

This report No. 2215, Final Report on 'Arcolor Data Book', by R.R. Enight, dated April 27th, 1948 has a small section on physiological effects.

The first deals with skin effects and is based on information from BIOS reports. It indicates how such troubles as chloracne and internal sickness experienced in the early days when people were handling chlorinated hydrocarbons could be avoided by adoption of suitable methods of hygiene, and the use of a suitable barrier cream.

The second section which is taken from The Journal of Industrial Hygiene and Toxicology, Volume 20, Number 2, February 1938, gives a brief description of the systemic toxicity effect which chlorinated hydrocarbons including chlorinated byphenols can cause. Liver damage is of course the outstanding effect and of the various chlorinated hydrocarbons tested, diphenyl gave evidence as being the most toxic. It is indicated that in white rats breathing air containing around 0.57 mgms. per cu. m. over a period of 134 - 143 days caused liver injury.

W. E. HAMER.

SCM 048755

COPY

Dr. H.R. Newman. February 12th, 1954.

Newport, England.

We do not know what the maximum allowable concentration of Aroclor is. One milligram per cubic meter has been set up. We have run animals for about 60 days at 7 times this and found some liver damage. We are now running this at a lower level.

We have never found any liver trouble in any of the workers in our plant, but we watch the control of the fumes in our customers' plants and always recommend exhaust ventilation. I am sure you realize that 1 mg per cubic meter is recommended for an 8-hour day for indefinite periods of time. In painting a room we have found 1 - 2 mg for a day or so, but after that the level drops down to nothing.

What we were really worrying about was the possibility that a man would develop hepatitis on an idiopathic, viral, or serum basis and on questioning would recall that he had painted a room with Aroclor paint and state that he had smelled it very strongly. I am afraid then we might be convicted by association even though we were sure one could not get a level high enough to cause trouble. We have, however, been concerned with the level of Aroclor during spray painting, but I think that level can only be determined by actual measurements.

Please do not worry about asking me these questions because we certainly want you to have the entire picture about Aroclor toxicity. As soon as I get a report on the work at Kettering, I will let you know.

R. Emmet Kelly, M.D.

REK/MFL.

SCM 048756

Monsanto

FROM (NAME & LOCATION): George Roush, Jr., M. D.

DATE: July 30, 1975

SUBJECT: PCB's

REFERENCE: Memo HSB to FJF 7/17/75

TO: H. S. Bergen
B2SL

cc G. L. Bratsch - B3NA
D. L. Eby - A3NA
J. T. Garrett - A2SA
T. L. Gossage - B2SL
G. J. Levinskas - A2SC
W. B. Papageorge - B2SK
R. G. Potter - B3SA
K. W. Easley - 1920
W. W. Withers - B2SA

Attached is a draft for the toxicity section of the Monsanto statement under Action No. 5 of the reference memo.

I believe this draft contains the essentials which must be included. It will undoubtedly need to be revised before it becomes a part of the final statement which should be completed in late August.

Comments are solicited.

George Roush, Jr., M. D.

GR/ln
att.

[redacted]

C.A. No. B-84-1103-CA

[redacted]

SCM 019723

013704

PCBs

Recently, we were informed that liver carcinomas were observed in female Sherman strain rats fed AROCLOR 1260 for 20 1/2 months. This prompted us to re-examine livers from male and female rats of the Charles River strain which had been fed AROCLOR 1242, AROCLOR 1254 or AROCLOR 1260 for 2 years in earlier studies conducted by Monsanto. In addition, we have discussed our findings and those reported to us with scientists working in the field of carcinogenicity.

There are 4 elements which are closely interwoven in this matter: (1) differences in test procedures, (2) differences in results obtained by various investigators, (3) definition of what is a cancer, and (4) evaluation of potential risks, if any, to man. These will be summarized briefly.

(1) Several animal studies have been conducted with various brands of PCBs. In some studies, the test material has been

identified by trade name (AROCLOR, KANECLOR). In others, there was just a general reference to PCB. Consequently, the quality of test material with respect to the amounts and nature of contaminating impurities or by-products cannot be determined in all cases. In addition, several strains of test animals were used, the duration of the experimental periods varied, and there was a wide range in the depth of detail with which the observations were reported. Consequently, it is difficult to make comparisons between these studies.

(2) In general, studies have shown mice to be more susceptible than rats and females to be more sensitive than males to the liver effects of PCBs. Beyond these generalizations, the results have not been consistent. Some investigators have reported liver carcinomas. Others have observed only benign tumors. Several have noted changes in liver tissue without detecting tumor formation. For the reasons just cited, it is difficult to determine the bases for these different results.

The most direct comparison can be made between the 2 studies on AROCLOR 1260 since the same high dosage level of the same lot of AROCLOR 1260 was employed in both experiments. In the studies reported to us, liver carcinomas occurred in approximately 8% of female rats of the Sherman strain (the only sex used). In Monsanto's study, none of the liver lesions had progressed beyond the stage of benign tumors (hepatomas) despite a slightly longer duration of feeding of AROCLOR 1260 to rats of Sprague Dawley, Charles River strain. The Monsanto study employed rats of both sexes and it did confirm the previously noted greater sensitivity of female rats to liver effects of PCBs.

(3) In the traditional pathologic sense, liver alterations seen with all 3 AROCLORS in Monsanto's studies were benign in character. Lesions of the type seen may be induced by other chlorinated aromatic and aliphatic hydrocarbons such as aldrin, dieldrin, and carbon tetrachloride. In fact, the experts whom we consulted expressed opinions that the potential carcinogenicity of PCBs was comparable to that of DDT, aldrin, dieldrin and carbon tetrachloride.

The Environmental Protection Agency (EPA) and the National Cancer Institute (NCI) have redefined the traditional concept of benign and malignant tumors. Those agencies now view any tumor induced by a chemical as malignant despite the absence of the classical histologic features of malignancy. The legal division of EPA has used this redefinition of carcinogenicity to cancel the registrations of dieldrin and aldrin and it is about to launch litigation against chlordane and heptachlor. In this connection, it should be noted that, by virtue of their intended use as pesticides, these materials were intended to be used in a dispersive manner.

(4) Commenting upon EPA's reclassification of tumors, the Food and Drug Administration's (FDA) Associate Commissioner of Science remarked that . . . "It should be emphatically emphasized that there is by no means universal acceptance of . . . the above . . . classification of tumors." In addition, it should be noted that FDA has had the microscope slides of tissues, including livers from

rats on the Monsanto studies with the 3 AROCLORS for about three years, and that the FDA has been informed of the more recent study on AROCLOR 1260. To this date, no adverse comments have been received.

After a review of all information available to us, we conclude that AROCLOR 1260 has been shown to be a carcinogen in one strain of rat. It is not carcinogenic in the traditional meaning of that word to all commonly used strains of laboratory test animals. Our overall interpretation of the available data is that AROCLOR 1260 has a carcinogenic potency comparable to that of DDT and carbon tetrachloride.

AROCLORS 1242 and 1254 have not been shown to be carcinogens.

Monsanto

FROM (NAME & LOCATION) W. B. Papageorge - General Offices

DATE April 17, 1970

SUBJECT Earth Day -- The Question of PCB?

REFERENCE

TO : Regional Vice Presidents
Plant Managers
District Sales Managers
U.S. Subsidiaries
U.S. Plant Communicators

As a result of recent publicity about polychlorinated biphenyl (PCB) and the possible threat this chemical poses to the environment, we have prepared background information for your use on Earth Day, April 22. We have anticipated some questions you might be asked and provided some answers.

Please do not present any Teach-In "visitors" with prepared handouts on PCB. You may use this information in verbal conversations should the occasion arise.

Press queries on PCB may be answered with a copy of the attached news release. Press queries for further information should be directed to E. V. John, Organic division public relations manager, in St. Louis.

W. B. Papageorge

stw

Attachment

[redacted]

SCM 042316

024725

C.A. No. B-84-1103-CA

[redacted]

FORM NO. REV 11-68

QUESTION AND ANSWER SHEET ON POLYCHLORINATED BIPHENYL

This question and answer sheet, for verbal use only by Monsanto personnel, is accompanied by our recent news release replying to charges that PCB threatens the environment.

1. How was PCB first identified in the environment?

   Late in Feb., 1969, the San Francisco Chronicle carried a major feature story about "a menacing new pollutant" found in the San Francisco Bay area. The article was based on research done by Dr. Robert Risebrough of the University of California. In his search for residues of pesticides (DDT and DDE) he encountered "interfering substances."

   A few years prior to Dr. Risebrough's work, two Swedish scientists at Stockholm University's Institution of Analytical Chemistry reported they, too, had encountered these other substances. The Swedish scientists were able to identify some of these materials as polychlorinated biphenyls or PCB.

   Based upon this work, other scientists, in this country and throughout the world, have looked for and identified PCB.

They subsequently asked themselves two questions -- is PCB a threat to the environment, and, how is PCB entering the environment?

Since PCBs are not broadcast or spread around the land, as are pesticides, the scientists theorized the source must be industrial wastes.

Monsanto Company has been in contact with many of these scientists and agencies throughout the world. Monsanto is as concerned as anyone about this potential problem. We are continuing our own research programs as well as cooperating fully with other studies.

Since Monsanto is the sole manufacturer of PCB in this country (there are other producers, worldwide), it was obvious from the beginning that we would be singled out for criticism.

2. Is PCB as hazardous to the environment as recent charges would indicate?

The question of hazard to the environment is relative. Some scientists have discovered it is harmful to certain species of fish and birds. Whether it is harmful to man is a question which is still under study.

SCM 042318

-more-

Recent charges, regarding the hazard to man, have been based upon technical bulletin toxicity descriptions and warning labels carried on shipping containers. These warnings are common throughout the industry. Users of industrial chemicals are accustomed to handling these materials with caution. As far as we know, at this time PCBs are not a threat to the world population.

3. What is Monsanto doing about this possible threat to the environment? (See attached news release.)

When the subject first came to our attention in 1968, we began a six-point program. The program consists of:

A. Working with scientists around the world to properly identify and measure PCB in the environment. Our contacts have resulted in meaningful exchanges of scientific data. This effort has been directed toward locating the source of PCB emissions.

B. One possible source of PCB in the environment could be from manufacturing facilities. For this reason, we have been modernizing many of our manufacturing techniques installing new pollution abatement devices and generally have "tightened up" our plant techniques.

-more-

C. Earlier this year, we alerted all our customers to the possible threat posed to the environment by PCB. At the same time, we offered our technical services to assist them in the proper handling, use and disposal of these products.

D. We have had under way for nearly a year toxiological studies to determine the effect of higher chlorinated hydrocarbons on animals. Early results from these studies indicate PCB is not highly toxic as has been charged.

E. We have also begun studies to determine the biodegradability of PCB. We have come to early conclusions which indicate lower chlorinated products are degraded in the environment. Higher chlorinated substances do appear to resist degradation. We are on the trail of some promising leads to solve this problem.

F. Finally, we are working toward the introduction of alternate products which will be either new formulations or rapidly degrading compounds which retain the functional characteristic of PCB but pose no threat to the environment.

-more-

4. Is the public in any immediate danger?

It is our opinion that the public is not faced with any immediate danger to its health from PCBs. Contrary to the sensational headlines of recent days, PCB is not commonly found around the household.

The major market for PCB-containing products is in electrical equipment. It is also used in closed system heat-transfer applications. The "plasticizer" uses are very limited and are restricted to specialty products.

5. Since PCB does linger in the environment and could be a long-term threat similar to DDT, should it not be banned?

Monsanto Company and the electrical industry believe these products are so vital to our society that they should not be banned. One major electrical equipment manufacturer has told us that a ban on the use of PCB-containing products would mean major power failures throughout the world. We believe that strict control over the use and disposal of PCB, and substitution in uses that cannot be controlled, is the answer to this problem. We are working toward this solution.

-more-

6. If PCB is only used in specialized or "closed systems", why would Monsanto publish a bulletin which said PCB is used in many other ways?

Our bulletin O/PL-306, referred to in recent publicity, was first published in 1960 when there was no evidence that PCB could be a threat to the environment. When the possible threat was brought to our attention two years ago, we discontinued circulation of the bulletin.

The bulletin was designed to be a "sales tool." It had many suggested applications in order to increase our sale of these chemicals. Monsanto is not unique in this marketing approach. To our knowledge, PCB has never been used in all these applications as has been charged.

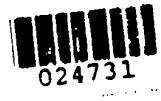
7. Where does Monsanto produce its Aroclor products?

Monsanto produces Aroclor products containing PCB at its William G. Krummrich Plant, Sauget, Ill., and its Anniston, Ala., plant.

8. How long has the company produced these chemicals?

About 40 years.

-more-



9. How much PCB has been produced?

Monsanto's production figures are confidential and will be released only to the appropriate governmental agencies.

-oOo-

NEWS

Monsanto

FOR RELEASE

E. V. John
(314) 694-2891
PUBLIC RELATIONS DEPARTMENT
Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166

MONSANTO REPLIES TO CHARGE THAT PCB THREATENS ENVIRONMENT

ST. LOUIS, April 10 -- Monsanto Company said today it was well aware of the concern over possible environmental contamination by polychlorinated biphenyl (PCB), an industrial chemical made by the company. The company began a six-point program in 1968 to properly identify and measure PCB in the environment. Steps have been taken to strictly control use of the chemical and replace those grades of PCB which linger in nature.

Monsanto's statement came in response to charges by Congressman William F. Ryan (Dem.) of New York that the discovery of PCB in the ecology represented a major threat.

Howard L. Minckler, Monsanto vice president and general manager of its Organic Chemicals Division, said, "We have and will continue to cooperate fully with governmental agencies investigating this problem. We also have been in close contact with our customers. Monsanto has spent over $1 million to verify or correct scientific reports, monitor the use of PCB and search for substitute products where needed. This program will be successfully concluded this year.

SCM 042324

-more-

--2 MONSANTO: REPLY TO PCB CHARGE xxx year.

"It is unfortunate that Congressman Ryan evidently did not have all this information at his disposal. Just last month we participated in a U.S. Department of the Interior meeting where we exchanged ideas with some 40 scientists and told them of our findings and actions," Minckler said.

The Monsanto executive also noted that the use of PCB is misunderstood by some investigators. "For example, we do not know of any current use of PCB in insecticides. Even so, we are asking the U.S. Department of Agriculture to reject any insecticide which has PCB as an inert carrier," Minckler said.

"PCB is not a household product, as some have suggested," Minckler continued. "To our knowledge, it is not used in plastic food wraps, house paints, cellophane, asphalt or tires. The principal market is electrical applications where the chemical performs a vital function as an insulating fluid. In this use, PCB is completely sealed in a metal container. Other major markets employ similar closed systems."

Monsanto's PCB program was initially directed at proper identification of chlorinated hydrocarbons appearing in the environment. This research, confirmed by others, found only the higher chlorinated materials. At the same time, Monsanto undertook animal feeding studies which show PCB is not a highly toxic material.

-more-

--3 MONSANTO: REPLY TO PCB CHARGES material.

The second part of Monsanto's investigation was coordination with all customers on a rigid critique of its PCB manufacturing units. Although loss of PCB during manufacturing was negligible, production techniques were further modernized and new pollution abatement devices are continually being upgraded.

Monsanto has concentrated its further research on those few PCB compounds which degrade slowly. Alternate products for these grades, which retain the functional properties of PCB and present no potential threat, will be introduced later this year.

Minckler concluded, 'Monsanto is seeking the best solution to this potential environmental problem. Action not based on reason and scientific facts can only result in greater problems. For example, we have been advised by one electrical equipment manufacturer that an immediate ban on PCB would result in major power failures throughout the world. This is not the answer. Proper use of this vital chemical and substitution, where appropriate, is the answer.'

-oOo-

R. A. Stohr - 32SA

January 24, 1977

MOBIL STUDY ON PCB'S

Mr. M. Brandstetter - 32SA
F. B. Papageorge - 35MR
R. G. Potter - 32SB
J. C. Weber - 32SE
P. L. Wright - A2SC

George Roush
A2SA

Attached is the latest correspondence in what appears to be a major error by Mobil when it indicted polychlorinated biphenyls as a possible carcinogen among its employees. Bill Papageorge's recent discussion with John Fajen of NIOSH certainly supports our understanding that Mobil is now repudiating its initial study.

Bill Papageorge has been attempting to obtain additional details from his contacts at Mobil. As you know, [redacted] he has not experienced significant cooperation from Mobil and has detected some reluctance to discuss the [redacted]. In order to make sure that Mobil does not merely allow this to "fade away" and because of your earlier contacts on this matter with Mobil, I would like to suggest that you [redacted] Mobil to determine the exact status of the continuing study and to urge that Mobil take prompt steps to correct its initial reports. In my view, Mobil has an obligation to correct immediately the allegations against polychlorinated biphenyls even though the actual cohort has not been identified. The harm caused by the erroneous report has been significant--the least Mobil can do is to acknowledge publically that polychlorinated biphenyls are not involved.

[redacted]

Richard A. Stohr
Company Counsel

RAS:dmf
Enclosures

C.A. No. B-84-1103-CA

SCM 058617

[redacted]

028842