

# Monsanto

C O M P A N Y

ORGANIC CHEMICALS DIVISION

800 N. Lindbergh Boulevard  
St. Louis, Missouri 63166  
(314) OXford 4-1000

December 12, 1969

Mr. Kevin P. Shea  
Environment Magazine  
438 N. Skinker Blvd.  
St. Louis, Missouri 63130

Dear Mr. Shea:

We appreciate the opportunity you have extended to provide information in conjunction with a paper Environment is planning to publish in January, 1970, on "environmental contamination by polychlorinated biphenyls (PCBs)."

As you suggested, we have attempted to keep our statement up-to-date as new scientific data comes to light, and I am sending the most recent copy to you in the event you wish to use it in connection with the article.

In lieu of arranging an interview in the short time remaining to your deadline, I would like to take this opportunity to comment on as many of your questions as possible. Please feel free to use any of the information as you see fit, of course, attributing it to a Monsanto spokesman rather than myself -- which is standard practice.

Aroclor polychlorinated biphenyls were first produced in this country in 1929 by the Swan Chemical Company which later became part of the Monsanto Company. We believe this preceded the manufacture of PCBs in Europe and Japan by about ten years, although I was not able to specifically tie down this historical data.

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Supplies of the bulletin you requested have been exhausted for several months, and it is in the process of being reprinted. I have been able to secure a draft copy of the new bulletin and am attaching it for your review. Please understand that this bulletin covers only the plasticizer applications, many of which are only suggested applications. To our knowledge, Aroclor PCB is not used in all the applications suggested in the bulletin. Primary markets are chlorinated rubber and polypropylene, styrene-butadiene copolymers and polysulfide sealants.

Aside from plasticizers, the principal market for polychlorinated biphenyls is in electrical applications where the insulating fluids used in transformers and capacitors are completely sealed. In another major market, heat-transfer applications, the fluid is used in closed systems.

In the United States, Monsanto presently manufactures its Aroclor products at plants located in Sauget, Ill., and Anniston, Ala. Extensive efforts are in practice at these plants to prevent PCB losses to the environment. These practices have been in use for many years and controls are continually being improved. Controlling practices are also in effect to prevent loss in those manufacturing operations where Aroclor is incorporated into other Monsanto products.

In the more than 40 years of manufacturing Aroclor products by Monsanto, we have had no instances of injury or adverse effects which could be associated with either the manufacturing or handling of these products.

Your letter requested additional information such as scientific reports. Our research department summarized some of their work and rather than try to incorporate their observations into this letter, I am making it an enclosure.

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## PRESENT STATE OF POLYCHLORINATED BIPHENYL RESIDUE ANALYSIS

When extracts of environmental samples are examined by electron capture gas chromatography, peaks corresponding to widely disseminated chlorinated hydrocarbon (CHC) pesticides and their metabolites and break down products appear on the resultant chromatograms. In addition to these peaks pesticide researchers have been aware for some time that it was not unusual for an additional series of as many as 10 to 20 peaks, corresponding to unidentified compounds, to also appear on these chromatograms. Little is known of the structure and origin of these compounds except that they possessed electron capture gas chromatographic properties similar to the CHC pesticides.

In about 1965, it was established that these unidentified materials were organochlorine in nature, with substantial chlorine content and consequently possessed electron-capturing properties.

Early in 1967, Swedish researchers at the University of Stockholm (Jensen and Widmark) announced that they had succeeded in identifying a series of such peaks as higher chlorinated biphenyls using gas chromatographic/mass spectrometric techniques.

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--2 POLYCHLORINATED BIPHENYL RESIDUE ANALYSIS xxx techniques.

Based on Jensen and Widmark's unpublished mass spectrometric identification of some similar unknown contaminants in a relatively small number of Swedish fish and bird extracts, some researchers in the United States and other parts of Europe precipitously began to report unidentified organochlorine materials as polychlorinated biphenyls with no supporting data other than relative retention times from electron capture gas chromatograms.

This is not to say that polychlorinated biphenyls are not present in our environment, but only to indicate that in view of the well-known limitations of electron capture gas chromatographic analysis that it would be scientifically prudent to continue the established practice of reporting these materials as organochlorine contaminants when positive structural confirmation techniques such as mass spectrometry are not employed. This is especially true when one considers that any number of technical grade chlorinated materials (toxaphene, chlordane, chlorinated naphthalenes, etc.) produce electron capture gas chromatographic peaks with retention times corresponding to those produced by commercial PCB.

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--3 POLYCHLORINATED BIPHENYL RESIDUE ANALYSIS xxx PCB.

Furthermore, the response of an electron capture detector to closely related isomers can vary considerably. Theoretically, there are 210 possible PCB isomers. So it should be clearly stated at this point in time, that PCB residue analysis using only electron capture gas chromatography is neither positive nor quantative.

In attempts to make the less sophisticated and more readily accessible technique of electron capture gas chromatography more selective (positive), several laboratories have introduced prior chemical treatments (saponification, extraction with sulfuric acid, nitration, etc.). Unfortunately the use of the nitration procedure has caused considerable confusion. This treatment is essentially that used to remove DDT and its metabolites from toxaphene.

In our laboratories we have found that this treatment results in the disappearance of the early eluding PCB isomer peaks and in the production of peaks with longer retention times (nitrochlorobiphenyls). Additionally, the treatment is not easily reproduced nor specific for PCB.

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It is apparent that our primary concern at this time should be to develop more specific and systematic analytical procedures which will allow us to accumulate enough unequivocal data to permit the ecologist to conscientiously assess the scope of the so-called global PCB pollution problem.

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STATEMENT FROM:  
MONSANTO COMPANY  
ST. LOUIS, MO.

Late in February, 1969, a West Coast newspaper carried a major feature about "a menacing new pollutant" found in the San Francisco Bay area. The article was based on marine life research carried out by Dr. Robert Risebrough of the University of California. The article stated that residues of pesticides (DDT and DDE) and polychlorinated biphenyl (PCB) were threatening the welfare of certain birds and posed a long-term threat to humans.

Monsanto manufactures polychlorinated biphenyl and markets it under our Aroclor trade name. (There are other manufacturers in Europe and Japan.) We, therefore, would like to present some additional facts.

The work done by Dr. Risebrough dates back to earlier research by other scientists who, while analyzing pesticide residues in wildlife, soil and water, encountered unknown or "interfering" substances in the parts-per-million range.

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Several years ago, two Swedish scientists at Stockholm University's Institution of Analytical Chemistry, Professor Gunnar Widmark and Soren Jensen, reported they had identified these other substances. They said some of the materials were polychlorinated biphenyl or PCB. Since PCBs are not "broadcast" or spread around the land as are pesticides, the scientists theorized that the source must be the industrial wastes of PCB users.

In addition to the work of Dr. Risebrough and the Swedish scientists, there have been other studies which indicate the presence of PCBs in the environment. Monsanto is concerned over the situation and is cooperating fully with these studies.

The common uses of commercial PCB would not normally lead to its release into the natural environment.

A principal market for PCB is in electrical applications where they are used as insulating fluids for transformers and capacitors. In this use, the chemical is completely sealed in metal containers. Another market is for heat-transfer applications where the PCB fluid functions in a closed system.

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PCBs are also used in several applications where the chemical is incorporated into a polymer as an integral part of the solid material. Such polymers are used in highly specialized applications as an adhesive, elastomer or surface coating.

Polychlorinated biphenyls are not sprayed or dusted on crops, woodlands or any other areas, as are pesticides. To our knowledge, they are not used in tires, house paints, household products, or major vinyl plastics, as has been charged. Therefore, conclusions as to the source of PCB reportedly found in the environment are difficult to make.

It has also been implied that polychlorinated biphenyls are "highly toxic" chemicals. This is not true. Just like other industrial chemicals and home products now in widespread use, PCBs are not hazardous when properly handled and used. During more than 40 years of U.S. production and use, cases of any toxic effect have been extremely rare -- and then only where the simple precautions recommended for use were not followed.

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Monsanto has research programs under way to identify the compounds, reported to be PCB, and locate their source. The programs involve precise analysis of environmental samples of water and soil. Also under way are studies to determine the biological effects of deliberate dosage of PCBs on fish and mammalian animals. Special emphasis is being paid to endocrinological effects, mineral metabolism and reproduction physiology.

Some preliminary biodegradability studies are under way. Further studies to clearly demonstrate this phenomenon are contemplated.

Very early results of chronic toxicity studies confirm that PCBs are not highly toxic. In 90-day studies on rats and other normal laboratory species, there have been no adverse effects when feedings of up to 100 parts-per-million were administered.

Monsanto has always cooperated on a regular basis with federal, state and university laboratories in their analysis of chlorinated hydrocarbon residues. We will continue to do so. Additionally, Monsanto will continue to exercise the highest degree of control in its manufacturing, shipping and storing of PCB -- as we do with all products. In the functional fluids market, we have carried out a program for several years for the reclamation of used PCBs to reuse these valuable materials.

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The source of the marine life residue identified as PCB is not yet known. It will take extensive research on a worldwide basis, to confirm or deny these initial scientific conclusions.

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