BRIEF SUMMARY OF PCB MEETING
March 17, 1970

I. PRESENT RESEARCH.

A. G. Fred Lee, Water Chem. Lab., Univ. of Wisconsin.

Four questions are important to the study:

1. What are the compounds that interfere in the chlorinated hydrocarbon analyses in fish?

2. What is the relation with Monsanto's Aroclors?

3. What are the sources of PCB's in the environment?

4. What significance do these PCB's have?

Fish have been sampled from the Milwaukee River area. Water contains PCB's in the low ppt range. Carp contain 1 - 5 ppm of PCB-like compounds. Peaks from gas chromatographs of these compounds were identical to those for Monsanto's Aroclors. Studies are now being conducted to determine the sources of these compounds within the river.

B. William T. Donaldson, Southeast Water Lab., FWPCA.

Discussed the analytical capabilities in quantitating the various peaks and trying to separate the isomers. They have used calibrated chlorine detectors, gas chromatographs, GC mass spectra and have attempted to determine the degree of chlorination of each compound. Thus far, they have gotten 95% pure samples. PCB's with less chlorine may be more toxic.

C. Matthew Zabik, Pesticide Research Center, Michigan State University.

While conducting DDT - DDE residue analyses on coho salmon, a series of chlorinated compounds whose GC patterns match those of PCB's were found along with trimethylbenzenes, phthalates, etc. Attempts have been made to separate the PCB's by nitration and sulfonation. No consistent pattern between

the material first reported as DDE and actual DDE has been noted. It varied in coho salmon taken from the same area (1 to 30% other material).

D. J. J. Lichtenberg, FWPCA Analytical Quality Control Laboratory, Cincinnati.

PCB's have not been recognized as a real problem in the water monitoring program. They do interfere with DDT or DDE analyses.

E. E. H. Dustman, Patuxent Wildlife Research Center, Bureau of Sport Fisheries and Wildlife.

In tests conducted on ring-necked pheasant, mallard ducks, bobwhite quail, and Coturnix quail, the higher chlorinated compounds were found to be more toxic to birds (in cold-blooded animals the low Cl ones are more toxic). Aroclors tested: 1232, 1242, 1248, 1254, 1260, 1262. A great species difference in susceptibility was noted. PCB's were found in all eagles checked.

F. Richard A. Schoettger and David L. Stalling, Fish Pesticide Research Laboratory, Columbia, Missouri.

Tested Aroclors 1222 - 1268 and some of the 4,000 and 5,000 series. Found that the toxicity is greater at lower degrees of chlorination.

96-hour TL_m cutthroat trout: 1 ppm for 1221
Goes up for 1248
40 ppm for 1254

Gammarus sp. 50 ppm

The difference in toxicity to fish and birds in relation to the amount of chlorination of the PCB's might be due to the method of exposure (birds were fed PCB;s while for fish the PCB's were in the water) or to water solubility limitations.

Discussed PCB analysis and interference with DDE, heptachlor, and aldrin analyses. Work is underway using mass spectroscopy to further identify compounds in flesh and other samples. Pond studies and lab bioassays are being started.

G. Sidney Williams, Food and Drug Administration.

PCB's have been found only in a few foods: catfish 0.5-12 ppm. In one localized case it was found in milk (3-12 ppm). It was later discovered that oil that had leaked from a transformer was substituted for the fuel oil usually mixed with 2,4-D to spray for brush along power lines. FDA has no plans to establish food tolerances.

H. J. C. Street, Department of Animal Science, Utah State University.

In mammals the PCB's were found to cause hepatic microsomal enzyme induction (this was increasingly strong with higher Aroclors). There was extensive transformation during metabolism. 1248 and 1254 are commonly found in animal tissue. It appeared that ones with low Cl were more readily metabolized, so they would disappear from the residue. This may indicate that residue found in the animal does not indicate the source accurately. The interaction with other pesticides is an area where further research is needed.

I. John J. Birdsall, WARF Institute, Madison, WI.

Many samples from heavily industrialized areas contain substances like PCB's. Other chlorinated compounds are also found that have not been positively identified. BHC or Lindane may be one of these. Have completed a large number of samples from Lake Michigan, but positive confirmation of PCB's is needed.

J. William B. Papageorge, Monsanto Company.

Uses of Aroclors:

Biggest: Electrical transformers (1248, 1254)
Capacitors and heat transfer systems
Plasticizer in Cl rubbers (1254, 1260)
Caulking materials
Hydraulic fluids (1242, 1248)

Production has increased 8% per year, but no dramatic increase recently. 1242, 1254, and 1260 account for most of the use.

K. Jack T. Garrett, Monsanto Company.

Discussed toxicity to rats and beagles (paper distributed). Discussed the problem of establishing human tolerances.

II. ANALYTICAL.

1242, 1248, 1254, and 1260 Aroclors should be used as references. The separation of PCB's into isomers and homologs is a must for positive identification. Sample clean-up is critical and recovery measurements are necessary. The proposed method is:

1. Extraction with mixed ethers or methylene chloride.

2. For samples with fats, waxes or oils, use Jonas-Riddich acetonitrile - petroleum ether partition.

3. Florisil column chromatography.

4. Silicic acid column chromatography.

5. Detection by GC using chlorine specific detector and support coated open tubular or capillary column.

6. Mass spectroscopy confirmation.

III. BIOLOGICAL.

A. Monitoring program.

1. Incorporate the monitoring of PCB's into the present pesticide monitoring program on Lake Michigan as a pilot study by 1971.

2. All fish residue monitoring should be based on total fish residues, although levels in fat should be determined concurrently.

3. All sampling should be done on a statistically sound basis.

4. Fish monitoring should receive priority but water measurements should be made where appropriate.

5. Objectives of the monitoring program should be as follows:

a. Establish existing PCB levels.

b. Establish the major sources of PCB introduction into the environment.

c. Establish a baseline of PCB concentrations which can be used later for determining long-term trends.

B. Biological Research Needs.

1. Initial laboratory bioassay should be made and limited to testing four Aroclors, 1242, 1254, and 1260 (high production) and 1248 (high persistence).

2. Representative species from all trophic levels should be tested to determine acute toxicities.

3. Representative species from all trophic levels should be tested through at least one generation with emphasis on the effects on survival, growth and reproduction.

4. Multiple generation tests should be made with some organisms having short life histories.

5. Physiological studies should be made to determine the effects of PCB's on enzyme systems, hormones, and tissues.

6. Studies should be made on the toxicity of PCB degradation products.

7. Food chain studies should be made to consider the PCB residues at each level. The compounds present at different levels must be characterized in relation to parent compounds.

8. PCB levels must be analytically measured in test tanks for all bioassays.

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