COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS - STATE OF OHIO

COLLEGE OF AGRICULTURE AND HOME ECONOMICS, THE OHIO STATE UNIVERSITY AND THE U.S. DEPARTMENT OF AGRICULTURE COOPERATING



1735 NEIL AVENUE
COLUMBUS, OHIO 43210

AGRICULTURAL CHEMICALS NEWSLETTER

PESTICIDES / FEED ADDITIVES / PROPHYLACTIC DRUGS

March 16, 1972

To: State Staff, County and Area Agricultural and Community Resource Development Agents, Area Supervisors, OARDC Staff, and all other newsletter recipients.

Some extension agents expressed desire during the recent Pesticide Custom Applicator Schools to obtain slide sets concerning the agricultural chemical and environmental relationship. Two sets that I have relied heavily upon in supplementing personal slides are available for purchase. One set with narration entitled "Environment, Pesticides, People" can be purchased from Dr. Ray R. Kriner, Pesticide-Chemicals Program, College of Agriculture and Environmental Science, Rutgers University, New Brunswick, New Jersey. The cost is $24.00. The second set with narration costing $15.00 is entitled "Agriculture and the Environment" and is available from Geigy Agricultural Chemicals, Ardsley, New York 10502. Other slides used in presenting the subject of safe use of pesticides may be reproduced in the near future as the budget permits and placed in Area Extension offices.

The Environmental Protection Agency has proposed rules that would provide the public with the right to use Federal administrative machinery to challenge the government's pesticide decisions and give the public the right to trigger further administrative review of pesticide decisions by EPA which they might regard as unfavorable or potentially harmful to human health or the environment. New rules would also give the public more rights in dealing with scientific advisory committees in that such committees would be required to solicit scientific data from public interest groups. Any person would have the right to submit comments on any advisory committee report. Television and radio coverage of Federal pesticide hearings would be permitted.

The subject of this newsletter issue is "PCB Contamination in the Environment." Considerable interest has been expressed concerning this subject in the last few months. The material herein is only a brief review of some of the environmental problems. Problems in Ohio with contamination in some silos and subsequent residues in some milk supplies have been discussed previously. Extensive research is being conducted at OARDC to alleviate such problems.

Yours truly,

Acie C. Waldron

Acie C. Waldron
Extension Specialist
Pesticide Chemicals

MONS 070653

PCB CONTAMINATION IN THE ENVIRONMENT

Chemistry and Use of PCB's

There are many "chlorinated hydrocarbons" in addition to those that have been used in agriculture as insecticides. Two such groups of compounds are "PCB's" (polychlorinated biphenyls) and chlorinated napthalenes.

Of the two classes of compounds, "PCB's" (polychlorinated biphenyls) have received the most publicity both in technical and popular journals.

Widespread headlines were generated earlier this year when 50,000 turkeys in Minnesota, as many as 88,000 chickens in North Carolina, and tens of thousands of eggs at various locations were destroyed after they were found to be contaminated with polychlorinated biphenyls (PCB's). Similar headlines have accompanied other findings that indicate that PCB's are extensively distributed in the environment.

PCB's have been known for nearly a century, and have been used extensively since the 1930's. Chemically, PCB is a generic term covering a family of partially or wholly chlorinated isomers of biphenyl; commercial PCB's (42 to 60% chlorine) may contain as many as 50 different detectable isomers. In the United States, the sole manufacturer is the Monsanto Company which markets the products under the trade name Arochlor. The Arochlors are distinguished by a four digit number, the last two of which represent the percentage of chlorine in the mixture, i.e. Arochlor 1254. PCB's are also manufactured in Japan, Europe, and the U.S.S.R.

PCB is a colorless, highly viscous fluid that can withstand temperatures up to 650° F. without degradation, does not conduct electricity, and is resistant to fire. Such properties make PCB an ideal fluid for heat exchangers and electrical equipment such as transformers. These properties also make the more highly chlorinated PCB's very resistant to degradation in the environment, so that their persistence is similar to that of DDT.

Since 1960, Monsanto has made some 353,000 tons of PCB, with output reaching a maximum of 42,500 tons in 1970 (C&EN, Dec. 6, page 15). About 60% of that output has been for closed-system uses and much of the remainder has been either recycled or safely destroyed. Nonetheless, a certain amount has apparently been allowed to enter the environment, where contamination continues to be detected.

PCB's uses include:

1. coolant - insulation fluids in transformers
2. formulation into ballast for fluorescent fixtures
3. impregnation of cotton and asbestos for braided insulation of electrical wiring.
4. a plasticizer in wire and cable coatings
5. capacitors and askarel-type transformers
6. plasticizers of vinyl chloride polymer films
7. in high pressure hydraulic fluids, specialized lubricants and gasket sealers, heat transfer agents and machine tool cutting oils
8. some epoxy paints
9. protective coating for wood, metal and concrete
10. in some adhesives
11. carbonless reproducing paper

PCB Contamination

PCB's have been detected in environmental samples including rainwater in England, waters in the Great Lakes, water and zooplankton in the ocean, human hair, human adipose tissue, shrimp in Florida, adelie penguin eggs in the Antarctica and brown pelican eggs in Panama. More recent research has shown as indicated, in an earlier paragraph, contamination in poultry and eggs as the result of accidental leakage into feed. Contamination of silage and subsequently cows and milk has resulted from use of PCB as an ingredient in the sealer coating of some silos in Ohio and afterwards Pennsylvania and New York. In November Dr. George R. Harvey of Woods Hole Oceanographic Institution revealed that PCB at levels ranging from 1 to 100 p.p.b. have been found in nearly all animal and plant species from the Atlantic Ocean. Levels as high as 1.5 p.p.m. were found in zooplankton but corresponding PCB levels were not found in fish that feed on the zooplankton.

Also in November, Rep. Gilbert Gude (R.-Md.) disclosed that the Maryland Department of Natural Resources has found PCB at levels as high as 0.2 p.p.m. in soft-shelled clams taken from the Chesapeake Bay. This level is well below the Food and Drug Administration's guideline of 5 p.p.m. PCB in fish and poultry.

The Food and Drug Association found PCB in some dried foods (shredded wheat, corn meal, spaghetti dinner, grits, mixed baby cereal, noodle dinner, and pancake mix, ranging from 0.1 to 2.1 p.p.m.) originating from leaking from the cardboard containers which were made with recycled paper. The problem was eliminated and FDA considered no crisis was encountered.

In the particular situation related to PCB contamination of eggs and chicken tissues the source of trouble was traced to a fish meal ingredient sold by a Wilmington, N. C. firm. Fluid containing PCB dripped directly from a heat exchanger into the fish meal which subsequently was used in formulating chicken feed. The mill closed voluntarily when the accident was discovered and a trace on the formulated feed helped to prevent a widespread contamination problem. As it was, 12 southeastern states were affected with one commercial poultry producer required to destroy 77,000 chickens and two lots containing 76,500 eggs seized by FDA. Other lots of eggs (27 out of 64 analyzed contained from 0.6 to 1.9 p.p.m. PCB whereas the FDA acceptable level is 0.5 p.p.m.) were voluntarily withdrawn from the market. Investigation by FDA reported July 30, 1971, showed that any PCB contained in representative samples of slaughtered broilers from the affected areas were within the acceptable levels and that most of the contamination was concentrated in a relatively few lots of feed.

PCB Banning Proposed

Sweden's national environmental protection board has proposed a ban on import, manufacture, and sale of polychlorobiphenyl compounds (PCB). Sweden claims PCB is persistent and toxic, particularly to aquatic life in the Baltic Sea where there's been a buildup. The proposed ban excludes use of PCB in sealed electrical apparatus, such as transformers. The Swedish government in early April 1971 was considering the restriction, which could become effective by Jan. 1, 1972. The main problem with PCB arises from its use in such products as paints and sealants.

Rep. William Ryan (D.-N.Y.) has introduced a bill that would ban manufacture, shipment, and sale of polychlorinated biphenyls (PCB's) pending a full investigation of their effect on the environment. The bill would also permanently restrict their use to closed systems where they cannot affect the public health. Monsanto, the only domestic producer of PCB's, says it has already taken steps to restrict their use and that is is "impractical to legislate what has already been accomplished."

Biological Cause-Effect Relationships (Taken from C & E News, Dec. 13, 1971)

The November 1971 issue of Natural History magazine described a three-year study of birth defects among terns on Great Gull Island in Long Island Sound. The authors, Helen Hays of the American Museum of Natural History, New York City, and Dr. Robert W. Risebrough of the University of California's Bodega Marine Laboratory, Bodega Bay, say they found birds with no flight feathers, with twisted mandibles, with stunted extremities, and one specimen with four legs that survived for 3 days. The two workers attribute the high incidence of deformities to pollution in the sound.

Dr. Risebrough says the median concentration of the pesticide DDE in the flesh of all terns was 2.1 p.p.m. - about the same level found in other wild birds, and sufficient to account for the observed thinning of eggshells. The concentration of PCB in the flesh of the birds, however, ranged from 5 p.p.m. to 175 p.p.m. Despite these high levels, he points out, no cause-effect relationship between PCB levels and birth defects has been established for the terns, or other birds and animals.

Laboratory tests in the Netherlands, Dr. Risebrough notes, have shown that fertile chicken eggs injected with chlorinated dibenzofurans, a PCB contaminant, produce similarly deformed chicks. Monsanto, however, says that U.S.-made PCB's do not contain that contaminant.

Ospreys. Dr. Risebrough in collaboration with Paul R. Spitzer of Cornell University disclosed in November that the ospreys examined in Long Island Sound may be more contaminated than any other wildlife in North America. They found that lipids of both viable and overdue osprey eggs obtained from the shore of the sound have PCB levels varying from 545 to 2270 p.p.m.

Another Cornell worker, Dr. David B. Peakall, has found strong evidence of chromosomal damage in ring doves fed food containing 10 p.p.m. PCB. His preliminary results, sent to the Environmental Protection Agency in September, indicate that all hatchings from the first generation of birds were normal. When the hatched doves were mated, however, only 20% of the embryos survived. Dr. Peakall is continuing his work in an effort to find why the damage is manifested only in the third generation.

Monsanto, meanwhile, continues to stand firm behind its contention that there is no "scientific data that indicate polychlorinated biphenyls may cause birth defects." A company spokesman indicates that Monsanto has sponsored several feeding tests and a teratogenicity study , all of which indicate only minimal effects from PCB's. Rats fed food containing 100 p.p.m. PCB, for example, showed only slightly increased liver weights after 18 months. Dogs fed a similar diet exhibited a tendency not to gain weight as well as expected. Chickens, however,

were observed to exhibit loss of weight, thinning of eggshells, and decreased hatchability of eggs, although no embryonic deformation were observed.

Clearly the PCB file isn't closed. Monsanto's withdrawal of PCB from the market for uses where end products can't be controlled will reduce the amount of PCB entering the environment. But until a cause-effect relationship between PCB's and birth defects can definitely be proved or disproved, controversy will surround any use of PCB at all.

Task Force to Investigate PCB Contamination (C & E News, Sept. 13, 1971)

An interdepartmental task force has been set up in the Federal Government to coordinate a government-wide investigation into contamination by polychlorinated biphenyls (PCB) of food and other products.

The action, according to the Food and Drug Administration, is aimed at ensuring effective coordination of government response to specific and preventable PCB contamination and at developing "a long-range strategy for coordinating scientific resources to better define the PCB problem and its possible implications for human health." FDA says that on the basis of current scientific knowledge, there is no imminent threat to the safety of food or to public health from PCB's.

The PCB task force, which will be coordinated through the Office of Science and Technology and the Council on Environmental Quality, includes representatives from the Environmental Protection Agency, FDA, National Institute of Environmental Health Sciences, and Agriculture Department. It was set up at a meeting on Sept. 1, called by FDA to share information gathered by FDA and USDA on PCB's. The agencies have been conducting followup investigations of "industrial incidents," which FDA says have resulted in low-level PCB adulteration of some food products. An FDA spokesman says that information from the industrial accidents coupled with information gleaned from other investigations "indicated to us that there might be a potential problem that would require more than FDA involvement." He adds that the first chore of the PCB task force will be to check segments of Government and industry to find out what's known about PCB's.

Monsanto, the only domestic producer of PCB's, says that the Government's task force approach to the PCB environmental issue is "most appropriate" and that "the company stands ready to continue its support of and cooperation with these agencies. At the same time, a company spokesman says, "we believe our three-year-old program to control uses and escape of PCB is correct and that it will supplement the agency's effort." He adds that the company's program to control usage includes selling PCB's only for use in closed systems.

Public Health - No Threat from PCB's (C & E News, Oct. 4, 1971)

The Government, basing its judgment on current knowledge, sees no imminent threat to the safety of the food supply or to the public health from polychlorinated biphenyls (PCB). Dr. Charles C. Edwards, spokesman for FDA, believes that the confusion over the danger from PCB's is being compounded by alarmists and "unbalanced reporting."

According to Dr. Edwards, the Government and industry have been actively eliminating potential and actual PCB contamination of the food supply since 1968. In spite of these efforts there have been some isolated instances of food contamination.

On behalf of FDA, Dr. Edwards rejects the idea that crisis headlines and demands for national health alerts are either justified or needed to meet the present situation. He observes that science does not support such actions and that FDA will continue to abide by the dictates of science in making regulatory judgments on behalf of the consumer.

In summarizing its actions on the PCB problem, FDA applauds the cooperation of industry. Specifically, Monsanto, the primary domestic producer of PCB's, is now selling PCB's only for nonfood uses. National Cash Register Co. has also stopped using PCB's for its carbonless carbon paper. The paper has been withdrawn from the production of recycled packaging materials.

Except for isolated incidents involving fish, FDA says that almost all of the high levels of PCB's found to date have been associated with accidents which FDA is working to prevent. FDA has also stepped up its surveillance of the food supply to detect PCB's and has entered into a coordinated government effort under the direction of the Office of Science and Technology and the Council on Environmental Quality to deal with the problem.

Dr. Albert C. Kolbye, deputy director of FDA's Bureau of Foods, classifies PCB's as moderately toxic, and certainly much less toxic than DDT. He observes that animal and human data point to 150 to 300 micrograms per day as being in the safe range as far as temporary dietary intake is concerned. According to Dr. Kolbye FDA is not aware of any foods contaminated on a regular or consistent basis.

PCB's May be Common in Humans. . .

Polychlorinated biphenyls (PCB's), known to be widespread in fish and wildfowl, appear to be common in humans also, says Dr. Anne R. Yobs of the Environmental Protection Agency. She told a federally sponsored meeting on PCB's in December that an EPA analysis of 593 human tissue samples collected from 38 hospitals in 17 states revealed that 33.6% of the samples contained greater than 1 p.p.m. PCB and another 30.1% contained detectable quantities of PCB. Dr. Harold A. Price of the Michigan department of public health told the meeting he found that more than 41% of 80 human adipose tissue samples collected in Michigan contain more than 1 p.p.m. PCB.

. . . But Levels Decline Elsewhere

PCB levels in two Green Bay tributaries meanwhile have dropped sharply over the past year, says University of Wisconsin water chemist Gilman D. Veith. He notes that "PCB levels in Peshtigo and Oconto river waters dropped from 0.31 and 0.45 p.p.b. respectively in November 1970 to less than 0.01 p.p.b. last summer." Dr. Veith believes that the decline is probably a direct result of Monsanto Co.'s restrictions on sales of PCB's. He adds, however, that waters of the Fox river, which flows through the city of Green Bay, have not yet shown a similar decline in PCB levels.