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Polychlorinated Biphenyls Join List of Deadly Pollutants

Friday, December 4, 1970

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College Press Service

Come the Silent Spring, when life on earth is dying and helpless man asks why, the names of those chemicals, pesticides and synthetics he has poured into his environment for the sake of "progress" will come back to haunt him.

Along with DDT, mercury, 2,4,5-T, dieldrin, parathion and other deadly substances, the autopsy of earth will reveal another compound whose recently-detected effects are widespread, chronic, and insidious.

This latest chemical infiltrator is PCB, which stands for polychlorinated biphenyls, a special class of compounds with a great variety of household and industrial uses. Available commercially since 1929, the prevalence of PCB in the environment was not discovered until 1966, when Swedish scientists found it in concentrations as high as DDT.

Like DDT, the PCB compounds contain chlorine, hydrogen and carbon. Also like DDT, they are not soluble in water, are resistant to oxidation, they accumulate in fatty tissues and are extremely persistent in the environment.

PCB Spread Accidentally

The major difference between the two is that DDT has been distributed *deliberately* as a pesticide; the spread of PCB has been *accidental* and no one knows exactly how it happens, where leaks occur nor how much escapes. But in the past four years, scientists have detected PCBs in fish, birds, water, trees, sediment and–inevitably–in human fat and mothers' milk. Samples containing PCBs have been taken in England, Scotland, Scandinavia, the Netherlands, Antarctica, Central America and in many parts of the United States, making them truly ubiquitous pollutants.

In the U.S., PCBs are manufactured solely by the Monsanto Company and sold under the trade name "Aroclor." They are also made by chemical companies in Europe and Japan, and have been used extensively since World War II. PCBs can be purchased in containers ranging from 50-pound cans to 600-pound drums, or are available by the railroad car tankload.

The unique qualities of PCBs make them useful as flame retardants, insulating fluids, plasticizers and coating compounds. Consequently, they may appear in a bewildering variety of consumer products, such as floor tile, flourescent lights, printer's ink, brake linings, swimming pools, automobile-body sealants, asphalt, adhesives, molded plastics, polyester film, paraffin, paints, carbonless copy paper, window envelopes, imitation gold leaf, varnishes, waxes, ceramic pigments, synthetic rubber and water-repellant canvas for camping equipment.

Industrial applications of PCBs include coolant fluids in transformers, capacitors and askarel-type transformers, hydraulic fluids, specialized lubricants, gasket sealers, electrical wiring, heat transfer agents and machine tool cutting oils.

In addition, the Monsanto technical sales bulletin recommends mixing PCBs with chlorinated insecticides to act as a vapor suppressant and sticking agent, so the insecticide may maintain its "kill-life" on hard surfaces for as long as three months. The bulletin also suggests blending insecticides into tacky PCB–coatings "to make insect traps or barriers on tree trunks for foliage or fruit protection."

With all of these uses, it is little wonder that PCBs are released into the environment in persistent forms, which can be distributed widely over the earth in water and air currents. Scientists have cited 5 chief ways in which PCBs get into the environment:

---From the smokestacks of the Monsanto plants (in Sauget, Ill., and Anniston, Ala.) where Aroclor is manufactured, from the stacks of plants which manufacture products containing Aroclor, and from European and Japanese PCB plants.

—From other forms of industrial waste, such as leakage of hydraulic fluids from supposedly "closed systems," which are seldom leak-proof.

—Gradual wear and weathering of products (such as asphalt) containing Aroclor which may cause PCBs to be slowly released in the form of vapor or particles into the atmosphere.

—From products containing PCB which are thrown out as trash and eventually end up being burned in city dumps or incinerators, releasing PCBs in the form of highly toxic fumes. (Carbonless copy

paper, paints and many plastics, for example, are commonly burned.)

—And finally, through PCB-containing pesticides.

The acute effects on human beings of high dosages of PCBs are evident from a series of poisonings in Japan in 1968, in which more than 10,000 people were affected. The PCB source was traced to cooking oil extracted from rice hulls, which were treated in paddy fields by herbicide. The outbreaks involved a number of miscarriages and stillbirths among pregnant women and abnormally dark skin pigmentation in infants. Poisoning victims suffered from chloracne, a condition of severe pimples and pustules common with PCB exposure, and several cases showed symptoms of jaundice and liver damage.

Levels of exposure for workers in Aroclor plants have been set by the American Conference of Governmental Industrial Hygienists, but members of the Oil, Chemical and Atomic Workers union have consistently had trouble getting industries to enforce occupational standards. Monsanto refused to answer a written request from *Environment* magazine to describe its control measures for PCB levels in the plant atmosphere, and was evasive about its emission- monitoring efforts.

Inhalation of PCBs in sufficient quantity produces nausea, vomiting, loss of weight, shortness of breath, lowered red blood cell count, loss of libido, and inhibition of carbohydrate metabolism. Jaundice and other sever liver damage may result in coma, atrophy, and death.

But like so many other environmental hazards, the dangers of acute toxicity of PCBs are probably less than the threat of chronic, long-term, low-level exposure, which cannot be measured or, so far, controlled. There have been no experiments as yet to learn chronic PCB effects on humans, but several studies have produced disturbing evidence of their effects on animals.

The initial discovery of PCBs in the environment, in 1966, was made by Swedish scientist Soren Jensen, who identified PCBs in the bodies of 200 pike taken from different areas of Sweden, in other fish, and in the body of an eagle. Examining eagle feathers preserved in a museum, Dr. Jensen found PCB traces as early as 1944.

In the U.S., PCBs were first detected by Monte Kirven of the San Diego Natural History Museum, who found DDT compounds in abandoned peregrine falcon eggs. Also in the unhatched egg shells were other compounds which Kirven could not identify until the Swedish research came to his attention, when they were recognized as PCBs.

Prof. El McCune, of the University of Missouri, discovered by accident that PCBs have a toxic effect on chickens. When chickens began dying after a feeding house was freshly painted, careful research showed that the toxic factor was Aroclor 1242, a binding ingredient in the epoxy paint.

1,980 Parts Per Million

Perhaps the most extensive research on PCBs has been done by Robert Risebrough of the Institute of Marine Resources, University of California at Berkeley. Risebrough has taken samples from peregrine falcons, seagulls, brown pelicans, cormorants, herons, petrels and terns in San Francisco Bay, San Diego Bay, the Farallon and Anacapa Islands off the California coast and in Baja California. All of his samples have shown traces of PCBs, and some amounts have been as large as 1,980 parts PCB per million parts of body fat in the birds sampled.

What are the effects of PCBs on wildfowl? The close similarity between DDT and PCB suggested that they might have similar physiological effects, and some research has confirmed this. Dr. David Peakall of Cornell University found that PCB stimulated production in pigeons of enzymes which broke down sex hormones and interfered with reproductive cycles. The PCB actually had almost twice as much deleterious effect on the laboratory pigeons as did DDT and its compounds, even though lesser amounts of PCB were used.

At Utah State University, Prof. Joseph C. Street led a project to investigate the effect of PCBs on rats. With PCBs containing more than 50 percent chlorine, the enzyme induction potency was as great as that of DDT. Among other effects this brought about more rapid metabolism of drugs, insecticides, and other for compounds in the rats' bodies. Street believes that PCBs can cause ste degradation, which may lead to alte endocrine relationships.

Very little data is available about P in people. Both Swedish and Bri scientists have reported finding them samples of human fat. They were f documented in human milk by t scientists at Colorado College in Color Springs. Then Dr. Risebrough measu PCB in a series of mothers' milk samp from Berkeley and Los Angeles. Ev sample contained both DDT and PCB, it was impossible to tell how much of PCB in humans derived from food and h much was absorbed by the lungs from air. Nonetheless, this convincing evide of PCB ubiquity was incontrovertible ominous. Until recently, information ab PCB could be found only in techn journals, scientific literature, in-hous publications and a few informed maga such as *Environment* and *Nature*. T commercial media largely ignored problem, even though an increasing volu of information was bei accumulated.

Stricter Controls Requested

Finally, last April, the dangers of P were called to public attention by R William F. Ryan, Democratic Congressm from New York, who asked for act from various departments in the Ni administration and called upon Monsa to establish stricter controls on PCB use.

Ryan asked the Department Agriculture to ban the use PCB-containing pesticides, called for t Food and Drug Administration to requ proper labeling of PCB products and study a possible complete PCB ban, a requested that the Department of t Interior take steps to protect fish a wildlife from the hazards of PCBs.

Ryan's initiatives met with mix results. The Agriculture Departme replied that PCB pesticides would discontinued and agreed to can registrations for such pesticides. Howe it soon became apparent the "discontinu and "cancel," in federal-regulatory jarg don't automatically result in the dras and conclusive actions which the wo connote.

If Agriculture had chosen to "suspen the pesticide registrations, the suspens would have taken force immediately a federal law would have stopped shipmen of the products in interstate commerc Department inspectors could also se stocks of the products in retail sto (although they seldom do because there only 32 inspectors for all the thousands retail stores in the U.S.)

When the Agriculture Dept. merely "cancels" a registration, however, the manufacturing companies have 30 days before they must stop shipping the products in interstate commerce. If they appeal the order, even this mild restriction is lifted, and the company can continue to produce, ship, and sell the cancelled products during the lengthy process of appeal.

Furthermore, homeowners, gardeners, farmers or others who buy the products are free to use them in any way, even if contamination of large areas is the result.

FDA Responds With Study

The F.D.A., in response to Ryan's request for labeling, merely promised to study the amounts and toxicity of PCBs in food. Even if cautionary labels are implemented, the labels on containers have no binding force on the purchaser, and there is no guarantee that the products will not continue to be used in harmful ways.

While still Secretary of the Interior, Walter Hickel told Ryan that "when sufficient facts are established as to the sources and nature of the pollutants, we will be in a position to take appropriate corrective measures."

The Monsanto Company, in response to Ryan's inquiries, first responded with ambiguities and refusals to provide details, such as a list of PCB uses, production and sales figures. The company claimed, for example, that a complete list of PCB-containing products "would serve no useful non-political purpose."

But Ryan persisted, and in June, Monsanto finally agreed to restrict the use of PCBs to "closed-system applications," such as transformers, capacitors and heat transfer fluids. As of Aug. 30, Monsanto would no longer sell PCBs to customers for use in general plasticizer operations where disposal of end-products cannot be controlled. The company also said that it would no longer sell PCB-containing hydraulic fluid ("Pydrual" is Monsanto's trade name) after Dec. 31, 1970. And finally, Monsanto said it would offer a recovery service for spent fluids used as coolants in transformers and other closed-systems, and begin research to develop modified, biodegradeable PCBs.

These actions were encouraging to Ryan, who said in Congress: "I am extremely gratified that my exposure of PCBs as a major environmental hazard was instrumental in having them excluded from uses that allow widespread escape into the environment."

"However," he continued, "I am not satisfied that PCBs are no longer an environmental threat," citing high PCB levels found this summer in England. Ryan

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PCB Threat . . .

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urged the United Nations Conference on the Human Environment, which is to be held in Sweden in 1971, to study the danger of PCBs to animal and human life throughout the world, and to ban any use of PCBs that would allow further escape into the environment.

There will be some lag period before these steps show any results. After that, if Monsanto's former customers look for PCB substitutes, rather than buying PCBs from Japan or Europe, the projected decrease in quantity of PCB in the environment could become a reality. The only question then will be, was it too late?