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PCB's: Leaks of Toxic Substances Raises Issue of Effects, Regulation

Sharp criticism of federal regulatory agencies has followed in the wake of a bizarre contamination of poultry feed marketed in a part of southeastern United States. The controversy reached full steam on 18 August when the Food and Drug Administration (FDA) meekly acknowledged that a shipment of some 60,000 eggs contaminated with toxic polychlorinated biphenyls (PCB's) escaped federal inspectors and apparently got into the stomachs of Washington, D.C., area residents. The announcement came on the heels of FDA's seizure of another batch of PCB-contaminated eggs (75,000) on 13 August—almost a month after the initial discovery that PCB's had gotten into fish meal eaten by millions of chickens in ten southeastern states.

Besides possibly threatening human health through direct contamination, PCB's are considered a long-term potential hazard to the environment. In the United States, PCB's are produced solely as a heat transfer mechanism and an insulating fluid, particularly in cooling systems and big power transformers. In response to mounting evidence that PCB's are a potential hazard, the single U.S. manufacturer of PCB's, Monsanto Chemical Company, in order to restrict their release into the environment has limited the chemicals' uses to sealed systems. In the past, Monsanto widely produced PCB's as an additive in such things as sealants, rubber, paints, plastics, adhesives, printing ink, and insecticides.

Infiltration of PCB's into the environment occurs mainly in three ways:

- From accidental leaks in industrial equipment, such as heat-transfer systems;
- Through the weathering or friction wearing of the many materials that have PCB's as an ingredient. (Since they are fire resistant, PCB's usually remain intact even as a waste product.)
- Through interaction with food products in their uses as an ingredient in substances like paint and plastic.

Before the fish meal contamination incident, however, PCB's were virtually unknown except to a few scientists and some professional environmentalists. Critics have now become quite vocal in warning about the threat of PCB's, and, more important, they have expressed doubt about the ability and desire of federal agencies to effectively shield the consumer and the environment from the potential long-term dangers of thousands of synthetic chemicals.

The controversy is fueled by a basic disagreement among the participants as to the precise threat PCB's pose to human health and the environment. Federal officials, while acknowledging a problem, do not feel that PCB's are a serious enough hazard to justify major governmental action. Research on composition of PCB's and toxicity is very incomplete. The actual composition of their product is known only by Monsanto. Present evidence indicates that severe injury or death from short-term exposure to PCB's is unlikely. Like so many other environmental hazards, the potential PCB danger is long-term, low-level exposure, perhaps making it difficult for "crisis prone" regulatory agencies to respond in a big way now. Except for isolated accidents, federal officials contend, PCB's in their present application will not get into the environment or the food chain in harmful amounts.

From an industrial standpoint, PCB is considered very valuable, mainly for its incredible persistence as a chemical, being capable of withstanding temperatures of up to 1600°F (870°C). Like DDT—another, related chlorinated hydrocarbon—PCB's are fat-soluble but do not dissolve in water. For these reasons, industry holds that PCB's are in fact "safety" chemicals that are needed in populated areas to reduce the chances of accidental explosions, especially in big power transformers. It is this very persistence of PCB's that makes them a

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concern to environmentalists. PCB's have been detected throughout the world in fish, birds, waterways, and humans. In a study released by the Environmental Protection Agency (EPA), PCB's were detected in samples of human fatty tissue with concentrations as high as 250 parts per million (ppm).

Despite Monsanto's assurances that the present uses of PCB's are safe, critics say the recent fish meal incident vividly illustrates that use of PCB's in any form is too risky to permit. Leading the fight against PCB's are consumer advocate Ralph Nader and New York Democratic Congressman William Fitts Ryan. They argue that, even if Monsanto can stop PCB's from getting into the environment, products containing them are in wide use and will continue to disperse PCB's in the environment in harmful amounts. The government should act now, Nader asserts, to ascertain where PCB's have been used before they cause serious damage to the environment and get into the food chain.

Besides the fish meal incident, there have been two other hazardous leaks of PCB's in the past 2 years. One of these accidents, in Japan in 1968, resulted in 300 people developing a severe skin disease and in babies showing symptoms of chlorobiphenyl poisoning. Indeed, the preliminary research, though incomplete, makes Nader's anxiety about PCB's potential danger quite plausible. University of California research ecologist Robert Risebrough, one of the foremost authorities on PCB's, says that while the effects of PCB's on humans are undetermined, the contaminants in PCB's are "among the most poisonous compounds known." Tests of PCB's by the Environmental Protection Agency's Florida laboratory revealed the chemical killed one-half of the test population of pink shrimp exposed to 1 ppm and similarly killed samples of white shrimp. These tests, EPA's Thomas Duke told *Science*, indicate that PCB's are a "potential threat to the environment." Monsanto, however, has reported that its own tests have shown "no adverse effects" to rats or other laboratory species fed PCB's in amounts up to 100 ppm. This conflicts with tests repeated by others that have linked repeated dosages of PCB's to liver damage in mice and lower fertility in birds.

In fact, the recent contamination at the North Carolina plant that manufactures fish meal was detected only after the hatchability of eggs from chickens fed the meal began to diminish alarmingly.

The PCB's were traced to a leak in a pipe in the cooling system at the fish meal plant. Although the leak began in late April, PCB's were allowed to drip into the fish meal until the defect was discovered in mid-July. In the intervening period of 2½ months, approximately 16,000 tons of fish meal had been distributed to more than 60 companies in ten states. One of the purchasers of the fish meal, Holly Farms, the nation's largest poultry producer, voluntarily slaughtered 77,000 fowl after discovering PCB's in amounts above those deemed safe, reportedly as high as 40 ppm. In the meantime, the U.S. Department of Agriculture undertook its own tests of poultry that had been fed the fish meal. On 29 July, USDA said that its tests turned up no evidence that chickens given the contaminated meal were unsafe. The chickens in the ten-state area, USDA reported, were "wholesome," and the consumer could continue to eat chickens "with confidence." But this did not explain why chickens at Holly Farms contained unsafe amounts of PCB's. In response to this apparent disparity, Harry Mussman, director of USDA's laboratory service division, told *Science* that the department "surmised" that Holly Farms got an "extremely contaminated" batch of fish meal while the other producers did not.

Contaminated Eggs Seized

Two weeks later, on 13 August, FDA, under prodding from associates of Nader, revealed that it had seized over 75,000 eggs because tests had detected excessive amounts of PCB's in eggs from chickens that had consumed the contaminated fish meal. On 16 August—a month after the leak was detected—USDA took its turn and "detained" more than 50,000 pounds of frozen-egg products in which the level of PCB's was high. When FDA seized the 75,000 contaminated eggs, a spokesman said they knew of no incident in which contaminated eggs had reached consumers but could offer no assurances that this had not happened. Unwilling to stop there, associates of Nader and Ryan conducted their own ad hoc investigation and, to their dismay, discovered that contaminated eggs had reached the consumer. The FDA, on 18 August, confirmed that a shipment of 60,000 contaminated eggs had reached the retail market and apparently had been consumed in the Wash-

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lington, D.C., area after this information had been released by Ryan's and Nader's associates.

The disclosure prompted both Ryan and Nader to blast the government's handling of the entire fish meal incident as one of the most flagrant examples of misregulation by federal agencies.

In denying that it has lagged on PCB's the FDA points out that since January it has been conducting studies to determine the toxicity of PCB's and their effect on humans. An FDA spokesman said that the test results should be known "within a year." For its part, EPA is doing some research at two field laboratories. Since the beginning of the year USDA, according to Mussman, has conducted a routine surveillance of poultry for PCB's and other related chemicals.

Perhaps some of the difficulties in regulating PCB's can be attributed to the confusing, overlapping jurisdictions of federal agencies. For example, FDA has jurisdiction over PCB's in whole shell eggs and in fish meal, USDA has control over cracked eggs and their products—such as mayonnaise—and poultry, and EPA is in charge of PCB's once they get into the air and water.

In the recent incident, FDA had to recall the contaminated fish meal and locate where it was sold and then, in turn, supply USDA with a list of the fish meal purchasers, so that USDA could check the affected chickens. When associates of Nader raised the possibility of contamination of egg products, they had to go to FDA for testing whole eggs and to USDA for cracked eggs and frozen poultry products.

Such a confusing arrangement makes it almost inevitable that some of the contaminated eggs would slip through this network. As for the eggs that did reach the consumer, an FDA spokesman says there is no immediate danger since "any potential health hazard would come from continued consumption of PCB's over an extended period of time."

PCB's intrusion into the environment is difficult to regulate because of a lack of federal laws and because no one is quite sure how much PCB's have been produced. EPA and FDA officials point out that at present they have no legal authority to halt Monsanto's present uses of PCB's. Last year PCB's in pesticides were banned by USDA's pesticide regulation division, now a part of EPA. According to a spokesman, FDA has, in the past, indicated to Monsanto that it would not allow PCB's to be used in food as an additive.

It is virtually impossible to determine the exact amount of PCB's already present in the environment and where the chemical might be concentrated because no one, except Monsanto, knows what amounts of PCB's have been made. A National Academy of Science panel estimates that, in 1968 alone, 5 billion grams of PCB's were produced in the United States, in addition to those made by PCB's manufacturers in Europe, the Soviet Union, and Japan. Monsanto has refused repeatedly to make available, even to government officials, production and sales figures for PCB's because it regards this information as a "trade secret." Monsanto is backed up by its industrial counterparts and by a law that permits a company in certain situations to withhold information that might seriously jeopardize its competitive advantage. A National Academy of Sciences panel, in disagreeing with Monsanto's refusal to release the important figures, noted "It is not only competitive concerns alone that determine the less than candid posture assumed by industry concerning production figures." A bill now before Congress would give federal agencies the authority to get production figures from companies manufacturing hazardous chemicals.

In a further effort to cut down on PCB's released into the environment, Monsanto recently built a special incineration unit at Sauget, Illinois, to destroy waste PCB's. It has also told government officials that it will not sell PCB's for use in power transformers and cooling systems that will be used near foodstuffs. In the fish meal plant, Monsanto reportedly claims that it was misled by the name—East Coast Terminal, Inc.—into believing that the PCB's sold for cooling purposes would not be used near food products. Monsanto now refuses to comment on PCB's for publication. The reason, a company spokesman told *Science*, is that there are "many investigations under way" of Monsanto and PCB's, and the company does not want "misinterpretations" about Monsanto's production of PCB's.

Associates of Nader and Ryan admit, in part, that their strong criticism of the federal handling of PCB's via the fish meal incident stems from their disagreement with the way federal agencies respond to environmental problems. They dislike what they feel is the slow response of federal agencies to potential hazards like PCB's. The

EPA Moves on Refuse Act

The Environmental Protection Agency (EPA) has told its regional offices to notify laggard industries that they face possible legal action if they fail to explain why they haven't applied for waterway discharge permits under the recently resuscitated Refuse Act of 1899.

The deadline for filing permit applications was 1 July. Detailed follow-up data are required by 1 October. But so far, says EPA administrator William Ruckelshaus, applications received by the Army Corps of Engineers (which administers the program) have leveled off at about 18,000, although at least 40,000 firms are supposed to be affected by the permit program.

The EPA is still conducting the industrial waste studies on which to base the standards it had planned to have ready in early July. Officials explain that this task has taken longer than expected because it was found that laying down specific limitations on effluents for each of the 20 designated industrial categories would be too complex and rigid. Instead, the agency is working on more flexible "guidelines," which will aid regional EPA directors in interpreting federal-state water quality standards and in advising companies on how to conform.

Meanwhile, Ruckelshaus has urged regional offices to proceed with enforcement actions, using the knowledge and equipment already available to them.

Ruckelshaus told *Science* recently that press reports to the effect that EPA was backing down on its standards were wrong. Nevertheless, he said, some industries "read these stories and think we're easing off. Then we have to start all over rattling sabres at them."—C.H.

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