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Animal Tests Show Reproductive Failure

FOR a year and a half, 16 female monkeys were fed food contaminated with the chemical PCB (polychlorinated biphenyl) in concentrations similar to those found in fish caught off Long Island and elsewhere in the United States.

When the monkeys mated, seven miscarried. Two could not conceive at all. Uterine growths were recorded. The monkeys developed facial sores and swollen eyelids and lost their hair. Their offspring all were undersized and contained detectable levels of the toxic chemical.

The infants were then breast-fed. They all developed the same symptoms as their mothers. Within four months, half the infants died. Two years later, even when taken off the breast milk, the other monkeys still exhibit learning and behavioral disabilities.

Last year, the Environmental Protection Agency began testing the breast milk of American women for PCB contamination. The chemical was found in the milk of 78 of the first 80 women tested from all over the country. The average levels were about half the lowest concentrations found in the monkeys and about an eighth of the highest concentrations.

That study by Dr. J. R. Allen, a pathologist at the University of Wisconsin, is one of the principal reasons why the federal government is preparing to lower drastically its allowable limits of PCBs in fish. In its proposed standards, expected to be enacted this year, the Food and Drug Administration goes even further and cautions women of childbearing age and children to eat as few PCB-laden fish as possible, even if the fish are just under the limit.

"PCBs are more toxic than we had originally thought," said Elizabeth Campbell, an agency chemist who wrote the new guidelines. "The more information we collect about them, the worse they seem to be."

Few negative effects from regular exposure to long-term, low level doses of PCBs have been observed in humans, although consumers have been eating contaminated fish for years. The fatty tissues of workers exposed to PCBs have been found to contain levels dozens of times the proposed limits, but the main detected symptoms have been skin sores that cleared up after the exposures ceased.

Animal studies, however, show reproductive failure, cancer, decreased resistance to disease and other ailments at doses not far above what humans could get over a period of many years, since PCBs accumulate in the body, once ingested, and do not break down. Currently, 90 per cent of the people in this country have detectable levels of PCBs in their fatty tissues and the fatty portion in the breast milk of the average woman has levels that approach or exceed the new safe limits for edible fish.

Recently studies have found PCBs in the embryonic fluid surrounding developing human fetuses and in the placenta and other tissues, in amounts many times the safe levels. In fact, children are being born with PCBs in their tissues.

Moreover, an official of the National Cancer Institute calculated for Newsday that a person eating the low levels of PCBs present in Long Island fish increases the risk of liver cancer by 8 per cent.

The most widely known and accepted animal studies have found that:

- Complete reproductive failure occurred when minks ate food contaminated with five parts per million of PCBs, which is the current federal safe limit. After 105 days at 3.6 parts per million, all the test minks died. That level is similar to the average in Long Island bass and bluefish. Minks, of course, are smaller than humans, so exhibit more symptoms at lower doses.
- Chickens, rabbits and birds fed doses of PCBs from 10 to 100 parts per million showed various symptoms including loss of feathers, skin lesions, tremors and diminished growth.

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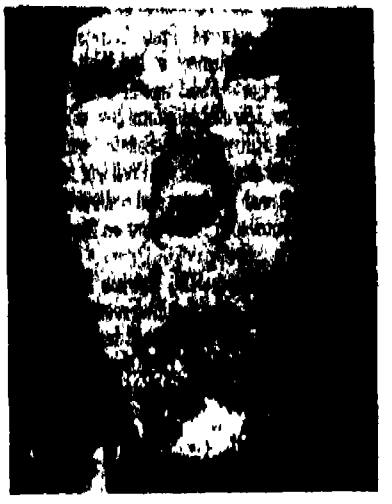



A 1968 victim of PCB poisoning in Yusho, Japan, shows acnelike skin sores, called chloracne.

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PCB:
The Ubiquitous Contaminant

Animal Testing Shows Reproductive Failures

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● Eighty per cent of the exposed rats tested showed cancerous or pre-cancerous growths, compared to less than 1 per cent of an unexposed group. The doses were about 350 times higher than people would get if they ate contaminated fish. An interagency study of PCBs last year said that although such doses (100 parts per million) are high when compared to daily consumption by humans, they are not very high for PCB workers or for people who eat a lot of fish contaminated with the chemical.

● All detectable levels of PCBs in water, no matter how small, were found to collect in the tissues of marine organisms. At a tenth of a part per billion in water, fish offspring became lethargic, stopped feeding, developed fin rot and started dying 24 hours after hatching. At one part per billion of PCBs in water, half the exposed shrimp died in 15 days. This concentration is similar to that in the Hudson River from the General Electric Co.'s discharges at plants near Albany. Reproduction rates in all species were reduced at varying concentrations. Resistance to disease was lowered, many species died of viruses that did not infect an unexposed group. Even exposed organisms placed in clean water transferred the chemical to their offspring.

● The female rhesus monkeys tested by Allen developed telltale PCB acne after about one month on a continuous diet of the contaminated food.

Of the female monkeys fed food with five parts per million PCBs, reproduction dropped by more than 80 per cent. Of those fed 2.5 parts per million, reproduction dropped by about 55 per cent. Male monkeys, on the other hand, had few symptoms at those doses, Allen said.

"These studies indicate that women who plan to have children had best discontinue eating (contaminated) fish," Allen said. He said that a woman who simply stops eating fish once she gets pregnant may already have consumed and collected PCBs in her tissues. Since the monkeys weighed about 12.5 pounds, a tenth what the average woman weighs, it would take a woman about 10 times as long to accumulate the same doses, he said.

Even the proposed federal two-parts-per-million limit on edible fish is not meant for daily consumption, especially by women and children, said the FDA's Campbell. "We figure that four fish meals per month at those levels should be the maximum, especially for women and children," she said.

The caution on the consumption of PCBs by children is based primarily on the fact that since children are smaller than adults, the PCB doses they receive when eating a contaminated fish are much larger per pound of body weight.

"An average child nursing at mother's breast for a year could ingest what adults ingest in a decade," said Joseph Highland, a biochemist and PCB expert for the Environmental Defense Fund, a Washington-based organization that prodded the federal government two years ago into taking action to curtail consumption of PCBs.

In the absence of human analysis, the chemical can still be shown to be harmful in theory. PCBs are foreign to the body and are viewed by the system as pollutants. The liver tries to change the substance in some way so that it can be metabolized and excreted as waste. But PCBs are so stable that they cannot be broken down by the body, except slightly, in some instances. The liver works hard to metabolize the substance, and can be damaged in the process.

Laboratory tests indicate that PCBs, even if they do not produce negative effects themselves, can change the liver in a way so that the body is more prone to cancer from other toxic substances.

Since the body cannot metabolize PCBs, they generally cannot be excreted. They concentrate in the lipids, or fatty tissues, which are the body's storage area for most pollutants and excess food energy. The areas include the layer under the skin, the breasts and the abdominal area. They average about 20 per cent of the body's tissues for a person of average proportions.

Negative health effects of PCBs were initially reported in 1936, seven years after the material was first produced commercially. A U.S. Public Health Service report said workers had gotten skin sores from PCB exposures. The sores are believed now to be caused by concentrations of the chemical in the fatty layer under the skin. The ailment became known as "chloracne," or acne from chlorinated hydrocarbons.

Why, then, wasn't the material curtailed?

"The reports were evaluated as an example of misuse and poor handling," said William Papageorge, a biochemist and PCB expert for Monsanto Chemical Co. of St. Louis, the sole manufacturer of PCBs.

But in the mid-1960s the chemical started turning up in human hair, bird eggs and fish. Then, in February, 1968, about 1,200 Japanese consumers ate rice oil contaminated with PCBs. The chemical was used in a closed heating element and had accidentally leaked into cooking oil as it was being prepared in a factory in Yusho, Japan. By March, victims had skin eruptions, swelling of the eyelids and joints, impaired vision, loss of appetite, nausea, vomiting, overall fatigue, darkened skin, abnormal menstruation, impotence, jaundice, fever, hearing difficulties, headaches and spasms.

The offspring born to contaminated parents had darkened skin and PCB concentrations in their tissues. The skin symptoms persisted to a lesser extent after three years. Of the 13 contaminated women who became pregnant, there were two stillbirths and 12 of the 13 babies were smaller than national standards, according to scientific papers in a new book, "PCB Poisoning and Pollution."

Up to Sept. 13, 1973, 22 deaths had occurred among the 1,200 PCB victims. Of those nine were from cancer, "suggesting a possible excess mortality [from cancer]," according to one of the scientific papers. The paper adds, however, that the rigorous statistical analysis" has not been done.

Among the 22 dead were a 13-year-old boy and a 25-year-old truck driver. Autopsies discovered internal growths similar to chloracne and various irregularities in lymph nodes, glands or the liver. Neither of those two died from cancer.

The average concentration of PCBs consumed by the Japanese victims over several weeks was 2,000 to 3,000 parts per million. That is 1,000 to 1,500 times the proposed federal limits for fish consumption. In Long Island waters the average concentration of PCBs in striped bass and bluefish—those with the highest levels—is about three parts per million, with levels up to 21 parts per million.

To reach the minimum levels that caused adverse symptoms at Yusho a person would have to eat about 500 pounds of contaminated fish. The doses are cumulative, however. Each meal consumed brings one closer to danger, scientists say.

The average Long Islander eats about 50 pounds per year—about four times the national average, according to J. L. McHugh, a biologist at the Marine Sciences Research Center of the State University of New York at Stony Brook. A 10-year dose of contaminated fish would equal the minimum Japanese accumulation. Sports fishermen, however, usually consume more than the general population, perhaps as much as 150 pounds annually, according to Robert Rance, head of Save Our Stripers, a Long Island sport fishing association. If a fisherman and his family ate only contaminated fish, they could therefore build up enough for the minimum Yusho concentration in less than five years.

Officials are quick to point out that the figures are for the worst case. Not all the fish are contaminated, and there is no way of determining which are, without a laboratory analysis.

In the last five years, the more studies that have been done, the more places PCBs have been found. Recently, the chemical was found in fish 11,000 feet beneath the ocean. The government has been holding hearings in Washington this month on the cleanup possibilities and alternatives. Detailed epidemiological studies on humans are just being started, and in a much-disputed study, University of Pennsylvania researchers linked PCB to cancer in New Jersey workers.

The Environmental Defense Fund's Highland contended that unless drastic action is taken to limit exposures, it will be just a matter of time until health problems start showing up in the general population.

But scientists do not yet agree on the best course of action. There is consensus on only two aspects. First, there is no easy answer. Second as one federal expert put it, "the animal studies give us very great cause for concern. —Stuart Diamond

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