

Monsanto Backgrounder

PCB BACKGROUNDER

July 1990

Production and Use History

Polychlorinated biphenyls (PCBs) were first sold in 1929 by the Swann Chemical Company. Monsanto Company became a manufacturer of PCBs in 1935 when it acquired Swann Chemical Company and its product lines.

PCBs are compounds consisting of carbon, hydrogen and chlorine atoms. They have a mild odor and their physical form ranges from a free-flowing, oily liquid to a waxy solid. They are chemically inert, which means they do not readily react with other substances, and they are fire resistant. These properties made them invaluable for their principal use -- as cooling and insulating fluids in heavy-duty electrical equipment, including capacitors and transformers.

For more than 40 years, the use of PCB electrical fluids was required by building safety codes in most high-rise buildings, schools, hospitals and industrial operations where the risks of fires or explosions were major concerns.

0792

In 1970, following confirmation that PCBs were present in the environment, Monsanto voluntarily began to phase out sales of PCB products for "open applications" that could lead to uncontrolled environmental release. These uses, which represented about 65 percent of the company's PCB sales, included heat-transfer fluids, hydraulic fluids, plasticizers and other miscellaneous applications.

By 1972, Monsanto was limiting PCB sales to selected customers solely for use in totally enclosed electrical equipment. This action was endorsed by a federal task force which recommended that Monsanto continue production for these uses until effective substitute products could be developed. This view was reinforced in 1975 by the administrator of the U.S. EPA, who cautioned that massive power disruptions would occur if Monsanto were to cease production before suitable replacement fluids became available.

In October of 1976, following indications from the electrical industry that replacement products would soon be in hand, Monsanto announced that it would voluntarily cease production and sales of PCBs by October 31, 1977. In fact, Monsanto was completely out of the PCB business prior to October 1, 1977.

Largely as a result of their widespread presence in the environment, their effects on laboratory animals and their initial association with human health effects resulting from an incident in Japan, the federal government in 1979 banned the intentional manufacture and use of PCBs except for specifically authorized activities. These regulations can be found in the Code of Federal Regulations, 40 CFR 761. For some applications, most notably in certain types of capacitors and transformers, the use of PCBs is authorized for the remainder of the useful life of the equipment.

It is important to note the following: 1) Monsanto's decision to withdraw from the PCB business was based on evidence that PCBs persist in the environment. There was not and still is not evidence that PCBs significantly affect human health; 2) In switching over to substitute products, the electrical industry was forced to accept increased risk of fires in electrical equipment; 3) PCBs continued to be manufactured for 8-10 years after Monsanto ceased production by other firms in Germany, France, Spain, Italy and eastern European countries for use in many areas of the world.

Health Effects

PCBs have been widely and mistakenly regarded as among the most toxic compounds known. They frequently have been

incorrectly labeled as "deadly toxins" and "cancer-causing agents."

The weight of scientific evidence, however, including many health effects studies done in the last few years, continues to grow and indicates that PCBs are neither extremely toxic nor carcinogenic to humans.

For example, a 1987 review of the human health effects of PCBs by Dr. Renate Kimbrough, then at the Centers for Disease Control, concluded: "When humans were exposed only to PCBs ..., the only observed acute effects have generally been minor. So far, no significant chronic health effects have been causally associated with exposure to PCBs ..." (1).

Because PCBs are widespread in the environment, most humans have measurable amounts of PCBs in their blood and fat. These levels are generally very low, a few parts-per-billion in blood and low parts-per-million in fat, and not a cause for concern. People who have levels 10 to 100 times higher, because of long term exposure to high concentrations, as in an occupational setting, have shown no significant health effects. Chloracne (a skin condition resembling teenage acne) is the only clinical symptom that has been associated with high level PCB exposure. However, it gradually disappears when PCB exposure is reduced.

Yusho Incident

During 1968 in Japan, about 1600 people became ill after eating cooking oil contaminated with up to a 1000 ppm of a Japanese-manufactured PCB heat transfer fluid. This incident became known as Yusho (Japanese for rice oil disease). A similar incident occurred in 1979 in Taiwan. Symptoms included skin discoloration, acne-like conditions, eye discharges, and central nervous system irregularities. Because PCBs were present in the fluids, they were initially blamed for these maladies. Scientists now generally agree that the symptoms resulting from these unfortunate industrial accidents were not caused by PCBs but by toxic impurities later identified as having been present in the rice oil(2).

Environmental Concentrations

Even though PCBs are frequently characterized as being environmentally persistent or resistant to degradation, it has been known for some time that lower chlorinated PCB products can be readily degraded by naturally occurring microorganisms. General Electric Company scientists have recently reported that the more highly chlorinated PCBs can also be broken down, although at a slower rate. Their work has focused on contaminated sediments in the Hudson River(3).

Numerous studies have shown that concentrations of PCBs in wildlife have been declining since their use was first restricted in the early 1970's. Largemouth and striped bass from the Hudson River, Dover sole and mussels from Southern California, and brown pelicans from California have shown significant decreases in PCB body burden (4-7)

Data from the EPA show that PCB concentrations are declining in the U.S. population. The percentage of Americans with more than 1 ppm PCBs in fat tissue dropped from about 50% in 1972 to about 9% in 1983 (the last year for which data are available) (8).

The consensus of scientific opinion is that PCBs pose no threat to human health at concentrations typically encountered in the environment. Noted European scientist Otto Hutzinger stated his opinion following an EPA symposium in 1982:

. . . it is evident that after 50 years of industrial production and use of PCBs, no significant clinical disease or clear epidemiological correlations have been observed in occupationally exposed persons. Considering the lower and declining exposure to PCBs via the environment, it seems unlikely that significant injury will be observed from environmental exposure to PCBs(9).

REFERENCES

1. R. D. Kimbrough, "Human Health Effects of Polychlorinated Biphenyls (PCBs) and Polybrominated Biphenyls (PBBs)," Ann. Rev. Pharmacol. Toxicol., 27, 87 (1987).
2. T. Kashimoto and H. Miyata, "Differences Between Yusho and Other Kinds of Poisoning Involving only PCBs," in PCBs and the Environment, J. S. Waid, ed., CRC Press, Boca Raton, Florida, 1987, pp. 21-22.
3. J. F. Brown, D. L. Bedard, M. J. Brennan, J. C. Carnahan, H. Feng, R. E. Wagner, "Polychlorinated Biphenyl Dechlorination in Aquatic Sediments," Science, 236, 709 (1987).
4. M. P. Brown, M. B. Werner, R. J. Sloan, and K. N. Simpson, "Polychlorinated Biphenyls in the Hudson River," Env. Sci. and Tech., 19, 656 (1985).
5. D. J. McDermott, D. R. Young, and T. C. Heesen, "PCB Contamination of Southern California Marine Organisms," Proc. Natl. Conf. on Polychlorinated Biphenyls, J. L. Buckley, Ed., USEPA, Washington, DC, 1976.
6. D. R. Young and T. C. Heesen, "DDT, PCB and Chlorinated Benzenes in the Marine Ecosystem off Southern California," in Water Chlorination - Environmental Impact and Health Effects, Vol. 2, R. L. Jolley, H. Gorchev, and D. H. Hamilton, Eds, Ann Arbor Science, Ann Arbor, Mich., 1978, p. 267.
7. D. W. Anderson, R. M. Jurek, and J. O. Keith, "The Status of Brown Pelicans at Anacapa Island in 1975," Calif. Fish Game, 63, 4 (1977).
8. G. A. Mack and L. Mohadjer, "Baseline Estimates and Time Trends for 8-BHC, HCB, and PCBs in Human Adipose Tissue 1970-1983," USEPA Document No. NHATS-SS-01, September 30, 1985.
9. O. Hutzinger, Advances in Exposure, Health and Environmental Effects Studies of PCBs: Symposium Proceedings, R. J. Davenport and B. K. Bernard, eds., Bethesda, Maryland, May, 1982.

PCB/Breast Cancer Preparedness Statement
Approved version
4/21/92

Monsanto epidemiologists have reviewed the study conducted by Falck, et.al. which suggests that environmental exposures to chemicals such as DDE and PCBs, may somehow be associated with breast cancer. We are concerned about the study's shortcoming. It is important to note that even the authors of the study refer to their study as preliminary and a "pilot study", because of its inherent shortcomings.

Among these are the small size of the study, the ages of the cases (who are older than the controls), and the fact that the study does not take into consideration such complicating factors as diet and menopausal status. There are also methodological problems with the study. For these reasons, we believe the Falck study provides new, useful information and it must be interpreted with great caution in light of its preliminary nature.

The weight of scientific evidence, including many studies of the health effects of PCBs done in the last few years, continues to indicate that PCBs are not carcinogenic to humans and have no significant long-term human health effects. In studies of persons exposed to PCBs in the workplace, including at least two studies with large numbers of women, there is no indication that there is any increased risk of breast cancer associated with exposure to PCBs. Scientists consider such studies of large numbers of people as the most reliable indicators of potential cancer risk. The only clinical symptoms, associated with exposure to high levels of PCBs, in chloracne, are the skin condition chloracne and short term liver effects both of which go away once exposure is stopped.