The ABCs of PCB woes

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Waukegan Harbor is beset by two serious problems: a quagmire of toxic muck, and a near-stalemate over efforts to clean out the pollution.

The initial problem stems from PCBs (polychlorinated biphenyls). Outboard Marine Corporation had dumped more than a million pounds of PCBs, used as a lubricant in machinery, into the harbor and North Ditch, both of which directly empty into Lake Michigan, from the early 1950s until 1972.

The U.S. Environmental Protection Agency has charged that the harbor bottom contains 25 times more PCBs than sewage plant sludge lagoons, and that the PCBs have seeped down eight feet into the harbor muck.

The U.S. EPA and OMC have sued each other over who is responsible for cleaning out the PCBs. And Illinois Attorney General William Scott has sued both — OMC for not cleaning out the harbor and the EPA for not establishing standards for PCB removal, transport and storage.

Those lawsuits may take up to four years to resolve. The Lake County Health Department has proposed that the harbor be used as a national experiment in removing PCBs, but U.S. EPA attorneys have stated they will oppose any projects until the lawsuits are resolved.

While PCBs normally settle down in water, the harbor is stirred up by both small boats and large lake ships, and an OMC engine test station. Health Department scientists are afraid that PCBs may be kept in suspension by the action and transmitted out into the lake.

But what is a PCB? Why were they used? What danger is there to Lake County residents?

The PCB problem, which affects the world in general and many parts of the nation in particular, has been the focus of a study since 1970 by the University of Wisconsin Sea Grant College Program. The results of their study are published in a brochure entitled "The ABCs of PCBs" and are summarized here.

PCBs are a chemical compound similar to DDT, and are a colorless, odorless liquid with a thick, molasses-like consistency. They do not dissolve easily in water and have a high boiling point.

Because of that latter trait they were used extensively as coolant insulation fluids in industrial applications. The

News analysis

Monsanto Industrial Chemical Company, the sole U.S. manufacturer of PCBs, produced 1.4 billion pounds of PCBs before stopping production in 1977. Over half that amount has entered the environment through discharges to the air, land and water, according to the U.S. EPA, which did not take anti-PCB action until 1976.

Some foreign firms continue to produce PCB products.

Of the PCBs still in use, the U.S. EPA estimates that 10 million pounds are lost each year to the environment.

Across the nation about three-quarters of the discarded PCB's end up in dumps, much in abandoned capacitors and transformers, where they can leak out and be washed by rain and melted snow into waterways. Some industries shot PCBs out of smokestacks into the atmosphere, where winds carried the pollutant around the world, coming back to earth in a dangerous rain.

Once in the water the PCBs adhere to small particles, are taken in by lower life forms and passed up the food chain, with the higher life forms gaining increasing concentrations of PCBs.

Fish can take up PCBs through their gills, fins and skin. Some fish have been found which contain PCB concentrations one million times greater than the concentrations in surrounding waters.

PCBs persist in the environment for long periods of time and are hard to eliminate. They have been found all over the world, from Arctic polar bears to chickens in New York even in mothers' milk. Breast-fed infants receive more than 50 times the concentration of PCBs in food eaten by their mothers.

While scientists have long been aware of the acute effect of exposure to extremely high levels of PCBs (which has caused cancer in rats and mice), they know considerably less about the threat of long-term exposure to lower levels.

In one research program sponsored by the Sea Grant program, monkeys were fed steady diets with lower levels of PCB contamination. The animals suffered loss of hair and acne lesions within one or two months. They also suffered

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reproductive failures.

Their offspring were small and had PCB levels close to that in their mothers. Detectable levels persisted in infants and adults for more than 18 months following exposure.

The danger of PCBs first drew worldwide attention in 1968 when five people died and 1,000 were stricken in Japan after eating food containing cooking oil that had been contaminated by PCBs.

More recently, high levels of PCBs have been found in fish, particularly in the Great Lakes. Most affected are carp and the large lake trout and salmon. Wisconsin fishing licenses contain special warnings, and warnings have been issued to not eat more than one fish weekly from Lake Michigan.

Fish accumulate most of the PCBs in their fat. By removing all of the fat from a fish, most of the PCB contamination can be removed, according to the Sea Grant Program, which also advises that in cooking, the fish should be broiled, barbecued or baked, rather than fried.

Humans poisoned by PCBs are hit by acne-like eruptions of the skin, nausea and vomiting, abdominal pain, swelling, jaundice and fatigue. Long-term exposure to small amounts may weaken the body's ability to recover from illnesses and may affect the ability to reproduce.

PCBs can also harm unborn children. Babies born to Japanese mothers who had eaten PCB-contaminated rice oil had grayish-brown discolored skin, suffered discharges from their eyes and were below average weight.

Just what levels of PCBs are safe for humans is a point of much debate. Tolerance levels set by the U.S Food and Drug Administration were determined in 1973, when less was known about the effects of PCBs. Current levels are five parts of PCBs per million parts of fish, shellfish and poultry, 2.5 parts per million (ppm) in milk and dairy products, 0.5 ppm in eggs, 0.2 ppm in infant and junior foods, and 10 ppm in food packaging materials.

The FDA is proposing to lower the permissible amounts to 2 ppm in fish and shellfish, 1.5 ppm in milk, and 0.3 ppm in eggs, and 3 ppm in poultry.

According to the U.S. EPA, one out of two Americans carries PCB levels of 1 to 3 ppm. Surveys of Canadians show levels of 1 to 2 ppm. Japanese suffering effects of PCB poisoning showed concentrations of 75 ppm.

Although PCBs concentrate in fat, they are also found in the kidney, liver, brain, muscle and blood. Breast-fed infants receive more than 50 times the concentration of foods eaten by their mothers.

In wildlife, the most serious effects of PCB are found in birds and higher mammals. The most serious consequence in birds is reproductive failure, although kidney, heart and liver damage can also occur. PCBs degrade vitamin D and estrogen in birds, resulting in eggshell-thinning and reproductive failure.

Fish can contain very high concentrations without being severely affected, although it may hurt their reproduction. However, shellfish, including oysters and shrimp, are highly sensitive; they can be killed by only very small concentrations of PCBs in water.

While Waukegan Harbor is plagued by a concentration of high PCB levels, the environment in general is afflicted with considerable levels of PCBs. And PCBs will remain a significant contaminant in the environment, according to the Wisconsin Sea Grant study, for at least two or three decades. In some places it may get worse before it gets better.

PCB molecules do not break down readily, do not dissolve readily in water, and are heat resistant. Fish, while quick to pick up PCBs in their fat, are very slow in eliminating them. Since PCBs have been used in so many industrial products with service lives up to 20 years, PCBs will continue to be released to the environment as these materials are gradually discarded and decompose.

PCBs can be safely destroyed only by incineration at very high temperatures, about 2,400 degrees fahrenheit. Burning at lower temperatures can produce toxic gases. There are presently few facilities in the nation for high-temperature incineration of PCB material.

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