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Danger from PCB pollution likened

By BETTY LOU LEE

"IT'S LIKE a sword of Damocles hanging over our heads."

That's how widespread environmental pollution by polychlorinated biphenyls (PCBs) is described by Morris Millson, PhD, environmental assessment coordinator with Environment Canada.

The evidence mounts of these chemicals' toxic effects on fish, fowl, animals and man, and this latest ecological time bomb keeps ticking on as the technology is sought to replace it in industry and get it out of the environment.

Japan has had the only known experience with PCB poisoning in man, a 1968 disaster when hundreds ate rice oil contaminated with 1000 parts per million of it. The immediate effects were bad enough — hyperpigmentation, hair loss, severe skin eruptions and disruption of menstruation. The long-term effects, still being assessed, indicate even more widespread damage, including possible carcinogenesis.

The level of PCBs in human adipose tissue in Canada now averages two ppm, with wide variations. There appears to be no immediate danger to the general population, but recent findings of high levels in some species of Great Lakes fish pose a definite health hazard to anyone eating a diet inordinately high in fresh water fish — sports fishermen and their guides, Indians, and commercial fishing families.

From the limited testing done on animal species, there appears to be a wide range of susceptibility to PCBs. A mink rancher was financially wiped out when he fed his animals a diet of Great Lakes fish containing 2 ppm — the animals could no longer reproduce. Chickens are also highly sensitive.

As little as .5 ppm kills Atlantic salmon eggs. The whole Great Lakes commercial fishery is threatened if the U.S. adopts the 2 ppm limit Canada set late last year.

In Rhesus monkey experiments at the University of Wisconsin, Madison, females on diets ranging from 2.5 to 5 ppm developed facial lesions within two months, and irregularities in their menstrual cycles within four months. After six months at these dietary levels, they were mated to control males.

Six of eight animals on 5 ppm conceived, but five aborted or had early fetal resorption. The eight females on 2.5 ppm conceived, but three aborted. The six infants born were small for dates and had areas of hyperpigmentation. Their PCB levels increased rapidly with breast feeding, and within two months they developed acne, conjunctivitis and eyelash loss. Three died within four months.

Male monkeys, however, ate a 5 ppm diet for one year without signs of severe intoxication and with no reproductive abnormalities.

Much of the current knowledge on PCBs was reviewed at a recent three-day symposium held in Chicago by the U.S. Environmental Protection Agency, and attended by 500 people from research centres, regulatory bodies, industry, environmental groups and the health professions. They included about 25 Canadian researchers and civil servants.

It was a chilling recital of the long time that PCBs have been silently infiltrating air, water and soil; of the frustrations of trying to regulate and remove them; of the data from tests on various species; and of the Japanese experience.

PCBs have been around since 1929, and in North America have been made almost exclusively by the Monsanto Company. Their first

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to sword of Damocles over public's head

uses were as heat transfer fluids in transformers and capacitors in the electrical industry, because of their low flammability and stability.

Later, the colorless oils were extended to a multitude of uses — as plasticizers in paints, inks and adhesives, as lubricants and hydraulic fluids, and in plastic products, carbonless copy paper and investment casting waxes.

At about the same time that PCBs started showing up in surprising quantities in North American fish and birds, the Japanese tragedy struck when PCBs from equipment in a rice oil plant leaked into the oil.

Almost 1,300 persons are registered victims of Yusho (rice oil disease) and Dr. Masanori Kuratsune of the department of public health, Kyushu University, Fukuoka, outlined the seven-year follow-up of them at the Chicago meeting.

"The dermal and mucosal signs which were most marked at the incipient stage of the poisoning have gradually been improved, while symptoms such as general fatigue, poor appetite, inconstant abdominal pain, heavy headedness and headache, feeling of numbness and pain in the limbs, and cough and expectoration of sputum, all of which are considered to be due to some internal disturbances, have become more prominent year by year."

Hyperpigmentation, nail deformities and hypersecretion of the meibomian gland persist.

Serum triglycerides rose sharply at the incipient stage, and have shown no change in a group of men where they are as high as 160 ± 118 mg/100 ml. In a female group, the levels dropped about 1973, but still remain higher than 110 mg/100 ml in 42 per cent.

There were no symptoms of liver damage after the poisonings, but subsequent investigations have indicated marked hypertrophy of smooth endoplasmic reticulum, indicating stimulated enzyme induction in the liver. Serum bilirubin is significantly lower than in a control group.

rules, and there are individual differences. Those who are already likely to have had high exposure should be viewed as potential problem cases by public health authorities. They may already be invading their safety margin."

He estimated that 200 grams a week of fish containing 20 ppm of PCB residue (and many Great Lakes fish test higher) would "burn up the safety margin" in a year.

Fresh water fish appear to be the only major source of PCBs now in foodstuffs — the levels in other foods have gone down in the past five years with recognition of, and regulations against, the hazard.

The American EPA is now considering a water quality limit of one part per trillion for PCBs. But some lakes, including Michigan, already have 10 times that level, and there is no known way of getting it out.

Monsanto voluntarily restricted sales of PCBs to uses in closed electrical systems when it became known the chemicals were accumulating in the environment. But this didn't stop the import of them from countries such as France and Italy for other uses. Monsanto also tried to reduce loss to the environment by providing a waste disposal service for its PCBs to its transformer and capacitor customers.

Even if all PCB production stopped tomorrow, there is still that sword of Damocles to which Ottawa's Dr. Millson referred.

"I don't expect to see persistent PCBs in biological accumulators decrease in the 1970s," he said. "DDT use dropped in 1963 and ceased in 1969-70, and five years later we are seeing a decrease in DDE. But all the DDT ever manufactured was intended to be spread to the environment, and was, within two years of its manufacture.

"All PCBs were intended to be kept somewhere, and most of them are. They have not yet appeared in the environment: They are still in transformers and other equipment built to last 20 to 30 years."

Canada imports about 1,500 tons of bulk PCBs a year from Monsanto for the electrical industry, but the government has had no way of knowing how much is imported from other countries, and for what uses. The new Environmental Contaminants Act gives it the power to get such information from Canadian companies.

Babies born to mothers who ate the oil during pregnancy tended to be small-for-dates, have dark brown pigmentation of the entire skin which disappeared at about five months, and teeth at birth. Nine babies with hyperpigmented skin were born to mothers up to four years after ingestion of the oil.

Of 22 deaths from all causes recorded among one group of 1,200 Yusho patients, nine were from malignant neoplasms in a wide range of sites, "suggesting a possible excess of deaths from cancer."

No cases of occupational poisoning are known in North America, but the first study of workers with long-term exposure is just now getting underway in the United States.

In an interview with The Medical Post, U.S. assistant surgeon general Dr. Albert Kolbye was asked to estimate the danger level for Great Lakes fish in the diet. Dr. Kolbye is associate director for sciences in the Bureau of Foods in the U.S. Food and Drug Administration.

"There have been levels of almost 100 ppm in individuals with no overt disease, but the danger level is not clearly known. I would guess that 150 ppm or higher is the danger zone, and with an average level of 2 ppm in adipose tissue, we're pretty far away from that.

"But there are no hard and fast

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