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Little-Understood PCBs Pose Hazards to Humans and Food

By Elsie Carper
Washington Post Staff Writers

The substances have been around for 40 years but only in the last six has their danger to the health of man been suspected.

A Swedish chemist first found them in the tissues of birds and fish and in human hair.

Then a peculiar skin disease that reached epidemic proportions broke out in western Japan. The skin of the victims became pigmented and erupted into a virulent acne. Those affected experienced a profuse sweating in their palms, and a feeling of weakness and numbness. Five died. The attack was traced to heavily contaminated rice oil used in cooking.

Subsequently, the same substances have been detected all over the world—in Arctic polar bears, in house dust in Michigan, in a batch of New York chickens, in Minnesota turkeys, in milk from a West Virginia farm, in rainfall over Britain, in packaged noodles and in human blood plasma and human milk.

The ubiquitous and persistent substances make up a family of 210 different man-made chemical compounds widely used for industrial purposes called polychlorinated biphenyls or PCBs. They are odorless and colorless liquids and the properties that have made them valuable to industry—withstanding temperatures up to 1600 degrees—have made them an environmental hazard. They are slow to decompose and stay in the environment for many years. Scientists do not know how long.

Last week, the National Institute of Environmental Health brought together research scientists from universities and government agencies and from four foreign countries to pool available knowledge on how PCBs affect human beings. They met for two days at the Isolated Quail Roost Conference Center near Durham, N.C.

Effects Unknown

Summarizing the conference, Dr. Norton Nelson, director of the Institute Environmental Medicine at at New York University, pointed to the gaps in knowledge. Little is known about the toxic effects of long term, low-level exposure or how PCBs have spread to isolated parts of the world.

Last September, when the President's Office of Science and Technology and the Council on Environmental Quality established an inter-departmental task force to consider PCB contamination of food and other products, Dr. Charles Edwards, head of the Food and Drug Administration, called PCBs "a potential but not immediate health hazard" and warned against "alarmists seeking headlines."

With present knowledge, the FDA thinks that the only imminent health hazard would come when humans ate large amounts of heavily contaminated food, as happened in the Japanese epidemic. But the conference left a number of unanswered questions. Among the information gaps that Nelson mentioned was the need for more studies on whether the substances cause cancer and their effects on human enzyme actions and reproduction.

One study reported at the conference showed that the interaction of PCBs with DDT and dieldrin increase the toxicity of those pesticides. In the restrained language of the scientist, Dr. E. Paul Lichtenstein, department of etomology, University of Wisconsin, said that the potential effects of PCBs on biological systems, "especially in combination with other synthetic chemicals, should not be disregarded."

The conference also left open the question of the role of two impurities, dioxins and penzofurans, found in combination with PCBs.

In the Japanese incident three years ago, about 1,000 persons were poisoned, the conference was told by Dr. Masanori Kuratsune, professor of public health of Kyushu University. While showing pictures of the victims, he stopped his presentation to make an emotional appeal that such an accident never be allowed to happen again.

The contaminated rice oil contained from 2,000 to 3,000 parts per million (ppm) of Kanechlor 40, a brand of polychlorinated bipennyls, which leaked from a heating pipe into the oil during production. About two-thirds of those who consumed the oil were affected. Tests made on 325 victims showed that the severity of the reaction depended upon the amount consumed. Thirteen women believed to have used the oil were pregnant.

Two of the babies were stillborn. The two fetuses and ten of the remaining 11 babies had grayish dark brown stained skin, nails and gums and an eye discharge. All were stunted. As the children have grown, the stained skin has faded. The growth of boys but not the girls has been retarded. About half of the 325 victims have recovered while the remainder is "still tortured by the disease," Dr. Kurattsune, said.

The Japanese episode is the largest known poisoning of humans by PCBs but there have been other isolated cases. Tests here and abroad have shown that persons with high levels of PCBs suffer from acne, liver enlargement, brain and nerve impairment. These are people that have received massive doses.

There is increasing evidence of PCBs in the tissue of the general population. Detectable levels have been found in almost half of

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human fat tissue collected from hospitals and analyzed at the Michigan Department of Health. But there has been no indication that low levels contribute to death.

While the effect of the low concentrations in humans is unknown, laboratory studies on birds and animals raise questions of genetic defects for future generations.

PCB Uses Spread

In an experiment conducted with pheasants, South Dakota University scientists found that PCB-fed hens produced fewer eggs and that there was an increased number of chicks that did not have the strength to break out of their eggs PCBs decreased the weight of the hearts and spleens and increased weights of the kidneys and livers of the birds. Another experiment by Cornell University scientists with ring doves also turned up a high rate of embryonic deaths in the second generation.

PCBs are manufactured in the United States and six other countries — France, Germany, Japan, Italy, Spain and the Soviet Union —and exported to still others The sole producer in this country is the Monsanto Company of St. Louis. Its major PCB product is Aroclor 1254

PCBs were developed in response to the electrical industry's need for an explosion-proof insulating fluid for transformers. Other uses opened up—as fluids in heat transfer systems, in capacitors, hydraulic systems, gas turbines and vacuum pumps.

The market spread to special paints, lubricants, adhesives, sealants, asphalt tile, some printing inks and carbonless carbon paper As plasticizers they added flexibility, strength and durability.

The were used in paints for traffic lane markings, for concrete and cinder block that had to withstand hard use

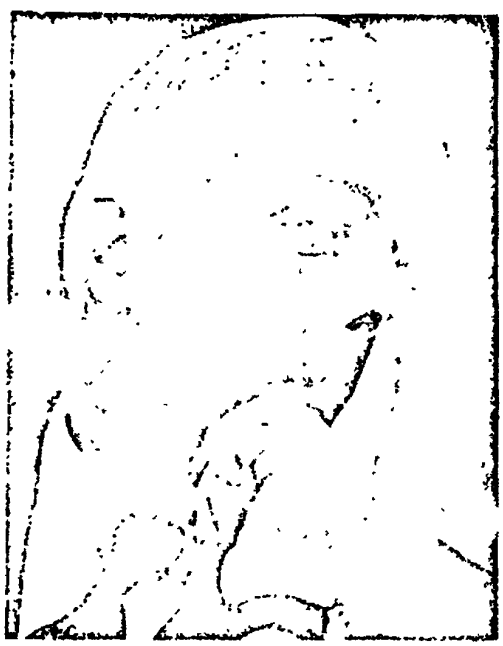
One incident of milk contamination came from the leaching of PCBs from paint used inside silos The PCBs got into the silage that was eaten by the cows. Another occurred when transformer oil was used for defoliant spray on a power line right-of way near a dairy pasture in West Virginia

Chickens in New York were contaminated when fed meal that had been ground in its plastic wrappers. More than 100,000 chickens were destroyed.

A leak in a heat exchange unit in a North Carolina plant processing fish for chicken feed led to the destruction of 88,000 more chickens and 60,000 eggs because they contained PCB levels in excess of allowable standards The Food and Drug Administration has been unable to track down the source of PCBs found in 50,000 Michigan turkeys that were also destroyed.

These are isolated incidents of high-level contamination from accidents But PCBs are turning up with frequency in products in the general market basket

FDA reported at the conference that in the past 18 months, 684 samples of fish, cheese, milk, shell eggs and fish by-products, out of 3,505



By Jim McNamara—The Washington Post

Food and Drug Administrator Charles C. Edwards does not believe PCB substances are an immediate hazard.

samples, have been found to contain PCBs

They have been detected most frequently in fish, ranging from trace levels to 35 ppm, about seven times the maximum level set by the FDA.

Recently the FDA found PCBs in a variety of packaged foods Container manufacturers had used recycled paper including carbonless carbon paper.

All of this runs counter to another environmental consideration the recylining of waste products. While PCBs are no longer used in carbonless carbon paper, there is still a lot of it around. It was used extensively by banks and by the Internal Revenue Service in 1040 tax forms.

After PCBs were identified as a risk, Monsanto cut back its production and limited sales to customers who would use them in closed systems. They have offered to buy back compounds sold to customers for other uses and will no longer sell to food processing firms even for closed systems because of the risk of a leak. The company has urged users not to discard the compounds but to send them back to Monsanto where they will be incenerated at 3000 degrees and destroyed

Monsanto also is reducing the chlorine content of the compounds it sells making them more biodegradable, but ironically increasing their toxicity

The National Bureau of Standards reported at the conference that there is no acceptable substitute for PCBs in transformers and capacitors A total ban on PCB production would require that large electrical transformers be redesigned.

Until recently Monsanto refused to divulge production figures claiming that potential competitors would be tipped off to the size of the market Now the company states that it produced 35,500 tons in the peak year 1970 and that production is now about half that.

No one knows how much is in the environment.

Dr. Adel Sarofim of the Massachusetts Institute of Technology and Dr I C T. Nisbet of the Massachusetts Audobon Society said at the conference that most of it is confined in sealed containers, either in active use or discarded in dumps.

But since PCBs were so widely used in so many products they have found their way into water systems, have become attached to sediment in rivers and lakes and on the continental shelf. This explains why high levels are found in fish and fish-eating birds.

There is also evidence that PCBs have been airborne. One of the major gaps in information is how they reach the atmosphere.