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PCBs in fish: a cause for concern?

Eating more oily fish, which is the richest dietary source of omega-3 fatty acids, is a wise move to hedge your bets against heart disease. But this advice, carried in last month's Special Report, has now been somewhat clouded by a study indicating that if fatty fish have high levels of the chemical PCB, the eating of such fish may pose problems for women who are planning to become pregnant.

A research team headed by the University of Maryland's Greta Fein, PhD, has just reported in the journal *Developmental Psychology* and in the *Journal of Pediatrics* that women who have had a long history of eating fatty fish contaminated with high levels of polychlorinated biphenyls (PCBs) gave birth to babies who exhibited sluggish behavior and other such "worrisome" responses. Their babies were also born smaller and earlier than infants not exposed to PCBs. Although this new finding is of scientific concern, Joseph Jacobson, PhD, one of the researchers at Wayne State University in Michigan, urges that women should not overreact. Indeed, he points out, the differences observed in PCB-exposed newborns were small and "do not necessarily predict anything bad down the road" for these children. Moreover, the women under study were regularly eating fish whose PCB levels were as much as 5 to 10 times higher than those considered normal or acceptable by the FDA.

The problems with PCB came to light in the 1970s when it was found that the chemical, widely used in such industrial products as electrical transformers and plastics, could cause concern. As a result, the FDA banned their further use in 1979. However, PCBs remain in items made before that time, are found in waste-disposal sites, and are sometimes produced as an inadvertent by-product in the manufacture of certain products.

PCBs leach from these sources into the water, soil, and air, ultimately winding up in the food

supply. Because further research linking PCBs to tumors and reproductive problems in animals has been reported, the FDA just last month reduced the allowable level of PCBs in fish and shellfish from 5 parts per million (ppm) to 2 ppm. Up to 3 ppm are permitted in poultry fat.

The main problem involves fresh-water fish caught in lakes and streams polluted by industrial waste. Seafood generally poses a lesser problem, although there have been reports of PCB contamination, particularly in harbors and bays near industrial sites. Fish that feed in such polluted water accumulate PCBs in fatty tissue, as do people who eat these fish. Oily fish, including lake trout, salmon, mackerel, catfish, smelt, and carp, are more susceptible to high levels. On the other hand, lean white fish, such as cod, haddock, and pike, do not usually concentrate as many PCBs.

For years the state of Michigan has advised young women to avoid eating certain Great Lakes fish because of exceedingly high PCB levels. Nevertheless, Dr. Fein and her colleagues were able to locate 242 child-bearing women who did not know of the warnings and, indeed, reported eating Lake Michigan salmon and lake trout 2 or 3 times a month for 16 years. In studying these women, the researchers compared their newborns to babies born to mothers who ate no Lake Michigan fish. They found that the more PCB-contaminated fish the mothers ate, the more their infants showed abnormal reflexes, general weakness, slower response to stimuli, and more signs of depression. They weighed 7 to 9 ounces less and their heads were slightly smaller even though their body size was within normal range. They also were born 6 to 12 days earlier than non-PCB-exposed babies. Dr. Jacobson believes that the affected infants will outgrow their differences, but he will re-examine these children when they are 4 years old to see if there are any long-term consequences of prenatal PCB exposure.

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RESEARCH REPORT

What does all this mean in practical terms? First, don't panic and quit eating all fatty fish, for their oils may indeed offer your heart some protection. But because statistics show that more than 20 percent of the fish Americans eat is fish they've caught, you should take special precautions—especially if such fish is eaten by women of childbearing age. PCBs accumulate in the body and can be transferred not only to the fetus but also to the baby via breast milk.

Second, heed advisories to avoid eating fish from known PCB-contaminated water sources. New York State, for example, has just recently issued an advisory to eat no more than one fish meal per week. As far as your favorite fishing spot is concerned, chances are you don't need to worry. But to find out if it is known to be PCB-polluted, you can try calling your state department of public health or the division of fisheries and wildlife. To be sure, they don't always know the answer, because there is no way the federal or state governments can monitor the safety of all waters and all fish. But one thing is certain, be circumspect about fishing downstream from industrial plants.

Finally, before you cook fatty fresh-water fish, clean the layers of fat off the backbone and stomach along with dark sections and the skin. And rather than frying the fish, broil or grill it.

Up with calcium, up with salt?

Could it be that calcium is more important than salt in determining whether you'll develop hypertension? Indeed, sodium chloride is most often implicated as the villain for people who have hypertension. But a report published in the journal *Science* might lead you to believe that a lifetime of consuming plenty of calcium is more likely to protect you from rising blood pressure than is regular curtailment of your salt intake.

Using data from a huge government survey called the HANES study, David McCarron, MD, and colleagues from Oregon Health Sciences University analyzed the diets of more than 10,000 people. The researchers assessed the relationship between the intake of 17 nutrients and high blood pressure.

Surprisingly, the results showed that people with hypertension tended to consume significantly less calcium than those with normal blood pressure. For example, individuals with a daily intake of less than 300 milligrams of calcium were more likely to have hypertension than those with a 1,500-milligram daily intake. Perhaps even more interesting, diets low in so-

dium were associated with hypertension. Conversely, high-sodium diets were associated with the lowest risk for hypertension. Individuals who consumed less than 1,600 milligrams of sodium a day ran a greater risk of developing hypertension than did people consuming more than 4,800 milligrams. Also worth noting, people with hypertension tended to take in less of vitamins A and C as well as less potassium.

Does all this really mean that calcium is more important than sodium in controlling blood pressure? Dr. McCarron's report emphasizes that the study "does not prove causality." The findings simply indicate possible associations between nutrients and the regulation of blood pressure. Furthermore, as pointed out in the *American Journal of Epidemiology* by another group of researchers who studied the same HANES data, the relationship between low salt intake and high blood pressures may be explained by the fact that older people, who had the lowest salt intake, had the highest blood pressures. Younger people, on the other hand, ate more sodium and had lower pressures. So the findings may be the result of an age difference rather than a cause-and-effect relationship between sodium and blood pressure.

Several people have pointed out that the data used by Dr. McCarron do not take into consideration the amount of salt people added at the table or in the preparation of food. One of the critics of the study, Herbert Langford, MD, Chief of the Endocrine and Hypertension Division at the University of Mississippi, has been studying the relationship between specific nutrients and hypertension for years and notes that all carefully done studies have identified sodium as a critical component in hypertension.

Moreover, the recently released National Heart, Lung, and Blood Institute guidelines for hypertension definitively label sodium restriction important in controlling blood pressure. Chairman of the committee that prepared the report, Harriet Dustan, MD, affirms that although calcium may influence blood pressure, more evidence is needed if the mineral is to be clearly implicated.

In the meantime, what's the best advice to follow? Watch your salt intake if you have high blood pressure or have a tendency toward its development. And make an effort to meet the RDA of 800 milligrams for calcium by eating foods such as milk, yogurt, cheese, or

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EPA, Utilities Grapple with PCB Problems

PCB's in transformers may be a thing of the past sooner than expected

The Environmental Protection Agency (EPA) and a few utility companies seem ready to accede to demands that steps be taken quickly to replace electrical equipment containing polychlorinated biphenyls or PCB's. This appears to be a reversal, at least on the part of EPA, of a long-standing view that PCB's in electrical equipment pose no significant health hazard. The utility companies, however, have responded as a result of recent PCB accidents and the lawsuits that followed.

In 1976, when Congress banned the manufacturing of PCB's, it presumably thought that problems with this pervasive and toxic chemical were for the most part solved. But a loophole in the law allowed the continued use of PCB's in electrical transformers and capacitors as insulation. A year ago, the utility

industry successfully argued before EPA that transformers filled with PCB's should only be replaced as the equipment wore out. At this rate, transformers would be replaced in 20 years. The cost to proceed any faster would be prohibitive, the industry contended.

Now EPA is moving to close the loophole. Because accidents involving the release of PCB's are occurring much more frequently than previously believed, EPA is considering a costly proposal that would ban PCB transformers in public buildings. But in the past 6 months, two utility companies say they have decided to speed up the replacement program not because they believe there are serious health hazards linked with PCB's but because they say they are weary of trying to counter the public

perception that PCB's are extremely toxic. Public concerns were heightened after transformer accidents in Binghamton, New York, and San Francisco resulted in the contamination of commercial buildings, costing millions of dollars to clean up.

Other companies are campaigning to calm public fears about PCB's. General Electric and Monsanto, for example, have been active in disseminating information claiming that the health effects of PCB's have been overblown. Although there is good evidence that PCB's are toxic at high dose levels, the companies maintain that the data on low-dose effects are far less clear cut.

Last May, the Pacific Gas and Electric Company decided to replace its large transformers shortly after one of them

exploded and contaminated a high-rise office building in San Francisco. The episode, and the subsequent lawsuits, prompted the company to allocate \$60 million over the next 5 years to replace about 1000 PCB transformers. "We got tired of battling public perception," said company spokeswoman Tony Ledwell. Recently, the Florida Power and Light Company, which services half of Florida, took the same step and will spend \$15 million over the next 5 years. Although it has not had a major PCB accident with its transformers, "we're getting ahead of the game before a problem occurs," said company spokeswoman Stacey Shaw, citing the accident in San Francisco and a similar one in Binghamton that occurred in 1982. "The public's concerns about PCB's have been severely exaggerated," she said.

The cause for concern can be largely attributed to the fact that PCB's are pervasive in the environment. According to EPA, there are 750 million pounds of PCB's either in storage or in use in the United States. In a national health study, EPA found that almost everyone has a detectable amount of PCB's in adipose tissue, although the number affected has dropped since Congress banned the production of PCB's in 1976. About 1 percent of the U.S. population in 1981 had more than 3 parts per million in their fatty tissue, a drop from 8 percent in 1977. The meaning of these low levels in not clear.

But many studies show that heavy PCB exposure is toxic, according to data presented at a recent meeting on PCB's held at the National Institute for Environmental Health Sciences at Research Triangle Park, North Carolina. PCB's are in a class of compounds related to dibenzodioxins and dibenzofurans. According to Ernest McConnell, chief of the chemical pathology branch at the National Institute of Environmental Health Sciences, PCB's rank third behind dioxins and furans when the most toxic isomer of each group is considered. Although General Electric has stated that "the question of whether PCB's cause cancer in animals is unresolved," there is little, if any, doubt in the academic scientific community that PCB's are animal carcinogens at high dose levels. According to separate studies by Diane Norbeck, a pathologist at the University of Wisconsin Medical School, and Renate Kimbrough, a medical officer at the Centers for Disease Control, PCB's cause liver tumors in rats when the animals are fed a heavy dose of 100 parts per million over a period of 2 years.

In animal studies, large doses of

PCB's are also known to cause a drop in body weight, enlarge the liver, damage kidneys, and change skin pigmentation. They cause reproductive disorders in minks and monkeys. According to one study, minks fed a diet of fish contaminated with PCB's showed a severe decrease in their reproductive rate. Monkeys exposed to PCB's became infertile. If, however, the monkeys were taken off the diet with PCB's, their fertility returned. It is not clear whether PCB's are mutagenic.

Several accidents with PCB's have provided some clinical data, but Kimbrough of CDC said at the institute meeting that "it is difficult to sort out the toxicity" because some of the accidents occurring in other countries may involve different mixtures of PCB isomers. Another problem is how to test for the

gested that more extensive study of reproductive effects in humans is needed.

A number of Taiwanese were also poisoned in 1979 by rice oil that had been contaminated with PCB's. Shu-ying Tang, a physician and biochemist at National Taiwan University, reported that researchers in her group have correlated neurological damage with PCB exposure among the Taiwanese who consumed the oil. Other scientists also noted molecular changes in liver cells from patients who have been exposed to PCB's. It is unclear, they say, what these changes mean because the patients have not as yet shown any clinical symptoms of disease.

Arnold Schechter, professor of preventive medicine at the State University of New York at Binghamton who has been studying the firefighters and others in-

Workers clean up after a PCB transformer fire in San Francisco last May. The accident prompted Pacific Gas and Electric to spend \$60 million to replace all the company's large transformers with PCB's.



presence of PCB's and how to best determine adverse health effects. The consensus seemed to be that fatty tissue provides the most sensitive sample for PCB's. Some scientists advocated serum samples, however, as a speedier and less invasive test. The drawback is that serum does not bind PCB's as much as adipose tissue.

Several studies do reveal some toxicity of PCB's. In 1968, about 1300 Japanese became ill after eating rice oil contaminated with PCB's that had leaked from a heat exchanger. With PCB concentrations exceeding 100 ppm, many developed chloracne, a disfiguring acne-like disorder. According to a literature search by Robert Miller, chief of the epidemiology branch of the National Cancer Institute, nine pregnant Japanese women who had eaten the rice oil gave birth to children with various abnormalities. Some of the babies showed dark pigmentation, which disappeared several months later. At least two children developed overgrown gums. The babies were also underweight. Kimbrough sug-

gested that more extensive study of reproductive effects in humans is needed. A number of Taiwanese were also poisoned in 1979 by rice oil that had been contaminated with PCB's. Shu-ying Tang, a physician and biochemist at National Taiwan University, reported that researchers in her group have correlated neurological damage with PCB exposure among the Taiwanese who consumed the oil. Other scientists also noted molecular changes in liver cells from patients who have been exposed to PCB's. It is unclear, they say, what these changes mean because the patients have not as yet shown any clinical symptoms of disease.

According to Martin Halper, chief of the exposure evaluation division at EPA, fires involving transformers and capacitors containing PCB's are "much more common than once thought." "It's no longer a one in a million chance. It's much more prevalent." By contacting fire departments, for example, EPA has discovered that "there have been a couple hundred fires involving transformers. Now the whole picture has changed."

Halper estimates that there are 20,000 to 30,000 transformers with PCB's. Whether other utility companies will follow the lead of those in California and Florida is unclear, but Halper speculates that the majority "will have to be forced to replace the old equipment."

—MARJORIE BUN