



## **METHYLMERCURY IN SPORT FISH: Information for Fish Consumers**

Methylmercury is a form of mercury that is found in most freshwater and saltwater fish. In some lakes, rivers, and coastal waters in California, methylmercury has been found in some types of fish at concentrations that may be harmful to human health. The Office of Environmental Health Hazard Assessment (OEHHA) has issued health advisories to fishers and their families giving recommendations on how much of the affected fish in these areas can be safely eaten. In these advisories, women of childbearing age and children are encouraged to be especially careful about following the advice because of the greater sensitivity of fetuses and children to methylmercury.

Fish are nutritious and should be a part of a healthy, balanced diet. As with many other kinds of food, however, it is prudent to consume fish in moderation. OEHHA provides advice to the public so that people can continue to eat fish without putting their health at risk.

### **WHERE DOES METHYLMERCURY IN FISH COME FROM?**

Methylmercury in fish comes from mercury in the aquatic environment. Mercury, a metal, is widely found in nature in rock and soil, and is washed into surface waters during storms. Mercury evaporates from rock, soil, and water into the air, and then falls back to the earth in rain, often far from where it started. Human activities redistribute mercury and can increase its concentration in the aquatic environment. The coastal mountains in northern California are naturally rich in mercury in the form of cinnabar ore, which was processed to produce quicksilver, a liquid form of inorganic mercury. This mercury was taken to the Sierra Nevada, Klamath mountains, and other regions, where it was used in gold mining. Historic mining operations and the remaining tailings from abandoned mercury and gold mines have contributed to the release of large amounts of mercury into California's surface waters. Mercury can also be released into the environment from industrial sources, including the burning of fossil fuels and solid wastes, and disposal of mercury-containing products.

Once mercury gets into water, much of it settles to the bottom where bacteria in the mud or sand convert it to the organic form of methylmercury. Fish absorb methylmercury when they eat smaller aquatic organisms. Larger and older fish absorb more methylmercury as they eat other fish. In this way, the amount of methylmercury builds up as it passes through the food chain. Fish eliminate methylmercury slowly, and so it builds up in fish in much greater concentrations than in the surrounding water. Methylmercury generally reaches the highest levels in predatory fish at the top of the aquatic food chain.

### **HOW MIGHT I BE EXPOSED TO METHYLMERCURY?**

---

---

Eating fish is the main way that people are exposed to methylmercury. Each person's exposure depends on the amount of methylmercury in the fish that they eat and how much and how often they eat fish.

Women can pass methylmercury to their babies during pregnancy, and this includes methylmercury that has built up in the mother's body even before pregnancy. For this reason, women of childbearing age are encouraged to be especially careful to follow consumption advice, even if they are not pregnant. In addition, nursing mothers can pass methylmercury to their child through breast milk.

You may be exposed to inorganic forms of mercury through dental amalgams (fillings) or accidental spills, such as from a broken thermometer. For most people, these sources of exposure to mercury are minor and of less concern than exposure to methylmercury in fish.

### **AT WHAT LOCATIONS IN CALIFORNIA HAVE ELEVATED LEVELS OF MERCURY BEEN FOUND IN FISH?**

---

---

Methylmercury is found in most fish, but some fish and some locations have higher amounts than others. Methylmercury is one of the chemicals in fish that most often creates a health concern. Consumption advisories due to high levels of methylmercury in fish have been issued in about 40 states. In California, methylmercury advisories have been issued for San Francisco Bay and the Delta; Tomales Bay in Marin County; and at the following inland lakes: Lake Nacimiento in San Luis Obispo County; Lake Pillsbury and Clear Lake in Lake County; Lake Berryessa in Napa County; Guadalupe Reservoir and associated reservoirs in Santa Clara County; Lake Herman in Solano County; San Pablo Reservoir in Contra Costa County; Black Butte Reservoir in Glenn and Tehama Counties;

Trinity Lake in Trinity County; and certain lakes and river stretches in the Sierra Nevada foothills in Nevada, Placer, and Yuba counties. Other locations may be added in the future as more fish and additional water bodies are tested.

## **HOW DOES METHYLMERCURY AFFECT HEALTH?**

---

Much of what we know about methylmercury toxicity in humans stems from several mass poisoning events that occurred in Japan during the 1950s and 1960s, and Iraq during the 1970s. In Japan, a chemical factory discharged vast quantities of mercury into several bays near fishing villages. Many people who consumed large amounts of fish from these bays became seriously ill or died over a period of several years. In Iraq, thousands of people were poisoned by eating contaminated bread that was mistakenly made from seed grain treated with methylmercury.

From studying these cases, researchers have determined that the main target of methylmercury toxicity is the central nervous system. At the highest exposure levels experienced in these poisonings, methylmercury toxicity symptoms included such nervous system effects as loss of coordination, blurred vision or blindness, and hearing and speech impairment. Scientists also discovered that the developing nervous systems of fetuses are particularly sensitive to the toxic effects of methylmercury. In the Japanese outbreak, for example, some fetuses developed methylmercury toxicity during pregnancy even when their mothers did not. Symptoms reported in the Japan and Iraq epidemics resulted from methylmercury levels that were much higher than what fish consumers in the U.S. would experience.

Individual cases of adverse health effects from heavy consumption of commercial fish containing moderate to high levels of methylmercury have been reported only rarely. Nervous system symptoms reported in these instances included headaches, fatigue, blurred vision, tremor, and/or some loss of concentration, coordination, or memory. However, because there was no clear link between the severity of symptoms and the amount of mercury to which the person was exposed, it is not possible to say with certainty that these effects were a consequence of methylmercury exposure and not the result of other health problems. The most subtle symptoms in adults known to be clearly associated with methylmercury toxicity are numbness or tingling in the hands and feet or around the mouth.

In recent studies of high fish-eating populations in different parts of the world, researchers have been able to detect more subtle effects of methylmercury toxicity in children whose mothers frequently ate seafood containing low to moderate mercury concentrations during their pregnancy. Several studies found slight

decreases in learning ability, language skills, attention and/or memory in some of these children. These effects were not obvious without using very specialized and sensitive tests. Children may have increased susceptibility to the effects of methylmercury through adolescence, as the nervous system continues to develop during this time.

Methylmercury builds up in the body if exposure continues to occur over time. Exposure to relatively high doses of methylmercury for a long period of time may also cause problems in other organs such as the kidneys and heart.

### **CAN MERCURY POISONING OCCUR FROM EATING SPORT FISH IN CALIFORNIA?**

---

---

No case of mercury poisoning has been reported from eating California sport fish. The levels of mercury in California fish are much lower than those that occurred during the Japanese outbreak. Therefore, overt poisoning resulting from sport fish consumption in California would not be expected. At the levels of mercury found in California fish, symptoms associated with methylmercury are unlikely unless someone eats much more than what is recommended or is particularly sensitive. The fish consumption guidelines are designed to protect against subtle effects that would be difficult to detect but could still occur following unrestricted consumption of California sport fish. This is especially true in the case of fetuses and children.

### **IS THERE A WAY TO REDUCE METHYLMERCURY IN FISH TO MAKE THEM SAFER TO EAT?**

---

---

There is no specific method of cleaning or cooking fish that will significantly reduce the amount of methylmercury in the fish. However, fish should be cleaned and gutted before cooking because some mercury may be present in the liver and other organs of the fish. These organs should not be eaten.

In the case of methylmercury, fish size is important because large fish that prey upon smaller fish can accumulate more of the chemical in their bodies. It is better to eat the smaller fish within the same species, provided that they are legal size.

### **IS THERE A MEDICAL TEST TO DETERMINE EXPOSURE TO METHYLMERCURY?**

---

---

Mercury in blood and hair can be measured to assess methylmercury exposure. However, this is not routinely done. Special techniques in sample collection, preparation, and analysis are required for these tests to be accurate. Although

tests using hair are less invasive, they are also less accurate. It is important to consult with a physician before undertaking medical testing because these tests alone cannot determine the cause of personal symptoms.

### **HOW CAN I REDUCE THE AMOUNT OF METHYLMERCURY IN MY BODY?**

---

---

Methylmercury is eliminated from the body over time provided that the amount of mercury taken in is reduced. Therefore, following the OEHHA consumption advice and eating less of the fish that have higher levels of mercury can reduce your exposure and help to decrease the levels of methylmercury already in your body if you have not followed these recommendations in the past.

### **WHAT IF I EAT FISH FROM OTHER SOURCES SUCH AS RESTAURANTS, STORES, OR OTHER WATER BODIES THAT MAY NOT HAVE AN ADVISORY?**

---

---

Most commercial fish have relatively low amounts of methylmercury and can be eaten safely in moderate amounts. However, several types of fish such as large, predatory, long-lived fish have high levels of methylmercury, and could cause overly high exposure to methylmercury if eaten often. The U.S. Food and Drug Administration (FDA) is responsible for the safety of commercial seafood. FDA advises that women who are pregnant or could become pregnant, nursing mothers, and young children not eat shark, swordfish, king mackerel, or tilefish.

FDA also advises that women of childbearing age and pregnant women may eat an average of 12 ounces of fish purchased in stores and restaurants each week. However, if 12 ounces of cooked fish from a store or restaurant are eaten in a given week, then fish caught by family or friends should not be eaten the same week. This is important to keep the total level of methylmercury contributed by all fish at a low level in the body. The FDA advice can be found at <http://www.cfsan.fda.gov/~dms/admehg.html>.

The United States Environmental Protection Agency (U.S. EPA) has issued the following advice for women and children who eat fish that are caught in freshwater bodies anywhere in the U.S. This advice should be followed for water bodies where OEHHA has not already issued more restrictive guidelines.

"If you are pregnant or could become pregnant, are nursing a baby, or if you are feeding a young child, limit consumption of freshwater fish caught by family and friends to one meal per week. For adults, one meal is six ounces of cooked

fish or eight ounces uncooked fish; for a young child, one meal is two ounces cooked fish or three ounces uncooked fish."

For more information on the nationwide advice, check the U.S. EPA Web Site at <http://www.epa.gov/ost/fishadvice/advice.html>.

In addition, OEHHA offers the following general advice that can be followed to reduce exposure to methylmercury in fish. Chemical levels can vary from place to place. Therefore, your overall exposure to chemicals is likely to be lower if you fish at a variety of places, rather than at one location that might have high contamination levels. Furthermore, some fish species have higher chemical levels than others in the same location. If possible, eat smaller amounts of several different types of fish rather than a large amount of one type that may be high in contaminants. Smaller fish of a species will usually have lower chemical levels than larger fish in the same location because some of the chemicals may become more concentrated in larger, older fish. It is advisable to eat smaller fish (of legal size) more often than larger fish. Cleaning and cooking fish in a manner that removes fat and organs is an effective way to reduce other contaminants that may be present in fish.

### **WHERE CAN I GET MORE INFORMATION?**

---

---

The health advisories for sport fish are printed in the California Sport Fishing Regulations booklet, which is available wherever fishing licenses are sold. OEHHA also offers a booklet containing the advisories, and additional materials such as this fact sheet on related topics. For more information on fish contamination in California, contact:

Office of Environmental Health Hazard Assessment (OEHHA)  
Pesticide and Environmental Toxicology Section (PETS)

1515 Clay St., 16th Floor  
Oakland, California 94612  
(510) 622-3170  
FAX (510) 622-3218

P.O. Box 4010  
Sacramento, California 95812-4010  
(916) 327-7319  
FAX (916) 327-7320

Additional information and documents related to fish advisories are available on the OEHHA Web Site at <http://www.oehha.ca.gov/fish.html>. County departments of environmental health may have more information on specific fishing areas.