CURRENT CLINICAL ISSUES
Balancing the Risks and Benefits of Fish Consumption

Annals of Internal Medicine
December 21, 2004, Volume 141, Issue 12, Pages 977-980

Jennifer Fisher Wilson

THIS AUTHOR NOTES:

"Most Americans know that eating fish is good for their health."

"Studies from the past 2 decades have repeatedly linked the consumption of fish—especially fish that is high in n-3 fatty acids—with healthier hearts in the aging population."

"Scientists have also found associations between fish consumption and a reduced risk for stroke, dementia, asthma, kidney disease, and diabetes."

However, "studies have linked over consumption of certain fish (particularly popular ones such as swordfish, tuna steaks, Chilean sea bass, and some kinds of salmon) to neurologic deficits, cancer, autoimmune and endocrine disorders, and even some heart disorders. The risks stem mainly from 2 toxins: mercury, which accumulates over the lifetime of larger, longer-living fish, and polychlorinated biphenyls (PCBs), which are found in fish living in polluted waters and in some farmed fish." **[VERY IMPORTANT]**

The federal government "has recommended that people eat salmon because it is high in n-3 fatty acids without mentioning that farmed salmon commonly contains high levels of PCBs." **[VERY IMPORTANT]**

Grocery stores do not label fish that are likely to have a high content of toxins.

Safe consumable seafood include flounder, rainbow trout, sole, anchovies, clams and shrimp.

"Much of the research on risks from fish has focused on mercury, a substance long known to be harmful to humans."

"Exposure to one form of mercury, methylmercury (the organic form of mercury that is found naturally in the environment and is released mainly through industrial practices, including the burning of fossil fuels and solid wastes), comes almost solely from eating fish."

"Methylmercury reaches its highest levels in large, predatory species, such as shark, tilefish, and tuna, and in bottom-feeders, such as crab."

"Two other forms of mercury—inorganic and elemental—pose a danger to humans when inhaled rather than ingested; exposure is usually occupational, such as from mining and processing mercury ores or from work with scientific instruments, batteries, and fungicides."

Many Americans have dangerous levels of methylmercury in their bodies, including 5% - 8% of American women of childbearing age.

Methylmercury levels higher than 5 μg/L in blood or higher than 1 μg/g in hair are hazardous to a developing fetus, according to U.S. Environmental Protection Agency (EPA) and National Academy of Sciences.

"The U.S. Food and Drug Administration (FDA) recommends that a 120-pound person consume no more than 38.5 μg of mercury per week." Six (6) ounces of swordfish can contain more than 200 μg of mercury.

Eating a pound of swordfish every week for some months can raise levels of mercury to 50 micrograms per liter blood.

In adults, methylmercury poisoning causes tremor, difficulty with concentration, vision deficits, and numbness and tingling.

"Methylmercury is absorbed from the gastrointestinal tract and binds readily with proteins; the highest levels in the body are found in the kidneys."

Methylmercury crosses the blood–brain barrier, affecting the brain.

"Children born to women exposed to high levels of methylmercury during or before pregnancy may face numerous health problems, including brain damage, mental retardation, blindness, and seizures."

"Lower levels of methylmercury exposure in the womb have caused subtle but irreversible deficits in learning ability."

"Methylmercury exposure in the womb may also alter male reproductive organs and increase risk for cancer."

A "patient who ate a tuna steak almost every night for dinner. After having trouble concentrating, feeling sluggish, and experiencing hand tremors, he saw 5 doctors who ruled out cancer, chronic fatigue syndrome, lupus, Parkinson disease, and multiple sclerosis. Some suggested that the problems might be psychological. Finally, after hearing about Hightower's study, the patient scheduled a visit with her and received testing for mercury poisoning. Laboratory tests showed high levels of mercury, and Hightower recommended that the patient change his diet. After a few months, the symptoms receded."

"For patients who frequently consume high-risk fish and who want to know their mercury exposure, Hightower and Goldman recommended ordering a blood and urine test for mercury, which costs less than $20. (Measuring mercury in hair or nail samples is another way to test for mercury poisoning, but experts said that the findings can be less accurate and harder to interpret.)"

"If the blood test shows elevated mercury levels but the urine test does not, then organic mercury from fish consumption is probably the source. The methylmercury in fish is mostly excreted in feces, not urine. When both the blood and urine test results are positive for mercury poisoning, the diagnosis is probably inorganic mercury exposure, usually from job exposure."

Dental fillings contain inorganic mercury, which is dangerous only when inhaled, not when swallowed. [Sadly, other studies show that vapors from dental inorganic mercury are released and inhaled when chewing.] "The difference between the exposure from inorganic mercury in dental fillings rather than from organic mercury in fish should be clear from laboratory tests."

The body will excrete low-level mercury exposures on its own, over a few months.

"Physicians treating patients with high levels of mercury might appropriately prescribe chelation therapy to enhance excretion of mercury from the blood and to avoid distribution of mercury in the body."

"The FDA provides the following advice about eating fish: Do not eat shark, swordfish, king mackerel, or tilefish because they contain high levels of mercury."

The 5 most commonly eaten fish that are low in mercury are shrimp, canned light tuna, salmon, pollock, and catfish.

"Like mercury, PCBs are also dangerous to adults as well as unborn and very young children."

"Fish are the main sources of concentrated PCB exposure. The highest dietary levels of PCBs are found in farmed salmon." **[IMPORTANT]**

"Flame retardants, electrical equipment, pesticides, paints, varnishes, and inks were made with PCBs until the manufacture of the organochlorine compounds was banned in 1979. Materials containing PCBs that were in service at the time of the ban, however, were not removed from use, and some are still used today. In addition, although the ban led to a dramatic drop in levels of PCBs in the environment, they persist as a common pollutant because of their low solubility in water and low volatility."

PCBs affect the central nervous system, and elevated levels of PCBs from eating fish causes significantly poorer performance on measures of memory and learning compared with controls.

PCB exposure is also associated with liver and breast cancer, neurologic and endocrine problems, and possibly even increased risk for heart disease.

“In children, PCB exposure in utero and from breast milk consumption has been linked with neurodevelopmental delays, impaired cognition, immune problems, and alterations in male reproductive organs.”

Testing PCB levels costs more than $1000.

“Because of PCBs, people are advised not to eat white bass, carp, or sturgeon caught in Wisconsin's Green Bay, for instance, or largemouth bass caught in various Florida waterways, or any fish at all caught in New York's Nassau Lake.”

“Generally, freshwater fish that live in inland lakes, such as bluefish, lake trout, and smelt, are more likely to be contaminated.”

“Commercially farmed fish are now receiving a lot of attention as a source of PCBs.”

The highest levels of dietary PCBs occurred in farmed salmon sold in the United States and Canada.

“Any more than a single 8-ounce portion of farmed salmon a month posed an ‘unacceptable cancer risk’ to consumers.”

“More than 90% of the salmon consumed in the United States is farm-raised; it is available year-round and is less costly than wild salmon.”

“As with mercury, the only treatment for PCB poisoning is removal of the source. However, it is almost impossible to completely eliminate exposure since PCBs occur in many foods besides fish.”

“Lean ocean fish such as cod, flounder, and haddock are the least likely to be contaminated with PCBs.”

“Passage out of the human body takes 3 months to a year for mercury and up to 8 years for PCBs,” but the contaminants have a different half-life in different organs.

These contaminants linger longer in the brain and kidneys than in the blood.

“There's absolutely no question that omega-3 fatty acids are very important in the prevention of sudden cardiac deaths.”

"Experts expect that mercury and PCBs will persist in fish for at least the next 50 years."

"While levels of PCBs have fallen in recent years, levels of mercury in fish continue to increase at a rate of 4.8% per year."

"Nutritional supplements containing n-3 fatty acids are also an option."

Omega-3 supplements can be purified to remove any mercury or other toxins.

People with coronary artery disease might consider taking purified n-3 fatty acid supplements as an alternative to eating lots of fish.

"Most physicians advise about 3 g per day, Carpenter said."

KEY POINTS FROM DAN MURPHY:

1) Omega-3 fatty acids from fish reduce hearts disease, risk for stroke, dementia, asthma, kidney disease, diabetes, and are very important in the prevention of sudden cardiac deaths.

2) However, large fish contain mercury and polychlorinated biphenyls (PCBs), which cause neurologic deficits, cancer, autoimmune and endocrine disorders, and heart disorders.

3) Humans can excrete 38.5 µg of mercury per week, but 6 ounces of swordfish can contain more than 200 µg of mercury.

4) Methylmercury poisoning from excess fish consumption causes tremor, difficulty with concentration, vision deficits, and numbness and tingling.

5) Children born to women exposed to high levels of methylmercury during or before pregnancy may face numerous health problems, including brain damage, mental retardation, blindness, and seizures.

6) Lower levels of methylmercury exposure in the womb can cause subtle but irreversible deficits in learning ability.

7) Dental fillings contain inorganic mercury, which is dangerous only when inhaled, not when swallowed [but vapors from dental inorganic mercury are released and inhaled when chewing.]

8) The highest dietary levels of PCBs are found in farmed salmon.

9) PCBs significantly impair memory and learning, and are associated with liver and breast cancer, neurologic and endocrine problems, and increased heart disease.

10) PCB exposure in utero and from breast milk consumption is linked with neurodevelopmental delays, impaired cognition, immune problems, and alterations in male reproductive organs.

11) More than 8-ounces of farmed salmon a month is an unacceptable cancer risk.

12) More than 90% of the salmon consumed in the United States is farm-raised.

13) It takes 3 months for our bodies to eliminate mercury, and 8 years to eliminate PCBs.

14) Levels of mercury in fish continue to increase at a rate of 4.8% per year.

15) Omega-3 supplements can be purified to remove any mercury or other toxins.

16) The recommended dose of fish oil supplementation is 3 g per day.