Fish

PHYSICIANS COMMITTEE FOR RESPONSIBLE MEDICINE

5100 WISCONSIN AVE., N.W., SUITE 400 • WASHINGTON, DC 20016
PHONE (202) 686-2210 • FAX (202) 686-2216 • PCRM@PCRM.ORG • WWW.PCRM.ORG

Fish, a leading source of heavy metals and other contaminants, is frequently the subject of government health-risk advisories. However, some people promote the consumption of fish as the best way to incorporate omega-3 fatty acids in the diet. Let's look at the issues.

Toxins

Experts agree that fish are the unfortunate harbingers of our polluted waters. Mercury, a toxic heavy metal, is probably the most referenced precaution related to fish consumption. According to a 2013 report by the United Nations, mercury emissions are rising all around the world, making this a global health problem.[1] Even global warming gets some of the blame with warmer temperatures leading to higher mercury levels in fish[2]—a crisis with no foreseeable reversal. Thus, fish consumption is becoming increasingly risky; a recent study found that as much as 84 percent of the world's fish contains unsafe levels of mercury.[3]

Mercury exposure has been linked to increased risk for diseases such as cancer and diabetes as well as to acute and chronic effects on the cardiovascular and central nervous systems. Exposure is an even greater concern for pregnant women, as mercury can cross the placenta and accumulate in fetal tissues, hindering fetal brain development.[4]

The link between mercury contamination and diabetes has become more defined through recent studies. An 18-year study published by the American Diabetes Association in 2013 found that those with the highest levels of mercury exposure had a 65 percent increased risk for developing diabetes, compared with those with the lowest levels of mercury exposure.[5]

Because mercury accumulates in our tissues, including the heart tissue, consumption of this neurotoxin increases the risk for high blood pressure, irregular and increased heart rate, and death from cardiovascular disease.[6]

While the consumption of fish and omega-3 fatty acids, including docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), has been associated with decreased risk of heart attack in individuals consuming a Western-style diet,[7,8] recent studies have shown that mercury exposure may produce the opposite effect. In one study, mercury levels were 15 percent higher among those patients who had suffered a first heart attack,[9] and a second study showed increased risk of cardiovascular mortality with increasing mercury exposure.[10] In 2005, researchers in Finland found that a high content of mercury in hair may be a risk factor for acute coronary events, coronary heart disease, and all-cause mortality in middle-aged men. In the same study it was discovered that mercury contamination from fish consumption effectively negates the positive effects of omega-3 fatty acids on heart health.[11]

There are numerous pollutants that accumulate in fish and shellfish. Polychlorinated biphenyls (PCBs), dioxin, chlordane, DDT, and mercury accounted for 98 percent of all fish advisories issued in 2010.[12]

These pollutants accumulate in our systems over a lifetime and can lead to problems including impaired neurological development, liver damage, and disruption of immune function. Many of these chemicals are especially problematic because they are not readily cleared from the body. Thus, even if exposure is limited to a discrete period of time, the potential risks persist.

Health Myths

Fish consumption is often touted for its possible benefits relating to heart disease because of the omega-3 fatty acids found in fish. However, we know that animal products are the main source of saturated fat and the only source of cholesterol in the diet. Although some of the fat in fish is in the omega-3 form, much of the remaining fat is saturated. Chinook salmon, for example, derives 52 percent of its calories from fat, and swordfish derives 30 percent. About one-quarter of the fat in both types of fish is saturated. Fish and shellfish are also significant sources of cholesterol. Three ounces of shrimp have 166 milligrams of cholesterol, while the same amount of bass has about 80 milligrams; in comparison, a 3-ounce steak has about 80 milligrams.[13]

High levels of toxins, fat, and cholesterol along with a lack of fiber make fish a poor dietary choice. However, fish oils, especially taken as a supplement, have been popularized as a panacea against everything from heart problems to arthritis. Though ingesting fish oil in supplement form eliminates some of the health concerns associated with eating fish, current research tends to disprove the claims of its benefits.

According to a review in *JAMA*, which compiled data from 20 studies, the use of omega-3 supplements over a two-year period had no effect on heart-related death, heart attack, or stroke.[14] Moreover, fish oil supplements were found to be ineffective as a measure for preventing secondary cardiovascular disease in a meta-analysis pulling data from 14 studies.[15]

012214

Fish oil supplements have also been hyped for brain health; however, according to a 2012 study, no link was found between supplementation and prevention of Alzheimer's disease.[16] For patients already diagnosed with Alzheimer's disease, supplementation did not slow mental decline.[17]

In a 2013 study published by the National Cancer Institute, researchers found that men with higher levels of omega-3 fatty acids, which are commonly found in fish oil pills, had a higher likelihood of developing prostate cancer and also of developing a higher-grade form of the disease.[18]

There has been some debate over whether or not fish oil supplements are helpful in pregnancy. A 2010 study published in *JAMA* showed that fish oil supplementation does not help to decrease postpartum depression or to increase cognitive function of the baby.[19] Although the omega-3 fatty acid DHA is a key structural component in the development of the brain and eyes, a meta-analyses found that adding long chain polyunsaturated fatty acids (EPA/DHA) to baby formula did not affect the physical, visual, or neurodevelopmental outcomes of infants born at term.[20]

Health Facts

It is already proven that plant-based diets help prevent, and even reverse, heart disease. Additionally, fiber helps reduce cholesterol levels, and fish contain no fiber. When individuals switch to a high-fiber, low-fat diet, their serum cholesterol levels often drop dramatically.

Instead of resorting to fish oil as a source of omega-3s, these fatty acids can be found in a more stable form, alpha-linolenic acid (ALA), in vegetables, fruits, nuts, seeds, and beans. ALA is actually the only essential omega-3 fatty acid and is concentrated in flaxseeds and flaxseed oil and also found in soybeans, walnuts, and wheat germ. The body naturally converts ALA to the longer chain omega-3 fatty acids EPA and DHA. Studies have shown that the conversion rate of ALA to EPA and DHA is sufficient for obtaining proper amounts of these longer chain fatty acids. In fact, results from the European Prospective Investigation into Cancer and Nutrition (EPIC) trials suggest women on vegan diets have more omega-3s in their blood compared with fish-eaters, meat-eaters, and lacto-ovo vegetarians. Thus, for those who do not consume fish, the conversion rate of ALA to EPA and DHA may increase naturally, to allow for the adequate supply of these fatty acids.[21]

Conclusion

Given the clear evidence that fish are commonly contaminated with toxins that have well-known and irreversible damaging effects on children and adults, the consumption of fish should not be encouraged. The risks are significant, especially for infants and women of childbearing age. The wide range of other risks associated with the consumption of fish and shellfish due to their levels of animal protein, saturated fat, and cholesterol are also considerable. Other, more healthful foods from plant sources offer the full range of essential nutrients without the toxins and other health risks associated with fish consumption.

References

1. UNEP, 2013. Global Mercury Assessment 2013: Sources, Emissions, Releases and Environmental Transport. UNEP Chemicals Branch, Geneva, Switzerland.
2. Dijkstra JA, Buckman KL, Ward D, et al. Experimental and natural warming elevates mercury concentrations in estuarine fish. *PLoS ONE.* 8:e58401.
3. Biodiversity Research Institute and IPEN. Global Mercury Hotspots: New Evidence Reveals Mercury Contamination Regularly Exceeds Health Advisory Levels in Humans and Fish Worldwide. January 9, 2013. Available at: http://www.briloon.org/research/research-centers/hgcenter/hgcenter-pub/gmh-media-library. Accessed October 29, 2013.
4. Gundacker C, Hengstschlager M. The role of the placenta in fetal exposure to heavy metals. *Wien Med Wochenschr*. 2012;162:201-206.
5. He K, Xun P, Liu K, Morris S, Reis J, Guallar E. Mercury exposure in young adulthood and incidence of diabetes later in life: the CARDIA trace element study. *Diabetes Care.* 2013;36:1584-1589.
6. Committee on the Toxicological Effects of Methylmercury, National Research Council. Toxicological effects of methylmercury. Washington, DC: National Academy Press; 2000.
7. Hu FGB, Bronner L, Willett WC, et al. Fish and omega-3a fatty acid intake and risk of coronary heart disease in women. *JAMA*. 2002;287:1815-1821.
8. Siscovick DS, Raghunathan TE, King I, et al. Dietary intake of long-chain n-3 polyunsaturated fatty acids and the risk of primary cardiac arrest. *Am J Clin Nutr.* 2000;71:208S-212S
9. Guallar E, Sanz-Gallardo MI, van't Veer P, et al; Heavy Metals and Myocardial Infarction Study Group. Mercury, fish oils, and the risk of myocardial infarction. *N Engl J Med.* 2002;347:1747-1754.
10. Salonen JT, Seppanen K, Nyyssonen K, et al. Intake of mercury from fish, lipid peroxidation, and the risk of myocardial infarction and coronary, cardiovascular, and any death in eastern Finnish men. *Circulation.* 1995;91:645-655.
11. Virtanen JK, Voutilainen S, Rissanen TH, et al. Mercury, fish oils, and risk ofacute coronary events and cardiovascular disease, coronary heart disease, andall-cause mortality in men in eastern Finland. *Arterioscler Thromb Vasc Biol.* 2005;25:228-233.
12. United States Environmental Protection Agency. National Listing of Fish Advisories: Technical Fact Sheet 2010. http://water.epa.gov/scitech/swguidance/fishshellfish/fishadvisories/technical_factsheet_2010.cfm. Accessed October 15, 2013.
13. Pennington JAT, Douglass JS. Bowes and Church's food values of portions commonly used. 18th ed. Baltimore, Md.: Lippincott Williams & Wilkins; 2005.
14. Rizos EC, Ntzani EE, Bika E, Kostapanos MS, Elisaf MS. Association between omega-3 fatty acid supplementation and risk of major cardiovascular disease events: a systematic review and meta-analysis. *JAMA*. 2012;308:1024-1033.
15. Kwak SM, Myung SK, Lee YJ. Efficacy of omega-3 fatty acid supplements (eicosapentaenoic acid and docosahexaenoic acid) in the secondary prevention of cardiovascular disease: a meta-analysis of randomized, double-blind, placebo-controlled trials. *Arch Intern Med.* 2012;172:986-994.
16. Dangour AD, Allen E, Elbourne D, et al. Effect of 2-y n23 long-chain polyunsaturated fatty acid supplementation on cognitive function in older people: a randomized, double-blind, controlled trial. *Am J Clin Nutr.* 2010; 9:1725-1732.
17. Quinn JF, Rama R, Thomas RG, et al. Docosahexaenoic acid supplementation and cognitive decline in Alzheimer disease. *JAMA*. 2010;304:1903-1911.
18. Brasky TM, Darke AK, Song X, et al. Plasma phospholipid fatty acids and prostate cancer risk in the SELECT Trial. *J Natl Cancer Inst.* 2013;105:1132-1141.
19. Makrides M, Gibson RA, McPhee AJ, et al. Effect of DHA supplementation during pregnancy on maternal depression and neurodevelopment of young children. *JAMA.* 2010;304:1675-1683.
20. Simmer K, Patole SK, Rao SC. Long-chain polyunsaturated fatty acid supplementation in infants born at term. *Cochrane Database Syst Rev.* 2011;12:CD000376.
21. Welch AA, Shakya-Shrestha S, Lentjes MA, Wareham NJ, Khaw KT. Dietary intake and status of n-3 polyunsaturated fatty acids in a population of fish-eating and non-fish-eating meat-eaters, vegetarians, and vegans and the product-precursor ratio [corrected] of α-linolenic acid to long-chain n-3 polyunsaturated fatty acids: results from the EPIC-Norfolk cohort. *Am J Clin Nutr.* 2010;92:1040-1051.