Mercury in the Ocean

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Abstract

Mercury is a major issue that should not be taken lightly. Mercury poisoning in humans includes serious physical and mental symptoms ranging from gum disease to nerve loss in the hands and face. Mercury poisoning comes from natural sources such as volcanoes but the reason it is such a problem now is because humans are contributing a lot of mercury to the environment. Over the past 150 years, humans have doubled the amount of mercury in the atmosphere which eventually gets deposited into our oceans when it rains. Mercury is not a problem alone, though, only methylmercury, which is the highly toxic form, poses health risks to humans and animals. The mercury conversion process happens when microbes in the ocean convert mercury to methylmercury. This toxic form of mercury gets passed up the food chain where it can be found in high amounts in large fish that are popular to eat, such as tuna.

How Mercury Gets into Fish

Mercury wouldn't pose such a health risk to humans if it weren't converted to methylmercury. The conversion process starts in bacteria living in seafloor sediments. Here, microbes use anaerobic respiration because there isn't enough oxygen in the sediment. Instead of relying on oxygen, microbes use sulfide for respiration and excrete sulfide into the water as a waste product. If the seawater within the sediment contains mercury, the fish will produce methylmercury. Methylmercury is the organic form that is highly toxic to the nervous system. Most forms of mercury can’t pass through a cell membrane but sulfide helps mercury get into cells. When positively charged mercury ions (Hg²⁺) meet negatively charged sulfide, the two bond. This forms the compound mercury sulfide (HgS) which can pass into microbial cells. Once inside the cells, mercury gets methylated and the cells release methylmercury into the open water where it is ingested by plankton. From there it gets passed up the food chain where it can ultimately be found at the top in the highest concentrations (Winner, 2010).

Where Mercury Comes From

Mercury is highly toxic to the nervous system. When ingested by humans and animals it can cause serious harm (saas.gov, 5/9/2019). Symptoms of mercury poisoning in humans include anxiety, depression, irritability, memory problems, numbness, pathologic dysphoria and tremors. Advanced mercury poisoning in adults can result in hearing and speech difficulties, lack of coordination, muscle weakness, nerve loss in the hands and face, trouble walking and vision changes (Healthline.com, 12/13/18). In infants and children, symptoms can be much worse depending on how much mercury is consumed. Symptoms include late development in walking and talking and decreased performance on neurological tests. Once inside the cells, mercury gets methylated and the cells release methylmercury into the open water where it is ingested by plankton. From there it gets passed up the food chain where it can ultimately be found at the top in the highest concentrations (Winner, 2010).

Mercury in the World's Oceans

The biggest source of mercury pollution is the burning of fossil fuels, which releases 160 tons of mercury into the air in the United States alone. From there, rainfall washes the mercury into the ocean (Winner, 2010). Oceans contain about 60,000,000,000 tons of mercury pollution. Shallow ocean waters have tripled in mercury concentration since the industrial revolution and total mercury in the ocean has increased by 30% since pre industrial times (Targeted News Service, 2018). It is likely that fish contain three times more mercury than 150 years ago (www.wdfWy.gov, 8/9/14). Large fish contain more mercury than smaller fish because they live longer in the ocean and have more time to accumulate high levels of mercury in their bodies (Stibich, 5/4/19).

Avoiding Mercury Poisoning and Hope for a Less Contaminated Future

Eating large amounts of seafood over a long period of time increases the risk of mercury poisoning. The Food and Drug Administration recommends that women who are pregnant or nursing, women who may become pregnant, and young children completely avoid eating shark, swordfish, large mackerel, and tilefish. It is recommended to eat no more than 6 ounces per week of white albacore tuna and to eat no more than 12 ounces per week of any other fish or shellfish to reduce the risk of mercury poisoning (www.cdc.gov, 2004).

On a lighter note, in areas where efforts have been made to cut down on mercury emissions, the amounts of mercury in the water have gone way down. Also the move to use “clean” coal is helping to reduce the amount of mercury going into the ocean. Clean coal has a low sulfur content and getting rid of the sulfur in turn gets rid of most of the mercury (Winner, 2010). Hopefully the future will see mercury emissions go down so we don’t have to worry about being poisoned by the fish we like to eat.

Illustrations Cited


Hawaiian Health. "How Does Toxic Mercury Get into Fish?"

www.StarKist.com, 9/22/17. It is recommended to eat no more than 6 ounces of white albacore tuna per week (Johnson, 2004).

Works Cited


In 1971, a chemical plant dumped methylmercury into the water supply of a village in Minamata Bay, Japan. This picture depicts a resident of the village, Tomoko, born blind, deaf and with deformed limbs being bathed by her mother (www.oceangoer.com, 10/19/08).