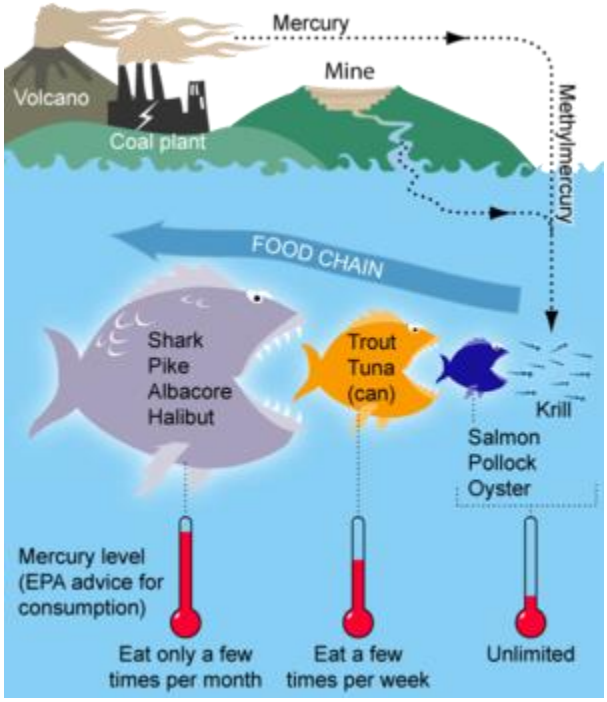
Mercury in fish

From Wikipedia, the free encyclopedia



Fish and shellfish concentrate mercury in their bodies, often in the form of methylmercury, a highly toxic organic compound of mercury. Fish products have been shown to contain varying amounts of heavy metals, particularly mercury and fat-soluble pollutants from water pollution. Species of fish that are long-lived and high on the food chain, such as marlin, tuna, shark, swordfish, king mackerel, tilefish, northern pike, and lake trout contain higher concentrations of mercury than others.[1]

The presence of mercury in fish can be a health issue, particularly for women who are or may become pregnant, nursing mothers, and young children.

Contents

[hide]

[edit] Biomagnification

Main article: Biomagnification

Mercury and methylmercury is present in only very small concentrations in seawater. However, it is absorbed, usually as methylmercury, by algae at the start of the food chain. This algae is then eaten by fish and other organisms higher in the food chain. Fish efficiently absorb methylmercury, but only very slowly excrete it.[2] Methylmercury is not soluble and therefore is not apt to be excreted. Instead, it accumulates, primarily in the viscera although also in the muscle tissue.[3] This results in the bioaccumulation of mercury, in a buildup in the adipose tissue of successive trophic levels: zooplankton, small nekton, larger fish etc. The older such fish become, the more mercury they may have absorbed. Anything which eats these fish within the food chain also consumes the higher level of mercury the fish have accumulated. This process explains why predatory fish such as swordfish and sharks or birds like osprey and eagles have higher concentrations of mercury in their tissue than could be accounted for by direct exposure alone. Species on the food chain can amass body concentrations of mercury up to ten times higher than the species they consume. This process is called biomagnification. For example, herring contains mercury levels at about 0.01 ppm while shark contains mercury levels greater than 1 ppm.[4]

[edit] Levels of contamination

[hide]Mercury levels in commercial fish and shellfish

Species	Mean (ppm)[1]	Std dev (ppm)[1]	Median (ppm)[1]		Trophic level[5]	Max age (years)[5]
Tilefish	1.450	n/a	n/a	Gulf of Mexico	3.6	35
Swordfish	0.995	0.539	0.870		4.5	15
Shark	0.979	0.626	0.811			
Mackerel (king)	0.730	n/a	n/a		4.5	14
Tuna (bigeye)	0.689	0.341	0.560	Fresh/frozen	4.5	11
Orange roughy	0.571	0.183	0.562		4.3	149
Marlin *	0.485	0.237	0.390		4.5	
Mackerel (Spanish)	0.454	n/a	n/a	Gulf of Mexico	4.5	5
Grouper	0.448	0.278	0.399	All species	4.2	
Tuna	0.391	0.266	0.340	All species, fresh/frozen		
Bluefish	0.368	0.221	0.305		4.5	9
Sablefish	0.361	0.241	0.265		3.8	114
Tuna (albacore)	0.358	0.138	0.360	Fresh/frozen	4.3	9

[hide]Mercury levels in commercial fish and shellfish

Species	Mean (ppm)[1]	Std dev (ppm)[1]	Median (ppm)[1]		Trophic level[5]	Max age (years)[5]
Patagonian toothfish	0.354	0.299	0.303		4.0	50+[6]
Tuna (yellowfin)	0.354	.231	0.311	Fresh/frozen	4.3	9
Tuna (albacore)	0.350	0.128	0.338	Canned	4.3	9
Croaker white	0.287	0.069	0.280	Pacific	3.4	
Halibut	0.241	0.225	0.188		4.3	
Weakfish	0.235	0.216	0.157	Sea trout	3.8	17[7]
Scorpionfish	0.233	0.139	0.181			
Mackerel (Spanish)	0.182	n/a	n/a	South Atlantic	4.5	
Monkfish	0.181	0.075	0.139		4.5	25
Snapper[*disambiguation needed*]	0.166	0.244	0.113			
Bass	0.152	0.201	0.084	Striped, black and sea bass	3.9	
Perch	0.150	0.112	0.146	Freshwater	4.0	
Tilefish	0.144	0.122	0.099	Atlantic		
Tuna (skipjack)	0.144	0.119	0.150	Fresh/frozen	3.8	12
Buffalofish	0.137	0.094	0.120			
Skate	0.137	n/a	n/a			
Tuna	0.128	0.135	0.078	All species, canned, light		
Perch (ocean) *	0.121	0.125	0.102			
Cod	0.111	0.152	0.066		3.9	22
Carp	0.110	0.099	0.134			
Lobster (American)	0.107	0.076	0.086			
Sheephead (California)	0.093	0.059	0.088			
Lobster (spiny)	0.093	0.097	0.062			
Whitefish	0.089	0.084	0.067			
Mackerel (chub)	0.088	n/a	n/a	Pacific	3.1	
Herring	0.084	0.128	0.048		3.2	21
Jacksmelt	0.081	0.103	0.050		3.1	
Hake	0.079	0.064	0.067		4.0	
Trout	0.071	0.141	0.025	Freshwater		
Crab	0.065	0.096	0.050	Blue, king and snow crab		

[hide]Mercury levels in commercial fish and shellfish

Species	Mean (ppm)[1]	Std dev (ppm)[1]	Median (ppm)[1]		Trophic level[5]	Max age (years)[5]
Butterfish	0.058	n/a	n/a		3.5	
Flatfish *	0.056	0.045	0.050	Flounder, plaice and sole		
Haddock	0.055	0.033	0.049	Atlantic		
Whiting	0.051	0.030	0.052			
Mackerel (Atlantic)	0.050	n/a	n/a			
Croaker (Atlantic)	0.065	0.050	0.061			
Mullet	0.050	0.078	0.014			
Shad (American)	0.039	0.045	0.045			
Crawfish	0.035	0.033	0.012			
Pollock	0.031	0.089	0.003			
Catfish	0.025	0.057	0.005		3.9	24
Squid	0.023	0.022	0.016			
Salmon *	0.022	0.034	0.015	Fresh/frozen		
Anchovies	0.017	0.015	0.014		3.1	
Sardine	0.013	0.015	0.010		2.7	
Tilapia *	0.013	0.023	0.004			
Oyster	0.012	0.035	n/d			
Clam *	0.009	0.011	0.002			
Salmon *	0.008	0.017	n/d	Canned		
Scallop	0.003	0.007	n/d			
Shrimp *	0.001	0.013	0.009			6.5[8]

* indicates methylmercury only was analyzed (all other results are for total mercury)
n/a – data not available
n/d – below detection level (0.01ppm)

U.S. government scientists tested fish in 291 streams around the country for mercury contamination. They found mercury in every fish tested, according to the study by the U.S. Department of the Interior. They found mercury even in fish of isolated rural waterways. Twenty five percent of the fish tested had mercury levels above the safety levels determined by the U.S. Environmental Protection Agency for people who eat the fish regularly.[9]

[edit] Sources

See also: Mercury cycle

Much (an estimated 40%) of the mercury that eventually finds its way into fish originates with coal-burning power plants and chlorine production plants.[10] The largest source of mercury

contamination in the United States is coal-fueled power plant emissions.[9] Chlorine chemical plants use mercury to extract chlorine from salt, which in many parts of the world is discharged as mercury compounds in waste water, though this process has been replaced for the most part by the more economically viable membrane cell process, which does not use mercury. Coal contains mercury as a natural contaminant. When it is fired for electricity generation, the mercury is released as smoke into the atmosphere. Most of this mercury pollution can be eliminated if pollution-control devices are installed.[10]

[edit] Current advice

The complexities associated with mercury transport and environmental fate are described by USEPA in their 1997 Mercury Study Report to Congress.[11] Because methylmercury and high levels of elemental mercury can be particularly toxic to a fetus or young children, organizations such as the U.S. EPA and FDA recommend that women who are pregnant or plan to become pregnant within the next one or two years, as well as young children avoid eating more than 6 ounces (one average meal) of fish per week.[12]

In the United States, the FDA has an action level for methylmercury in commercial marine and freshwater fish that is 1.0 parts per million (ppm). In Canada, the limit for the total of mercury content is 0.5 ppm. The Got Mercury? website includes a calculator for determining mercury levels in fish.[13]

Species with characteristically low levels of mercury include shrimp, tilapia, salmon, pollock, and catfish (FDA March 2004). The FDA characterizes shrimp, catfish, pollock, salmon, sardines, and canned light tuna as low-mercury seafood, although recent tests have indicated that up to 6 percent of canned light tuna may contain high levels.[14] A study published in 2008 found that mercury distribution in tuna meat is inversely related to the lipid content, suggesting that the lipid concentration within edible tuna tissues has a diluting effect on mercury content.[15] These findings suggest that choosing to consume a type of tuna that has a higher natural fat content may help reduce the amount of mercury intake, compared to consuming tuna with a low fat content. Also, many of the fish chosen for sushi contain high levels of mercury.[16]

According to the US Food and Drug Administration (FDA), the risk from mercury by eating fish and shellfish shall not be a health concern for most people.[17] However, certain seafood might contain levels of mercury that may cause harm to an unborn baby (and especially its brain development and nervous system). In a young child, high levels of mercury can interfere with the development of the nervous system. The FDA provides three recommendations for young children, pregnant women, and women of child-bearing age:

1. Do not eat shark, swordfish, king mackerel, or tilefish because they might contain high levels of mercury.
2. Eat up to 12 ounces (2 average meals) a week of a variety of fish and shellfish that are lower in mercury. Five of the most commonly eaten fish and shellfish that are low in mercury are: shrimp, canned light tuna, salmon, pollock, and catfish. Another commonly eaten fish, albacore or big eye ("white") tuna depending on its origin might have more mercury than canned light tuna. So, when choosing your two meals of fish and shellfish,

it is recommended that you should not eat more than up to 6 ounces (one average meal) of albacore tuna per week.
3. Check local advisories about the safety of fish caught by family and friends in your local lakes, rivers, and coastal areas. If no advice is available, eat up to 6 ounces (one average meal) per week of fish you catch from local waters, but consume no other fish during that week.

[edit] Background

In the 1950s, inhabitants of the seaside town of Minamata, on Kyushu island in Japan, noticed strange behavior in animals. Cats would exhibit nervous tremors, dance and scream. Within a few years this was observed in other animals; birds would drop out of the sky. Symptoms were also observed in fish, an important component of the diet, especially for the poor. When human symptoms started to be noticed around 1956 an investigation began. Fishing was officially banned in 1957. It was found that the Chisso Corporation, a petrochemical company and maker of plastics such as vinyl chloride, had been discharging heavy metal waste into the sea. They used mercury compounds as catalysts in their syntheses. It is believed that about 5,000 people were killed and perhaps 50,000 have been to some extent poisoned by mercury. Mercury poisoning in Minamata, Japan, is now known as Minamata disease.

[edit] See also

- *Diagnosis Mercury: Money, Politics and Poison*
- Friend of the Sea
- Got Mercury?
- Mercury cycle
- Mercury in tuna
- Safe Harbor Certified Seafood
- Seafood Watch, sustainable consumer guide (USA)
- Sustainable seafood