Mercury (Hg)

What is mercury and where does it come from?

Mercury is a unique metal that is released into the environment from both natural sources and human-related processes. Mercury is unusual in that it is the only metal that is liquid at room temperature. However, it is much more commonly found as a solid or gas. Like other elements, mercury is not broken down; it can only change from once chemical state to another, and so it is extremely persistent in the environment. The toxicity of mercury depends on its chemical form, and we are usually most worried about a type of mercury called methylmercury. Methylmercury is the form of mercury that builds up in food chains and causes health effects in humans and wildlife.

Mercury is released into the air, water, and soil from natural sources and human-related processes. Natural deposits of mercury are found in a particular mineral deposit called cinnabar, and also in granite. Mercury is released from these mineral deposits through natural processes such as volcanic activity, undersea vents, and weathering of rocks. Approximately 2000 tonnes of mercury are released into the atmosphere each year from natural sources.

Human-related sources contribute 2900 tons of mercury to the atmosphere per year. The three main sectors that contribute to mercury emissions are electricity generation (coal-powered generators like the one pictured to the right), certain types of mining and smelting, and incineration. These three sectors account for approximately 70% of Canada's current total mercury emissions. Interestingly, the concentration of mercury in the air has increased three-fold since the onset of industrialization.

Photo credit: Bruno Rodrigues
http://www.flickr.com/photos/davipt/164341428/

Mercury in the Environment

Once mercury has been released to the air, it can be transported long distances around the world. Consequently, mercury is found not only near sources, such as power plants and volcanoes, air and onto the landscape in rain, snow, and dust.

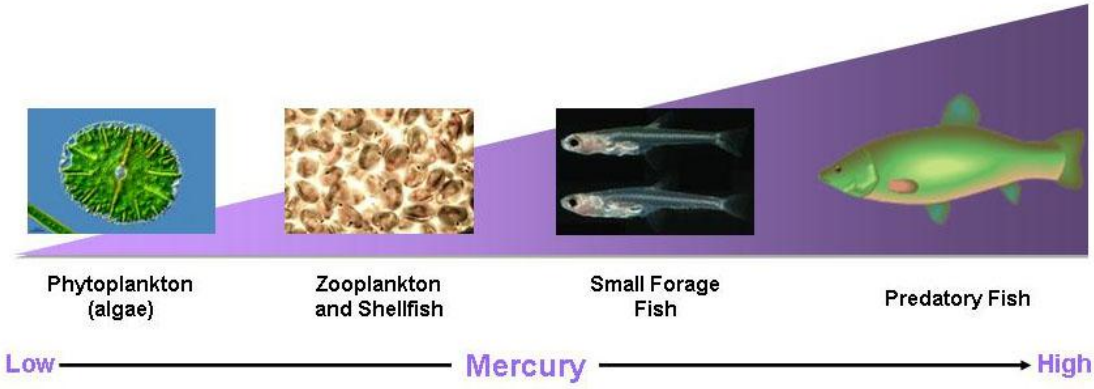
The majority of mercury in the air is present as elemental mercury, not methylmercury. In fact, approximately 98% of atmospheric mercury is elemental mercury. While elemental mercury is one of the less toxic forms of mercury, it can be converted to methylmercury once it is deposited onto the landscape. The conversion of mercury to methylmercury is actually done by bacteria, and often occurs in areas where there is not much oxygen (for example, lake bottoms, areas where the tundra is saturated with water, and wetlands). Once methylmercury is formed it is easily absorbed into the muscle tissue of fish, wildlife, and humans. Methylmercury can also

cross barriers that exist: 1) between the bloodstream and the brain; and, 2) between the placenta and developing babies in pregnant mothers.

When we talk about environmental and human health risks from mercury, fish are often a big part of the discussion. This is because fish are the largest source of mercury to humans, and because fish-eating wildlife such as loons can accumulate mercury to the point that their reproduction is affected. This is especially true in lakes that have received acid rain, which thankfully has not happened in the north.

How does mercury get into fish, and why do some fish have more mercury than others? Once mercury is deposited in lakes from the atmosphere and then converted to methylmercury by bacteria, it builds up in the food chain and accumulates in fish as they age (this is called *bioaccumulation*). This is similar to what we see for PCBs and organochlorine pesticides (see other fact sheets).

Large fish that feed higher in the food chain (e.g., predators that eat other fish) have higher levels of mercury than small fish that eat insects or plants. In this picture, the size and darkness of the purple bar represents the amount of methylmercury in the different organisms. The large fish on the right has the highest level of methylmercury.



References/For More Information

Environment Canada
http://www.ec.gc.ca/mercure-mercury/

U.S. EPA
http://www.epa.gov/hg/