

Originally published: September 13, 2009

Curbing mercury emissions is crucial

William H. Schlesinger

The Mad Hatter in "Alice in Wonderland" plays an important role in the history of occupational health and safety.

Because it is toxic to microbes, mercury was once used to preserve the animal hair used in felt hats. As a result of their direct exposure to mercury salts, hat makers frequently suffered from neurological deterioration.

Felt top hats have fallen out of style, but mercury contamination is still very much with us.

About one-third of the mercury in our environment comes from natural events, such as volcanic eruptions and emissions from the ocean's surface. The rest is released by human activities, with coal-fired power plants contributing the largest source of mercury to the atmosphere.

Mercury emissions come in three forms: oxidized mercury, particulate mercury and elemental mercury.

Oxidized and particulate mercury are deposited close to their source - that is, they have a short residence time in the atmosphere. In contrast, elemental mercury is a vapor that can travel long distances, even globally, lingering for up to two years in the atmosphere.

When any one of these forms of mercury drops from the atmosphere and is deposited on the landscape, it can get converted to an especially toxic form -methylmercury - by the bacteria that live in the sediments of lakes and other wetlands. Methylmercury is then passed up the aquatic food chain, with larger predatory animals such as trout and perch concentrating the pollutant in their fatty tissue up to 10 million times greater than in the water they swim in.

Consuming mercury-exposed fish is a health risk, particularly for pregnant women and young children.

Methylmercury is a powerful neurotoxin that can impair mental development. A recent U.S. Geological Survey study of 300 streams nationwide found methylmercury contamination in



This 2004 photo shows the Danskammer electric power plant across the Hudson River, looking west from New Hamburg. The visible substance coming from the smokestacks is mostly steam, but emissions do include mercury. Mercury drops from the atmosphere can be converted to toxic forms such as methylmercury, which gets passed up the aquatic food chain to fish such as this brown trout. (File photo by Spencer Ainsley/Poughkeepsie Journal)

every fish sampled, with 27 percent containing levels that exceeded the U.S. Environmental Protection Agency's standard for safe fish consumption.

Fortunately, there are ways to remove mercury from power plant emissions, and efforts to do so produce striking results.

Technology better

New smokestack-scrubbing technology is available that can reduce the mercury that coal-fired plants release to the atmosphere by 80 percent to 90 percent.

As emissions have been regulated in the United States and plants have adopted new technology, regional atmospheric mercury pollution has declined. We've also seen dramatic reductions in mercury emissions from waste incinerators.

During the past decade, Cary Institute researchers have found declining mercury deposition in the northeastern United States, but little change in the Southeast.

Lake sediment analyses indicate that mercury deposition has averaged about 43 micrograms per square meter per year ($43 \mu\text{g}/\text{m}^2/\text{yr}$) during the past century.

For the sake of comparison, in 1971, I measured mercury deposition of $73 \mu\text{g}/\text{m}^2/\text{yr}$ on the mountaintops of central New Hampshire. Recent deposition in rainfall across New England is around $7\text{-}10 \mu\text{g}/\text{m}^2/\text{yr}$, a significant decline tied to emissions reductions in waste disposal facilities.

The EPA is rewriting the laws that will regulate mercury emissions from power plants. About 50 percent of mercury deposition in the Northeast derives from power plants, and presumably that percentage will drop when more stringent regulations take effect.

As our local emissions decline, we will still be vulnerable to the effects of emissions from distant sources, sometimes halfway around the world. Coal burned in China may lead to mercury deposition several months later in the northeastern United States.

While we will gain some satisfaction in knowing our own emissions are lower, we must recognize the remaining mercury in the environment is increasingly a global problem.

It is painful whenever I hear an argument against the further regulation of mercury emissions in the United States, with the statement, "It's all coming from China."

True, some mercury comes from China. But once mercury is deposited from the atmosphere, all mercury is equal.

It behooves us to clean up our own power-plant emissions as a first step to reducing a major source, as an example to others, and so we can better see and understand the remaining impact of emissions from both natural sources and distant human activities.

Certainly, we've been waiting a long time for a national emissions standard for mercury. But once in place, the benefits will be felt quickly, and they will increase in the coming years.

William H. Schlesinger is president of the Cary Institute of Ecosystem Studies in Millbrook.