

MERCURY WHITE PAPER

The Utility Hazardous Air Pollutants Regulatory Determination

To reduce the risk mercury poses to people's health, EPA Administrator Carol M. Browner announced that the Environmental Protection Agency will regulate emissions of mercury and other air toxics from coal- and oil-fired electric utility steam generating units (power plants).

EPA plans to propose a regulation to control air toxics emissions, including mercury, from coal- and oil-fired power plants by the end of 2003. This regulation will be one more important piece of an Agency-wide effort to protect people and wildlife from exposure to the toxic pollutant mercury.

Sources and Fate of Mercury in the Environment

Like all elements, the same amount of mercury has existed on the planet since the Earth was formed. However, the amount of mercury mobilized and released into the environment has increased since the beginning of the industrial age. Mercury moves through the environment as a result of both natural and human activities. The human activities that are most responsible for causing mercury to enter the environment are burning materials (such as batteries), fuels (such as coal) that contain mercury, and certain industrial processes. These activities produce air pollution containing mercury.

Based on EPA's National Toxics Inventory, the highest emitters of mercury to the air include coal-burning power plants, municipal waste combustors, medical waste incinerators and hazardous waste combustors. Mercury emissions from these and other sources are transported through the air and eventually deposit to water and land, where humans and wildlife are exposed.

Most of the mercury entering the environment is the result of air emissions; however, mercury also can directly contaminate land and water as a result of the release of industrial wastewater or from the disposal of waste-containing batteries and other sources of mercury. Once mercury enters waters, either directly or through air deposition, it can bioaccumulate in fish and animal tissue in its most toxic form, methylmercury. Bioaccumulation means that the concentration of mercury in predators at the top of the food web (for example, predatory fish and fish-eating birds and mammals) can be thousands or even millions of times greater than the concentrations of mercury found in the water.

Mercury deposition can occur very close to the source or, depending on the chemical form in which it is emitted, it can be transported great distances – even crossing international borders. The highest deposition rates in the U.S. occur in the southern Great Lakes, the Ohio Valley, the Northeast and scattered areas in the Southeast. Approximately 60 percent of the mercury deposition that occurs in the U.S. comes from domestic human-made sources of pollution. The remaining 40 percent comes from human-made sources located outside of the U.S., re-emitted mercury from historic U.S. sources, and natural sources. While the U.S. contributes only about 3 percent of the global atmospheric pool of mercury, it still contributes more than it receives. Approximately two-thirds of U.S. emissions are transported outside our borders.

More information on the sources, fate, and risks of mercury in the environment can be found in EPA's 1997 Mercury Report to Congress and 1998 Utility Air Toxics Report to Congress.

Health Effects and Exposure

For the general U.S. population, exposure to mercury occurs primarily through eating contaminated fish. Women of childbearing age, and people who regularly and frequently eat highly contaminated fish (or large amounts of moderately contaminated fish), are the most likely to be at risk from mercury exposure. Those groups include subsistence fishermen (people who fish for their food) and some Native American populations.

Freshwater fish (caught by recreational or subsistence fishermen) from contaminated waters have been shown to have particularly high levels of methylmercury. Mercury contamination is the most frequent basis for fish advisories. Fish consumption advisories have been issued for thousands of water bodies nationwide, including all of the Great Lakes and their connecting waters, more than 52,000 lakes and more than 238,000 miles of rivers. As of July 2000, 40 states and one territory (American Samoa) had issued fish consumption advisories for mercury. Thirteen of those states issued advisories for all water bodies in their state; the remaining 27 states issued advisories for more than 1,900 specific water bodies.

High mercury levels also have been found in certain saltwater fish. In March 2000, for example, Florida, Georgia, North Carolina and South Carolina issued a joint fish consumption advisory because of high mercury levels in large king mackerel.

Certain species of commercially available saltwater fish, such as shark and swordfish, also have high levels of mercury. The U.S. Food and Drug Administration (FDA) issues consumption advice for commercial marine fish. The FDA plans to re-evaluate its current advice in light of a July 2000 report by the National Academy of Sciences that confirmed EPA's mercury reference dose. A reference dose is the level at which people could be exposed to a toxic (in this case, mercury) without the risk of health problems.

Neurotoxicity is the health effect of greatest concern with mercury exposure. Ingested methylmercury is almost completely absorbed into the blood and distributed to all tissues (including the brain); it also readily passes through the placenta to the fetus and fetal brain. The developing fetus is considered the most sensitive to the effects of mercury; therefore, women of childbearing age are the population of greatest concern. Children born of women exposed to relatively high levels of methylmercury during pregnancy have exhibited a variety of developmental neurological abnormalities, including delayed onset of walking and talking, cerebral palsy, and reduced neurological test scores. Far lower exposures during pregnancy have resulted in delays and deficits in learning abilities in the children.

In July 2000, the National Academy of Sciences completed a review of the latest scientific evidence regarding the health effects of methylmercury. The Academy confirmed EPA's assessment of the health risks related to mercury exposure and noted that children exposed to mercury in the womb as a result of their mothers' diets during pregnancy may be at special risk of neurological problems. In addition, children exposed after birth also are also potentially more sensitive to the toxic effects of methylmercury than adults because their nervous systems are still developing.

Mercury also poses risks to fish-eating wildlife, including some birds and mammals, such as the mink

and otter.

Efforts to Provide Information to the Public

Until we can eliminate the need for fish consumption advisories, federal, state and tribal governments will need to ensure that the public is well informed about which fish are safe to eat and in what amounts. The states and tribes are usually in the best position to give advice about whether fish from local waters are safe to eat. EPA works in partnership with states and tribes to develop advisories to assure that scientifically sound methods are used in issuing and communicating fish consumption advisories.

Recent Actions to Reduce Mercury Pollution

EPA has taken a number of actions to reduce mercury pollution, including issuing stringent regulations for industries that significantly contribute to mercury pollution. Once fully implemented, these actions will reduce U.S. mercury emissions caused by human activities by nearly 50 percent from 1990 levels:

- < Municipal waste combustors (MWCs) emitted about 20 percent of total national mercury emissions into the air in 1990. EPA issued final regulations for MWCs on October 31, 1995. These regulations reduce mercury emissions from these facilities by about 90 percent from 1990 emission levels.
- < Medical waste incinerators (MWIs) emitted about 24 percent of total national mercury emissions into the air in 1990. EPA issued emission standards for MWIs on August 15, 1997. When fully implemented in 2002, EPA's final rule will reduce mercury emissions from MWIs by about 94 percent from 1990 levels.
- < Hazardous waste combustors (HWCs) emitted about 2.5 percent of total national mercury emissions in 1990. In February 1999, EPA issued emission standards for these facilities that, when fully implemented, will reduce mercury emissions from HWCs by more than 50 percent from 1990 emission levels.

In addition, U.S. industrial demand for mercury dropped 75 percent from 1988 to 1997. The drop can be attributed to a number of actions, including:

- < federal bans on mercury additives in paint and pesticides;
- < industry efforts to reduce mercury in batteries;
- < increasing state regulation of mercury emissions and mercury in products;
- < state-mandated recycling programs; and
- < voluntary actions by industry.

EPA also provides technical assistance to state and local governments to develop mercury pretreatment programs at sewage treatment plants. And the Agency has recently lowered the threshold for reporting mercury emissions to the Toxic Release Inventory, beginning in 2000. The lower threshold will help ensure that citizens know about significant mercury emissions in their communities.

Planned Actions to Reduce Mercury Pollution

In addition to developing regulations to limit mercury emissions from utilities, EPA has developed an action plan to address other sources of mercury pollution. Already there are a number of planned activities under way:

- EPA is concerned that the current treatment standard for hazardous wastes containing high levels of mercury may not be the best method for reducing releases of mercury into the environment. EPA has recently issued an Advanced Notice of Proposed Rulemaking and has solicited public comment and information on alternatives to mercury recovery and incineration. A proposed rule is scheduled for 2001.
- EPA is developing rules that will limit mercury emissions from chlorine production plants. A proposed rule will be issued in early 2001.
- Under the Integrated Urban Air Toxics Strategy, published in 1999, EPA is developing emissions standards for categories of smaller sources of air toxics, including mercury, that pose the greatest risk to human health in urban areas. These standards are expected to be issued by 2004.
- EPA is developing a revised human health-based mercury standard for water quality and has identified the need to develop a standard that will protect wildlife from mercury's effects.

Actions to Reduce Mercury Pollution Internationally

EPA also recognizes the importance of working with other countries to decrease mercury pollution globally. EPA's international efforts include coordinated research, monitoring, capacity building, technology transfer and international policy development efforts. The Agency's commitment to decreasing mercury pollution internationally has led to several international agreements, including:

- the 1997 Great Lakes Bi-National Toxics Strategy, which involves the United States and Canada;
- the 1998 Protocol on Heavy Metals of the Convention on Long Range Transboundary Air Pollution, which involves the United States, Canada, and all of Europe; and
- the 2000 Phase II North American Regional Action Plan on Mercury, under the North American Agreement on Environmental Cooperation, which involves the United States, Canada and Mexico.

Ongoing Research Activities

To inform its ongoing program to reduce human exposure to mercury, EPA continues to conduct research on the complex behavior of mercury in the environment and its associated health and ecological effects. EPA also is working to design more efficient control technology and more effective public information programs.

Conclusion

EPA is making meaningful progress in addressing the mercury pollution problem in the United States and is exploring the regional, intercontinental and global dimensions of this problem. EPA is committed to increasing public awareness about the dangers associated with exposure to mercury and will continue to take actions that will provide increased protection of public health. The control of mercury emissions from coal- and oil-fired power plants will be a significant next step in this ongoing effort to address mercury pollution.