June 2010

Reducing Mercury in the Environment

Reducing mercury in the environment is one of the Virginia Department of Environmental Quality's highest priorities. To accomplish this, DEQ is working to gain a better understanding of mercury sources and the extent of contamination, reduce mercury and its use, and more effectively address mercury-related issues. As this work progresses, DEQ remains dedicated to ensuring that Virginians' exposure to mercury is as low as possible.

Mercury and human exposure

Mercury is a naturally occurring metal that is released to the environment from some manufacturing and industrial activities. Once mercury is deposited in streams, rivers, lakes or wetlands, natural biological processes can convert it into a toxin called methylmercury. Fish become contaminated with methylmercury when they are exposed to it from water and sediment and when they eat other organisms that contain the toxin.

Eating contaminated fish is the primary way people are exposed to mercury. DEQ and the Virginia Department of Health work together to ensure that elevated mercury levels detected by DEQ result in fish consumption advisories issued by the health department. The advisories give meal consumption recommendations when fish taken from a particular body of water are found to contain potentially harmful levels of contaminants. These advisories are available on the VDH website (www.vdh.virginia.gov) and are posted at public access points to streams, rivers and lakes.

Monitoring contaminated waters

Prior to being eliminated by state budget cuts, DEQ's fish tissue and sediment monitoring program included taking samples at 80 to 100 sites every year in streams, rivers and lakes. It required about five years to cover the entire state. The fish tissue and sediment samples were tested for a variety of pollutants, including mercury.

Rivers contaminated by industrial incidents

Mercury contamination derived from industrial activity persists in the North Fork Holston River in southwest Virginia and in the South River extending downstream to the South Fork Shenandoah River in the Shenandoah Valley. With initial releases occurring in the 1950s, the North Fork Holston River became contaminated with mercury thus leading to fish consumption advisories. Olin has been addressing contamination in the river with assistance from the U.S. Environmental Protection Agency and DEQ since the 1980s. Mercury was also released by DuPont in the South River between 1929 and 1950, with contamination extending to the South Fork of the Shenandoah River. The mercury contamination was discovered in fish during the 1970s. DEQ, in partnership with the South River Science Team, regularly takes samples of water, fish tissue and sediment in these water bodies, the cost of which is paid from a trust fund established by DuPont Co.

DEQ biologists collect fish tissue and sediment samples in the Blackwater River in eastern Virginia to investigate mercury contamination.

Mercury-sensitive waters

In recent years, numerous states have discovered elevated levels of mercury in fish from waters that do not have any direct mercury sources. It is thought that many of these waters have natural environmental conditions that allow even very small amounts of air-deposited mercury to be quickly converted into methylmercury and incorporated into the food chain, resulting in elevated levels of mercury in fish. Mercury sensitive waters often share three general characteristics: low levels of oxygen, high amounts of organic matter and low pH, which indicates that they are acidic. These traits are common in swamps, streams and rivers in Virginia's coastal areas and in some lakes or reservoirs.

These findings prompted DEQ to conduct additional monitoring in similar waters in eastern Virginia, even though they are without significant, known sources of mercury pollution. DEQ has found that fish in at least 15 waters in eastern Virginia are contaminated with mercury, yet there are no known significant sources of mercury to these waters other than air deposition. Sampling results triggered fish consumption advisories in portions of the Dragon Run Swamp, the Mattaponi, Pamunkey, Blackwater, Nottoway and Meherrin rivers, the Great Dismal Swamp Canal (including Lake Drummond), and several lakes.

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Efforts to study and reduce mercury

DEQ has identified the waters that are contaminated with mercury as having "impaired" water quality. These waters are included in what is commonly known as the impaired waters list that is submitted to EPA. DEQ develops pollution limits, called total maximum daily loads or TMDLs, and cleanup plans for impaired waters. TMDLs, once they are completed for waters with elevated mercury levels, will form the basis for future restoration efforts of these rivers. TMDLs have been completed and submitted to EPA for approval during spring 2010 for the North Fork Holston River and the South River, including the South Fork Shenandoah River. For the mercury sensitive waters that are impaired, a state-wide or regional based TMDL will likely be developed where a specific source is lacking and the atmosphere is believed to be the primary source.

In an effort to gain perspective from public partners about mercury-sensitive waters in eastern Virginia, DEQ formed the Mercury Advisory Committee. Representatives from DEQ, other government agencies, industry and academia participate. DEQ seeks advice from the committee on areas for additional investigations in Virginia's coastal waters.

Recent legislation

Recent legislative and regulatory changes are also addressing the reduction of mercury in the environment.

- The 2006 Virginia General Assembly passed legislation to reduce mercury from coal-fired power plants and required DEQ to begin a study on whether additional steps should be taken in Virginia to control mercury emissions. In 2007, the agency began a detailed assessment on the effects of mercury in air emissions, including studies on the risk to human health from eating fish contaminated with mercury, how the metal is deposited from air emissions and costs associated with pollution controls. From these studies, DEQ plans to evaluate the effectiveness of regulations that limit mercury emissions and how these emissions may affect Virginia's environment, especially its rivers, lakes and estuaries.

  The final report, submitted to the House of Delegates and Senate natural resource committees in October 2008, shows that mercury from outside Virginia contributes to mercury contamination found in the state. Global and background sources are responsible for the single-largest amount, 74 percent, of mercury deposited in the state. Discounting mercury from global and background sources, 54 percent of mercury deposition in Virginia comes from power plants in surrounding states, compared with 14 percent from power plants in Virginia.

  The second part of the study included a fish consumption survey in areas of Virginia affected by mercury advisories. Conducted in summer 2007, the survey found that a significant percentage of anglers and their families may be exposed to additional mercury in their diets by eating mercury-contaminated fish from the waters of the James River below Richmond, and the Chickahominy, Pamunkey, Mattaponi and upper Piankatank rivers.

- Separate legislation was also passed to reduce mercury in the steel manufacturing process by requiring the removal and recycling of mercury in automobile convenience light switches, commonly found under the hoods and trunks of cars with model year 2002 and older. If the switches are not removed, mercury is released into the air during the steel recycling process. DEQ is working in partnership with the Virginia Automobile Recyclers Association to remove mercury-containing switches from automobiles during dismantling.

Preventing mercury's use in businesses

One of the best ways to reduce mercury is to prevent its use in businesses. DEQ promotes and coordinates voluntary efforts across the state to reduce or eliminate the use of mercury. The agency works with partners to support efforts that reduce mercury in office buildings and health care facilities, and in the past few years, DEQ has partnered with the Virginia Dental Association, VDH and EPA on a series of mercury reduction projects.

Online Resources

Virginia DEQ website for further information

Power Plant Emissions
www.deq.virginia.gov/air/sab/mercury.html

Mercury Advisory Committee
www.deq.virginia.gov/fishtissue/hgcommittee.html

Virginia Mercury Study
www.deq.virginia.gov/air/vamercury/vamercurystudy.html

Virginia Mercury Symposium
www.deq.virginia.gov/info/symposium.html

Mercury Switch Program
www.deq.virginia.gov/waste/mercuryswitch.html

Pollution Prevention
www.deq.virginia.gov/p2/mercury/homepage.html

South River Science Team
www.deq.virginia.gov/fishtissue/mercury.html

Virginia Department of Health website

Fish consumption advisories
www.vdh.virginia.gov/epidemiology/DEE/PublicHealthToxicology/Advisories/index.htm