recent studies of mercury concentrations in residents of northeastern Minnesota

concerns about mercury in the Lake Superior Basin

The Minnesota statewide "total maximum daily load" (TMDL—see box on next page) for mercury reflects that about 90% of the mercury deposited in Minnesota originates in other states. Once deposited in lakes and rivers, mercury can build up in fish to the point that eating fish may pose a health risk. Fish consumption is assumed to be the main source of mercury exposure for most people, although the MDH has identified potential exposure from other sources such as cosmetics.

Based on a review of Minnesota's Fish Contaminant Monitoring Program, the Minnesota Department of Health (MDH) found that while there is considerable data on mercury levels in fish in the Lake Superior basin, there is limited human biomonitoring data (see box on next page). The agency recently published the results of two biomonitoring studies that used different approaches and yielded different results.

study of mercury in newborns' blood

In a 2011 study titled "Mercury in Blood from Newborns in the Lake Superior Basin," the MDH measured total mercury in dried blood spots from nearly 1,500 infants born between 2008 and 2010 whose mothers resided in the regions of Minnesota, Wisconsin, and Michigan that border the Lake Superior basin. Eight percent of the samples contained more than 5.8 micrograms of mercury per liter (µg/L) of blood, the concentration associated with the U.S. Environmental Protection Agency's "reference dose" (RfD) for methylmercury, considered to be protective of infants in the womb.

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implications for industry

As part of Minnesota's environmental-review and air-permitting processes, new and expanding industrial facilities emitting more than 3 pounds of mercury a year must complete a local mercury-deposition assessment. Communities in the Lake Superior Basin, including tribal communities, are assumed to have higher exposure to mercury from eating more locally caught fish than the general population.

To date, local mercury-deposition assessments conducted according to the Minnesota Pollution Control Agency's mercury risk estimation methodology have relied on general tribal fish-consumption rates considered sufficiently representative to estimate a background (existing conditions) risk for tribal members consuming locally caught fish. The estimated potential background risk provides a comparison point for assessing potential incremental increases in mercury from a new or expanding facility.

The results of the 2013 Fond du Lac biomonitoring study, which directly assessed levels of mercury in the blood of men and women over the age of 18, showed that concentrations in tribal members' blood were below the 5.8 µg/L level of health concern (July 2014 Fond du Lac and Minnesota Department of Health report).

While these biomonitoring results represent a point-in-time estimate, they provide important baseline information on mercury exposure and fish-consumption rates that can now be used in Minnesota's environmental-review and air-permitting processes. The fish consumption survey results and measurements of tribal-community blood mercury more closely represent existing exposure conditions and can be used to estimate potential background risks that are more refined than the risk estimates used up to this point, enabling scientists and regulators to better assess potential incremental mercury risks associated with a new or expanding facility.

Study results suggest a seasonal exposure pattern; the highest concentrations were recorded in infants born in the summer, which is likely associated with local fish consumption exposure. However, because no information on the mothers' diets was collected, that conclusion comes with some uncertainty.

study of mercury in Native American community

The federally funded 2013 Fond du Lac Community Biomonitoring Study analyzed blood and urine samples from nearly 500 members of the Fond du Lac Band of Lake Superior Chippewa residing in Duluth, Cloquet, and 17 surrounding communities and rural areas. Participants' fish-consumption rates ranged from zero to four or more meals per month. Mercury concentrations in the blood of all participants were below the 5.8 µg/L level of health concern. Women ages 18 to 39 had a median concentration of 0.64 µg/L, while men older than 60 showed the highest median concentration (1.27 µg/L). The majority of participants had less mercury in their blood than the overall U.S. population (see NHANES website link at right), as did participants in a similar First Nations biomonitoring initiative in Canada.

The Fond du Lac band continues to promote fish as an excellent food source (as do the MDH and a number of medical associations), and recommends that its community members follow established fish consumption guidelines.

comparison of results

Although the newborns study showed that mercury concentrations exceeded the level of health concern in 8% of all infants tested (and 10% of the Minnesota infants), the Fond du Lac study, which represented a population potentially more highly exposed to mercury in fish, found no mercury levels exceeding the level of health concern. Because both studies were point-in-time assessments, the implications for long-term exposure are unclear, and the MDH is conducting additional studies (see box) to help scientists continue to better understand the potential health implications of exposure to mercury.

what is a TMDL?

A TMDL describes a value of the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards.

what is biomonitoring?

Biomonitoring is a tool that helps researchers better understand exposures to chemicals in the environment by measuring chemicals in a person's body (for example, in blood, urine, or hair) at a given time.

why was mercury chosen for analysis?

Mercury has the potential to damage the nervous system. Young and unborn children are at the greatest risk from exposure.

where can I get additional information on biomonitoring data?

Fond du Lac Band website:
www.fdlrez.com/humanservices/biomonitoring.htm

Minnesota Department of Health websites:
www.health.state.mn.us/divs/eh/hazardous/topics/studies/newbornhglsp.html

www.health.state.mn.us/divs/eh/risk/studies/tribalstudy.html

www.health.state.mn.us/divs/hpcd/tracking/biomonitoring/projects/pnes.html

NHANES (National Health and Nutrition Examination Survey) website: www.cdc.gov/nchs/nhanes.htm

First Nations Biomonitoring Initiative in Canada:
www.afn.ca/uploads/files/afn_fnbi_en_-_2013-06-26.pdf

for more information...

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