

\*Project

S.E.N.S.O.R.

News

Volume 35 No.4

Fall 2024

### Mercury Exposure in Michigan

Mercury is a naturally occurring element found in air and water. The burning of coal, mining and discharges from specific industrial processes increase the release of mercury into the environment. Mercury released in the air settles on land and in the water. When mercury enters the ocean and other bodies of water, it is methylated by anaerobic bacteria, then ingested by plankton/protozoa, which in turn are ingested by small fish, then larger fish, then bird and mammal predators including humans. The amount of mercury in the tissues of fish and animals increases as one moves up the food chain (biomagnification).

Many of the industrial processes in which mercury has been used have either been eliminated or markedly reduced (e.g., alkaline batteries, dental amalgam, electronic switches, paints, medical equipment, felting hats, pharmaceuticals and production of chlor-alkali); accordingly, work-related exposures have become less common.

Medical knowledge of the health effects of mercury has been based on outbreaks of mercury poisoning among a Japanese fishing population (Minamata Disease), Iraqi farmers who ingested wheat treated with a mercury fungicide, multiple studies of chronic exposure to fishing/whaling populations (e.g., in the Faroe Islands, the Seychelles Islands, Amazon River basin, Nunavik region of Canada), and occupational studies among felt hat makers, chlor-alkali production workers and workers making mercury-containing paint.

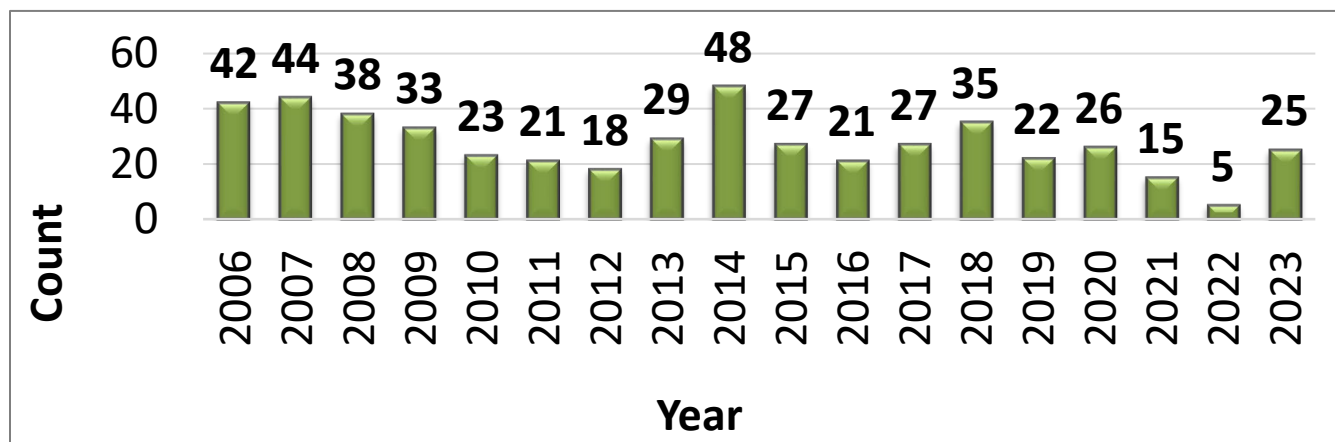
The major adverse health effects of mercury are neurologic, both peripheral (e.g., tremor, paresthesia) and central (e.g., neurocognitive deficits, vision loss), psychological (e.g., paranoia – “Mad as a Hatter”), renal tubular effects and congenital defects when pregnant women and women of child-bearing age are exposed.



“Mad Hatter” from Lewis Carroll’s Alice’s Adventure in Wonderland.

Laboratories in Michigan are required to report all mercury blood and urine test results. These results are used to identify sources of exposure and initiate public health investigations and educational activity. Figure 1 shows the number of individuals in Michigan with an elevated mercury test by year from 2006-2023.

**Figure 1. Number of Individuals with an Elevated Blood/Urine Mercury Level in Michigan, 2006-2023**



Unlike lead, where the source of exposure is usually work (for 80% of adults with an elevated blood lead level, their exposure to lead was at work), for 94% of individuals with an elevated mercury level their source of exposure was environmental. An unusual environmental source of mercury exposure is described in **Box 1**.

**Box 1- Case Report.** A non-English speaking, Albanian woman in her 70's, who had lived in the United States for 40 years sought medical care for attacks of nausea, vomiting and diarrhea associated with an elevated blood pressure. After negative radiographic and endoscopic studies, her gastroenterologist tested her for heavy metals. Her initial blood mercury was 91 µg/L (Reference value <10 µg/L), and her 24-hour urine mercury was 627 µg/L (Reference value <20 µg/L). Arsenic and lead levels were normal. The patient rarely ate fish, did not work, denied any history of spilled mercury (e.g., thermometer), denied using Ayurvedic or any other similar type of herbal or medicinal products and stated that all the skin products she used came from local department stores. Repeat mercury values four months later were blood 71 µg/L and 24-hour urine 405 µg/L. The patient had lived in the same house with her son and daughter for 20 years. The children worked in food services and retail and had no mercury exposure. Her daughter's blood mercury was normal, and the son had not been tested. The patient continued to have gastrointestinal symptoms. Her daughter had her seen by an occupational medicine physician. The lack of any known exposure to mercury was confirmed including not using any unusual skin creams. Given the patient's elevated mercury levels and the lack of any identified exposure to mercury, the occupational medicine physician asked the health department to visit the patient's home. The local health department visited the home when her blood mercury was 71 µg/L. Using a Lumex mercury analyzer, the mercury air level at the front door was 3.8 µg/m<sup>3</sup> (Agency for Toxic Substance Disease Registry (ATSDR) action level in residences is 1 µg/m<sup>3</sup>, ACGIH 25 µg/m<sup>3</sup>, NIOSH 50 µg/m<sup>3</sup>, and OSHA ceiling/TWA 100 µg/m<sup>3</sup>). The inspector went back to his vehicle and suited up with protective gear. Air levels in the home were 1.8 µg/m<sup>3</sup> in the basement, 6.6 µg/m<sup>3</sup> in the patient's bedroom, 59.7 µg/m<sup>3</sup> when the patient's facial cream was opened, and 8 µg/m<sup>3</sup> next to the patient's face. After the air testing by the health department, the patient indicated that she added a skin product sent to her by a relative in Europe to the commercial skin products she purchased in local department stores (see picture). At the advice of the local health department, she discarded her skin cream product. Three weeks later after stopping use of the skin product, the patient's mercury level decreased but remained elevated at 27 µg/L. Repeat air levels in her bedroom remained high (4.6-10.0 µg/m<sup>3</sup>). The local health department advised her to discard all her face towels, bedding and jewelry. Three weeks later, her repeat blood mercury was 17 µg/L. The FDA was notified and determined there was no domestic supplier of the product, which was consistent with what the patient said about the source of the skin cream. The FDA's imports program did not open a compliance case as no laboratory testing of the product was done before it was discarded. The California Department of Public Health has compiled a list of Skin Creams Containing Mercury.

(<https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHIB/CPE/Pages/CreamsTested4Mercury.aspx>)



Picture of skin whitening product used by the patient.

The usual environmental exposure for individuals in Michigan with elevated mercury levels is from eating fish (90%). Eating fish has health benefits related to the presence of the Omega -3 fatty acids: docosahexaenoic acid (DHA), and eicosapentaenoic acid (EPA)). To maximize the benefits of fish ingestion, it is important to minimize the ingestion of those types of fish with high mercury levels (e.g., tuna) and maximize the ingestion of fish with low mercury levels (e.g., salmon). Figure 2 shows a brochure from the Michigan of Department Health and Human Services brochure (with a chart) that makes it easy to select the type and number of servings of fish to eat in a month to maximize the benefits of Omega -3 fatty acids and minimize the risks of mercury from eating fish.

**Figure 2. Eat Safe Fish Brochure Including Chart on Selecting Low Mercury/High Omega-3 fish**



(<https://www.michigan.gov/mdhhs/safety-injury-prev/environmental-health/topics/eatsafefish/brochure>)

A comprehensive source of information about mercury is the Toxicological Profile of Mercury from the Agency for Toxic Substances and Disease Registry (<https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=115&tid=24>).

Dr. Rosenman can be reached at [rosenman@msu.edu](mailto:rosenman@msu.edu) or at (517) 353-1846 if you have diagnosis or management questions regarding patients and mercury.

\*Project

S E.N.S.O.R.

News

Michigan State University  
College of Human Medicine  
West Fee Hall  
909 Wilson Road, Room 117  
East Lansing, MI 48824-1316  
Phone (517) 353-1846

In this issue: V35n4: Mercury Exposure in Michigan

\*PS Remember to report all cases of occupational disease!

Printed on recycled paper.

**Advisory Board**  
Amrit Wolfe, M.D., President, Michigan Occupational & Environmental Medical Association  
Larry Hennessey, M.D., Michigan Allergy and Asthma Society  
Darryl Lesoski, M.D., M.P.H., Munson Medical Center  
Traverse City, MI  
Thomas G. Robins, M.D., M.P.H., University of Michigan School of Public Health  
Division of Occupational Medicine  
Samyr Nasr, MB, BCH, President, Michigan Thoracic Society  
Eric J. Rose, D.O., Marquette General Health System  
Marquette, MI

The project SENSOR News is published quarterly by Michigan State University-College of Human Medicine with funding from the National Institute for Occupational Safety and Health and is available at no cost. Suggestions and comments are welcome.  
(517) 353-1846  
MSU-CHM  
West Fee Hall  
909 Wilson Road, Room 117  
East Lansing, MI 48824-1316

**Project SENSOR staff**  
Barton G. Pickleman  
Director MIOSHA  
*At the Michigan Occupational Safety & Health Administration (MIOSHA)*  
Kenneth D. Rosenman, M.D., Professor of Medicine  
Project SENSOR, Director  
Mary Jo Reilly, M.S., Project SENSOR Coordinator  
Project SENSOR Office Staff:  
Tracy Carey

**Michigan Law Requires the Reporting of Known or Suspected Occupational Diseases**  
Reporting can be done by:  
**WEB**  
[oem.msu.edu](http://oem.msu.edu)  
**E-Mail**  
[ODREPORT@msu.edu](mailto:ODREPORT@msu.edu)  
**FAX**  
(517) 432-3606  
**Telephone**  
1-800-446-7805  
**Mail**  
Michigan Occupational Safety & Health Administration (MIOSHA)  
Management and Technical Services Division  
PO Box 30649  
Lansing, MI 48909-8149  
Reporting forms can be obtained by calling 1-800-446-7805