

HEALTH CONSULTATION

West Grand Boulevard Mercury Spill

Detroit, Wayne County, MICHIGAN

Prepared by

Michigan Department of Community Health
Under a Cooperative Agreement with
Agency for Toxic Substances and Disease Registry

Background and Statement of Issues

On Friday, July 6, 2001, the Michigan Department of Community Health (MDCH) received a call from the Poison Control Center located at Children's Hospital in Detroit regarding a mercury spill. They had a report from a patient who had observed the attempted cleanup of a spill from a sphygmomanometer while she was being seen at a local medical office. The patient did not think the cleanup was adequate and was concerned about the hazard that might still be present. MDCH called the physician's office and after speaking to staff and one of the physicians, called the U.S. Environmental Protection Agency's (EPA) Emergency Response Branch on Gross Ile, Michigan to request their assistance on behalf of the medical clinic.

The EPA agreed to send a team to the facility at 503 West Grand River Boulevard in Detroit immediately to investigate the situation and advise the people there regarding any containment and cleanup measures that may be necessary. When they arrived and started sampling using a Lumex RA915+ Mercury Analyser, they detected mercury concentrations of 25,000 nanograms per cubic meter (ng/m³) in the in the breathing zone as they entered the back door of the building. They proceeded to Examining Room #1, the room where the spill was discovered on Thursday, July 5 and measured breathing zone mercury concentrations in the range of 45,000 to 50,000 ng/m³. They investigated the building and found 6 rooms and 2 hallways that had elevated air concentrations of mercury. In 4 of the rooms, they observed visible beads and small pools of mercury. The clinic was crowded with patients both adults and children. That same day, MDCH and the EPA relayed the hazard information to the physician present in the office on Friday. By late afternoon the premises were cleared of people except for the EPA's investigation contractors and the environmental cleanup contractors the doctor was advised to engage. The owners of the facility had contracted an environmental firm to conduct the remediation. MDCH asked the EPA to test the clothing, home, and vehicle of the patient who reported the spill and those of any doctor or office staff who might have tracked mercury out of the office.

The initial removal of contaminated materials included 6 sphygmomanometers, 7 pairs of shoes, 8 articles of clothing and a large amount of carpet.

Discussion

MDCH frequently receives requests to assist with elemental mercury spills in many types of settings. MDCH is able to help in some circumstances with screening and clearance using a mercury vapor analyzer. We are also able to give guidance on managing the cleanup and evaluating the need for biological sampling of exposed and potentially exposed people.

The main routes of exposure for elemental mercury are ingestion, dermal absorption, and inhalation of mercury vapors. Of the three, inhalation is the most hazardous route particularly to children and women of childbearing age.

Inhalation of high levels of elemental mercury can cause permanent neurological damage and kidney impairment. The Agency for Toxic Substances and Disease Registry (ATSDR) recommends that breathing zone mercury levels not exceed 1,000 ng/m³ for long term exposures as would be likely in a residence (1). This recommended level is based on both animal studies and human epidemiology studies that describe the health effects of inhalation of mercury-contaminated air. Workers who were exposed to mercury vapors in an occupational setting exhibited hand tremors, increases in memory disturbances, and slight subjective and objective evidence of autonomic nervous system dysfunction. The ATSDR minimal risk level (MRL) for mercury in air was derived from the lowest observed adverse effect level (LOAEL) from this study of 26,000 nanograms of mercury per cubic meter of air (ng/m³). Because workers were only exposed during working hours, the LOAEL was adjusted to account for continuous exposure. The resulting value was divided by an uncertainty factor of 10 to protect sensitive human subgroups and by a factor of 3 because a LOAEL was used rather than a no observed adverse effect level (NOAEL). The resulting MRL is 0.2 micrograms per cubic meter (ug/m³) or 200 ng/m³. An MRL is defined as an estimate of the daily exposure level to a hazardous substance that is likely to be without appreciable risk of adverse, non-cancer health effects. The ATSDR recommended value for residential setting of less than 1000 ng/m³ is an action level that if exceeded would prompt the need for further cleanup or other remedial action. The initial screening of the facility determined that there were beads of mercury and high vapor levels emanating from the floors and carpet. More than one examining room and a hallway through a common area that received heavy traffic in the course of business were affected. When the clinic was cleared of patients and staff, the contractors hired by the physicians who own the facility began to remove contaminated material and the free flowing mercury found in the process.

MDCH advised the doctors to have their contractors or the EPA test the clothing, vehicles, and perhaps homes of anyone who may have come in contact with the mercury. Several pairs of shoes were found to be contaminated and were disposed of with the rest of the overpacked waste.

The remediation work started on Friday Jul 6, 2001 and continued over the weekend. The physician, his environmental contractor, and the EPA phoned MDCH with requests for advice or to provide updates of the activity every day. MDCH recommended a clearance level of 5 ug/m³ for reoccupation of the building measured using battery-powered, portable air-sampling pumps and sorbent tubes. Each sample collected in this manner was analyzed using the NIOSH 6009 method.

Addressing the Unique Vulnerabilities of Children

Children may be at greater risk than adults from certain kinds of exposure to hazardous substances at sites of environmental contamination. They engage in activities such as playing outdoors and hand-to-mouth behaviors that increase their exposure to hazardous substances. They are shorter than adults, which means they breathe dust, soil, and vapors close to the ground. Their lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. The developing body systems of

children can sustain permanent damage if toxic exposures are high enough during critical growth stages.

Children who breathe metallic mercury vapors may develop a disorder known as acrodynia, or “pinks disease.” The symptoms of this disorder include severe leg cramps; irritability; and abnormal redness of the skin, followed by peeling of the hands, nose, and soles of the feet. Itching, swelling, fever, fast heart rate, elevated blood pressure, excessive salivation or sweating, rashes, fretfulness, sleeplessness, and/or weakness may also be present. This disorder may also occur in teenagers and adults. Exposure to mercury vapors is more dangerous for children than for adults, because inhaled mercury vapors easily pass into the brain and nervous system of young children and may interfere with the development process. Exposure to high levels of mercury vapor can also cause lung, stomach, and intestinal damage. Death due to respiratory failure can result in cases of extreme exposures (3).

Given the levels of mercury detected and the frequency with which children are present in the medical building, MDCH was particularly concerned that the clinic service be curtailed as soon as possible to interrupt exposure and the premises be thoroughly cleaned before it reopened.

Conclusions

The following conclusions were made at the time of the initial notification and shortly afterward:

The West Grand River Boulevard event was considered an urgent health hazard because mercury levels within the medical facility ranged from 25 to 50 ug/m³ in the breathing zone during the initial entry.

The possibility of spread of mercury to the vehicles and homes of patients, doctors and staff of the clinic was also a concern.

Due to the remediation, this site currently poses no public health hazard with regard to the July 6, 2001 mercury spill.

Recommendations

The following recommendations were made and implemented during the investigation by MDCH:

1. Report the spill to the U.S. Environmental Protection Agency and request their help with the initial screening of the facility.
2. Isolate the highly contaminated areas and keep anyone other than investigators and remedial workers out of the atmosphere that exceeds recommended mercury air concentrations for a medical facility.
3. Based on the amount of mercury found and the high concentrations in the air throughout the clinic, engage the services of professional environmental

- contractors to carry out remedial activities rather than try to have clinic staff attempt it.
4. Offer and strongly suggest urine tests for mercury for clinic staff and anyone else who may have had significant opportunity for exposure.

Public Health Action Plan

The MDCH provided verbal consultation and referral to the physicians who owned the clinic, clinic patients and staff, the EPA on-scene coordinator, and the environmental contractor who accepted the clean-up contract.

MDCH delivered 8 urine test kits to a clinic representative in Detroit.

MDCH notified the Detroit City Health Department and briefed them to prepare for their assistance as necessary.

MDCH gave a verbal recommendation for the reopening of the clinic based upon clearance test data reported by the environmental contractor. Documented results received afterwards may be found in Table 1.

MDCH will be available to address any public health questions or concerns regarding this contamination event. Please contact the Michigan Department of Community Health, Division of Environmental and Occupational Epidemiology at 1-800- 648-6942.

References

- ATSDR (Agency for Toxic Substances and Disease Registry). 2000. Suggested Action Levels for Indoor Mercury Vapors in Homes or Businesses with Indoor Gas Regulators.
- ATSDR (Agency for Toxic Substances and Disease Registry). 1999. Toxicological Profile for Mercury, Update.
- Clayton Group Services, Report of NIOSH 6009 sampling and laboratory results, July 24, 2001.
- Tetra Tech EM Inc., Field log notes, July 2001
- United States Environmental Protection Agency, Pollution Report for West Grand Mercury Spill, 09 July 01

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CERTIFICATION

This West Grand Boulevard Mercury Spill Health Consultation was prepared by the Michigan Department of Community Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

Technical Project Officer, SPS, SSAB, DHAC, ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

Chief, State Program Section, SSAB, DHAC, ATSDR

Table 1. Results of Clearance Testing of the West Grand Boulevard Mercury Spill
(ug/m³)

Small Waiting Room	0.94
Exam Room #4	1.2
Exam Room #2	1.0
Exam Room #1	1.0
Corridor outside Exam Rooms #3 and #4	1.3
Corridor near Exam Room #7	1.3
Exam Room #7	1.1
Exam Room #9	1.5
Lavatory across from Exam Room #9	1.1
Corridor near Exam Room #9	1.1
Building Entrance/Basement Stairwell	N.D
Duplicate sample of Small Waiting Room sample	0.95
Field Blank Sample	N.D.