

HEALTH CONSULTATION

Royal Oak Clinic Spill
Oakland County, Michigan
August 6, 2004

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 Monday, November 5, 2001, the Michigan Department of Community Health (MDCH) Toxicology and Response Section (TARS) received a call from the Oakland County Health Department regarding a sphygmomanometer spill at a physician's office examining room. TARS staff called the office and found that the spill may have occurred as much as a year previously.

The office, located at 1223 S. Washington, Royal Oak, is owned and operated by an M.D. Tars staff gave the clinic's office manager preliminary advice and then called the U.S. Environmental Protection Agency (EPA) Emergency Response Branch office on Grosse Ile, Michigan to request help in characterizing the extent of elemental mercury contamination in the clinic. The EPA engaged the services of an environmental contractor who visited the office on 11/6/01 and screened the facility using a Lumex RA 915+ Mercury Analyser. On the initial entry to the building the Lumex mercury readings taken in the breathing zone ranged from 6,050 nanograms per cubic meter of air (ng/m^3) to 60,000 ng/m^3 at the doorway of Examining Room #4 where the spill occurred (Table 1). MDCH recommended that the clinic be closed, the physician engage the services of an environmental contractor to remediate the mercury contamination, and the shoes and vehicles of staff who might have tracked mercury out of the clinic be checked. MDCH further recommended that the staff arrange to have mercury urine tests since there was uncertainty regarding the length of exposure to mercury vapors.

Discussion

MDCH frequently receives requests to assist with elemental mercury spills in many types of setting. MDCH is able to help in some circumstances with the on-scene screening and clearance using a mercury vapor analyzer owned by MDCH. We are also able to give guidance on managing the investigation and cleanup, and on evaluating the need for biological sampling of exposed and potentially exposed people. MDCH routinely advises property owners, the EPA responders and the cleanup contractors regarding the clearance levels of mercury vapors in the air that would allow reuse of the affected structure. MDCH uses the mercury level guides developed by the Agency for Toxic Substances and Disease Registry (ATSDR) and adjusts for the particular conditions of the spill situations.

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. ATSDR guidance recommends that breathing zone mercury levels not exceed 1,000 nanograms of mercury per cubic meter of air (ng/m^3) 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. 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 ($\mu\text{g}/\text{m}^3$) or $200 \text{ ng}/\text{m}^3$. 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 $1000 \text{ ng}/\text{m}^3$ is an action level that if exceeded would prompt the need for further cleanup or other remedial action.

The initial screening of the facility in the current consultation determined that there were beads of mercury on, and high vapor levels emanating from carpeted floors, a countertop, and a wall mounted file folder. Exam Room #4 needed the most cleanup, followed in contaminant level by the carpeting upon which mercury was tracked from the room after the spill.

The physician engaged the services of an environmental contracting firm on November 7 and they arrived at the offices on November 8. They proceeded to test and then remove contaminated material and to decontaminate wall, counter and floor surfaces.

MDCH advised the doctors to have their contractors or the EPA test the clothing, vehicles and if necessary 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 was completed on November 8 and clearance testing using the approved NIOSH 6009 protocol was scheduled for November 9. The physician, his environmental contractor, and the EPA phoned MDCH with requests for advice or to provide updates of the activity throughout the process. MDCH recommended a clearance level of $3 \mu\text{g}/\text{m}^3$ with no visible beads of mercury present for reoccupation of the building measured using battery-powered, portable air-sampling pumps and sorbent tubes. One sample each from two exam rooms, a hall room, and a front office were collected in this manner and sent to a laboratory for analysis.

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 hear 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).

The initial measurements of mercury in air on November 6 indicated to MDCH that clinic service should be interrupted as soon as possible to mitigate exposure for the medical and clerical staff and patients, particularly young children and pregnant women.

Conclusions

At the time of the investigation of the Royal Oak Clinic was considered an Urgent Health Hazard because of mercury vapor levels on the floor ranging from 5,000 to 60,000 ng/m³ and the presence of free flowing mercury beads that could be tracked to vehicles and homes.

Recommendations

These recommendations were given at the time of the investigation by MDCH:

1. Notify the EPA’s Emergency Response Branch of the spill and request their assistance in characterizing the spill.
2. Remove and bag any staff shoes that may have become contaminated for testing and possible disposal.
3. Seek cleanup help from professional environmental cleanup contractors.
4. Arrange urine testing for those who spent the greatest amount of time in the office after the spill.
5. Use the physicians at the Poison Control Center as a resource for testing and health effects questions.

Public Health Action Plan

MDCH advised that any physician, staff or patient who had regularly spent time in the contaminated atmosphere have a urine test for mercury and gave them the phone numbers of the Poison Control Center physicians for medical consultation.

The owner of the clinic engaged an environmental contracting firm to clean the mercury contamination from the facility.

MDCH provided verbal consultation and referral recommendations to the owner of the clinic, and his staff. MDCH advised the EPA contractor and the environmental contractor who performed cleanup and arranged the aftertesting.

The EPA provided assistance in characterizing the contamination and oversight for the contractor the owner of the clinic contracted to conduct remediation.

MDCH gave a verbal recommendation for reopening the clinic based on NIOSH 6009 data received via fax from the cleanup contractors. (Table 2)

MDCH remains 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

Table 1. Results of Initial Screening by Contractors for the U.S. in ug/m³

Lobby floor	5,000
Lobby breathing zone	6,050
Hallway floor location (A)	18,500
Hallway floor location (B)	8,000
Hallway (B) breathing zone	8,500
Patient room floor	8,500
Central area floor	25,000
Doorway to room #4	60,000

Table 2. Clearance Test Results in mg/m³

Exam Room #4	< 0.0025
Hall Exam #3	< 0.0025
Front Office	< 0.0025
Hall Room X	< 0.0025

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CERTIFICATION

This (fill in) 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

References

1. ATSDR (Agency for Toxic Substances and Disease Registry). 2000. Suggested Action Levels for Indoor Mercury Vapors in Homes or Businesses with Indoor Gas Regulators.
2. ATSDR (Agency for Toxic Substances and Disease Registry). 1999. Toxicological Profile for Mercury, Update.
3. U.S. Environmental Protection Agency, Pollution Report for Dr. William Sills Medical Office Mercury Emergency Response. 8 November 2001
4. Clean Harbors Environmental Services Inc.. Emergency Response Report for Mercury Spill at Dr. William g. Sills Office.