

# **HEALTH CONSULTATION**

**Pattengill Middle School,  
Mercury Spill Assist**

Ingham 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

The Michigan Department of Community Health (MDCH) assisted the Ingham County Health Department (ICHHD) on a mercury release at the Pattengill Middle School at 1017 Jerome St., Lansing, Michigan (Figure 1). On August 30, 2002, the start of the Labor Day weekend and the last weekend before the scheduled first day of classes, Tuesday, September 3, 2002, a small volume of mercury was released in a hallway and nearby athletic room. The source of the mercury was a broken scientific thermometer.

Initially, school staff was uncertain as to the location of the mercury release and called the Lansing Fire Department (LFD) to investigate. LFD was unable to locate the mercury but spread zinc shavings on the floor of the athletic room, the most likely location of the spill. LFD referred the investigation to ICHHD, who requested MDCH assistance.

ICHHD and MDCH staff searched through the school with a handheld spotlight and an Ohio-Lumex RA915+ real-time mercury-vapor analyzer (detection limit:  $\pm 2$  nanograms of mercury per cubic meter of air [ $\text{ng}/\text{m}^3$ ]; accuracy  $\pm 20\%$ ). The portability, repeatability, and sensitivity of the RA915+ make it an excellent tool for determining the extent of a mercury release. Free mercury was found in a first floor hallway about 15 feet from a set of exit doors and in the adjoining athletic room, with the highest readings coming from the drain of the athletic room floor.

MDCH and ICHHD staff picked up the free mercury using ICHHD's mercury-safe vacuum. MDCH and ICHHD recommended to school staff that the area be ventilated throughout the weekend to reduce ambient air levels, which varied at the time of the cleanup between 1.5 and 4.2 micrograms of mercury per cubic meter of air ( $\mu\text{g}/\text{m}^3$ ). MDCH uses the Agency for Toxic Substances and Disease Registry (ATSDR) guideline of 1  $\mu\text{g}/\text{m}^3$  for mercury in the indoor air of schools and homes (1).

The shoes of several staff members were tested in the course of the investigation. Because the mercury went unnoticed before its discovery by ICHHD and MDCH and because it was in a frequently used hallway, several staff members had stepped into the mercury, contaminating their shoes and possibly transporting very small amounts off-site. Approximately 12 staff members had their shoes tested. Three staff members were asked to discard their shoes because readings exceeded 5.0  $\mu\text{g}/\text{m}^3$ .

All ventilation was halted, and the building was closed for several hours before clearance readings were taken on the morning of Sunday, September 1, 2002. ICHHD conducted the clearance readings. All breathing zone measurements were below 1  $\mu\text{g}/\text{m}^3$ . Readings in and around the drain in the athletic room floor remained elevated but did not pose a health hazard to building occupants. The Pattengill Middle School is investigating options to remove the drain.

## DISCUSSION

Calls for assistance on mercury spills at residential and school properties occur regularly at MDCH. The calls often involve households or schools and children. The possible routes of exposure to mercury include inhalation, ingestion, and dermal absorption; however, inhalation of mercury vapors is the primary concern in a residential or school setting.

Inhalation of high levels of elemental mercury can cause permanent neurologic damage and kidney impairment. ATSDR recommends that breathing zone mercury levels not exceed  $1.0 \mu\text{g}/\text{m}^3$ . This recommended level is based on both animal studies and human epidemiology studies that describe the health effects of inhaling 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  $26.0 \mu\text{g}/\text{m}^3$ . 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  $0.2 \mu\text{g}/\text{m}^3$ . 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  $1.0 \mu\text{g}/\text{m}^3$  is an action level that if exceeded would prompt the need for further cleanup or other remedial action.

Breathing zone measurements in the school hallway and adjoining athletic room exceeded the ATSDR guideline when readings were taken by MDCH and ICHD staff on August 30, 2002. Clearance screening conducted by ICHD on September 1, 2002, two days before the opening day of school, showed breathing zone readings were below the  $1.0 \mu\text{g}/\text{m}^3$  federal guideline.

### **Addressing the Unique Vulnerabilities of Children**

Children may be at greater risk than are 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 closer to the ground. Their lower body weight and higher intake rate result 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 pink skin. 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, or weakness may also

be present. This disorder may also occur in teenagers and adults. Exposure to mercury vapors is more dangerous for young 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 has resulted from cases of extreme exposures (2).

The absence of students in the school when the mercury was released ensured that childhood exposures were negligible. One teacher had her children with her that day; however, the duration of the exposure was minimal.

### **CONCLUSIONS**

An accidental release of elemental mercury at a school in Lansing, Michigan, resulted in breathing zone concentrations of mercury in the school above the ATSDR recommended action level of  $1.0 \mu\text{g}/\text{m}^3$ . The school was not officially open for students at the time and few, if any, children were exposed. However, because students were scheduled to attend classes in this building within the next three days, MDCH considered this circumstance to previously be an Urgent Public Health Hazard in the past that required immediate action.

MDCH and ICHD assisted the school in remediation activities with real-time readings and technical advice. ICHD conducted clearance screening with the RA-915+ on the morning of September 1, 2002. Readings indicated that mercury concentrations were below the ATSDR action level. MDCH and ICHD granted re-occupancy of the school in time for the opening day of school. No public health hazard from this release currently exists at Pattengill Middle School.

### **RECOMMENDATIONS**

MDCH made the following recommendations in the course of the investigation:

1. Isolate mercury-contaminated areas and objects from the general population.
2. Remove and appropriately dispose of contaminated materials in a manner consistent with established remediation practices and safeguards.
3. Increase the ventilation in contaminated areas to reduce mercury vapor concentrations.

### **PUBLIC HEALTH ACTION PLAN**

The recommendations listed above were implemented, and no further action is necessary at this site.

## 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.

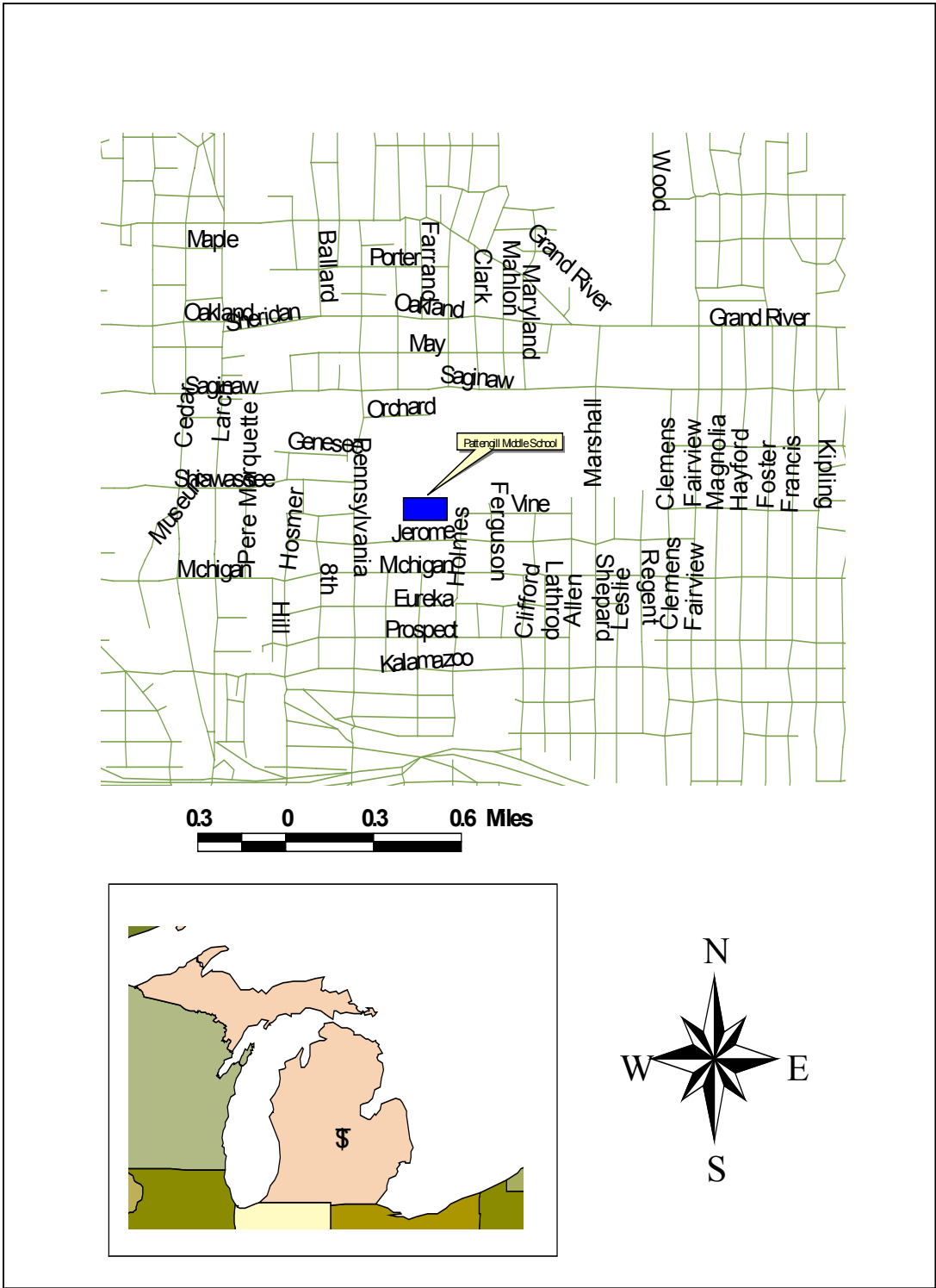


Figure1. Cleanup of mercury spill at Pattengill Middle School, Ingham County, Michigan, August 2002

**PREPARER OF THE REPORT**

Michigan Department of Community Health  
Division of Environmental and Occupational Epidemiology

Daniel Lince, M.S., Health Educator

Linda D. Larsen, Ph.D., Toxicologist

**ATSDR Regional Representative**

Mark Johnson  
Regional Services, Region V  
Office of the Assistant Administrator

**ATSDR Technical Project Officer**

Alan Yarbrough  
Division of Health Assessment and Consultation  
Superfund Site Assessment Branch

## **CERTIFICATION**

This Pattengill Middle School Mercury Spill Assist 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