

HEALTH CONSULTATION

CHARLOTTE MIDDLE SCHOOL MERCURY INCIDENT

CHARLOTTE, EATON COUNTY, MICHIGAN

Prepared by

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

Purpose Statement

The Michigan Department of Community Health (MDCH) was asked by the Barry-Eaton District Health Department to determine if a health hazard existed and to provide assistance with a school mercury spill. This health consultation documents the actions taken by the MDCH, and the recommendations made for cleanup activities.

Background and Statement of Issues

On Tuesday, February 3, 2004, three approximately ten-inch glass thermometers were broken at the Charlotte Middle School, Charlotte, Michigan. The teacher leading the experiment, in which the thermometers were broken, recalled that a student dropped the first thermometer on the floor at the rear of the classroom near the north door. The teacher told the children to move to the front of the classroom. The teacher put on rubber gloves and tried to clean up the beads of mercury with paper towels, but could not collect all the beads. While the teacher was collecting beads from the first spill, two other students each broke other thermometers when they collided with each other while trying to shake down the thermometers for the experiment. The mercury scattered in the direction of two other students. The teacher was unable to collect the mercury beads from these two thermometers. The area of this spill was near the south classroom door. The teacher sent one student to the boys' lavatory to wash all exposed skin. By this time, the dismissal bell was ringing and the teacher told another student, thought to be exposed, to wash exposed skin when she arrived home. Both students were also instructed to wash their clothing when they arrived home. The teacher notified the school custodian of the mercury spills. All the materials the teacher used in her attempt to clean up the spills were deposited in the classroom trashcans. In total, there were 29 students and one teacher in the classroom at the time of the spills.

The school custodian attempted to clean up the mercury using a dust mop but soon discovered this was not working. She took the head off the dust mop, tied it in a plastic bag and put it in a large red caution container. She then sprinkled a product normally used to absorb bodily fluids around the room and began to vacuum the room. She continued vacuuming for 1.5 hours. When she finished she placed the vacuum bag as well as the rubber gloves she was wearing into a plastic bag and placed the bag in the same red caution container as the dust mop head and put the vacuum cleaner back in the janitor closet. She re-mopped the room, sealed the mop head in a plastic bag, placed the bag in the red container and took the red container to the mechanical room at the other end of the building.

The following day, the Environmental Health Supervisor for the Barry-Eaton District Health Department, was contacted, by telephone, by the parent of a Charlotte Middle School student. The parent told the health department personnel that there had been a mercury spill in the 7th grade science classroom. The parent believed that there were two mercury thermometers broken during an experiment and that the students remained in the classroom during the cleanup of the mercury. The health department was able to reach

the Associate Superintendent of the Charlotte School District who said he had just been informed of the incident that day. He gave the health department staff the telephone number of the Middle School Principal because he would be unavailable the following day until after noon.

The Barry-Eaton District Health Department contacted the middle school principal on Thursday, February 5, 2004. The health department informed the principal of the public health concerns surrounding the incident. It was also made known that three, not two, mercury thermometers were broken during the incident. Health department staff then requested that the classroom be evacuated until the air quality could be evaluated in the area of the spill.

Barry-Eaton District Health Department contacted the Michigan Department of Community Health (MDCH) on February 5 to request the use of our Lumex RA-915 Mercury Vapor Analyzer. Staff from the Barry-Eaton Health Department met with the principal and the teacher conducting the experiment in which the thermometers were broken. The local health department staff used the Lumex to measure mercury levels in the area of the classroom (Table 1), but they never entered the classroom because the readings outside the room were sufficiently elevated and supported additional response by the school.

Table 1

Lumex RA-915 Mercury Vapor Analyzer Reading on February 5, 2004	
Floor tile at north entrance to room C-108	2,329 ng/m ³
Floor tile in corner at north entrance to room C-108	2,621 ng/m ³
Baseboard at north entrance to room C-108	4,737 ng/m ³
Breathing zone inside north entrance to room C-108	1,301 ng/m ³
Floor tile at south entrance to room C-108	3,389 ng/m ³
Breathing zone inside south entrance to room C-108	1,161 ng/m ³
Breathing zone middle of corridor	1,371 ng/m ³
Trash can in corridor	1,418 ng/m ³
Sink drain in boys' lavatory	1,273 ng/m ³
Breathing zone inside janitor closet	7,640 ng/m ³

Knowing that the Michigan Department of Community Health recommends that cleanup actions be taken if Lumex readings are above 3,000 ng/m³ in a school setting, the local health department staff placed a call to MDCH for further assistance. MDCH staff recommended two key responses. First, the 7th grade wing would need to be shut down and a consultant and/or cleanup contractor hired to remediate the area. Second, the school would need to send home a letter with students informing the parents of the incident and letting them know that the National Poison Control Center should be consulted over any medical-related concerns. Other recommendations from MDCH included: 1) any students or faculty that wanted clothing or shoes tested should seal them in plastic trash bags and return them to the school (if any readings were over 10,000 ng/m³ the items should be discarded, otherwise, they can be set aside for off-gassing for 30 days and then retested; 2) a National Institute for Occupational Safety and Health

(NIOSH) 6009 clearance test should be conducted at the end of the cleanup to make sure the area has returned to background levels; 3) in the classroom, return air ducts should be closed off, windows opened, and the heat turned down to 65 degrees until cleanup is completed; 4) in order to take a proactive approach to the media, a press release should be considered; 5) conduct an audit throughout the school to identify other areas where mercury may be present (spilled mercury or mercury containing devices) and dispose of any mercury found.

MDCH had recommended that a NIOSH 6009 clearance test be conducted at the end of the cleanup. However, on the advice of their contractor, the Charlotte Public Schools determined that a NIOSH clearance test was not necessary because all mercury vapor readings were less than 3,000 ng/m³ following clean up activities. All the other recommendations were implemented.

Discussion

MDCH frequently receives requests to assist with elemental mercury spills in many types of settings. We are 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. In this case, the exposure pathway was complete. The students and the teacher were exposed via inhalation once the thermometers were broken. Some dermal exposure likely occurred as the students, teacher, and custodian attempted to cleanup the spilled mercury.

Repeated or continuous exposure to elemental mercury can result in accumulation of mercury in the kidneys and brain with the potential for permanent damage to the nervous and renal systems. Symptoms of poisoning may include neuropsychiatric effects, renal impairment, and oropharyngeal inflammation (ATSDR 1999). In some instances, muscle weakness, muscle atrophy, and muscle twitching can occur as well as slowed nerve conduction velocities (ATSDR 1999).

MDCH determined that levels of mercury in the science room warranted the closing of the 7th grade wing, and the school district chose to close the entire middle school on Friday February 6, 2004. Isolation of the spill area was necessary to prevent exposure and tracking of mercury from the area to other areas of the school, cars and buses, and students' homes. MDCH provided advice on clean up and determined that exposure was likely to be minimal following remediation.

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.

Since the students, teacher, and custodian were exposed for a relatively short period of time, no symptoms are expected in this case. Children who breathe metallic mercury vapors for longer periods 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.

Conclusions

When the thermometers were broken, this spill event was deemed a public health hazard given the presence of children, degree of exposure, toxicity of mercury and past experience with similar mercury spills. Now that the school and classroom have been remediated with respect to this mercury spill, no further exposure exists. All mercury vapor readings were less than 3,000 ng/m³ following clean up activities. Therefore, this site poses no public health hazard at this time.

Recommendations

During the site investigation, MDCH staff made the following recommendations:

MDCH recommended that children be kept out of classroom where the incident occurred. Levels of mercury in the room warranted the closing of the 7th grade wing, and the school district chose to close the entire middle school on Friday February 6, 2004. Return air ducts were closed and windows opened to vent the area. MDCH provided staff from the local health department with a Lumex RA-915 Mercury Vapor Analyzer, provided verbal advice on clean-up activities, and recommended checking the school for tracking of spilled mercury as well as removing other sources of mercury. MDCH recommended sending letters home with students informing parents of the event, and suggested writing a press release for local papers. Each of these recommendations were implemented.

In addition, MDCH had recommended that a NIOSH 6009 clearance test should be conducted at the end of the cleanup. However, on the advice of their contractor, the Charlotte Public Schools determined that a NIOSH clearance test was not necessary because all mercury vapor readings were less than 3,000 ng/m³ following clean up activities.

Public Health Action Plan

These recommendations were implemented and no further action is necessary at this time.

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.

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CERTIFICATION

This Charlotte Middle School 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