

Health Consultation

ONTONAGON HIGH SCHOOL MERCURY RELEASE

ONTONAGON, MICHIGAN

EPA FACILITY ID: MIN000510157

APRIL 3, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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Prepared By:

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

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Summary

The Michigan Department of Community Health (MDCH) received a call on September 28, 2006, from the Michigan Department of Environmental Quality (MDEQ) Upper Peninsula District office regarding a mercury spill in a high school woodshop. Over the next several days, MDCH advised the school principal and the school district superintendent regarding mercury containment, communication to interested parties, remediation, and biologic testing. The school engaged the services of an environmental contracting firm who remediated the spill area and performed clearance testing after ventilation and stabilization. Upon receipt of the data, MDCH noted that the air temperature at the time of the clearance testing was lower than necessary for accurate reading. The contractor was called back to the school, and with the assistance of contractors for the U.S. Environmental Protection Agency (EPA), found remaining hot spots of mercury and an additional area in the wood shop storage room that needed remediation. The contractor performed the additional cleanup and removal actions with EPA oversight, and the areas were cleared for reuse. MDCH considers this site a Past Health Hazard because of the mercury from historic spills discovered in the storage room.

Background

The Ontonagon Junior-Senior High School is located at 701 Parker Avenue in Ontonagon, Michigan. On September 28, 2006, the MDEQ was notified of a mercury spill in the high school woodshop. Three students found a rubber tube containing mercury in the back of a drawer. When one of the students picked up the tube, approximately a pound of mercury spilled onto the floor. The students approached a teacher and reported the spill. The teacher took them to the principal's office and then they returned to the workshop to observe the affected area. The students were quarantined. The workshop room and an adjacent storage area were secured and kept off-limits to unauthorized entry. The woodshop and storage area are used by two classes of approximately 25 students each and their teacher. The MDEQ notified the MDCH and provided contact information for officials at the school. MDCH contacted the Western Upper Peninsula District Health department to have a representative ready to assist the school.

The MDCH contacted the school and gave verbal advice. MDCH faxed and emailed them resource materials to address the spill and also to communicate with parents and other stakeholders. The school engaged an environmental contractor from Wisconsin who arrived on the evening of the 28th. The contractor began taking air samples with a VM 3000 mercury vapor analyzer at 8:50 p.m (1). The results of this sampling, and subsequent sampling rounds, reported in micrograms of mercury per cubic meter of air ($\mu\text{g}/\text{m}^3$), are shown in Tables 1 through 3. Table 1 shows the initial screening performed to determine which parts of the school were affected and needed to be isolated from the rest. Tables 2 and 3 were at the time considered post-remediation sampling.

Table 1. Contractor VM 3000 Readings Taken on September 28, 2006, 8:50 p.m. Initial Characterization

Location	Range of Concentration ($\mu\text{g}/\text{m}^3$)
Storage Room	0.5 to 9
South Hallway	0.6
School Office	0.2 to 0.4

Table 2. Contractor VM 3000 Readings Taken 1:10 a.m. on September 29, 2006. Post-Remediation

Location	Range of Concentrations (ug/m ³)	
	Respiratory zone	Floor Zone
South Hallway	0.2 to 0.4	0.1 to 0.6
School Office	0.0 to 0.8	0.0 to 0.1

Table 3. Contractor VM 3000 Readings Taken at 6:30 a.m. on September 29, 2006. Post-Remediation

Location	Range of Concentrations (ug/m ³)	
	Respiratory Zone	Floor level
Wood Shop	0.4 to 1.0	0.1 to 0.8
Room 263	1.0	1.0

While reviewing the data sheets, MDCH noticed that the log indicated the notation “school boiler not on.” MDCH contacted the school and the contractor and determined that the air temperature at the time of the screening and the clearance testing was in the range of 67 to 68 degrees Fahrenheit. At this temperature the mercury contamination present would not be vaporizing into the air at a rate representative of normal and worst-case classroom temperatures throughout a school year.

MDCH contacted the school, the local health department and requested the assistance of the EPA Emergency Response Branch. The contractor was asked to return to the school, and with the assistance of the EPA contractors and the maintenance staff of the school, another screening was conducted. Accurate identification of contaminated areas, and additional contaminated furniture and stored materials lead to an effective cleanup. Additional mercury-in-air data at the higher temperature were not reported to MDCH. However, the disposal of the contents of the room including shelving, cabinets, boxes of documents, tools and equipment leads MDCH to conclude that the storeroom contained high levels of mercury vapor, perhaps for years. Anyone who entered the storeroom during that time likely received a significant exposure to mercury vapor for a short time.

After the second round of remediation and stabilization of the affected areas, clearance testing was conducted. The NIOSH 6009 clearance test results are shown in Table 4 (2).

Table 4. NIOSH 6009 Readings Taken in the Respiratory Zone on October 4, 2006.

Location	Concentrations (ug/m ³)
Wood Shop Store-room	2.47
Main Wood Room	1.54
Hallway outside main wood room	1.02

Discussion

MDCH frequently receives requests from a variety of sources to assist with elemental mercury spills and is prepared to help in several ways. Staff can quickly fax or email procedural guidance to the requester, which includes information on addressing small or large spills, fact sheets, sample press releases, sample letters to parents, patients, employees, and more. MDCH response can include requesting and coordinating the resources of other agencies such as local health departments, the Agency for Toxic Substances and Disease Registry (ATSDR), the EPA Emergency Response Branch, and the Michigan-based Poison Control Centers. MDCH can also provide guidance on containing the spill, managing the cleanup, and evaluating the need for biological sampling of exposed and potentially exposed people. MDCH assists local health departments in drafting letters to home and business owners after the event for insurance coverage purposes.

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 ATSDR recommends that breathing zone mercury levels not exceed 1.0 micrograms of mercury per cubic meter of air (ug/m^3) for long term exposures as would be likely in a residence (3). 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 $26.0 \text{ ug}/\text{m}^3$. 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 micrograms per cubic meter (ug/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. ATSDR and MDCH guidance recommends that the breathing zone of a residence not exceed a mercury vapor concentration of $1.0 \text{ ug}/\text{m}^3$ once the home has been remediated and ventilated and stabilized. Guidance recommends the breathing zone of a school where no one resides not exceed $3.0 \text{ ug}/\text{m}^3$ after remediation, ventilation and stabilization. If levels exceed that guidance number there needs to be additional cleanup to remove residual source mercury and mercury vapor (3,4).

The NIOSH 6009 protocol is the preferred clearance test for mercury spills especially in a setting where the age and pre-existing medical conditions of people that might be at risk of exposure is not known. The VM 3000 vapor analyzer reports mercury vapor levels in ug/m^3 and is capable of accurately screening and characterizing sites. The NIOSH 6009 which reports in ug/m^3 is the widely accepted best test for clearance testing.

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 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 for an extended period of time 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 (5). 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 (6).

In the Ontonagon circumstance, the concern was not only for the children directly involved in the spill event, but also for those who rode school buses, traveled in vehicles or lived in homes shared with those who may have tracked mercury away from the school spill. Though it was not considered necessary, based on the estimated exposures, the school gave the students and their parents information regarding biological testing for mercury. No one was known to have elected to have a blood or a urine test as a result of this mercury event.

Conclusions

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

The Ontonagon High School Mercury Release was a contamination event that required both immediate intervention and continued oversight to prevent exposure. If the first round of post-cleanup sampling had been accepted, students and teachers would have returned to occupy areas contaminated by the recent spill and historical spills also. The historic spills had contributed to a highly contaminated storeroom, the entire contents of which were disposed of. MDCH considers this site to be a Past Health Hazard.

Recommendations

At the time the final clearance testing results were available, all the recommendations made by MDCH and the local health agencies had been accepted and implemented. MDCH will remain available as needed for future consultation at this site.

If any citizen has additional information or health concerns regarding this health consultation, please contact the Michigan Department of Community Health, Environmental and Occupational Epidemiology Division, at 1-800-648-6942.

Public Health Action Plan

The Kingsford administration implemented all recommended recommendations and no further actions are needed. The school or the local health agency will contact MDCH should further assistance be required. MDCH will answer any questions or secure any additional resources that would be needed for additional activities.

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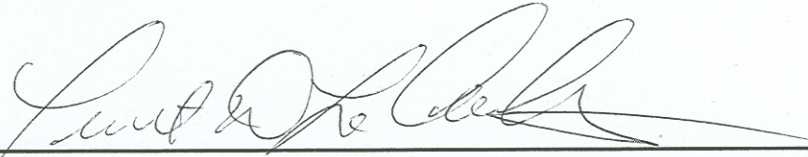
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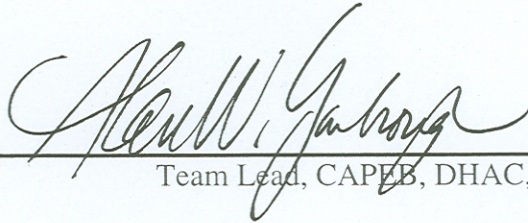
Certification

The Michigan Department of Community Health prepared this Ontonagon High School Woodshop Health Consultation 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. Editorial Review was completed by the Cooperative Agreement Partner.



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



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