Health Consultation

KINGSFORD MIDDLE SCHOOL

IRON MOUNTAIN, DICKINSON COUNTY, MICHIGAN

EPA FACILITY ID: MIN000510159

MARCH 30, 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 principal of a middle school in Michigan's Upper Peninsula called the Michigan Department of Community Health (MDCH) to request assistance with a mercury spill incident. A teacher had brought a small amount of mercury into the school and spilled some of it in a classroom while demonstrating its physical properties. The administration learned of the spill three weeks afterwards and immediately sought help. MDCH gave advice on the initial actions needed and brought in the assistance of the Dickinson Iron District Health Department and the U.S. EPA Emergency Response Branch office in Traverse City Michigan. EPA contractors screened the school and found mercury contamination in two classrooms. The initial screening levels detected in the breathing zone did not exceed 3 micrograms per cubic meter of air (ug/m^3). Contractors hired by the school remediated the contaminated areas and performed clearance testing according to the NIOSH 6009 protocol. MDCH and the local health department approved the reuse of the affected areas based on the results of the clearance test results. This event has been categorized as **No Apparent Health Hazard**.

Background

The Kingston Middle School is located at 431 Hamilton Drive, Iron Mountain, Michigan. MDCH received a call from the principal of the Kingsford Middle School on October 3, 2006, regarding a spill that had just come to come to their attention. A teacher had brought an unknown amount of mercury into a classroom and poured it onto a desk surface to demonstrate its physical properties. It was reported that he then returned the mercury to the container it was brought in and took it home at the end of the day. The school was in the process of arranging an interview with the teacher to learn details of the event. MDCH gave the principal information regarding the potentially affected carpeting, furniture, people, clothing, and vehicles, and encouraged him to begin communicating with those affected by the incident. The school estimated that the classroom in question, which held five classes a day, had as many as 125 students and their teachers occupying it over the course of three weeks. MDCH called the local health department and secured the assistance of a representative who could be on scene to assist environmental investigators and to provide oversight through the process until clearance test data was available.

The initial screening by the EPA contractors found an area of contaminated carpet near where the mercury demonstration took place in Room 203 and another area near the teacher's desk in Room 103. The contractors did not find any additional contamination in hallways, other rooms and common areas of the school. The screening was conducted using a Lumex RA 915+ Mercury Vapor Analyzer that has a lower detection limit of 0.02 ug/m^3 and provides readings in real time. None of the breathing zone readings verbally reported by the EPA contractors exceeded 3 ug/m^3 (1).

MDCH participated in several conference calls that included the school administrators, the EPA and their contractors, local health departments, and others during which the group exchanged information and made decisions. MDCH also reviewed draft correspondence used to inform parents and the media. The school brought in cleanup contractors to remove carpet and treat the surfaces underneath them with the appropriate

solutions to suppress vapor and capture elemental mercury. Anyone who had been in the affected areas during the time between spill and investigation were asked to bring their shoes back to the school for testing. The only pair of shoes that were contaminated and needed to be disposed of belonged to the teacher who gave the mercury demonstration.

Once the cleanup was completed and the rooms ventilated and stabilized the NIOSH 6009 clearance tests were conducted. The results from 4 stations within the school ranged from >0.968 ug/m3 to >01.03 ug/m3 (2). This is well below the 3 ug/m^3 clearance guideline for schools recommended when all source mercury has been removed.

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 and employees and more. MDCH response can include requesting and coordinating the resources of other agencies such as local health departments, ATSDR, the U.S. EPA Emergency Response Branch and the Michigan Poison Control Centers. MDCH can also give guidance on containing the spill, managing the cleanup, and evaluating the need for biological sampling of exposed and potentially exposed people. We have assisted 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 (3). The Agency for Toxic Substances and Disease Registry (ATSDR) recommends that breathing zone mercury levels not exceed 1 ug/m^3 for long term exposures as would be likely in a residence. 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 (4). 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 ug/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 three 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 ng/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

ug/m^3 once the home has been remediated and ventilated. (5, 6) If levels exceed that guidance number there needs to be additional cleanup to remove residual source mercury and mercury vapor.

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 Lumex RA 915+ vapor analyzer reports mercury vapor levels in ng/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. 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 (4).

The investigation, assisted by the EPA contractors, did not find evidence that the spread of mercury contamination occurred. 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 in the days that followed:

The Kingsford Middle School was a contamination event with an unknown amount of mercury that had a three-week-duration opportunity for exposure. The time between spill and the school administration's knowledge of it, put adults, children and their families at risk. Based upon the data that the investigation produced this event is considered **No Apparent Health Hazard**. Students, teachers and staff had been exposed to elemental

mercury vapors but not at concentrations or for durations that are expected to cause adverse health effects.

Recommendations

DCH made many recommendations to the school administrators and local health agency regarding issues like securing the contaminated areas, engaging contractors, and communicating with parents and others. MDCH offered to be available to the school as needed for future consultation for 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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5. ATSDR (Agency for Toxic Substances and Disease Registry). 2000. Suggested Action Levels for Indoor Mercury Vapors in Homes or Businesses with Indoor Gas Regulators.

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Certification

The Michigan Department of Community Health prepared this Kingsford Middle School 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.

Technical Project Officer, Cooperative Agreement and Program Evaluation Branch (CAPEB), Division of Health Assessment and Consultation (DHAC), ATSDR

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

Team Lead, CAPEB, DHAC, ATSDR