Health Consultation

WORLDMED MERCURY SITE

DETROIT, WAYNE COUNTY, MICHIGAN

EPA FACILITY ID: MIN000509958

MAY 26, 2006

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.

You May Contact ATSDR TOLL FREE at
1-888-42ATSDR
or
Visit our Home Page at: http://www.atsdr.cdc.gov

HEALTH CONSULTATION

WORLDMED MERCURY SITE

DETROIT, WAYNE COUNTY, MICHIGAN

EPA FACILITY ID: MIN000509958

Prepared by:

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

HEALTH CONSULTATION

WorldMed Mercury Site

Detroit, Wayne County, Michigan

Prepared by

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

Summary

The Michigan Department of Community Health was contacted to follow up on a mercury cleanup where the contractor thought the contamination might have been more extensive than was apparent. The initial screening on the second floor of a building with very few windows showed very high levels of mercury vapor outside the room in question. MDCH enlisted the services of the U.S. EPA Emergency Response Branch for the cleanup and encouraged the employer to have staff tested for mercury.

Background and Statement of Issues

In June, 2005 MDCH staff received a call from an environmental contractor who had performed an initial cleanup of spilled elemental mercury at the World Medical Relief (WMR) building in Detroit. WMR, a non-profit organization, owns and operates the building at 11745 Rosa Parks Boulevard in Detroit, Michigan. WMR is in the business of gathering medical supplies, medicines and equipment from various sources, and shipping them to benefit medically impoverished people locally, nationally and internationally. Paid staff and volunteers spend varying amounts of time in the building. The room was regularly used years ago, but had been recently used mainly for repair, adjustment and storage of equipment. Staff and volunteers have not routinely spent much time inside it in recent years. The organization was in the process of changing the use of the room when staff, entering it to establish new work areas, discovered the mercury beads and pools resulting from historic breakage of mercury-bearing medical devices. The organization's administrator elicited the services of an environmental contractor to remove the visible beads.

MDCH, while in the process of other Detroit investigations, contacted the WMR administrator and offered to screen the area that had been cleaned by the contractor. MDCH staff visited the WMR building on June 17, 2005, and was shown to the equipment room in the northwest corner of the second floor. The room has two doors. Both were closed; one was sealed. MDCH staff set up equipment outside the door and ran initial tests using a Lumex RA 915+ mercury vapor analyzer that has a lower detection limit of 2 nanograms per cubic meter of air (2 ng/m^3). The first measurement observed was the average of ten one-second readings and revealed 22,000 ng/m^3 in the breathing zone at a location approximately 10 feet in front of the closed door on the west side of the room.

The building staff opened the door to the room long enough for MDCH to hold the Lumex sampling hose inside and sample the air. The readings instantly rose to 50,000 ng/m^3 (the upper detection limit of the device) and continued to climb. MDCH asked them to shut the door and secure it until such time as workers wearing the appropriate personal protection and safety equipment could finish characterizing the contamination.

MDCH met with the WMR director and learned that there were only two small windows on the entire second floor and one of them was in the highly contaminated equipment room. After discussing the situation with the director and two board members, MDCH requested the assistance of the United States Environmental Protection Agency Emergency Response Branch (EPA). Based on the MDCH data, the EPA mobilized a team of environmental contractors who

visited the building and screened for mercury wearing the appropriate personal protection and safety equipment. The mercury vapor concentrations detected inside the room ranged from 20,000 to 200,000 ng/m3.

EPA determined that a removal response was necessary based on the large amount of mercury involved and the potential for track-out of mercury from the room. On June 20, the EPA and their contractor began clean-up activities. During the period June 21 through June 23 they captured mercury beads, tested and separated highly contaminated items and furniture from uncontaminated, removed contaminated drywall sections and ventilated the room. They returned to conduct final air monitoring on June 24 and reported breathing zone levels ranging from 1,000 to 3,200 ng/m3 in the equipment room and from 1,800 to 2,400 ng/m3 in the adjacent storage area within the room. The EPA contractors recommended that WMR engage contractors to seal the floor to suppress residual mercury vapor sources. EPA further recommended follow-up screening of the building in the winter.

WMR offered free mercury urine testing for any employee or volunteer who wanted to be tested. Of the 22 people who accepted the testing and submitted a spot urine sample, only three people had detectable levels of mercury in their urine. The positive results were 7.3; 7.3; and 3.9 micrograms of mercury per gram of creatinine (ug/g creat). The three workers were scheduled to have follow-up urine tests six months after the first one. Their work area is on the same floor but a distance of more than 50 feet away from the equipment room, and it is unlikely that they have ever entered the room. Other workers, including a volunteer who has worked in the room at least some of the time during the two months he had been working at the organization, declined the offer to be tested.

Discussion

MDCH frequently receives requests to assist with elemental mercury investigations and is prepared to help in several ways. As in this case, MDCH will use equipment to determine if a mercury bearing-material is giving off mercury vapor in quantities that pose a health hazard. Staff can also quickly fax or email procedural guidance to the caller following a spill. This may include information on addressing small or large spills, sample press releases, and sample letters to parents, patients and employees. Our response can include bringing in and coordinating the resources of other agencies such as ATSDR, the U.S. EPA Emergency Response Branch, the Michigan-based Poison Control Centers and county and city health agencies. We are also able to give guidance on containing spills, 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 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. In this case, the exposure pathway was complete for those who entered the room and anyone working nearby and breathing the mercury vapors emanating from the room.

Inhalation of high levels of elemental mercury can cause permanent neurological damage and kidney impairment. The MDCH and the Agency for Toxic Substances and Disease Registry (ATSDR) recommends that breathing zone mercury levels not exceed 1,000 ng/m3 for long term exposures as would be likely in a residence, nursing home or other place where people spend a large amount of time. They recommend levels not exceed 3,000 ng/m3 in non-residential settings where nobody spends more than a workday and mercury is not usually handled. (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 nanograms of mercury per cubic meter of air (ng/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 ng/m^3. An MRL is defined as an estimate of the daily exposure level to a hazardous substance that is likely to without appreciable risk of adverse, non-cancer health effects. **The ATSDR recommended values of less than 1000 ng/m^3 for residential setting and 3000 ng/m^3 non-residential, are levels that if exceeded would prompt the need for further cleanup or other remedial action.**

The laboratory that processed the urine samples for WMR reported a detection limit of 4 ug/g and a "Biological Exposure Index" (preshift) of 35 ug/g. In persons not occupationally exposed to mercury urine levels rarely exceed 5 ug/g creatinine. Many experts propose 50 ug/g creatinine as a biologic threshold limit value for chronic (long term) exposure. At this level, individuals should be placed in a non-exposed job until sources can be identified and urine levels have fallen below 50. Based on the results it is very unlikely the workers with the 7.3 ug/g creatinine would experience any symptoms or health effects from their exposure. The worker with the 3.9 ug/g creatinine urine test would be even less likely to experience any affects from exposure. Indeed, there is little confidence in this measurement because it is below the detection limit the laboratory indicated.

Addressing the Unique Vulnerabilities of Children

Though it is unlikely that children would ever visit the contaminated area of the WMR building, pre-response there was the potential that chemicals tracked out of the WMR might contaminate vehicles and employee homes where children might be exposed. 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 an adult, 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 exposed to similar amounts of mercury vapor as adults may receive larger doses because of greater lung surface area relative to their body weight. Their lower body weight and higher intake rate can result in a greater dose of mercury per unit of body weight. Children tend to be shorter in stature than adults, thus their breathing zone is nearer the floor where higher mercury levels are typically found. Children also engage in activities such as crawling and rolling around on the floor. Given that mercury affects the nervous system and that the neuropathways of children (<15 years old) are still developing, children can sustain permanent damage if the mercury exposure reaches toxic levels during critical growth periods.

Children who inhale significant amounts of 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 heart rate, elevated blood pressure, excessive salivation or sweating, rashes, fretfulness, sleeplessness, and /or weakness may also be present. This disorder may occur, in some cases, when exposure lasts for only a few days.

Conclusions

Based on the sampling data, the mercury vapor measured in the equipment storage and repair room was of sufficient concentration to pose a **Public Health Hazard** to anyone occupying the room. MDCH also concluded that vapors emanating from the room could result in unacceptable air concentrations at a distance from the room especially when one or both of its doors were open. This indoor air quality circumstance was exacerbated by the scarcity of windows and other fresh outside air sources. After remedial activities conducted by contractors for the U.S. EPA the concentrations of mercury in the air were reduced a great deal. WMR had the floors sealed per the recommendations. A follow-up Lumex sampling in February 2006 indicated concentrations averaging approximately 1000ng/m3 in the breathing zone with floor samples of discrete areas ranging from 1000ng/m3 to 24, 000 ng/m3 on the floor. As of March 2006 the room is not being actively used; however, equipment and supplies are still being stored there. Anyone who must enter the room, even for a short time, must wear shoe coverings to prevent track-out. MDCH will resample the room when the outside temperature is warm enough to determine if any change in concentrations would necessitate any additional recommendations.

Recommendations

MDCH recommended the following to the WMR administration and Board:

1. Secure the room and allow no one to enter it until after it is fully characterized and remediated by environmental contractors.
2. Notify all workers in the building, especially those who regularly spent time in the affected room, that they may have been exposed to hazardous air concentrations of mercury vapors.
3. Offer workers urine tests for mercury.
4. Refer workers to MDCH staff and Poison Control Center physicians if they or their personal physicians had questions or concerns.

5. MDCH concurs with the EPA recommendations regarding sealing the floor surfaces and retesting the room and surrounding areas in the winter when the building is most closed up and heated.
6. Pregnant women will not be allowed to enter the room.
7. Anyone who must enter the room, even for a short period must wear shoe protection to prevent track out of residual contamination

Public Health Action Plan

MDCH performed the initial screening of the suspect areas of the building.

MDCH suggested sealing and restricting access to the equipment storage and repair room until full characterization was done to discover the extent of contamination.

MDCH interpreted the initial finding to the director and two board members and made recommendations regarding addressing the contaminated room and biological screening of potentially exposed workers.

MDCH requested U.S. EPA Emergency Response Branch's assistance in fully characterizing the extent of recent and historic mercury spills within the building.

MDCH will perform warm weather sampling to determine if any additional restrictions or actions are necessary.

PREPARERS OF THE REPORT

Michigan Department of Community Health
Division of Environmental and Occupational Epidemiology

Brendan Boyle, M.P.A., Health Assessor
Linda D. Dykema, Ph.D., Toxicologist

ATSDR Regional Representative

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

ATSDR Technical Project Officer

Trent D. LeCoultre
Division of Health Assessment and Consultation
Superfund Site Assessment Branch

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.

- MDCH (Michigan Department of Community Health). 2003
  Suggested Action Levels for Indoor Mercury Vapor in Michigan

- Oklahoma State University, Environmental Health and Safety, The Health Effects of Mercury

- Concentra Medical Centers, Non-Injury Status (Laboratory) Report, 7/27/05

- Nancy Smith, Tetra Tech EM Inc., Personal communication, 3/2/06

CERTIFICATION

This WorldMed Mercury Site 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