

Health Consultation

ASHLAND MEMORIAL MEDICAL CENTER MERCURY SPILL

CITY OF ASHLAND, ASHLAND COUNTY, WISCONSIN

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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

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HEALTH CONSULTATION

ASHLAND MEMORIAL MEDICAL CENTER MERCURY SPILL

CITY OF ASHLAND, ASHLAND COUNTY, WISCONSIN

Prepared By:

Washington Department of Health and Family Services
Under cooperative agreement with the
The Agency for Toxic Substances and Disease Registry

Summary

The Ashland Memorial Medical Center (AMMC) requested assistance from the Wisconsin Division of Public Health (DPH) regarding the human health implications and cleanup of a large mercury spill that occurred within an administrative wing of the hospital. The spill likely resulted in unsafe indoor air mercury vapor levels in a maintenance shop that posed a *public health hazard* in the past. Small amounts of mercury were unintentionally carried home on worker's clothing and resulted in unsafe levels of mercury that was a *public health hazard* in the past. Cleanup actions at the hospital and homes were effective at decreasing mercury indoor air concentrations to safe levels. A quick response at the hospital and homes and subsequent urine sampling indicates cleanup actions were effective at decreasing mercury indoor air concentrations to safe levels, which currently is a *no apparent public health hazard*. No further actions are needed.

Background

On Saturday, November 4, 2006, an AMMC staff member was working in the building operations shop of the hospital, at 1615 Maple Avenue in Ashland, Wisconsin, when they accidentally knocked from a 6-foot high shelf a plastic bottle that contained an estimated 500 ml (milliliters) of elemental mercury. The falling bottle broke on a large power saw, releasing liquid mercury that spilled over the machine and across the floor of the shop. After the spill, AMMC staff spent a number of hours cleaning up all visible beads of mercury with syringes and amalgamating powder, and placing and sealing these materials inside plastic jars. Soon after the spill, staff secured the area of the spill, kept the shop door closed and began ventilating air inside of the shop directly outdoors, minimizing vapor dispersal to other areas of the hospital. The air handling system that serves the building operations shop is separate from other air handling systems at the hospital. Therefore, any elevated mercury vapor levels inside the air within the shop were not further dispersed by air handling systems.

On November 6, AMMC contacted DPH and discussed potential exposure risks and agreed that professional cleanup was warranted. DPH concluded that while hospital staff apparently collected all visible mercury, microscopic mercury beads likely remained and could volatilize and result in unacceptable levels of mercury vapor inside of the shop. It was also possible that AMMC staff who came into the shop picked up these microscopic beads on their shoes and tracked the contamination to other areas in the hospital. As a result of discussions with DPH, AMMC hired an environmental consultant experienced in cleaning up elemental mercury spills. DPH also assisted AMMC and their contractor with the interpretation of ATSDR guidelines for air screening data (ATSDR 2000). DPH also provided mercury spill guidance and fact sheets to AMMC to aid in addressing health questions and concerns of hospital staff.

Since AMMC staff who first cleaned up the spill on November 4 may have been exposed to high levels of mercury vapors, DPH recommended these staff have their urine screened for mercury. Urine samples were collected from three AMMC staff on November 8 and sent to the Wisconsin State Laboratory of Hygiene for analysis. The urine-mercury results for these three staff were

at 6.0 µg/L, less than 1.0 µg/L, and less than 1.0 µg/L, which is within a normal range for adults (Tsuji, 2003).

On November 7, the cleanup contractor, Veolia Environmental Services, arrived at AMMC and evaluated for mercury vapors in the shop and adjacent hallways. While Veolia did not observe any visible beads of mercury in the shop or hallways, a direct-readout vapor analyzer detected average mercury vapor levels in the shop at 8 µg/m³ (micrograms per cubic meter air) in the ABZ (adult breathing zone), 25 µg/m³ a few inches above the floor, and 2.5 µg/m³ just above floor mats at the shop entry way. Elevated mercury vapor levels were also found very close to the power saw that the mercury bottle broke on. Mercury vapors were not detected in the hallway immediately outside of the shop. An automated floor scrubber, which is used daily to clean the acrylic tile floors in the hallway, had greater than 20 µg/m³ mercury vapor levels in the collection tank head space, and 3 µg/m³ levels along the rubber squeegee. For these results of air screening, the higher concentrations were similar to the ACGIH 8-hour Threshold Limit Value for mercury of 25 µg/m³ (ATSDR 2000). If the spilled mercury was not cleaned up, such levels of mercury vapors could pose a health concern for workers exposed over a long term. While these lower levels are not likely to pose a health concern for hospital workers, the levels are clear evidence of an elemental mercury spill and the need to initiate cleanup actions.

In response, the cleanup contractor used a mercury vacuum on all surfaces in the shop and hallway, followed with the application of an amalgamating solution. The power saw was disassembled and cleaned using the mercury vacuum. The contractor removed and disposed the holding tank and squeegee of the floor scrubber. Subsequently, air inside of the shop and adjacent hallways was screened and all mercury vapor concentrations were less than 1 µg/m³.

DPH recommended that each AMMC staff who assisted with spill cleanup have their shoes and clothing be placed inside of sealed plastic bags and the head space of the bag screened to determine whether these items are contaminated. The mercury level in the head space of each bag of personal effects exceeded 10 µg/m³, the level at which these are considered contaminated and were subsequently disposed of as hazardous waste. This exceedance led DPH to conclude that AMMC staff may have unintentionally transported mercury away in their clothing and it could have reached their cars and homes. DPH recommended that their vehicles and homes be screened for elevated mercury vapors.

On November 6, DPH also shipped a Lumex mercury vapor meter (Ohio Lumex model RA-915) to the Ashland County Health Department, which was used by environmental health staff from the DPH Northern Regional office to assist with evaluating indoor air impacts of the mercury spill. The DPH Regional Office screened the air in homes of three AMMC staff and found mercury vapor levels very elevated in one home, and slightly elevated in the other two homes. The home with the highest mercury vapor levels had between 10 and 12 µg/m³ in the ABZ, and with more elevated levels at a clothes hamper (47 µg/m³), sofa (16 µg/m³), and carpeted floor (13 µg/m³). The other two homes had average ABZ levels at 1.1 and 4.3 µg/m³. Following two days of ventilation, the affected home was closed up for 8 hours and mercury levels were less than 1.0 µg/m³.

In the home with mercury vapor levels above $10 \mu\text{g}/\text{m}^3$, the clothes hamper and impacted sofa cushions were removed, as well as a section of floor carpeting. These items were properly disposed of by Veolia Environmental Services. Following two days of ventilation, the home was closed up for 8 hours and mercury levels in the ABZ were less than $1.0 \mu\text{g}/\text{m}^3$.

Discussion

The November 4, 2006, mercury spill at the AMMC likely resulted in mercury vapor concentrations inside the building operations shop that were a *public health hazard*, and actions were necessary to reduce inhalation exposure to safe levels. However, quick cleanup actions immediately after the spill and the results of urine sampling indicated that no hospital staff or patients were previously or are currently exposed to mercury vapors at levels of health concern. Therefore, conditions in AMMC are currently a *no apparent public health hazard*.

The release of 500 ml of elemental mercury is a very large indoor spill, but quick cleanup actions and techniques used by AMMC staff captured almost all of the mercury, an impressive accomplishment. When DHFS has responded to other mercury incidents that had spills less than 50 ml (one-tenth of the AMMC spill), air screening has found levels of mercury vapors that exceeded the top range of the mercury vapor screening equipment ($50 \mu\text{g}/\text{m}^3$). Given the very large volume of the spill at AMMC, it is reasonable to assume that immediately after the spill, mercury vapors exceeded $50 \mu\text{g}/\text{m}^3$, which would be a *public health hazard*. Proper ventilation and isolating the spill area minimized the dispersal of visible mercury beads and vapors to other areas of the hospital. Despite these actions, AMMC staff inadvertently carried microscopic mercury contamination to their homes on their clothing and shoes, where it became dispersed. The average mercury vapor levels in the air of one home were measured as high as $12 \mu\text{g}/\text{m}^3$, which posed a *public health hazard* and which required cleanup. Young children are the most sensitive to the immediate adverse health effects of breathing elevated mercury vapors, however no children live in any of these three homes.

The urine mercury levels of all three AMMC staff were found to be a normal range. A higher level may have been measured if a urine sample was collected immediately after the spill, rather than 4 days later. No staff described symptoms or health effects associated with exposures to breathing mercury vapors.

Once the AMMC shop and homes were cleaned up, indoor mercury vapor levels were less than $1.0 \mu\text{g}/\text{m}^3$.

Child Health Considerations

DPH recognizes that children can be especially sensitive to contaminants. Children are often at greater risk than adults to certain kinds of exposure from hazardous chemicals in the environment. Children engage in activities, such as playing outdoors and hand-to-mouth behaviors, that increase their exposure to hazardous substances. Being much smaller than adults and playing on their hands and knees, children breathe air close to the ground that can have more dust, soil particles, and vapors. Children have a lower body weight, but a higher intake rate which results in a greater dose to hazardous substances per unit body weight. Also, children's bodies are developing and have permanent damage if toxic exposures are high enough during critical growth stages. For that reason, DPH considers children as one of the most sensitive population evaluated in this health consultation, and always takes into account children when evaluating exposures to contaminants.

Children have not been exposed to mercury vapors at levels that would be expected to cause adverse health effects, either at the AMMC or at staff homes.

Conclusions

- The November 4, 2006, spill of 500 ml mercury at the Ashland Memorial Medical Center likely resulted in mercury indoor air vapor levels in the building operations shop that was a *public health hazard* in the past.
- Small amounts of mercury that were unintentionally carried home on worker's clothing resulted in unsafe levels of mercury and was a *public health hazard* in the past.
- A quick response at the hospital and homes and subsequent urine sampling indicates cleanup actions were effective at decreasing mercury indoor air concentrations to safe levels, which currently is a *no apparent public health hazard*.

Recommendations

- DPH recommends no further actions are needed regarding this incident.

Public Health Action Plan

- DPH provided time-critical assistance to AMMC staff to appropriately respond to a large elemental mercury spill in the hospital.
- In collaboration with the Wisconsin State Laboratory of Hygiene, DPH ensured that exposed workers had their urine screened for elevated levels of mercury.
- DPH will continue to assist AMMC staff in identifying and replacing mercury containing devices at the medical center with non-mercury containing alternative devices.

References

Agency for Toxic Substances and Disease Registry (ATSDR). March 1999. Toxicological Profile for Mercury, Update Report. Atlanta, GA: US Public Health Service, Department of Health and Human Services.

ATSDR. 2000. Suggested Action Levels for Indoor Mercury Vapors in Homes or Businesses with Indoor Gas Regulators. Atlanta, GA: US Public Health Service, Department of Health and Human Services.

Tsuji JS, Williams PRD, Edwards MR, Allamneni KP, Welsh MA, Paustenbach DJ, and Sheeran PJ. Evaluation of Mercury Urine as an Indicator of Exposure to Low Levels of Mercury Vapor. Env Hlth Persp, 111(4): 623-630, April 2003.

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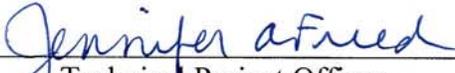
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Certification

This Health Consultation for the Ashland Memorial Medical Center Mercury Spill was prepared by the Wisconsin Department of Health and Family Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved methodology and procedures existing at the time the Health Consultation was begun. Editorial review was provided by the cooperative agreement partner.



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



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