INDOOR AIR QUALITY ASSESSMENT
INCIDENT RESPONSE

J.S. Sullivan Elementary School
151 Kemp Avenue
North Adams, Massachusetts 01247

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality and Environmental Toxicology Programs
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Background/Introduction

On the evening of Tuesday, October 21, 2008, the Massachusetts Department of Public Health (MDPH), Bureau of Environmental Health (BEH) was contacted to provide consultation and assistance regarding an incident involving a broken mercury thermometer at the J.S. Sullivan Elementary School (SES), 151 Kemp Avenue, North Adams, Massachusetts. As a result of the incident, indoor air quality and exposure concerns were raised.

On October 21, 2008, school staff found the remains of a broken mercury thermometer in a hallway outside a locker in the lower wing of the building (Picture 1). Shortly after this discovery was made, the North Adams Board of Health, North Adams Fire Department, Massachusetts Department of Environmental Protection (MDEP) and State Hazardous Materials (HazMat) Team were contacted and the building was closed. The State HazMat Team conducted mercury air sampling, and evaluated/remediated contaminated materials. The HazMat team removed the lockers to clean up the spill in and around the locker. Mercury beads were removed and broken glass was picked up. The area was then cleaned with soap and water. The hallway was ventilated overnight to remove mercury vapors.

Later in the evening of October 21, 2008, Beverly Anderson, Director of BEH's Coordinated Environmental Response, contacted Michael Feeney, Director of the BEH's Indoor Air Quality Program. Mr. Feeney subsequently contacted Martha Steele, Deputy Director of BEH, and various North Adams city officials involved in the response to the incident. Ms. Anderson also contacted Mary Clark, Director of the MDPH's Bureau of Emergency Preparedness and the MDPH Communications Office to report the incident. On Wednesday, October 22, 2008, Mike Feeney visited the SES to assist in evaluation and remediation efforts related to the mercury release.

Methods

BEH staff performed a visual inspection of the building's heating, ventilation and air conditioning (HVAC) system for pathways of mercury migration. At the request of North Adams city officials, the MDEP conducted mercury testing using a LUMEX Zeeman mercury analyzer RA-915 (Lumex).

Discussion

As mentioned, the HazMat team screened for mercury vapors using a Jerome mercury vapor analyzer (Jerome meter). The Jerome meter has a detection limit of 3 $\mu g/m^3$ (AI, 2005). All samples taken by the HazMat team were reportedly below the detection limit, with the exception of the samples taken directly over the mercury beads and broken glass on the floor and in the locker. These results indicated that mercury contamination was contained to the floor and locker where the thermometer had broken, and were not spread to other areas of the school. For these reasons, it was concluded that human exposure to mercury, at levels approaching health concern, were extremely unlikely.

While it is helpful to determine if acute hazards exist, the Jerome meter does not have the capacity to measure levels less than 1 $\mu g/m^3$ (1,000 ng/m^3), the Agency for Toxic Substances and Disease Registry (ATSDR) Suggested Action Level (SAL) for mercury clean up air (ATSDR, 2001). In order to determine if mercury concentrations in the NACH were below the ATSDR SAL, North Adams city staff requested the MDEP conduct air sampling using a LUMEX (Picture 2). The LUMEX has a detection limit of 0.002 $\mu g/m^3$ (2 ng/m^3) for measuring mercury vapor (LUMEX, 2008). All samples measured on the floor and locker using the LUMEX were below the ATSDR SAL for mercury (Table 1).

Conclusions/Recommendations

In view of findings at the time of assessment, no further recommendations were made concerning mercury contamination clean up nor in relation to concerns over human exposure.

References

AI. 2005. Jerome 431-X Mercury Vapor Analyzer Operation Manual. Arizona Instruments LLC, Tempe, AZ www.azic.com/pdf/manual_700-0046.pdf

ATSDR, 2001. Health Consultation Residential Mercury Spills from Gas Regulators in Illinois (a/k/a NICOR) Mt. Prospect, Lake County, Illinois. Agency for Toxic Substances and Disease Registry, Atlanta, GA. http://www.atsdr.cdc.gov/HAC/PHA/resmerc/nic_p1.html

LUMEX. 2008. Zeeman mercury analyzer RA-915+. LUMEX, Inc., St. Petersburg, Russia. http://www.lumex.biz/product/ra915.shtml

Picture 1

Moved Locker Section Where Mercury Beads Were Discovered
(Circle Indicates Reported Local of Thermometer Break on Floor)

Picture 2

DEP Staff Conducting Air Sampling With LUMEX Mercury Vapor Analyzer

Location: J. S. Elementary School **Indoor Air Results**

Address: 151 Kemp St., North Adams, MA **Table 1** **Date: October 22, 2008**

Location	Instantaneous Reading ng/m^3
Front Lobby	14
Floor outside locker	19
Baseboard of wall near locker	42
Tile crack near locker	21
Tile crack near locker	111
Tile crack near locker	161
Tile crack near locker	88
Under locker	22-30
Tile crack near locker	30
Tile crack near locker	34
Tile crack near locker	40
Tile crack near locker	26
Locker 186	75
Tile crack near locker	30
Tile crack near locker	27
Tile crack near locker	39
Above floor breath zone	25
Outdoors	6

ATSDR Suggested Action Level (SAL) for
mercury clean up air = <1 µg/m^3 (<1,000 ng/m^3)

Appendix A

ATSDR Suggested Action Levels

Suggested Action Levels for Mercury (CAS # 7439-97-6) – **Residential Settings** †

Indoor Air Concentration (ug/m^3)	Use of the Action Level	Rationale for Action Level	Method of Analysis *	Reference
≤1.0	Level acceptable for occupancy of any structure after a spill (also called the residential occupancy level.)	A spill occurred in this building, and the risk manager needs to know if the building is safe for occupancy. ATSDR would prefer no one ever be chronically exposed to concentrations above the MRLs; however, experience has shown cleanup operations in a response to concentrations below 1 ug/m^3 can be extremely disruptive to individual and family quality of life. While this concentration is slightly above HGVs, this level is still 25 times lower than the human LOAEL on which the MRL is based. An indoor air concentration of 1 ug/m^3, as measured by the highest quality data (e.g., NIOSH 6009 or equivalent), is considered safe and acceptable by ATSDR, provided no visible metallic mercury is present.	NIOSH 6009 or equivalent	Based on HGVs above. ATSDR, 1999. EPA/IRIS
No qualitative detection on an Arizona Instrument's Jerome™ Meter.	Screening level for homes that had indoor gas meters with no evidence of a spill	Mercury was present in the regulator inside the home, but no evidence of a spill is found. The qualitative detection limit of the most commonly available air monitoring instruments approximates 1 order of magnitude below levels of known human health effects. As there was no spill, no visible metallic mercury should be present. Natural ventilation (e.g., windows, HVAC air changes, etc.) should reduce any concentration even lower with no disruption of family life or costs.	Real-time Air monitoring instrument (i.e., Jerome™ meter or equivalent)	
10	Isolate residents from the exposure	When adjusted from an intermediate to chronic exposures to a continuous exposure scenario (i.e., 24 hrs/day, 7days/week), this concentration approaches levels reported in the literature to cause subtle human health effects. Applied to acute exposures with good accuracy by real-time instruments, this value allows for interventions before health effects would be expected. Whenever possible, the mercury vapors should be prevented from reaching living spaces rather than temporarily relocating individuals. See the building evaluation protocol developed for these situations in your area and Section 2.1 of ATSDR's Toxicological Profile.	Real-time Air monitoring instrument (i.e., Jerome™ meter or equivalent)	ATSDR, 1999.
10	Acceptable level in a modified test procedure to allow personal effects to remain in the owner's possession	For personal effects, such as clothing, warmed in a discrete plastic container much smaller than a typical room (e.g., a garbage bag), this concentration in the air trapped inside the container is considered safe by ATSDR based on a number of factors.	Real-time Air monitoring instrument (i.e., Jerome™ meter or equivalent)	

*** - Environmental analysis should be in accordance with the requirements specified by environmental authorities. When real-time air monitoring instruments are specified in this table, laboratory analysis may be substituted at the discretion of the risk managers involved in the event. Operation of real-time instruments should be in accordance with manufacturer's instructions.**

† - Structures where mercury pressure regulating devices for natural gas meters were moved from inside the structure to outside the structure.

Appendix A

Suggested Action Levels for Mercury (CAS # 7439-97-6) – **Occupational and Commercial Settings** †

Indoor Air Concentration (ug/m^3)	Use of the Action Level	Rationale for Action Level	Method of Analysis *	Reference
3.0	Re-occupancy after a spill of an occupational or commercial setting where mercury is not usually handled.	Based on residential occupancy level but adjusted for the shorter duration exposures typical of most workplaces. This concentration approximates one order of magnitude below levels of known human health effects, provided no visible metallic mercury is present to act as an attractive nuisance or a source for more vapors. Those exposed in this instance would not expect hazards associated with mercury as part of their normal work and may include transient exposures by more sensitive individuals (e.g., retail facilities).	NIOSH 6009 or equivalent	HGVs. ATSDR, 1999. EPA/IRIS
25	Occupational settings where mercury is handled. •	Based on the 1996 ACGIH TLV. Assumes hazards communications programs as required by OSHA; engineering controls as recommended by NIOSH; and medical monitoring programs as recommended by the ILO, NIOSH, and ACGIH are in place. This concentration is ½ the peer-reviewed 1973 NIOSH REL and 1/4 the regulatory 1972 OSHA PEL. See HSDB at toxnet.nlm.nih.gov/sis on the Internet.	Real-time Air monitoring instrument (i.e., Jerome™ meter or equivalent)	HSDB, 1999
25	Response Worker Protective Equipment Upgrade. •	Response workers subject to HAZWOPER should evaluate need to upgrade protective equipment. Based on the 1996 ACGIH TLV. Assumes hazards communications programs as required by OSHA; engineering controls as recommended by NIOSH; and medical monitoring programs as recommended by the ILO, NIOSH, AND ACGIH are in place. This concentration is half the peer-reviewed NIOSH REL and a quarter of the regulatory OSHA PEL. See HSDB at toxnet.nlm.nih.gov/sis on the Internet. For these workers, engineering controls are not typically in place, and it is not possible to control the exposure by other safety techniques.	Real-time Air monitoring instrument (i.e., Jerome™ meter or equivalent)	29 CFR 1910.120; 40 CFR 311; NIOSH, 1987
10,000	IDLH Response Workers Protective Equipment upgrade.	Response workers subject to HAZWOPER should upgrade protective equipment. See http://www.cdc.gov/niosh/idlh/ on the Internet.	Real-time Air monitoring instrument (i.e., Jerome™ meter or equivalent)	29 CFR 1910.120; 40 CFR 311; NIOSH 1987

*** - Environmental analysis should be in accordance with the requirements specified by environmental authorities. When real-time air monitoring instruments are specified in this table, laboratory analysis may be substituted at the discretion of the risk managers involved in the event. Operation of real-time instruments should be in accordance with manufacturer's instructions.**

† - Structures where mercury pressure regulating devices for natural gas meters were moved from inside the structure to outside the structure.

• - Women workers in these settings who are pregnant or attempting to become pregnant should consult their physicians regarding their mercury exposure.