Letter Health Consultation

Evaluation of Mercury Exposure Risk for Families Residing at Apartment Complex

TWIN FALLS MERCURY SPILL

341-359 PHEASANT ROAD WEST

TWIN FALLS, IDAHO

Prepared by the
Idaho Department of Health & Welfare

MARCH 3, 2010

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners 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 or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR Toll Free at
1-800-CDC-INFO
or
Visit our Home Page at: http://www.atsdr.cdc.gov

LETTER HEALTH CONSULTATION

Evaluation of Mercury Exposure Risk for Families Residing at Apartment Complex

TWIN FALLS MERCURY SPILL

341-359 PHEASANT ROAD WEST

TWIN FALLS, IDAHO

Prepared By:

Idaho Department of Health & Welfare
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

IDAHO DEPARTMENT OF
HEALTH & WELFARE

C.L. "BUTCH" OTTER– GOVERNOR
RICHARD M. ARMSTRONG – DIRECTOR

ELKE SHAW-TULLOCH – CHIEF
BUREAU OF COMMUNITY & ENVIRONMENTAL HEALTH
450 West State Street, 6th Floor
P.O. Box 83720
Boise, Idaho 83720-0036
PHONE 208-334-5927
FAX 208-334-6573

Kai Elgethun PhD MPH
Public Health Toxicologist / Health Assessor

March 2, 2010

Melody Bowyer
South Central Public Health District
1020 Washington St N
Twin Falls ID 83301-3156

Tom Askew
IDEQ Twin Falls Regional Office
1363 Fillmore St
Twin Falls, ID 83301

RE: **Evaluation of risk for families exposed to mercury at an apartment complex**

Dear Partners,

At the request of the South Central Public Health District (SCPHD) and the Twin Falls office of the Idaho Department of Environmental Quality (IDEQ), the Bureau of Community and Environmental Health's (BCEH) Environmental Health Education and Assessment Program (EHEAP) has completed an evaluation of mercury exposure risk for families living in two apartment units located at 341-359 Pheasant Road West in Twin Falls, Idaho. This letter provides BCEH's conclusions and recommendations based on that evaluation in order to help safeguard the health of the apartment residents.

BACKGROUND

Purpose
Elemental mercury spills occurred at an 8-plex apartment complex in Twin Falls. The EPA On-scene Coordinator report for this site is available at:
http://www.epaosc.org/site/site_profile.aspx?site_id=5402.

IDEQ and SCPHD contacted EHEAP to help interpret risk from confirmed mercury exposures at this location. Exposure occurred for approximately 6 months. This document evaluates the health risk to the occupants exposed to mercury vapors. Cleanup efforts are completed at the site; thus, this evaluation will focus on retrospective exposure and risk. Findings will be communicated to impacted parents and children.

Elemental Mercury Toxicity

At a sufficient dose, mercury vapor can cause effects on the central and peripheral nervous systems, lungs, kidneys, skin, and eyes in humans. It is also mutagenic and affects the immune system at a sufficient dose (Hathaway et al. 1991; Clayton and Clayton 1981; Rom 1992). Acute exposure to high concentrations of mercury vapor can cause severe respiratory damage, while chronic exposure to lower levels is primarily associated with central nervous system damage (Hathaway et al. 1991). Sub-chronic (approximately six month) exposure will be considered here.

DISCUSSION

This evaluation focuses on inhalation exposure only (the major exposure pathway). Comparison values used in this evaluation all relate to the volume of contaminated air a person could inhale (breathe in) over a period of time.

Acute Exposure Approach

There are no relevant comparison values (CVs) for acute exposure to mercury in a non-occupational setting. Occupational exposure values are not relevant because they consider exposure only during the work shift. A likely exposure window in a residence is much longer in duration and more frequent.

Sub-Chronic Exposure Approach

Exposure occurred over a time period of approximately six months. ATSDR considers this an 'Intermediate' duration; however, there is no intermediate comparison value for mercury vapor. Sub-chronic refers to any exposure that is longer than an acute exposure. There are no federal or state standards for sub-chronic inhalation exposure to mercury vapor, so we must use chronic standards with a few caveats. The values considered are:

1) The ATSDR Minimal Risk Level (MRL) of 200 nanograms of mercury per cubic meter of air (ng/m^3),
2) The ATSDR Action Level of 1,000 ng/m^3, and
3) The experimentally-derived Lowest Observable Adverse Effect Level (LOAEL) of 9000 ng/m^3.

Data and Comparison to Standards and the LOAEL

Table 1. Mean Detected Mercury Concentration in Air on September 16, 2009 and Comparison Values

Parameter	Value	Unit	Comments
Mean Concentration (C)	Unit 341 C **140-1,100** (ambient) **140-350** (furnishings) **2,000** (vacuum) Unit 359 D **20-12,000** (ambient) **1,000-12,000** (furnishings and clothing)	ng/m^3	Direct Lumex readings, <u>not</u> headspace
ATSDR Action Level	1,000	ng/m^3	Clearance level; re-occupy level
ATSDR MRL	200	ng/m^3	Chronic; 24 hr
LOAEL	9000	ng/m^3	Chronic; 24 hr Health Endpoint: hand tremor, memory disturbance

ng/m^3: nanograms per cubic meter

Table 2. Mean Detected Mercury Concentration in Air by Specific Location on September 16, 2009 (Source: EPA)

Bldg.	Apt.	Level	Location	Value (ng/m^3)
341	C	Lower	Main entrance, floor	1050
			Main entrance, breathing zone	340
			Bedroom entrance floor	1100
			Bedroom floor	390
			Bedroom bed	290
			Bathroom floor	250
			Kitchen floor	330
			Living room floor	340
			Crib	350
			Washer/dryer	290
			Vacuum	2000
		Upper	Stairs	330
			Landing	200
			Hamper	240
			Corner room floor	150
			Corner room bed	150
			Corner room crib	140
			Center room breathing zone	160
			Center room floor	160
			Center room closet	150
			Bathroom	140
359	D	Lower	Main entrance breathing zone	20
		Upper	Landing floor	280
			Landing breathing zone	250
			Threshold to corner bedroom	260
			Corner room breathing zone	12000
			Clothing next to door (corner bedroom)	1000
			NE corner (corner bedroom) floor	2800
			NE corner (corner bedroom) breathing zone	9600
			SE corner (corner bedroom) floor	10000
			SE corner (corner bedroom) breathing zone	7100
			Box w/clothing, SE corner (corner bedroom)	12000
			Backpack	8500
			SW corner bag of trash	8500
			Top bed of bunk beds	9500
			Closet	8700

Values highlighted in red text are easily removable items that have moderate to high Lumex readings. Values highlighted in yellow represent levels of concern in comparison to the LOAEL.
ng/m^3: nanograms per cubic meter

Acute Exposure
There are no relevant comparison values (CVs) for acute exposure to mercury in a non-occupational setting. Occupational exposure values are not relevant because they consider exposure only during the work shift. A likely exposure window in a residence is much longer in duration and more frequent.

According to a study on mercury, acute inhalation of mercury vapor above occupational limits may cause chills, nausea, general malaise, tightness in the chest, chest pains, dyspnea, cough, salivation, and diarrhea (Hathaway et al. 1991). If none of these symptoms were reported by any of the occupants or visiting children, it is still possible that other long-term effects could occur given the six month or more duration of exposure.

Sub-Chronic Exposure
Sub-chronic refers to any exposure that is longer than an acute exposure. There are no federal or state standards for sub-chronic inhalation exposure to mercury vapor, so we must use chronic standards with a few caveats. The ATSDR chronic MRL is simply a screening tool, not a threshold of health effects. Clearly, most of the samples from the apartments were above the MRL of 200 ng/m^3, indicating that further analysis is justified. The MRL and RELs all incorporate uncertainty factors to insure protectiveness of even the most sensitive receptors. The LOAEL does not. The chronic LOAEL is the threshold at which health effects are known to occur. As noted above, chronic exposure is generally defined as one year or longer. In the case of the study that found the chronic LOAEL in humans, many of the exposed people were in a workplace with mercury vapors for approximately 12-18 years. Many measured mercury levels at the Pheasant Road apartments, particularly in the one child's bedroom at 359D, were above this LOAEL level, and the levels were likely much higher back when the initial spill(s) occurred. The documented health endpoint with this level of exposure over several years is hand tremor and memory disturbance (nervous system toxicity), as determined by the LOAEL study.

Being above the LOAEL for six months, particularly in the child's bedroom at 359D, is sufficient reason to have a full medical monitoring work-up on the child. The initial assessment of the child's symptoms by a clinician prior to indoor air sampling was consistent with mercury poisoning. Urine measurements are more reliable than blood for assessment of chronic exposure. Hair samples may be difficult to interpret and are not recommended. Neurobehavioral tests and long-term monitoring may be recommended by the physician/healthcare provider if neurological impairment is suspected. If urine mercury levels are still high, chelation therapy to draw mercury out of the body may be recommended by the physician/healthcare provider.

Exposure Uncertainty
Duration and frequency of exposure are estimated but not known. Children have different breathing rate and volume-to-body weight ratios than adults; in general, they breathe a greater overall volume of air per kg of body weight than adults. Children also have behaviors that make them more susceptible to higher exposures, such as playing and sleeping on floors that are contaminated. The most exposed child (who is 8 years old) at 359D was reported to sleep on the floor right next to the spill location. The child also reportedly spent a significant amount of time in her bedroom each day. The duration of the exposure was sub-chronic, whereas the LOAEL used in these comparisons is from a study of chronic multiple-year exposure.

Health Effect Uncertainty
All available human health effects data are for adults. Children are not small adults; their bodies behave differently in response to toxicants. Children's bodies are known to be more susceptible to neurotoxicants such as mercury, but there is not any data to quantify how they might respond differently than adults to elemental mercury vapor. The duration of the exposure was sub-chronic, whereas the LOAEL used in these comparisons is from a study of chronic multiple-year exposure.

CONCLUSIONS

The top priority of the Bureau of Community and Environmental Health (BCEH) is to ensure that the residents of these apartments have good information to safeguard their health. BCEH concludes the following:

Sub-Chronic Exposure. Past levels of mercury in air due to the mercury spill could harm the health of children. The child with the most contaminated bedroom (in 359D) and possibly other children and adults were exposed above the chronic LOAEL. Hand tremor and memory disturbance (nervous system toxicity) are the documented health effects of *multiple-year* exposure to mercury at these levels in adults. It is possible that these effects could occur in the most exposed child given a six month exposure. Other children were likely not exposed for a sufficient duration to cause these serious effects. Parents of the child whose room was most contaminated (359D) should take the child to see a physician/care provider *immediately.* Parents of each exposed child may want their child to see a physician/care provider if worried about potential health effects. Adults living in the more contaminated apartment (359D) may also want to be assessed by a physician/care provider, especially if any symptoms are noted.

Current levels of mercury in air due to spilled mercury *are not expected to harm the health of residents breathing the air* at either of the apartment units, provided that no contaminated personal items were intentionally or unintentionally overlooked by residents. EPA and its contractors did a thorough job of cleaning the units.

RECOMMENDATIONS

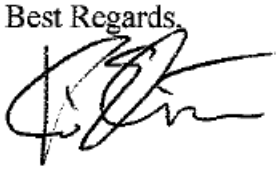
Based on our Bureau's communication with IDEQ and the EPA On-Site Coordinator, cleanup was completed according to EPA protocol and occurred rapidly following the spills. Affected rooms were remediated, mercury vacuumed, heated, ventilated, and re-sampled. The post-cleanup air concentration of mercury in both units was below the ATSDR action level standard listed in Table 1. Further recommendations are:

1. The 8 year old child whose room was the most contaminated (359D) should be taken to a physician/healthcare provider *immediately*.
2. All individuals with confirmed or suspected exposures should consult with their physician/healthcare provider if they experienced any adverse health effects or would like more information about the health effects of mercury exposure.
3. All non-essential personal items contaminated with mercury should be discarded if they have not been already.

4. Individuals should contact IDEQ for directions on where and how to dispose of mercury in their area. A list of sites that accept mercury thermometers is available from the IDEQ website at: http://www.deq.state.id.us/waste/recycling/Recycle_category.cfm?county=&recycle_category_id=97, or by calling (208) 373-0124.

If you have questions, please feel free to contact us any time.

Best Regards,



Kai Elgethun PhD MPH
ATSDR Health Assessor
208-334-5682

Attachment: References

CERTIFICATION

This health consultation was prepared by the Idaho Division of Public Health (IDPH) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. The editorial review was completed by the Cooperative Agreement partner.

Audra Henry
Technical Project Officer
Division of Health Assessment and Consultation
Agency for Toxic Substances & Disease Registry

Alan W. Yarbrough
Team Lead
Division of Health Assessment and Consultation
Agency for Toxic Substances & Disease Registry

REFERENCES

ATSDR. Toxicological profile for mercury (update). March 1999.

California Office of Environmental Health Hazard Assessment (OEHHA). Determination of acute reference exposure levels for airborne toxicants.
Accessed online: April 1, 2008:
http://oehha.ca.gov/air/acute_rels/pdf/hga.pdf

Clayton G, Clayton F. Patty's industrial hygiene and toxicology. 3rd rev. ed. New York, NY: John Wiley & Sons, 1981-82.

Fawer RF, deRibaupierre Y, Guillemin MP et al. Measurement of hand tremor induced by industrial exposure to metallic mercury. British J of Ind Med 40: 204-208 (1983).

Hathaway GJ, Proctor NH, Hughes JP, and Fischman ML. Proctor and Hughes' chemical hazards of the workplace. 3rd ed. New York, NY: Van Nostrand Reinhold, 1991.

US OSHA (OSHA). Occupational safety and health guideline for mercury vapor. Accessed online: February 27, 2008: http://www.osha.gov/SLTC/healthguidelines/mercuryvapor/recognition.html.

Rom WN . Environmental and occupational medicine. 2nd ed. Boston, MA: Little, Brown and Company, 1992.

Underwood MC. Health Consultation: El Camino Middle School mercury spill; Lompoc, Santa Barbara County, California. California Department of Health Services, under cooperative agreement with the Agency for Toxic Substances and Disease Registry. October 4, 2005.