Health Consultation

RESIDENTIAL MERCURY SPILL

LINCOLN, LOGAN COUNTY, ILLINOIS

EPA FACILITY ID: ILN000510232

JUNE 23, 2008

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

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Prepared By:
Illinois Department of Public Health
Under Cooperative Agreement with the
The U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances and Disease Registry
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Date June 27, 2008

From Division of Health Assessment and Consultation, ATSDR

Subject Health Consultation
Residential Mercury Spill

To Mark Johnson
Senior Regional Representative, ATSDR, Region V

Enclosed please find a copy of the Health Consultation on the following site prepared by the Illinois Department of Public Health under cooperative agreement with the Agency for Toxic Substances and Disease Registry.

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Please address correspondence to the Agency for Toxic Substances and Disease Registry (ATSDR) Records Center, 1600 Clifton Road, NE (F09), Atlanta, Georgia 30333.

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Health Consultation

Residential Mercury Spill
Lincoln, Logan County, Illinois

Prepared by:
Illinois Department of Public Health
Under Cooperative Agreement with the
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Purpose

In September 2007, the Logan County Health Department (LCHD) requested that the Illinois Department of Public Health (IDPH) assist in sampling a residential mercury spill. In response to this request, IDPH staff went to Lincoln, Illinois to sample and provide assistance. This health consultation summarizes the public health response to this incident.

Background and Statement of Issues

On September 10, 2007 a resident of Lincoln, Illinois contacted the Logan County Health Department. The resident reported finding droplets of mercury in her personal vehicle while moving her belongings from a rental home on South College Street to a rental home on 8th Street during the week of September 3. The resident also stated that her mother lives in the same home and recently had been evaluated for mercury exposure after the droplets were discovered. She reported that her mother had a blood concentration of 48 micrograms of mercury per deciliter of blood (µg/dL). Unexposed adults generally have a blood mercury concentration less that 1.5 µg/dL; a blood concentration of 5 µg/dL or greater is considered the threshold for symptoms of toxicity [1]. Using an IDPH mercury fact sheet, LCHD provided the resident with recommendations for removing the mercury droplets and disposing of contaminated personal items.

On September 11, 2007, LCHD contacted IDPH and asked for assistance in the investigation. IDPH contacted the resident and learned that she first discovered mercury droplets on her kitchen table while living in the South College Street home three months before contacting LCHD. The resident acknowledged having a mercury-containing blood pressure measurement device and reported that it had been moved to the 8th Street home.

On September 12, 2007, IDPH and LCHD performed air monitoring of both homes and the resident's personal vehicle using a Lumex Mercury Vapor Analyzer (MVA). Mercury levels in the breathing zone at the 8th Street home exceeded 50 micrograms of mercury per cubic meter of air (µg/m^3), the upper limit of detection (or quantification) for the MVA. Breathing zone mercury levels at the South College Street home ranged from 24 to 29 µg/m^3. Breathing zone mercury levels inside the personal vehicle initially ranged from 4 to 7 µg/m^3 but decreased to 1 to 2 µg/m^3 after ventilation. IDPH advised the resident to ventilate both homes and find alternative housing for her and her mother. IDPH notified the U.S. Environmental Protection Agency (USEPA) of the elevated levels of mercury in the homes, and requested clean-up assistance.

In 2000, the Agency for Toxic Substances and Disease Registry (ATSDR) and IDPH established a residential mercury clearance level of 1 µg/m^3 and a relocation action level of 10 µg/m^3 [2]. These values were used as the basis for data interpretation for this response investigation.

The county Emergency Services Disaster Agency, at the request of LCHD, provided temporary alternative housing for the resident and her mother while cleanup activities took place.

On September 13, 2007, Weston Solutions, accompanied by IDPH, LCHD, and USEPA staff, performed additional air monitoring with an MVA. The resident had ventilated both homes overnight and had placed the blood pressure monitor in a garbage bag and moved it outside.

These actions dramatically reduced the mercury vapor levels at the 8th Street home; however, vapor levels near the floor and horizontal surfaces were as high as 14 µg/m^3. Mercury droplets also were observed in the mother's bedroom. Weston removed all personal items with mercury levels exceeding 10 µg/m^3 from both homes. Both homes were ventilated overnight.

Weston performed follow-up air monitoring at both homes on September 14, 2007, but mercury vapor levels still exceeded the suggested cleanup clearance and relocation action levels. Moreover, mercury droplets were observed in the bathroom, hallway and thresholds of both bedrooms at the South College Street home. As a result, USEPA mobilized a cleanup contractor to decontaminate both homes. The USEPA cleanup contractor performed cleanup activities at the South College Street and 8th Street homes from September 15 to 19, 2007 and ultimately generated fifteen 55-gallon drums of mercury-contaminated waste and personal items [4].

On September 19, 2007, Weston and the cleanup contractor opened the garbage bag containing the blood pressure monitor and examined it. The blood pressure monitor had been stored this way since September 13, when the mercury vapor level inside the bags was 44 µg/m^3. They observed mercury on the monitor and inside the cardboard box used to store it. The graduated column that should have contained mercury appeared empty [4].

After the cleanup efforts, all breathing zone and floor/surface mercury levels in both homes were less than the 1 µg/m^3 clearance level [4].

Discussion

Mercury vapor levels in both homes and the vehicle were, prior to remediation, greater than the residential mercury clearance level as well as the relocation action level originally established by ATSDR and IDPH in 2000. Clean-up crews also observed mercury droplets in several locations throughout the South College Street location. Elevated mercury levels also were detected in areas of the homes that had considerable foot traffic.

Chemicals of Interest

IDPH compared the results of each environmental sample with the appropriate screening comparison value used to select chemicals for further evaluation for carcinogenic and non-carcinogenic health effects. Chemicals found at levels greater than comparison values or those for which no comparison values exist were selected for further evaluation. The only chemical of interest for this response investigation was elemental mercury.

Elemental Mercury

Mercury occurs naturally in the environment and exists in several forms. These forms can be organized under three headings: elemental mercury (also known as metallic mercury), inorganic mercury, and organic mercury. Elemental mercury is a shiny, silver-white metal that is a liquid at room temperature. It has been used in thermometers, some electrical switches and medical devices. At room temperature, some metallic mercury will evaporate and form mercury vapor. Mercury vapor is colorless and odorless. At higher temperatures more vapor is released from elemental mercury [3].

Exposure Evaluation

Persons are exposed to elemental mercury primarily through inhalation of mercury vapor. Ingestion of and direct contact with elemental mercury are not significant routes of exposure. When mercury vapor is inhaled, it easily enters the bloodstream and is carried throughout the body and also can move into the brain. Permanent damage to the brain has been shown to occur from exposure to sufficiently high levels of mercury vapor. Mercury vapors may affect many different areas of the brain and their associated functions, resulting in a variety of symptoms. These include personality changes (irritability, shyness, nervousness), tremors, changes in vision (constriction or narrowing of the visual field), deafness, muscle in-coordination, loss of sensation, and difficulties with memory [3].

Short-term exposure (hours) to high levels of mercury vapor in the air can damage the lining of the mouth and irritate the lungs and airways, causing tightness of the chest, a burning sensation in the lungs, and coughing. Other effects from exposure to mercury vapor include nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation [3].

During initial sampling, prior to remediation, breathing zone levels at the 8th Street home exceeded 50 $\mu g/m^3$ and levels at the South College Street home ranged from 24 to 29 $\mu g/m^3$. Both levels were greater than the residential mercury clearance level of 1 $\mu g/m^3$ and the relocation action level of 10 μ/m^3. Consequently, residents were exposed to mercury at levels greater than guidance values set forth by ATSDR and IDPH. Blood sampling of one resident of the home indicated that occupants of the home were exposed to elevated levels of mercury vapor. After cleanup, both homes and the vehicle had no visible mercury present and mercury vapor levels were less than 1 $\mu g/m^3$ thus eliminating future exposure to mercury.

Child Health Considerations

No children were exposed to mercury vapor as a result of this mercury spill. The occupants of the homes were both adults.

Conclusions

Based on the sampling information collected before remediation, IDPH concludes that a public health hazard existed from mercury contamination in the home at South College Street, the home on 8th Street, and in the vehicle. After the cleanup and removal of contaminated personal items, including a leaking blood pressure device, exposure to mercury has been reduced to acceptable levels and no apparent health hazard currently exists.

Recommendations

IDPH recommends that follow-up mercury sampling be conducted at the South College Street home and the 8th Street home in the spring of 2008.

Public Health Action Plan

IDPH worked with the local health department and other agencies to respond to this residential mercury spill.

IDPH returned to both properties on October 22, 2007 to conduct follow-up sampling. The 8th street property had a mercury level of 1.4 µg/m^3 in the hallway closet where the blood pressure measurement device had been stored. All other rooms of the apartment were less than 1 µg/m^3.

The property on South College Street had two mercury measurements that slightly exceeded the 1 µg/m^3 clearance level (1.176 µg/m^3 in the kitchen and 1.025 µg/m^3 in the living room), but the average for the house was less than 1 µg/m^3.

IDPH recommended that the current residents continue to ventilate the homes as much as possible. IDPH will return in the spring of 2008 to sample again and ensure that mercury levels are continuing to decrease.

IDPH discussed the potential health effects of mercury exposure with the individuals involved in the spill. At the time of this health consultation, all of those with elevated levels of mercury in their body were being treated by a physician and appropriate follow-up tests will be conducted by the physician.

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