Health Consultation

Investigation of a Residential Mercury Spill from Tilt Switch Capsules

St. Joseph County, Michigan

Prepared by the

Michigan Department of Community Health

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Summary

This investigation was conducted to ensure proper cleanup of a home after a mercury spill. A resident of St. Joseph County, Michigan contacted the Michigan Department of Community Health (MDCH) concerning a mercury release from three smashed, tilt switch capsules. MDCH provided instructions on how to clean the spill and conducted a site visit to measure mercury vapor concentrations around the spill area and throughout the home. After conducting this investigation, MDCH determined that the residence was safe for occupancy.

Event and Response

On the evening of September 4, 2012, a resident of St. Joseph County, Michigan, broke three tilt switch capsules, each estimated to contain about 1-1.5 grams of mercury. The resident contacted MDCH on the morning of September 5, 2012, because he was concerned for the health and safety of his two young children (aged 3 and 6 years). The resident had already attempted to clean up the mercury using a vacuum cleaner. MDCH staff instructed the residents to ventilate the house to remove mercury vapors and to dispose of the vacuum cleaner and the affected carpeting.

MDCH personnel arrived at the residence later on September 5 and used a Lumex® mercury vapor analyzer to determine the concentration of mercury vapor in the house (Table 1). For more information about the Lumex® mercury vapor analyzer and acceptable mercury concentrations, refer to the MDCH Mercury Quick Reference Guidance Sheet (http://www.michigan.gov/documents/mdch/Mercury_Quick_Reference_Sheet_216557_7.pdf).

Table 1: Real-Time Mercury Vapor Readings

Location in House	Reading (ng/m^3)
Back Door	24-46
Kitchen Floor	140-180
Kitchen Shelf	160
Kitchen Countertop 1st	2500
Kitchen Countertop 2nd	2000
Kitchen Countertop 3rd	600
Kitchen junk drawer	20
Living room	100
Front door	100
Vacuum	13,000
Shoes near back door	30
Shoes on resident	800

MDCH personnel inspection at the doorway to the kitchen revealed a safe concentration of mercury (<50 nanograms per cubic meter [ng/m^3]). The shelf where the tilt switch capsules had been stored and the floor where the mercury was spilled were within the safe limits of mercury concentration (<200 ng/m^3). However, initial Lumex® readings revealed high concentrations of mercury along the countertop adjacent to the storage shelf (2500 ng/m^3). MDCH personnel located mercury droplets along this countertop and the resident cleaned this area further and disposed of the mercury in two plastic bags. A second reading with the Lumex® still resulted in high concentrations of mercury

(2000 ng/m^3) along the countertop. After a third round of cleaning, MDCH personnel's analysis with the Lumex® indicated safe levels of mercury (about 600 ng/m^3) along the countertop and the floor directly below this area.

Analysis of the other rooms in the house and the front porch indicated safe levels of mercury (about 100 ng/m^3). However, readings of the vacuum cleaner exceeded recommended levels of mercury (13,000 ng/m^3), and MDCH personnel instructed the resident to immediately discard the vacuum. MDCH personnel instructed the residents to continue airing out the home and to re-clean all affected surfaces.

Discussion

Metallic (elemental) mercury, such as the type involved in this spill, can be extremely dangerous to human health. Because mercury can affect neural development, exposure to it can be even more dangerous in children and developing fetuses [1]. Exposure to metallic mercury occurs once the mercury volatilizes; the mercury is then directly absorbed into the bloodstream through the lungs [1]. In pregnant women, the placenta can transport the mercury to the fetus. Once in the blood, the mercury can pass through the blood brain barrier to affect neural growth and development. People who have been exposed to enough mercury for enough time may develop tremors, ataxia, problems with motor coordination, personality changes and problems with memory [1, 2].

Studies have also shown that mercury can harm other parts of the body. Mercury inhalation can lead to problems with the airway, immune system, endocrine system, skin and kidneys [3]. In children, metallic mercury inhalation can cause acrodynia, a disorder characterized by muscle cramping, irritability, redness and peeling of skin [3].

In this specific event, any adult exposure to metallic mercury was limited to about a 16 hour timespan. The residents removed their children from the house on the morning of September 5, so it is estimated that the children could have been exposed to the mercury for up to 10 hours. However, the mercury concentrations in the house (excluding the spill site in the kitchen) were below 1000 ng/m^3 mercury, suggesting that exposure would not cause harm. MDCH concluded that the duration and amount of the children's exposure to mercury was minimal and that the subsequent cleanup of the spill eliminated any long-term exposure to the vapor. Therefore, no harm would be expected as a result of the mercury release.

Conclusions

After the cleanup of the mercury spill, MDCH determined that there was no remaining health threat at the St. Joseph County home. Although one small area initially had unsafe levels of

mercury, thorough cleanup reduced the high mercury concentrations and brought the concentrations down to acceptable levels.

Recommendations

- The resident should discard the vacuum cleaner and cut the vacuum cleaner cord to render it unusable.
- The resident should leave his shoes in the sun for several days to allow any liquid mercury on them to become a vapor and dissipate.
- The resident should wipe down kitchen countertops, shelves and floor with pre-moistened cleaning cloths to remove any more residual mercury.
- The resident should continue airing out the home while cleaning the countertops.
- The resident should safely dispose of any other mercury present in the household to avoid any other mercury spills.

Public Health Actions

- MDCH gave the residents information on how to safely clean up the mercury spill and how to dispose of items contaminated with mercury.
- MDCH conducted a site visit to determine if the residence was safe from mercury vapor.
- After additional cleanup, MDCH determined that the levels of mercury in the home were safe for the children and that no further actions were necessary.
- MDCH is available to address any public health questions or concerns regarding this contamination event. The Michigan Department of Community Health Division of Environmental Health can be reached at 1-800-648-6942.

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References

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3. Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Mercury*, United States Department of Health and Human Services Public Health Service, Editor. 1999: Atlanta, GA.