



## Mercury Exposure in a Rural Kentucky Community

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### Background

Elemental mercury is a liquid substance that many of us are familiar with from our high school chemistry class. It is silvery in appearance, and generally beads up and rolls around when poured out onto a surface. To kids it looks like fun to play with. Liquid mercury is found in items in our everyday life such as thermometers and blood pressure gauges. Surprisingly, many people have mercury stored in jars in the basement, attic or garage, kept for 20 or more years for reasons we can't even remember. You may even find some in your own house!

The problem with mercury is that it is toxic and can cause a variety of temporary and even long-term health problems. Mercury fumes are odorless and are absorbed into the bloodstream to collect in the body's tissues when inhaled. If mercury is spilled onto a porous surface such as carpet, wood flooring, furniture or even the ground, it will sink in and slowly evaporate over a very long time period.

Only a very small amount of mercury can produce dangerous levels of fumes in enclosed spaces such as a classroom, house or automobile. Symptoms of mercury exposure include tachycardia (racing heart), diaphoresis (excessive sweating), hypertension, desquamation (shedding of the outer layers of skin) of the soles and palms, rashes, muscle pain, insomnia, vomiting and behavioral/psychiatric changes. Danger also exists for children exposed in utero (when the mother is exposed while pregnant), as mercury was associated in one study with spontaneous abortions, stillbirths and congenital malfor-

mations.

Yet mercury spills and exposure are relatively common. In U.S. Environmental Protection Agency (EPA) Region 4 (including KY, NC, MS, AL, GA, FL, TN and SC), 14 spills were documented in fiscal year 2005. Kentucky experienced 15 spills between September 1, 1999 and March 23, 2005—10 associated with schools and five with residences only. The following account relates to one of those spills. Agencies involved in the response and investigation of the account include: Larue County and Lincoln Trail District Health Departments; Hardin Memorial Hospital; Kosair Children's Hospital; Kentucky Department for Public Health's Division of Epidemiology and Health Planning; Division of Public Health Protection and Safety; the Kentucky Regional Poison Center; state and federal EPA; the local school administration; and local police officials. Coordination, cooperation and collaboration of all these agencies were essential to mounting an effective public health response, which quickly outstripped local resources.

### Investigation

In late 2004, a schoolboy brought a small jar of liquid mercury on a school bus and into a county high school in rural Kentucky. School officials discovered the mercury as children were pouring it out and playing with it in the school cafeteria early that morning. Officials quickly isolated approximately 50 children who were thought to have come in contact with the mercury at school and on the bus. The officials instituted 20-minute hand washing, notified parents to bring the children a change of

clothes, and bagged the clothes they had been wearing.

Upon questioning, the student claimed that he had only one bottle of mercury, which was recovered at the site. This bottle held about a pound of liquid mercury. He related that he had found the bottle of mercury in a garbage can at his dentist's office the day before when he was there for a dental visit. (Mercury is used by dentists to create amalgam fillings.)

The Kentucky Department for Environmental Protection initiated cleanup, but was only able to recover a small amount of mercury on site so the decision was made to close the school for the following day. Federal EPA officials began testing and cleaning the school, school buses, the student's manufactured home, and a family van. The school cafeteria was found to have higher than normal levels of mercury, but after two days of cleanup supplemented by heating and venting, the EPA deemed the school safe for the students to return. Approximately 15 school buses were also tested and/or cleaned. The home and family van had larger amounts of mercury, so cleaning processes were continued. The total amount of liquid mercury recovered exceeded the amount originally held in the bottle that the boy had brought to the school.

Through the investigation, evidence mounted that the student had mercury far longer than one day. A family friend reported playing with the boy's mercury in his family's car over a year earlier. A 14-year-old female cousin of the student who lived in the same household had experienced severe physical and psychological symptoms consistent with high-level mercury exposure one year earlier. Other family members reported seeing the mercury months before the present incident.

Questioning of the dentist's staff revealed that apparently several vials of mercury from a previous tenant (another dentist who operated the office before) were stored in a bathroom closet since the current dentist moved into that location in 1979. Examination of dental office records showed that the student had visited this dentist the day before the incident, but had also visited once 15 months

earlier. The student eventually confessed that he had the mercury for several months. Though he denied taking more than one vial, investigators suspect that he took a vial on the visit 15 months ago and then another vial on the visit the day before the mercury was discovered at the school (given the excess amount of mercury recovered during the investigation).

### **The Toll**

The family's home and all of their possessions inside were deemed unrecoverable when levels of ambient mercury could not be adequately lowered through extensive cleaning, heating and venting procedures. The family van was eventually cleaned and returned, in addition to another family vehicle. However, a vehicle belonging to a friend of the family was removed by the EPA and classified as unrecoverable.

Nine family members (including the student) had lived in the family's home for different periods of time in the past year. An additional 12 individuals were found to have spent significant amounts of time in the family home during the exposure interval and were advised by the local health department to be medically evaluated by their providers. A friend also indicated significant exposure to the mercury, especially during play sessions in his mother's car (noted above as unrecoverable). The boy's sister was pregnant in 2004 and rode in the car frequently during the pregnancy, when the car was most probably contaminated with mercury.

Blood and urinary concentrations of mercury on the eight family members who currently lived in the home of the student were obtained within five days of leaving the home. Urinary concentrations were significantly impacted by time spent in the home. Three of the children lived in the contaminated home for 15 months and had urinary concentrations ranging from 193 - 496  $\mu\text{g/L}$  (micrograms per liter; normal is 1 - 3  $\mu\text{g/L}$ ), while three of the children had lived in the home for only 10 weeks and had urinary concentrations ranging from 28 to 68  $\mu\text{g/L}$ . A close friend of the student, his mother, and his sister, whose exposures were primarily through riding in a car heavily contaminated by mercury, were

## Notice to Readers: Caution Regarding Testing for Lyme Disease

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The Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration (FDA) have become aware of commercial laboratories that conduct testing for Lyme disease by using assays whose accuracy and clinical usefulness have not been adequately established. These tests include urine antigen tests, immunofluorescent staining for cell wall--deficient forms of *Borrelia burgdorferi*, and lymphocyte transformation tests. In addition, some laboratories perform polymerase chain reaction tests for *B. burgdorferi* DNA on inappropriate specimens such as blood and urine or interpret Western blots using criteria that have not been validated and published in peer-reviewed scientific literature. These inadequately validated tests and criteria also are being used to evaluate patients in Canada and Europe, according to reports from the National Microbiology Laboratory, Public Health Agency of Canada; the British Columbia Centres for Disease Control, Canada; the German National Reference Center for Borreliae; and the Health Protection Agency Lyme Borreliosis Unit of the United Kingdom.

In the United States, FDA has cleared 70 serologic assays to aid in the diagnosis of Lyme disease. Recommendations for the use and interpretation of serologic tests have been published previously (1). Initial testing should use an enzyme immunoassay (EIA) or immunofluorescent assay (IFA); specimens yielding positive or equivocal results should be tested further by using a standardized Western immunoblot assay. Specimens negative by a sensitive EIA or IFA do not need further testing. Similar assays and recommendations are used in Canada (2). In the European Union, a minimum standard for commercial diagnostic kits is provided by Conformité Européene (CE) marking. Application and interpretation guidelines appropriate for Europe have been published (3,4).

Health care providers are reminded that a diagnosis of Lyme disease should be made after evaluation of a patient's clinical presentation and risk for exposure to infected ticks, and, if indicated, after the use

of validated laboratory tests. Patients are encouraged to ask their physicians whether their testing for Lyme disease was performed using validated methods and whether results were interpreted using appropriate guidelines.

### References

1. CDC. Recommendations for test performance and interpretation from the Second National Conference on Serologic Diagnosis of Lyme Disease. MMWR 1995;44:590--1.
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tested and had urinary mercury levels ranging from 3.8 to 8 µg/L. A baby girl was eventually born to the sister of this friend with no indication of mercury exposure or effects. One female adult, who had been out of the home since June of 2004, yielded a urine concentration of 241 µg/L, despite having left the home five months prior to testing. Five family members were given therapy to help remove mercury from their tissues. The three adolescent family members who had the longest exposure periods received three sessions. The female adult noted above failed to report for follow-up therapy despite repeated attempts to contact her to provide medical evaluation and advice.

Several of the children living in the home had experienced symptoms indicative of mercury toxicity, including itchy rashes and headaches. Additionally, the 14-year-old cousin residing there had experienced such severe illness that she was hospitalized for more than 30 days at Kosair Children's Hospital in Louisville during the previous year. Mercury toxicity was never considered as a differential diagnosis so testing was not performed. However, the patient improved with a cardiac stent (concurrent with removal from the exposure setting). She has subsequently shown no further symptoms.

### Closing Notes

After publicity arose in the current case, the local health department and the Kentucky Regional Poison Center received numerous inquiries from private citizens about quantities of mercury in their possession that they wished to dispose of. Thus, local public health officials need to be familiar with the symptoms of mercury exposure and how to respond appropriately. Education of the public about mercury and the risks associated with mercury exposure should be aggressively pursued.

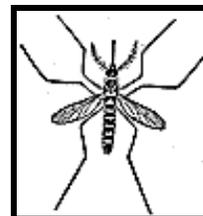
Collaboration of local, state, private and federal officials was an essential factor in this response. The response cost for this incident was estimated at \$160,000 (and hundreds of manpower hours). Preparedness planning due to bioterrorism funding has significantly increased communication between agencies and between departments within agencies, which made this kind of collaboration more likely in the present situation.

## Updated CDC Information Regarding Insect Repellents (dated April 22, 2005)

Updated repellent guidance from the Centers for Disease Control and Prevention (CDC) includes the addition of two active ingredients – picaridin and oil of lemon eucalyptus that have been shown to offer long-lasting protection against mosquito bites. Repellents containing DEET also continue to be a highly effective repellent option and are also included in the CDC guidelines. DEET, picaridin and oil of lemon eucalyptus are all registered with the U.S. Environmental Protection Agency (EPA), which regulates these products. Picaridin, also known as KBR 3023, is an ingredient that has been found in many mosquito repellents used in Europe, Australia, Latin America and Asia for some time. One product containing 7 percent picaridin is being distributed in the United States for the first time this year. Oil of lemon eucalyptus (also known as p-menthane 3,8-diol or PMD) is a plant-based mosquito repellent that provides a length of protection time similar to low concentration DEET products. It is available in a variety of formulations throughout the United States.

Trained personnel will conduct mosquito surveillance in 13 Kentucky counties and statewide bird surveillance from May until October. Additional surveillance will be performed by the Tennessee Valley Authority and military personnel at Fort Campbell. Equine testing will be available to veterinarians through both of Kentucky's animal disease laboratories.

The Department for Public Health encourages hospitals and physicians to submit specimens on patients with suspected arboviral neurological illness to the Division of Laboratory Services. For specific information on specimen submission contact the Virology Section at (502) 564-4446, Ext. 4484.



## **Our Readers Are Important!!!**

### **Tell Us What You Think!**

We want to continue publishing a newsletter that you find useful and look forward to receiving.

### **Reader's Survey of *Kentucky Epidemiologic Notes & Reports***

**A. Your reading habits** (please circle **ONE** response)

I read the newsletter:	Every month	Sometimes	Rarely
I usually read:	Every article	Selected articles	
I rate the overall quality:	Excellent	Good	Poor

**B. How do you rate us?** (please circle **ALL** that apply)

**Content and data:**

Interesting	Useful in my work	Accurate	Relevant	Not relevant
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**Literary quality:**

Clear	Satisfactory article length	Appropriate	Needs improvement
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**Appearance:**

Attractive	Readable type	Clear graphics	Appealing layout	Needs improvement
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**C. Topics you want to read in the newsletter** (please circle **ALL** that apply)

Infectious diseases	Chronic diseases	Maternal and child health	Oral/Dental health
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Environmental health	Injury/safety/violence protection	Vital statistics reports
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Health policy and planning	Letters to Editor Section	Other: _____
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**Suggested topic(s) and/or author(s) for future issues:** \_\_\_\_\_

**D. Would you be interested in having an expanded quarterly issue or continuing with the monthly issue?** (please circle **ONE** response)

Expanded quarterly issue	Continue with monthly issue
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**E. Something about yourself:** (Please check appropriate items)

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University faculty  Administrator  Veterinarian

Other local or state agency  Sanitarian  Nutritionist

Other \_\_\_\_\_

(attach your mailing label here)

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Other reason \_\_\_\_\_

**Thank you for completing and returning this survey.**

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## **Do What's Right and Protect Your Sight—July is UV Safety Month!**

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We all take precautions to protect our skin from the sun's harmful rays by applying sunscreen, but what about protection for our eyes? In honor of UV Safety Month this July, the American Academy of Ophthalmology and eye doctors across the country are encouraging Americans to protect their vision from UV-related damage by wearing sunglasses and wide-brimmed hats when spending prolonged time in the sun. Sunglasses don't have to be expensive to offer the correct type of UV protection. Many \$10 sunglasses provide equal or greater protection than a \$100 pair.

Damage from UV-A rays can harm central vision by damaging the macula, a central portion of the retina located at the back of the eye. The light-sensitive cells of the macula generate high resolution and color vision we depend on for everyday activities such as reading, driving and recognizing familiar faces. It is also important to protect your eyes when UV light is most intense at midday (10:00 a.m. to 2:00 p.m.), but also whenever you are outside for a prolonged period, even when it's gray and overcast. Reflected sunlight off of water, snow and pavement can be the most dangerous type of UV light because it is intensified. Your eyes can also be harmed by UV light sources other than the sun, such as welding lamps or tanning lights.

For further information, please contact the American Academy of Ophthalmology at <http://www.aao.org>, Prevent Blindness America at <http://www.preventblindness.org>, or the Macula Vision Research Foundation at <http://www.mvrf.org>.