Notes from the Field

Acute Mercury Poisoning After Home Gold and Silver Smelting — Iowa, 2014

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In March 2014, a man, aged 59 years, who lived alone and had been using different smelting techniques viewed on the Internet to recover gold and silver from computer components, was evaluated at a local emergency department for shortness of breath, tremors, anorexia, and generalized weakness. During the smelting processes, he had used hydrogen peroxide, nitric acid, muriatic acid, and sulfuric acid purchased from local stores or Internet retailers. For protection, he wore a military gas mask of unknown type. The mask was used with filter cartridges, but their effectiveness against chemical fumes was not known.

On the day he developed symptoms, he was using a technique that he had learned by watching a documentary on cable television, which used mercury to separate gold from soil. After purchasing elemental mercury through Internet retailers, he used a frying pan to smelt gold from computer chips using mercury on his kitchen stove. Approximately 5 minutes after starting, he developed throat irritation and changed the mask filter cartridge before resuming smelting. After an additional 5 minutes, he developed shortness of breath, weakness, and tremors, at which point he sought medical care. He was admitted to the intensive care unit at the local hospital with a diagnosis of acute respiratory failure associated with chemical pneumonitis. His condition subsequently deteriorated, and he received a diagnosis of acute respiratory distress syndrome, which required intubation and mechanical ventilation until his pulmonary function recovered.

On the seventh hospital day, testing for exposure to heavy metals, including arsenic, lead, and mercury, was performed, and the patient was found to have a blood mercury level of 86 μg/L (testing commercial laboratory reference value: <10 μg/L). No further heavy metal testing was performed, and chelation therapy was not prescribed. After 4 weeks, the patient was discharged to a long-term–care facility on supplemental oxygen because his chemical pneumonitis was not fully resolved.

The elevated blood mercury level was reported to the Iowa Department of Public Health by the testing laboratory on the 18th hospital day. The Iowa Department of Public Health immediately initiated an investigation to identify the source of exposure and potential risk to others; however, public health officials were unable to obtain exposure information from the acute care facility. Approximately 1 month after the exposure, public health officials interviewed the patient at the long-term–care facility; he described the smelting activities he had conducted in the home, as well as the cleanup that was being arranged by family members. The local fire department was consulted to assess the home for residual mercury contamination and the potential for risk to others.

Thirty-four days after the exposure, the fire department's hazardous materials team assessed the house using a portable mercury vapor detector; the kitchen's air mercury level was 0.8 μg/m^3 (Environmental Protection Agency [EPA] reference concentration: <0.3 μg/m^3) (*1*,*2*). Remediation included cleaning kitchen surfaces with chemical wipes, and heating and ventilating the kitchen with a negative pressure fan venting outside until air levels of mercury were <0.3 μg/m^3. All contaminated materials, including furniture, clothing, air system filters, and utensils, as well as remaining liquid mercury and other chemicals, were removed and disposed of according to EPA-recommended guidelines (*3*). No other person was reportedly exposed.

Mercury exists as elemental mercury and is found in inorganic mercury compounds and organic forms. Adverse health effects of mercury exposure depend on the chemical form, dosage, route and duration of exposure, and age and health of the exposed person (*4*). The major route of elemental mercury exposure of health concern is vapor inhalation. Symptoms resulting from acute exposures include shortness of breath, chest pain and pulmonary congestion, tremors, nausea, vomiting, and weakness. Respiratory symptoms can progress to chemical pneumonitis, pulmonary edema, respiratory failure, and death (*5*,*6*). Treatment of acute mercury exposure typically consists of removal of the patient from further exposure, followed by support of respiratory and cardiovascular function. Chelation therapy should be considered for any symptomatic patient with a clear history of acute elemental mercury exposure; however, the decision to treat should be made by experienced professionals, preferably in consultation with the regional poison control center (*5*).

Many Internet resources describe processes to extract precious metals from various substances. These include approximately 12,000 videos that demonstrate home smelting techniques to recover gold and precious metals from computer parts, and cable television documentaries presenting gold mining processes, some using mercury to recover gold from soil. An Internet search identified approximately 200,000 websites purporting to describe how mercury can be used to extract

gold from computer parts. Among a convenience sample of 30 Internet videos viewed by one of the authors, only five mentioned potential dangers involved in handling smelting chemicals or advised smelting in open areas, or using fume hoods, gloves, or unspecified types of respirators.

Electronics recycling for precious metals recovery by persons lacking the proper training, equipment and facilities can result in exposure to and illness caused by chemicals, including mercury. Health care providers should include mercury poisoning in the differential diagnosis when assessing patients who have symptoms of heavy metal exposure and a history of smelting activities, and should report known or suspected exposures to poison control centers and local or state public health officials to ensure appropriate and timely intervention.

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