Inhalational mercury toxicity from artisanal gold extraction reported to the Oregon Poison Center, 2002–2015

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BACKGROUND
• Mercury-containing facemasks were discarded among artisanal and small-scale gold mining communities in developing countries, particularly in rural areas.
• Secondary sources (commonly jewelry or other items) of mercury may enter these communities, rather than individual exposure incidents.
• Communities, rather than individual exposure incidents, may be at risk for the adverse health effects.

METHODS
• Weekly news clipping files were reviewed for inhalational mercury exposure from artisanal and small-scale gold mining communities in developing countries.
• Studies included cases in the United States, and international exposure incidents from the Amazon basin communities, particularly in Brazil, as well as source mining communities, particularly in Ghana.

RESULTS
• Between 2002–2015, there were 11 cases of mercury exposure from recognition incidents included in the Oregon Poison Center.
• Every incident involved trying to extract a precious metal for personal financial profit (i.e., not involved in an industrial mining operation).
• By the end of 2015, all exposures were assumed to involve elemental mercury.
• Eight (89%) cases involved acute exposures.
• Eight (89%) cases explicitly involved the patient/worker ingesting mercury amalgam.
• Seven of eight (88%) patients with acute exposures reported symptoms consistent with acute elemental mercury inhalation (two [2] patients, four [4] patients) requiring medical attention, where two [2] patients were transferred to hospital, and one [1] patient was intubated for impending respiratory failure.
• Six (75%) patients experienced whole-blood mercury concentrations less than 150 mcg/L, where four [4] patients were elevated above 150 mcg/L (range 184–505 mcg/L).
• All (89%) patients had measured urinary mercury concentrations reported.
• Elevated blood mercury concentrations, typically serum and/or urine mercury concentrations, occasionally severe and requiring critical care, were identified.

CONCLUSION
• To what extent do inhalational mercury exposure and toxicity occur among artisanal and small-scale gold mining communities in developing countries remains to be determined.

CASE REPORT

A 50-year-old female (patient #14) with a prior stroke and residual mild left-sided weakness was referred to the Oregon Poison Center for evaluation of symptoms consistent with mercury vapor exposure. She telephoned a local gold mine operator to report that she had attempted to extract gold from some crystal quartz, wholesalers, and fragments from her local home. She stated that she was in the yard near a wood appartment, thought not within 6 months prior, and had ingested a gold-mercury amalgam.

On arrival at the local hospital, she was found to have hypothermia (97°F), non-productive cough, and bilateral reticular interstitial opacities. Laboratory studies were notable for an elevated white blood cell level of 16,700 cells/μL, which was attributed to the patient’s prior stroke.

The patient was intubated for impending respiratory failure while in the emergency department (ED) and was subsequently transferred to a level 1 facility with the assistance of a critical care transport team.

Initial mercury concentrations eventually resulted at 305 mcg/L. Additional follow-up evaluations are pending.

REFERENCES

Figure 1: Gold-mercury amalgam

Figure 2: Inhalational mercury CT scan

Figure 3: Inhalational mercury CT scan

DISCUSSION
• Inhalational mercury toxicity with elevated blood mercury concentrations, consistently severe and requiring critical care intervention, may occur following occupational gold mining exposure.
• In small-scale cases of acute inhalational mercury exposure reported to the Oregon Poison Center, acute exposure may be fatal.

CONCLUSION
Toxicologists should be aware of the association of inhalational mercury toxicity and artisanal gold extraction.

RESEARCH QUESTION
To what extent do inhalational mercury exposure and toxicity occur among artisanal and small-scale gold mining communities in developing countries?

METHODS
• This is a systematic retrospective review of the Oregon Poison Center Toxicall database.
• All cases of mercury or “mercury inhalation” exposures were reviewed and cases where the patient had attempted previous metal extractions were included in the analysis.

RESULTS
• Between 2002–2015, there were 11 cases of mercury exposure from recognition incidents included in the Oregon Poison Center.
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