

#48: Clocked by Mercury: Grandfather Time's Toxic Spill

Breanna Pancioli¹ PharmD, CSPI, Sheila Goertemoeller¹ PharmD, DABAT, ICPS, Jon Gulch² OSC, Jonathan Colvin¹ RN, MS, CSPI, Alysha Currie¹ MSN, CSPI, Shan Yin¹ MD, MPH
Cincinnati Drug and Poison Information Center¹, Environmental Protection Agency²

Background

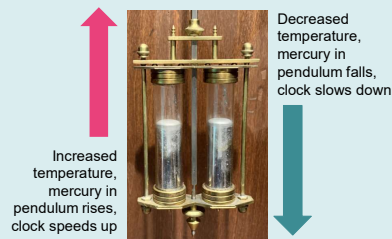
- Elemental mercury is an inert liquid at room temperature
- Chronic inhalation of the vapors is toxic
- Mercury poisoning without a source often goes misdiagnosed
- 24-hour urine mercury collection assesses body burden with chronic exposure



Figure 1. Mercury Source

- Mercury expands uniformly based on changes in temperature
- Minimal degradation with time
- Mercury is rarely used in modern products
- Historical use in grandfather clock pendulums

Figure 2. Mercury in Grandfather Clocks



- Agency for Toxic Substances and Disease Registry (ATSDR) standards for mercury at residences is $<1 \mu\text{g}/\text{m}^3$
- Vapor testing is quicker and actionable when compared to soil or water testing

Figure 3 & 4. Mercury Vapor Detection Devices On Site



Case Series

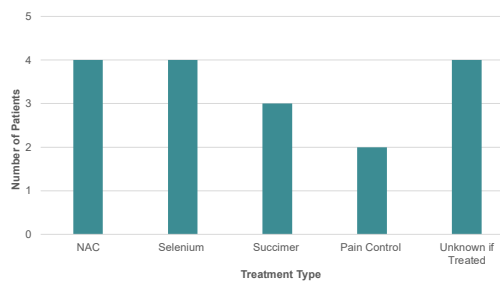
- Two brothers (15 yo, 17 yo) presented for second opinion following initial diagnosis of functional neurologic disorder
- Both had three weeks of progressive muscle fasciculations, myalgias, diaphoresis, and gait disturbance
- Workup revealed markedly elevated whole blood and 24-hour urine collection mercury concentrations (Table 1)

Table 1. Mercury Levels and Symptoms

Patient	Blood Level (Ref $<10 \text{ mcg/L}$)	24 h Urine Collection (Ref $<20 \text{ mcg/L}$)		Symptoms
		Day 1	Month 4	
15 yo M	39.5	54.8	13	Myalgia, muscle fasciculations, cramping, difficulty walking, emesis, diaphoresis, headaches, hand swelling, globulus sensation
17 yo M	32	>80	14	Myalgia, muscle fasciculations, unable to walk, diffuse rash on torso, fever, hypertension, diaphoresis
34 yo F	26.3	70	Lost to follow up	Changes in sensation and taste, abnormal movements, back pain, pain with urination
2 mo M	25.7	35.5	3	Occasional myoclonic jerk, possible upper lip muscle fasciculations

- Chelation regimen for both adolescents: oral Succimer (10 mg/kg, maximum 500 mg, three times daily for 4 days), 90-day regimen of oral selenium (500 mcg daily) and N-acetylcysteine (50 mg/kg three times daily)
- Two days of inpatient chelation improved mobility and decreased muscle fasciculations, but did not resolve pain
- No identifiable mercury exposure
- Six additional family members and three shared residences were screened for mercury
- At least two additional family members had detectable levels prompting treatment (mother and infant brother)

Figure 5. Common Therapies Performed



- Environmental Protection Agency (EPA) identified ambient indoor mercury levels exceeding $50 \mu\text{g}/\text{m}^3$ in the primary residence
- Primary source detected was container of elemental mercury (Figure 1) left by a former clock repairman
- Suspected historical use of mercury in the home without proper drainage led to chronic inhalation exposure from sustained off-gassing
- EPA remediation efforts spanned over one month costing around \$500K including removal of most household items, permanent sealing of mercury-emitting basement drains, partial removal of the home's foundation, installation of a vapor mitigation system
- 10.5 months post-exposure, both adolescents were at baseline with normal urine mercury levels
- Repeat screenings of the home have been below actionable limits

Case Series (continued)



Figure 6. Remediation of the Foundation

Discussion

- Chronic exposure to elemental mercury vapor can result in the insidious onset of nonspecific, multisystem toxicity
- Chelation therapy led to symptomatic improvement in patients
- Sustained clinical recovery required comprehensive and resource-intensive environmental remediation

Conclusions

- There are substantial medical and environmental consequences of elemental mercury spills
- Diagnosis is often challenging with no known source
- Coordination of poison control centers, public health authorities, and the EPA is critical in remediation of mercury spills

References

- Environmental Protection Agency. (2025, March 6). *Mercury in Consumer Products*. EPA. <https://www.epa.gov/mercury/mercury-consumer-products>
- Handling Mercury in clocks. Minnesota Clocks Watches. <https://minnesotawatches.com/handling-mercury-in-clocks/>
- ATSDR. (2024, October). *Toxicological Profile for Mercury*. Toxicological Profiles. <https://www.atsdr.cdc.gov/toxprofiles/tp46.pdf>