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Acute Mercury Poisoning Revisited: Any Role for the Physician?

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Abstract

Mercury is a metal whose toxicity triggers neurological impairments at all ages, although the feti carry special risks. Mercury poisoning mostly occurs as a result of occupational accidents or attempted suicide. The bulk of evidence that addresses the health effects associated with longterm postnatal mercury exposure is limited for all age groups. Public education on poisoning and the potential threats arising from mercury are of utmost importance for general well-being.

Keywords: Mercury poisoning; Intoxication; Management; Treatment; Elimination; Elemental mercury

Abbreviations: CaNa(2)EDTA: Disodium Ethylenedia mine Tetraacetate; DPA: D-Penicillamine; NAPA: N-Acetyl-D-Penicillamine; CaNa(3)DTPA: Calcium Trisodium Diethylene Triamine Pentaacetate; ZnNa(3)DTPA: Zinc Trisodium Diethylene Triamine Pentaacetate; DFO: Deferoxamine; PB: Prussian Blue; BAL: British Anti Lewisite; DMPS: 2,3-Dimercapto-1-Propanesulfonic Acid; DMSA: Dimercaptosuccinic Acid.

What Do We Know About Mercury and its Poisoning?

Mercury is used in many industrial sectors to produce industrial chemicals, paints, explosives, batteries, thermometers, sphygomanometers, electronic instruments, etc. It is also included in some drugs on the market such as Thiomersal, which is used to prevent contamination of vaccines. Mercury is a metal with toxicity which triggers neurologic hazards at all ages, although the feti carry special risks [1]. Mercury poisoning mostly occurs as a result of occupational hazard or suicide attempt. In the last decades, researchers focused on environmental pollution as a source of mercury poisoning for the community as a whole. Interestingly, Pirkle et al. [2] indicated that many northern American populations are deeply connected to the sea and rivers for food and medicine, while interestingly, they are often exposed to mercury via their diets, which incorporate wild foods from these ecosystems. For example, some whales can accumulate considerably high concentrations of mercury (>1.0 μg/g) [3].

Virtually all chemical forms of mercury are hazardous to human being. The entity varies in the absorption route, clinical presentation, and responses to therapy. Exposure to mercury is a threat to public health in either forms, acute and/or chronic. Mercury poisoning is encountered

following an occupational accident or attempted suicide. Mercury is silver-colored and liquid at room temperature. The element can be found in inorganic and organic forms. Neurotoxicity mostly stems from the soluble form of methylmercury. Elemental (organic) mercury is especially hazardous for children since it is in liquid form and can easily be found [4]. Blood and hair represent the best media to use for measurements for the load of mercury in the body for evaluation of mercury ingestion in adults [2]. On the other hand, maternal blood and hair sampled during early pregnancy, and cord blood at delivery, are gold standards to evaluate prenatal exposure. In the last decade, researchers also demonstrated mercury thresholds of concern and appropriate clinical actions depending on the individual features [5]. The clinical effects of mercury poisoning change in accord with the form and the route of entry to the body. The most severe impairments are noted in neurologic, gastrointestinal and renal systems, in accord with the route of exposure.

Elemental mercury attracts children with its bright gray appearance [6]. The compound rapidly distributes into body compartments and thus has a short half life- only two months. Acute inhalations of mercury vapors can trigger pneumonia, respiratory distress, progressive pulmonary fibrosis and eventual death. Elemental (metallic) mercury can pass to systemic circulation via alveoli or directly through the skin. Nursing mothers can pass it directly to infants via breastfeeding [7]. All kinds of neurological findings can be seen in chronic mercury exposure. Some effects of high dose mercury inhalation are shown on Table 1 [4,6]. Guidelines point out that "should the elemental mercury be heated -with some method- in a closed space, all people in the area should be examined and investigated at a healthcare institution due to the high risk of poisoning (Grade C)" [4]. Small exposures to the element can be fatal in young children and feti [8]. Inhalation of the heavy metal vapors by the infant or baby leading to necrotizing pneumonia and acute respiratory distress syndrome is thought to be the main reason of death in 24 hours [9]. Poisoning due to self-injected metallic mercury has also been published in the literature. Local tissue or systemic consequences (i.e., mercurialism) can be seen in patients with deep tissue injection, while death due to pulmonary embolism and cardiac, brain, hepatic or renal toxicity may occur in cases of high dosage intravenous administration [10].

Central nervous system	Weakness, unconsciousness, headache, irritability, fatigue, confusion, insomnia, tremor, polyneuropathy, loss of hearing and/or vision.
Cardiovascular system	Tachycardia, arrhythmia, problems with blood pressure, sometimes signs&symptoms resembling pheochromacytoma.
Respiratory system	Cough, dyspnea, chest pain, pulmonary edema.
Urogenital system	Tubular dysfunction, dysuria.
Dermatological	Itching, erythema, rash.
Digestive system	Stomatitis, colitis, abdominal pain, nausea, vomiting, diarrhea.
Liver	Elevation of liver function tests, hepatomegaly, centrilobular vacuolization.
Musculoskeletal system	Tremor, fasciculation, myoclonus, myalgia.

Table 1**:** Signs and symptoms in patients with mercury exposure.

How Should We Treat Mercury Poisoning?

Treatment starts with keeping the patient away from the exposure and toxic agents. NAC can be beneficial for chelation of mercury. It binds mercury by its cystein groups [4]. Most commonly used chelating drugs include dimercaprol (BAL), disodium ethylenediamine tetraacetate (CaNa(2)EDTA), succimer (meso-DMSA), unithiol (DMPS), D-penicillamine (DPA), N-acetyl-D-penicillamine (NAPA), calcium calcium trisodium or zinc trisodium diethylenetriaminepentaacetate (CaNa(3)DTPA, ZnNa(3)DTPA), deferoxamine (DFO), deferiprone (L1), triethylenetetraamine (trientine), and Prussian blue (PB). British Anti Lewisite (BAL) (2.5 mg/kg) is also commonly used in the treatment [4,11]. DMPS and DMSA are especially useful antidotes in mercury intoxication, while DMPS can be a more effective remedy against arsenic poisoning. On the other hand, recent reports indicate that a combination of low-dosed BAL with DMPS may be a practical antidotal treatment to render mobilization of the intracerebral deposits into the bloodstream for expedient urinary elimination [12]. Intramuscular administration of dimercaptopropanol (BAL) has mostly been used in acute arsenic, lead, and mercury poisonings, but repeated BAL administration increased the brain uptake of heavy metals including mercury in experimental animals [13].

Conclusion

This review emphasizes that scientific research has culminated a significant amount of information on the mechanisms mediating Mercury-induced toxicity in the last decades. Further research in this area is well warranted. We can not overemphasize the importance of public education on poisoning and specifically, potential hazards of mercury to protect public health.

References

1. Karagas MR, Choi AL, Oken E, Horvat M, Schoeny R, et al. (2012) Evidence on the human health effects of low-level methylmercury exposure. Environ Health Perspect 120(6): 799-806.

2. Pirkle CM, Muckle G, Lemire M (2016) Managing mercury exposure in northern Canadian communities. CMAJ 188(14): 1015-1023.

3. Health Canada (2011) Mercury in fish- questions and answers. Ottawa, Government of Canada.

4. Caravati EM, Erdman AR, Christianson G, Nelson LS, Woolf AD, et al. (2008) Elemental mercury exposure: an evidence-based consensus guideline for out-of-hospital management. Clin Toxicol (Phila) 46(1): 1-21.

5. Legrand M, Feeley M, Tikhonov C, Schoen D, Li-Muller A (2010) Methylmercury blood guidance values for Canada. Can J Public Health 101(1): 28-31.

6. Nakayama H, Shono M, Hada S, Niki F (1983) Mercury exanthem. Contact Dermatitis 9(5): 411-417.

7. Ford MD (1999) Metals and Metalloids Mercury. In: Tintinalli JE, et al. (Eds.), Emergency Medicine: A Comprehensive Study Guide, (5th edn), McGraw Hill, Newyork, pp. 1191-1193.

8. Goldman LR, Shannon MW, American Academy of Pediatrics, Committee on Environmental Health (2001) Technical Report: Mercury in the Environment: Implications for Pediatricians. Pediatrics 108(1): 197-205.

9. Tchounwou PB, Ayensu WK, Ninashvili N, Sutton D (2003) Environmental exposure to mercury and its toxicopathologic implications for public health. Environ Toxicol 18(3): 149-175.

10. Da Broi U, Moreschi C, Colatutto A, Marcon B, Zago S (2017) Medico legal aspects of self-injection of metallic mercury in cases of suicide or self-harming. J Forensic Leg Med 50: 12-19.

11. Blanusa M, Varnai VM, Piasek M, Kostial K (2005) Chelators as antidotes of metal toxicity: therapeutic and experimental aspects. Curr Med Chem 12(23): 2771-2794.

12. Bjørklund G, Mutter J, Aaseth J (2017) Metal chelators and neurotoxicity: lead, mercury, and arsenic. Arch Toxicol 91(12): 3787-3797.

13. Andersen O, Aaseth J (2016) A review of pitfalls and progress in chelation treatment of metal poisonings. J Trace Elem Med Biol 38: 74-80.