

# MERCURY TOXICITY

Mercury is found in batteries, thermometers and barometers. It can also be found in fungicides used in the agricultural industry. In medicine, mercury is used in dental amalgams and various antiseptic substances. It can also be found in deep sea water fish.

Mercury is toxic in any form. Mercury poisoning can result from vapor inhalation, ingestion, injection, or absorption through the skin. Nervous, digestive and renal systems are most commonly affected in mercury exposure. Long-term effects on the nervous system are most worrying. Children and pregnant women are especially vulnerable to mercury exposure.

**“In the US:** The 2003 annual report of the American Association of Poison Control Centers' Toxic Exposure Surveillance System documented 3362 exposures to mercury or compounds containing mercury. Of these, 569 were in children younger than 6 years and 1705 were in persons older than 19 years. Overall, 44 individuals were reported to have moderate effects, 6 had major effects, and none died as a result of mercury exposure. <http://www.emedicine.com/EMERG/topic813.htm>

There are 3 forms of Mercury:

- Elemental – mercury in its pure liquid form. Elemental mercury, when vaporised, has the ability to penetrate the Central Nervous System, where it is ionized and trapped, attributing to its significant toxic effects. It is not well absorbed by the digestive system and, for this reason, are only mildly toxic when ingested. So the most toxic effect of elemental mercury happens through its inhalation.
- Inorganic – mercury in the form of salts. Highly toxic. “It gains access to the body orally or dermally and is absorbed at a rate of 10% of that ingested. Although poor lipid solubility characteristics limit CNS penetration, slow elimination and chronic exposure allow for significant CNS accumulation of mercuric ions and subsequent toxicity. Long-term dermal exposure to inorganic mercury may also lead to toxicity”.  
<http://www.emedicine.com/EMERG/topic813.htm>
- “Organic mercury can be found in 3 forms, aryl and short and long chain alkyl compounds. Organic mercurials are absorbed more completely from the GI tract than inorganic salts are; this is because of intrinsic properties, such as lipid solubility and mild corrosiveness (although much less corrosive than inorganic mercury). Once absorbed, the aryl and long chain alkyl compounds are converted to their inorganic forms and possess similar toxic properties to inorganic mercury. The short chain alkyl mercurials are readily absorbed in the GI tract (90-95%) and remain stable in their initial forms. Alkyl organic mercury has high lipid solubility and is distributed uniformly throughout the body, accumulating in the brain, kidney, liver, hair, and skin. Organic mercurials also cross the blood brain barrier and placenta and penetrate erythrocytes, attributing to neurological symptoms, teratogenic effects, and high blood to plasma ratio, respectively”.  
<http://www.emedicine.com/EMERG/topic813.htm>

“The clinical presentation of mercury toxicity can manifest in a variety of ways, depending on the nature of the exposure, the intensity of the exposure, and the chemical form. Acute toxicity usually is related to the inhalation of elemental mercury or ingestion of inorganic mercury. Exposure to organic mercury leads to chronic toxicity and, occasionally, acute toxicity”.

“Acute exposure caused by inhaled elemental mercury can lead to pulmonary symptoms. Initial

signs and symptoms, such as fever, chills, shortness of breath, metallic taste, and pleuritic chest pain, may be confused with metal fume fever. Other possible symptoms could include stomatitis, lethargy, confusion, and vomiting. In addition, elemental mercury can also be injected causing a life-threatening pulmonary embolism”.

“Chronic and intense acute exposure causes cutaneous and neurological symptoms. The classic triad found in chronic toxicity is tremors, gingivitis, and erethism (ie, a constellation of neuropsychiatric findings that includes insomnia, shyness, memory loss, emotional instability, depression, anorexia, vasomotor disturbance, uncontrolled perspiration, and blushing).

Additional findings may include headache, visual disturbance (eg, tunnel vision), peripheral neuropathy, salivation, insomnia, and ataxia.

Without a complete history, mercury toxicity, especially in elderly individuals, can be misdiagnosed as Parkinson disease, senile dementia, metabolic encephalopathy, depression, or Alzheimer disease.

Elemental mercury has poor GI absorption and, therefore, oral or rectal exposure to elemental mercury from a thermometer should have no toxic effect. Dental amalgams also contain elemental mercury. Dental professionals who are in contact with amalgam must follow specific guidelines to avoid exposure to toxic amounts of aerosolized elemental mercury. Patients with dental amalgam fillings have slightly elevated levels in their urine, but these findings have not correlated with any systemic disease.

Inorganic mercury or mercuric salt exposure mainly occurs through the oral and GI tract. Its corrosive properties account for most of the acute signs and symptoms of inorganic mercury or mercuric salt toxicity. The acute presentation can include ashen-gray mucous membranes secondary to precipitation of mercuric salts, hematochezia, vomiting, severe abdominal pain, and hypovolemic shock. Systemic effects usually begin several hours postingestion and may last several days. These effects include metallic taste, stomatitis, gingival irritation, foul breath, loosening of teeth, and renal tubular necrosis leading to oliguria or anuria”.

Chronic exposure usually results from prolonged occupational exposure to elemental mercury that is converted into the inorganic form, topical application of mercurial salves, and the chronic use of diuretics or cathartics.

Chronic exposure results in renal failure, dementia, and acrodynia.

Acrodynia, known as Pink disease and considered to be a mercury allergy, presents with erythema of the palms and soles, edema of the hands and feet, desquamating rash, hair loss, pruritus, diaphoresis, tachycardia, hypertension, photophobia, irritability, anorexia, insomnia, poor muscle tone, and constipation or diarrhea.

Acrodynia does not present in everyone who is exposed to inorganic mercury, but it is an indicator of widespread disease.

Organic mercury poisoning usually results from ingestion of contaminated food. The long chain and aryl forms of organic mercury have similar characteristics of inorganic mercury toxicity.

The onset of symptoms usually is delayed (days to weeks) after exposure.

Organic mercury targets enzymes, and the depletion of these enzymes must occur before the onset of symptoms.

Symptoms related to toxicity are typically neurological, such as visual disturbance (eg, scotomata, visual field constriction), ataxia, paresthesias (early signs), hearing loss, dysarthria, mental deterioration, muscle tremor, movement disorders, and, with severe exposure, paralysis, and death.

Organic mercury targets specific sites in the brain, including the cerebral cortex (especially visual cortex), motor and sensory centers (precentral and postcentral cortex), auditory center (temporal cortex), and cerebellum.

All forms of mercury are toxic to the fetus, but methylmercury most readily passes through the placenta. Even with an asymptomatic patient, maternal exposure can lead to spontaneous abortion or retardation". <http://www.emedicine.com/EMERG/topic813.htm>

**“Causes:**

- Causes of elemental mercury toxicity include barometers, batteries, bronzing, calibration instruments, chlor-alkali production, dental amalgams, electroplating, fingerprinting products, fluorescent and mercury lamps, infrared detectors, the jewelry industry, manometers, neon lamps, paints, paper pulp production, photography, silver and gold production, semiconductor cells, and thermometers.
- The causes of inorganic mercury toxicity include antisyphilitic agents, acetaldehyde production, chemical laboratory work, cosmetics, disinfectants, explosives, embalming, fur hat processing, ink manufacturing, mercury vapor lamps, mirror silvering, the perfume industry, photography, spermicidal jellies, tattooing inks, taxidermy production, vinyl chloride production, and wood preservation.
- The causes of organic mercury toxicity include antiseptics, bactericidals, embalming agents, the farming industry, fungicides, germicidal agents, insecticidal products, laundry products, diaper products, paper manufacturing, pathology products, histology products, seed preservation, and wood preservatives.
- Another route of organic mercury exposure is thimerosal, an additive preservative used in vaccines to prevent bacterial contamination. The most commonly used vaccines that contain Thimerosal are for diphtheria-tetanus-whole cell pertussis (DTP), *Haemophilus influenzae* (HIB), and hepatitis B". <http://www.emedicine.com/EMERG/topic813.htm>

**Further reading:**

<http://curezone.com/dental/amalgampage.asp>

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