

SYMPTOMS OF ELEMENTAL MERCURY VAPOR EXPOSURE AND TOXICITY

Prepared by the International Academy of Oral Medicine and Toxicology
(IAOMT, www.iaomt.org); 2016

All dental amalgams, often called “silver fillings,” contain approximately 50% mercury. A World Health Organization (WHO) report warned of mercury: “It may cause harmful effects to the nervous, digestive, respiratory, immune systems and to the kidneys, besides causing lung damage...Recent studies suggest that mercury may have no threshold below which some adverse effects do not occur” (WHO, 2005). Properly diagnosing “adverse health effects” related to dental mercury amalgam fillings is impeded by the intricate list of potential responses to the elemental form of the substance, which include over 250 specific symptoms (Rice et al., 2014). The table below is a brief listing of some of the symptoms most commonly associated with inhalation of elemental mercury vapors (which is the same type of mercury continually emitted from dental amalgam fillings):

Acrodyndia or similar symptoms such as emotional instability, loss of appetite, general weakness, and skin changes (<i>Magos and Clarkson, 2006</i>)	Anorexia (<i>Bernhoft, 2011</i>)	Cardiovascular problems/ labile pulse [frequent changes in heart rate]/tachycardia [abnormally rapid heartbeat] (<i>Klassen, 2008</i>)
Cognitive/neurological impairments /memory loss/decrease in mental function/difficulties with verbal and visual processing (<i>Echeverria et al., 1998; Clarkson and Magos, 2006; Magos and Clarkson, 2006; Syversen and Kaur, 2012; USEPA, 2016</i>)	Delusions/delirium/hallucination (<i>Bernhoft, 2011; Syversen and Kaur, 2012</i>)	Dermatological conditions/ dermatographism [skin condition characterized by raised red marks]/dermatitis (<i>Bernhoft, 2011; Klassen, 2008</i>)
Endocrine disruption /enlargement of thyroid (<i>Bernhoft, 2011; Klassen, 2008</i>)	Erethism [symptoms such as irritability, abnormal responses to stimulation, and emotional instability] (<i>Bernhoft, 2011; Clarkson et al., 2003; Clarkson and Magos, 2006; Magos and Clarkson, 2006</i>)	Fatigue (<i>Bernhoft, 2011; Echeverria et al., 1998</i>)
Headaches (<i>USEPA, 2016</i>)	Hearing loss (<i>Rothwell and Boyd, 2008</i>)	Immune system impairments (<i>Bernhoft, 2011; Clarkson and Magos, 2006</i>)
Insomnia (<i>USEPA, 2016</i>)	Nerve response changes /peripheral neuropathy/decreased coordination/decreased motor function/polyneuropathy/neuromuscular changes such as weakness, muscle atrophy, and twitching (<i>Bernhoft, 2012; Clarkson et al., 2003; Clarkson and Magos, 2006; Echeverria et al., 1998; USEPA, 2016</i>)	Oral manifestations/ gingivitis/metallic taste/oral lichenoid lesions/stomatitis/salivation (<i>Bernhoft, 2011; Camisa et al., 1999; Clarkson et al., 2003; Clarkson and Magos, 2006; Klassen, 2008; Magos and Clarkson, 2006</i>)
Psychological issues /mood changes related to anger, depression, excitability, irritability, mood swings, and nervousness (<i>Echeverria et al., 1998; Klassen, 2008; Magos and Clarkson, 2006; USEPA, 2016</i>)	Renal [kidney] problems/ proteinuria/nephrotic syndrome (<i>Bernhoft, 2011; Clarkson et al., 2003; Clarkson and Magos, 2006; Klassen, 2008; USEPA, 2016; Syversen and Kaur, 2012</i>)	Respiratory problems/ bronchial irritation/bronchitis/cough/dyspnea [breathing difficulties]/pneumonitis/respiratory failure (<i>Bernhoft, 2011; Clarkson et al., 2003; Echeverria et al., 1998; Klassen, 2008; Magos and Clarkson, 2006; Syversen and Kaur, 2012; USEPA, 2016</i>)
Shyness [excessive shyness]/social withdrawal (<i>Magos and Clarkson, 2006; USEPA, 2016</i>)	Tremors /mercurial tremors/ intention tremors (<i>Bernhoft, 2011; Clarkson and Magos, 2006; Klassen, 2008; USEPA, 2016; Syversen and Kaur, 2012</i>)	Weight loss (<i>Bernhoft, 2011</i>)

One reason for the wide-range of symptoms is that mercury taken into the body can accumulate in virtually any organ. In relation to dental amalgam fillings, the World Health Organization (WHO) has stated: “Dental amalgam constitutes a potentially significant source of exposure to elemental mercury, with estimates of daily intake from amalgam restorations ranging from 1 to 27 µg/day” (Risher, 2003). Research has shown that this results in 67 million Americans aged two years and older exceeding the intake of mercury vapor considered “safe” by the U.S. EPA due to the presence of dental mercury amalgam fillings [or over 122 million Americans exceeding the intake of mercury vapor considered “safe” by the California EPA due to their dental mercury amalgam fillings] (Richardson et al., 2011).

An estimated 80% of this mercury vapor is absorbed by the lungs and passed to the rest of the body (Lorscheider et al., 1995), particularly the brain, kidney, liver, lung, and gastrointestinal tract (Health Canada, 1996). The half life of metallic mercury varies depending on the organ where the mercury was deposited and the state of oxidation (Bernhoft 2011). For example, the half lives of mercury in the whole-body and kidney regions have been estimated at 58 days (Clarkson and Magos, 2006), whereas mercury deposited in the brain can have a half life of up to several decades (Rooney, 2014).

Furthermore, mercury vapor taken into the body binds to sulfhydryl groups of protein and to sulfur-containing amino acids throughout the body (Bernhoft, 2011). Mercury vapor, which is lipid soluble, can cross the blood-brain barrier with ease and is converted into inorganic mercury in the cells by catalase oxidation (Lorscheider et al., 1995). This inorganic mercury is eventually bound to glutathione and protein cysteine groups (Lorscheider et al., 1995).

Toxic effects of this mercury exposure vary by individual, and one or a combination of symptoms can be present and can change over time. An array of co-existing factors influence this personalized reaction to dental mercury including the presence of other health conditions, the number of amalgam fillings in the mouth, gender, genetic predisposition, dental plaque, selenium levels, exposure to lead, consumption of milk or alcohol, methylmercury levels from fish consumption, and the potential for mercury from dental amalgam fillings to be transformed into methylmercury within the human body (Kall et al., 2016a; Kall et al., 2016b).

In addition to the fact that individual response to mercury varies, the effects of these exposures are even more insidious because it can take many years for symptoms to manifest themselves, and previous exposures, especially if they are relatively low-level and chronic (as is often the case from mercury amalgam fillings), might not be associated with the delayed onset of symptoms. The concept of a delayed reaction after a chemical exposure is supported by the Occupational Safety and Health Administration (OSHA)’s requirement that employers keep a record of incidences with toxic substances on-site for three decades in part because “[m]any chronic diseases are characterized by long latency periods of 20-30 years or longer” (OSHA, 1994).

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