

SEVEN COMMON MISCONCEPTIONS ABOUT DENTAL MERCURY By Amanda Just, MS, Program Director of the IAOMT and John Kall, DMD, FAGD, MIAOMT July 31, 2017

1) The kind of mercury in dental fillings is safe. Only methylmercury in fish is known to be harmful.=NOT TRUE

The different forms of elements are an essential factor in evaluating the exposure risks related to environmental toxicants: mercury can exist in different forms and compounds, and these different forms and compounds can produce different results in humans that are exposed to them. The type of mercury used in amalgam fillings is elemental (metallic) mercury, which is the same type of mercury used in certain types of thermometers (many of which have been banned). In contrast, the mercury in fish is methylmercury, and the mercury in the vaccine preservative thimerosal is ethylmercury.

All forms of mercury are dangerous, and exposure to mercury, even in minute amounts, is known to be toxic and poses significant risks to human health. A 2005 World Health Organization report warned of mercury: "It may cause harmful effects to the nervous, digestive, respiratory, immune systems and to the kidneys, besides causing lung damage. Adverse health effects from mercury exposure can be: tremors, impaired vision and hearing, paralysis, insomnia, emotional instability, developmental deficits during fetal development, and attention deficit and developmental delays during childhood. Recent studies suggest that mercury may have no threshold below which some adverse effects do not occur."¹

Similarly, the US Environmental Protection Agency has explained: "Mercury is a neurotoxin. How someone's health may be affected by an exposure to mercury depends on a number of factors: the form of mercury (for example, methylmercury or elemental {metallic} mercury), the amount of mercury in the exposure, the age of the person exposed (the fetus is the most vulnerable), how long the exposure lasts, how the person is exposed -- breathing, eating, skin contact, etc., [and] the health of the person exposed."²

The EPA goes on to specifically describe effects of elemental/metallic mercury vapor exposure, which is the same type of exposure associated with dental mercury fillings. The EPA describes these effects as tremors, emotional changes (such as mood swings, irritability, nervousness, excessive shyness), insomnia, neuromuscular changes (such as weakness, muscle atrophy, twitching), headaches, disturbances in sensations, changes in nerve responses, and poor performance on tests of mental function.³

Additional health risks directly linked to dental amalgam mercury are included throughout the rest of this article.

2) ...but ______ says that dental mercury fillings are safe.

Whether it is a dentist claiming that mercury fillings are safe, a governing body saying that they are not harmful, or a health website reassuring patients that amalgam has been safely used for over 150 years, it is essential to know that the alleged safety of dental amalgam mercury is currently being successfully challenged with new science and new actions by authorities around the globe. The result is that dental mercury fillings are now being recognized as dangerous, and numerous countries have taken action against them. This growing global awareness of the harms of mercury will likewise result in even more protective measures in the coming decades.

In 2013, the United Nations Environment Programme (UNEP)'s Intercessional Negotiating Committee formalized a global, legally-binding mercury treaty, which has now been ratified by over 70 countries, including the U.S. Part of UNEP's "Minamata Convention on Mercury," which enters into force on August 16, 2017, includes initiatives with regards to dental mercury amalgam such as setting national objectives aimed at minimizing its use, promoting the use of cost-effective and clinically effective mercury-free alternatives for dental restoration, discouraging insurance policies and programs that favor dental amalgam use over mercury-free dental restoration, and promoting the use of best environmental practices in dental facilities to reduce releases of mercury and mercury compounds to water and land.⁴

As part of this effort, a new EU mercury regulation plans to prohibit the use of dental mercury amalgam for vulnerable populations (pregnant or breastfeeding women, children under 15 years old), to require amalgam separators in dental offices, and to provide for discussion about ending dental mercury use in the European Union by 2030.⁵

Some individual countries have already taken protective actions against this dental material. Norway banned dental amalgam in 2008,⁶ Sweden banned the use of dental amalgam for almost all purposes in 2009,⁷ and Denmark, Estonia, Finland, and Italy, use it for less than 5% of tooth restorations.⁸ Japan and Switzerland have also restricted or almost banned dental amalgam.⁹ France has recommended that alternative mercury-free dental materials be used for pregnant women, and Austria, Canada, Finland, and Germany have purposely reduced the use of dental amalgam fillings for pregnant women, children, and/or in patients with kidney problems.¹⁰

In spite of this international action, the U.S. Food and Drug Administration (FDA) "considers dental amalgam fillings safe for adults and children ages 6 and above."¹¹ While the FDA does not claim safety for children under the age of six, there is no regulation for this population. Also, details in the FDA's public statements about dental amalgam on its website have changed over the years, including information about amalgam's potentially harmful impact on pregnant women, fetuses, and children under the age of six.

Due in part to concerns about the FDA's lack of protection, the IAOMT filed a lawsuit in 2014 against the FDA over its classification of dental mercury amalgam.¹² As part of the case, the IAOMT secured an internal document from the FDA that had proposed restricting dental mercury amalgam use in pregnant and nursing women and children under the age of six, as well as individuals with mercury allergies and pre-existing kidney or neurological disease.¹³ Yet,

allegedly for administrative or political reasons, the FDA communication (dated January 2012) was never released to the public.

The U.S. EPA recently utilized measures in the Clean Water Act to develop standards for dental clinics to use amalgam separators so that dental mercury is not flushed down the drain and into the environment.¹⁴ These standards went into effect on July 14, and the EPA has estimated that it could reduce the discharge of mercury by 5.1 tons annually.

Meanwhile, scientific studies continue to demonstrate that the mercury used in dentistry poses serious risks to both the environment and public health. Some of these studies are discussed in this article below.

3) Dental mercury and other forms of mercury are only dangerous to the environment, and countries who have banned dental mercury and other forms of mercury have only done so because of harm to the environment.=NOT TRUE

By closely reading the section above, it should be clear that actions are being taken specifically to protect patients from the potential hazards of dental mercury. In fact, the United Nations Environment Programme clearly states: "The Minamata Convention on Mercury is a global treaty to protect **human health and the environment** from the adverse effects of mercury" [emphasis added].¹⁵ Likewise, countries taking action against dental mercury have demonstrated concerns about its impact on patients by limiting its use for all people or for specific subpopulations, especially pregnant women and children. Some of the science offering evidence of harm from dental mercury fillings will be discussed below.

4) The mercury in dental fillings is bound to the material (trapped in the fillings) and is not released.=NOT TRUE

All dental amalgam restorations contain approximately 50% mercury, ¹⁶ and reports and research are consistent that these fillings emit mercury vapors. ¹⁷ ¹⁸ ¹⁹ ²⁰ ²¹ ²² ²³ ²⁴ ²⁵ ²⁶ ²⁷ ²⁸ ²⁹ ³⁰ ³¹ ³² ³³ ³⁴ Scientific research demonstrates that dental mercury amalgam exposes dental professionals, dental staff, dental patients, and fetuses to releases of mercury vapor, mercury-containing particulate, and/or other forms of mercury contamination. ³⁵ ³⁶ ³⁷ ³⁸ ³⁹ ⁴⁰ ⁴¹ ⁴² ⁴³ ⁴⁴ ⁴⁵ ⁴⁶ ⁴⁷ ⁴⁸ ⁴⁹ ⁵⁰ ⁵¹ ⁵² ⁵³ ⁵⁴ ⁵⁵ ⁵⁶ ⁵⁷ ⁵⁸ ⁵⁹ ⁶⁰ ⁶¹ ⁶² ⁶³ ⁶⁴ ⁶⁵ ⁶⁶ ⁶⁷ ⁶⁸ ⁶⁹ ⁷⁰ ⁷¹ ⁷² Furthermore, mercury vapor is known to be released from dental mercury amalgam fillings at higher rates during brushing, cleaning, clenching of teeth, chewing, etc., ⁷³ ⁷⁴ ⁷⁵ ⁷⁶ ⁷⁷ ⁷⁸ ⁷⁹ ⁸⁰ ⁸¹ ⁸² ⁸³ ⁸⁴ ⁸⁵ ⁸⁶ and mercury is also known to be released during the placement, replacement, and removal of dental mercury amalgam fillings. ⁸⁷ ⁸⁸ ⁸⁹ ⁹⁰ ⁹¹ ⁹² ⁹³ ⁹⁴ ⁹⁵

A series of studies demonstrate that urinary mercury concentrations consistently increase as the number of amalgam fillings increases.^{96 97 98} In these studies, the average urine mercury content is consistently greater in groups with amalgam fillings than in those without, and urine mercury content consistently increases as the number of dental mercury amalgam fillings increases.

Numerous studies have also demonstrated that the mercury exposure or concentration increases in the following tissues and situations

- Due to chewing, brushing, and/or bruxism^{99 100 101 102 103 104 105 106 107 108 109}
- In exhaled or intra-oral air of persons with amalgam fillings¹¹⁰ ¹¹¹ ¹¹² ¹¹³
- In saliva of persons with amalgam fillings¹¹⁴ ¹¹⁵ ¹¹⁶ ¹¹⁷
- In blood of persons with amalgam fillings¹¹⁸ ¹¹⁹ ¹²⁰ ¹²¹ ¹²² ¹²³ ¹²⁴ ¹²⁵
- In various organs and tissues of amalgam bearers, including the kidney, liver, pituitary gland, thyroid, and brain or parts thereof¹²⁶ ¹²⁷ ¹²⁸ ¹²⁹
- In feces of amalgam bearers¹³⁰ ¹³¹
- In amniotic fluid, cord blood, placenta, and various fetal tissues including liver, kidney and brain, in association with maternal amalgam load¹³² ¹³³ ¹³⁴ ¹³⁵ ¹³⁶ ¹³⁷ ¹³⁸
- In colostrum and breast milk in association with maternal amalgam load¹³⁹ ¹⁴⁰ ¹⁴¹

Scientific evidence confirms that in most individuals with dental mercury amalgam fillings, mercury exposure exceeds the Reference Exposure Level (REL).¹⁴² [REL is a term used to denote the exposure level defined by national and international regulatory agencies at which there is an expectation of *no negative health outcomes* within the population.]

Also, reports from the World Health Organization (WHO) and Canada's federal department of health (Health Canada) conclude that mercury vapor from dental amalgam is the greatest source of human exposure to mercury in non-industrial settings.¹⁴³¹⁴⁴

Additionally, in research published in 2011, Dr. G. Mark Richardson reported that more than 67 million Americans aged two years and older exceed the intake of mercury vapor considered "safe" by the U.S. EPA due to the presence of dental mercury amalgam fillings, whereas over 122 million Americans exceed the intake of mercury vapor considered "safe" by the California EPA due to their dental mercury amalgam fillings.¹⁴⁵

5) There are no peer-reviewed journal articles demonstrating risk from dental mercury fillings.=NOT TRUE

Whereas some groups have endorsed the use of dental mercury amalgam and claim that there are no peer-reviewed articles on this topic, this is simply not the case. Numerous peer-reviewed, scientific studies report risks associated with dental mercury amalgam fillings. In fact, over 200 scientific articles produced by a literature search on PubMed (through the U.S. National Library of Medicine National Institutes of Health) have been collected by the IAOMT. It should be noted that MEDLINE, of the U.S. National Library of Medicine, is the primary component of PubMed,¹⁴⁶ and that the majority of journals included in MEDLINE are peer-reviewed.¹⁴⁷

The PubMed literature search was conducted by IAOMT researchers online at the PubMed database (<u>https://www.ncbi.nlm.nih.gov/pubmed/</u>) from September 16, 2013 to March 6, 2014. The purpose of the research was to answer the following question: "Are there risks associated with dental mercury?" The PubMed search term used was "dental mercury risk," and clinical trials and reviews were included in the search. The search was conducted from March 6, 2014 to as far back as PubMed provided results (1972), and the PubMed search resulted in 280 sources.

All PubMed sources were categorized into risk, no risk, or ambiguous categories. Articles were excluded from the final results of the search if they were not in English, they were not relevant (i.e. not significantly about dental mercury amalgam), they were an erratum, they were a comment on a different article, and/or if the abstract and study could not be found. Thus, 124 articles were excluded. Based on the 156 articles that were included, the PubMed search yielded 86 articles (55.1%) suggesting risk, 55 articles (35.3%) suggesting no risk, and 15 articles (9.6%) deemed as ambiguous.

An IAOMT hand-search of documents was conducted to supplement the PubMed search. The hand-search was originally conducted from September 16, 2013 to March 6, 2014, but it was updated from December 1, 2015 to December 23, 2015. Over 700 documents about this issue are currently on file in the IAOMT's Library, which has documents dating from 1926 to present.

Some of the over 200 articles from the PubMed and IAOMT searches demonstrating risk have been used as sources for this document since they serve as evidence of the known hazards of dental mercury amalgam. To read more about the PubMed and IAOMT searches, you can read the <u>IAOMT's Position Statement against Dental Mercury Amalgam Fillings for Medical and Dental Practitioners, Dental Students, Dental Patients, and Policy Makers</u> which contains over 900 citations.

It should also be noted that although two studies¹⁴⁸ ¹⁴⁹ (commonly referred to as the "New England Children's Amalgam Trial" and the "Casa Pia Children's Amalgam Trial") have repeatedly been used to defend the use of amalgam in children, other researchers have since demonstrated that factors such as long term effects, genetic predisposition, and measurement errors must be taken into account. ¹⁵⁰ ¹⁵¹ ¹⁵² ¹⁵³ ¹⁵⁴ ¹⁵⁵ Furthermore, researchers studying the same cohort (of the Children's Amalgam Trials) have provided data that has identified potential risks to these subjects from mercury exposure based on gender, ¹⁵⁶ ¹⁵⁷ ¹⁵⁸ genetic predisposition, ¹⁵⁹ ¹⁶⁰

More specifically, the CPOX4 genetic variation was identified as a factor for neurobehavioral issues. The researchers noted, "...among boys, numerous significant interaction effects between CPOX4 and Hg [mercury] were observed spanning all 5 domains of neurobehavioral performance...These findings are the first to demonstrate genetic susceptibility to the adverse neurobehavioral effects of Hg [mercury] exposure in children."¹⁶³

In fact, some of these same researchers have further associated neurobehavioral consequences from dental mercury exposure with the specific genetic polymorphism CPOX4. In a study published in 2006, they linked CPOX4 to decreased visuomotor speed and indicators of depression in dental professionals.¹⁶⁴

The ability of these specific genetic variants to negatively impact the body's reaction to dental mercury exposure has even achieved attention in the mainstream media. A January 5, 2016, article by Greg Gordon of McClatchy News included interviews with some of the researchers of the studies mentioned above. Markedly, Dr. James Woods stated: "Twenty-five percent to 50 percent of people have these (genetic variants)."¹⁶⁵ In the same article, Dr. Diana Echeverria discussed "a lifetime risk" of neurological damage related to this population, and she elaborated: "We're not talking about a small risk."¹⁶⁶

6) If mercury fillings were really harmful, then everyone who has them would be sick.=NOT TRUE

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.¹⁶⁷ Not all patients will experience the same symptom or combination of symptoms.

Moreover, an extensive number of studies have documented risks for other health conditions associated with dental amalgam. In fact, scientists have associated the mercury in amalgam fillings with Alzheimer's disease, ^{168 169 170} amyotrophic lateral sclerosis (Lou Gehrig's disease), ¹⁷¹ antibiotic resistance, ^{172 173 174 175} anxiety, ¹⁷⁶ autism spectrum disorders, ^{177 178 179} autoimmune disorders/immunodeficiency, ^{180 181 182 183 184 185 186 187 188 189} cardiovascular problems, ^{190 191 192} chronic fatigue syndrome, ^{193 194 195 196} depression, ¹⁹⁷ infertility, ^{198 199} kidney disease, ^{200 201 202 203 204 205 206 207} multiple sclerosis, ^{208 209 210 211} Parkinson's disease, ^{212 213 214} and other health problems. ²¹⁵

Another 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 μ g/day."²¹⁶ 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 due to their dental mercury amalgam fillings].²¹⁷

An estimated 80% of the mercury vapor from amalgam fillings is absorbed by the lungs and passed to the rest of the body,²¹⁸ particularly the brain, kidney, liver, lung, and gastrointestinal tract.²¹⁹ The half life of metallic mercury varies depending on the organ where the mercury was deposited and the state of oxidation.²²⁰ For example, the half life of mercury in the whole-body and kidney regions has been estimated at 58 days,²²¹ whereas mercury deposited in the brain can have a half life of up to several decades.²²²

Furthermore, mercury vapor taken into the body binds to sulfhydryl groups of protein and to sulfur-containing amino acids throughout the body.²²³ 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.²²⁴ This inorganic mercury is eventually bound to glutathione and protein cysteine groups.²²⁵

Effects of toxic exposure 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."²²⁶

Allergies also play a role in potential reactions to dental amalgam mercury. Most patients are not tested for dental metal allergies, but, according to statistics in scientific research, ²²⁷ millions of patients are allergic or sensitive to the dental mercury amalgam fillings in their mouths because of the mercury or the other components. A gamut of health conditions has been linked to dental metal allergies. These include autoimmunity, ²²⁸ ²²⁹ chronic fatigue syndrome, ²³⁰ ²³¹ ²³² fibromyalgia, ²³³ ²³⁴ metallic pigmentation, ²³⁵ multiple chemical sensitivities, ²³⁶ ²³⁷ multiple sclerosis, ²³⁸ myalgic encephalitis, ²³⁹ oral lichenoid lesions, ²⁴⁰ ²⁴¹ ²⁴² ²⁴³ ²⁴⁴ orofacial granulomatosis, ²⁴⁵ and even infertility. ²⁴⁶ A number of patients with health conditions linked to dental metal allergies have improved or recovered from their ailments after removal of their fillings. ²⁴⁷ ²⁴⁸ ²⁴⁹ ²⁵⁰ ²⁵¹ ²⁵² ²⁵³ ²⁵⁴ ²⁵⁵ ²⁵⁶ ²⁵⁷ ²⁵⁸ ²⁵⁹ ²⁶⁰ ²⁶¹ ²⁶² ²⁶³ Studies also establish that exposure to dental mercury amalgam fillings correlates with higher prevalence of mercury allergies.

The issue of genetic predisposition to specific, adverse effects from mercury exposure has also been examined in several studies. Other than CPOX4^{266 267} and APOE, ²⁶⁸ genetic traits that have been examined for association with health impairments caused by mercury exposure include BDNF (brain-derived neurotropic factor), ^{269 270 271} metallothionein (MT) polymorphisms, ^{272 273} catechol-O-methyltransferase (COMT) variants, ²⁷⁴ and MTHFR mutations and PON1 variants. ²⁷⁵ The authors of one of these studies concluded: "It is possible that elemental mercury may follow the history of lead, eventually being considered a neurotoxin at extremely low levels."²⁷⁶

7) All of these dentists are just trying to make money by telling people that they're mercury-free and/or mercury-safe.=NOT TRUE

Many of the individuals who have brought concerns about dental amalgam to the attention of the public or government authorities, including dentists, have been ostracized and even attacked for taking a stance against mercury. Perhaps the best example is the late Hal Huggins, DDS, who was regarded by many as one of the most outspoken dentists against amalgam. In his 1993 book, *It's All in Your Head: The Link between Mercury Amalgams and Illness*, he chronicled his own experiences of bringing research about the harms of dental amalgam to the attention of the authorities: "I was slurred, slandered, and spit upon by people I had thought were colleagues, friends, and professional family. The scientists at the ADA [American Dental Association], who were supposed to be doing the research...were the most resistant."²⁷⁷ Dr. Huggins, who was obviously a target of the ADA himself, also wrote of the gag rule imposed on dentists: "Today, any dentist who mentions that mercury might be a hazard is liable (under the new dentistry commandment of 'ethics') to lose his license."²⁷⁸

The late Sandra Duffy, JD, was a lawyer who testified to the U.S. government about the injustice of the ADA's gag order. In a 2006 article about the issue, she penned:

The most effective tool of state dental boards to keep dentists from warning patients about the dangers of mercury amalgams is the disciplinary process that has been used against mercury-free dentists with the encouragement and support of the ADA. Mercury-free dentists have been disciplined, and even lost their licenses to practice, for practicing mercury-free dentistry, for advertising their mercury-free practices, for publishing articles or lecturing about mercury-free dentistry.²⁷⁹

In other words, dentists who have spoken out against mercury have risked losing their patients, their licenses, and their professional standing. It also means that they have had to maintain the courage to question their dental education and other authorities.

The IAOMT, a non-profit organization with public charity status, was created in 1984, when eleven dentists, a physician and a lawyer were discussing a seminar they had just attended on the dangers of mercury from dental amalgam fillings. They agreed that the subject was alarming. They also agreed that if there really was a problem with dental mercury, the evidence ought to be in the scientific literature. They set out to investigate the issue with the motto: "Show me the science!"

Three decades later and hundreds of scientific articles later, the IAOMT has grown to over 800 active members in North America, with affiliated chapters in fourteen other countries. The mission of the IAOMT is to be the trusted Academy of medical, dental and research professionals who investigate and communicate safe science-based treatments to promote whole body health. The IAOMT accomplishes its mission by promoting and funding relevant research, accumulating and disseminating scientific information, investigating and promoting non-invasive scientifically valid therapies, and educating medical professionals, policy makers, and the general public. The profit that the IAOMT hopes to gain is the end of dental mercury and the worldwide acceptance of safe, non-toxic dental products.

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