

# Heavy Metal Detoxification for Biological Dentistry

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While dentists do not prescribe pharmaceutical drugs or supplements for detoxification, it is important for dental professionals to understand the basics of “chelation.” This is especially because a growing number of patients are seeking out biological dentists to remove their mercury fillings as part of a detoxification program. More specifically, in some cases, a health care practitioner recommends mercury-free dentistry and detoxification (chelation) to assist the patient in recovering from a medical condition or in achieving a more optimal level of well-being.

Derived from the Greek word for *claw*, the verb *chelate* (pronounced “key-late”) is defined as “1. To combine a metal ion with a chemical compound to form a ring. 2. To remove a heavy metal, such as lead or mercury, from the bloodstream by means of a chelate.”<sup>1</sup> Thus, chelation is used to detoxify the body by assisting it in excreting heavy metals.

Chelation was first developed for industrial purposes in the early twentieth century, and research during World War II for its effectiveness as an antidote to poison gas advanced the use of chelation for other forms of poisoning.<sup>2</sup> Due to a burgeoning awareness of the impacts of heavy metals on health, chelation is currently being practiced for medical purposes more often.

Importantly, heavy metals testing and chelation address mercury as well as other metals such as cadmium and lead, all of which are **stored within the body through a lifetime of exposures**. This means that the combination of testing and detoxification has the potential to improve a wide-range of health conditions associated with these heavy metals.

This concept is essential considering that scientific research has linked metals to the risk of cardiovascular disease, diabetes, and obesity,<sup>3</sup> and even more specifically, in a series of studies from 2011-2015, mercury was associated with increased body mass index,<sup>4</sup> cardiometabolic risk factors,<sup>5</sup> insulin resistance,<sup>6</sup> and metabolic syndrome.<sup>7 8</sup> Relating this body burden of heavy metals to medical interventions, researchers of a study published in 2014 warned that metals and environmental chemicals should be considered as factors “when studying the complex etiology of cardiometabolic diseases which could result in targeted interventions to decrease health disparities and the associated risks of ongoing exposures.”<sup>9</sup>

Scientific literature also supports the potential of heavy metal detoxification in improving health outcomes. Perhaps the most well-known study documenting the efficacy of chelation is from the National Heart, Lung, and Blood Institute, which sponsored the first large-scale clinical trial on detoxification in patients with coronary heart disease. The results, published in 2014,<sup>10</sup> showed that chelation therapy with disodium EDTA benefitted patients with diabetes, producing the following statistics: “Patients with diabetes, who made up approximately one third of the 1,708 TACT participants, had a 41 percent overall reduction in the risk of any cardiovascular event; a 40 percent reduction in the risk of death from heart disease, nonfatal stroke, or nonfatal heart attack; a 52 percent reduction in recurrent heart attacks; and a 43 percent reduction in death from any cause.”<sup>11</sup>

Not surprisingly, a variety of products and practices related to detoxification have emerged due to the interest in detoxification and the scientific evidence of its benefits. Most therapeutic protocols involve plant-based or nutritional compounds that stimulate the body's innate free-radical and toxin control systems, with focus on glutathione and total thiol status.<sup>12 13 14 15 16 17 18 19 20 21</sup>

However, there is no overall consensus among medical practitioners as to what the best, safest, or most effective way to chelate is. In fact, the gamut of chelation products and protocols available for use today have found themselves at the root of a debate because both health care practitioners and patients have distinct preferences.

Needless to say, as a biological dentist, it is highly likely that you will encounter patients following a number of different detoxification methods in your practice. So, being familiar with the wide-range of chelation options, which are still rapidly evolving, is beneficial for your interactions with patients and health care professionals alike.

However, before continuing with an overview of the practices and products related to chelation, it is essential to note that ANY and ALL chelating agents and detoxification programs can cause adverse reactions, especially if a patient is allergic to any of the ingredients. Chelation can also remove essential nutrients, so patients need to be closely monitored. **Thus, chelating agents are very powerful tools, and they should be used only under the supervision of a qualified medical professional.**

Since baseline testing for heavy metals is often used prior to and after chelation, the first portion of this article, adapted from Sam and Michael Ziff's book *Dentistry without Mercury*, reviews the types of testing available. The second portion of this article summarizes some of the products and protocols commonly used for chelation and is mainly compiled from scientific reviews by Margaret E. Sears<sup>22</sup> and Joseph Mercola with Dietrich Klinghardt.<sup>23</sup>

### **Commonly Used Testing for Mercury Exposure**<sup>24</sup>

*This testing portion of the article has been adapted from Sam and Michael Ziff's book Dentistry without Mercury. Note that this material is copyrighted by the IAOMT. Michael Ziff, DDS, MIAOMT, was a founding member of IAOMT.*

For years, the American Dental Association (ADA) maintained that urine and blood tests for mercury content were a valid means of determining safe exposure levels and dangerous exposure levels. However, after the 1984 Workshop on the Biocompatibility of Metals in Dentistry, the ADA finally agreed with the overwhelming scientific evidence (existent since the early 1960's) indicating that blood and urine tests are invalid for determining toxicity or cellular damage that may be occurring in the body.

Since that time, some urine and blood tests have been updated based on new information, and a variety of other tests for mercury exposure have also been developed. Many of these tests are employed to help document levels of mercury in the body potentially caused by dental amalgam fillings or other sources. It should be noted again that some individuals can have reactions to these tests, and any test for heavy metals should only be pursued with the care of a knowledgeable medical professional.

Of course, the first criterion for testing in relation to potential toxic side effects from mercury fillings is that evaluation be done prior to amalgam replacement and prior to the implementation of any detoxification protocols. This is necessary to establish a “base line” of values. Once a base line has been established for all the values to be monitored, then these values can be monitored by subsequent testing to determine whether changes that occur in the individual's health and base line values have any relationship to the elimination of mercury-containing dental fillings.

### 1. Hair Analysis

This is a simple test that has been around for many years, and published research studies clearly document the validity of hair analysis for heavy metal screening. For example, a 1980 U.S. Environmental Protection Agency (EPA) report indicated that human hair is excellent for biological monitoring of mercury.<sup>25</sup>

Although human hair primarily reflects organic mercury exposure, studies have indicated that 10-20% is from inorganic mercury.<sup>26</sup> Regardless of the composition, high mercury hair values, without any external source of exposure should be a matter of concern.

### 2. Urine mercury, lead, copper, tin, and albumin testing

Testing the urine for the presence of mercury, lead, copper, tin and albumin is another route for establishing base line values.

The reason for testing lead levels is two-fold. First, it can rule out lead toxicity, or it can show that the toxic effects of mercury are increased when lead is present. Second, lead inhibits the enzyme delta-aminolevulinic acid dehydratase (ALA-D) and causes an increased excretion of delta-aminolevulinic acid (ALA). Mercury inhibits delta-aminolevulinic acid dehydrogenase (different from what is listed above, but also known as ALA-D) and causes an increased excretion.<sup>27</sup> Therefore, if lead is not a factor but urine ALA-D is increased, then blood levels of ALA-D should be checked to evaluate which enzyme (dehydratase or dehydrogenase) has been inhibited. If dehydrogenase has been inhibited, that would further tend to support the toxicity of the mercury body burden.

Copper, silver, and tin are also given off by amalgam fillings. The presence of high copper, silver, or tin in the urine could further indict amalgam fillings.

Urine albumin may be indicative of mercury burden, too. This is because the excretion of albumin is decreased during acute or chronic exposure to mercury. Research has shown an increase or normalization of urine albumin after replacement of amalgam fillings.<sup>28 29</sup>

### 3. Urine mercury porphyrin profile

The testing of porphyrins can produce a profile specific to mercury.<sup>30</sup> John Wilson, MD, explains, “Urinary porphyrin tests...start off showing impaired enzyme function, and subsequently, following detoxification of mercury, show restored enzyme function, suggest that mercury levels have dropped to a point at which the enzymes are functioning again for that patient.”<sup>31</sup>

#### 4. Fecal metal screen

This is a single-sample, one-pass analysis of a stool specimen that provides information on 25 different elements. The feces are a major route of excretion for mercury and silver; yet, while this is a valid test, it is seldom, if ever, performed to check for heavy metal body burden.

Production and collection of this type of data would permit establishing correlations between the health condition of an individual, the numbers and surfaces of amalgam dental fillings, and the fecal content of mercury, as well as other amalgam metals such as silver, copper, tin and zinc.<sup>32</sup>

#### 5. Intra-oral mercury vapor levels

By testing intra-oral mercury vapor levels, it is possible to establish how much mercury is being released from an individual's amalgam fillings. A measurement is taken before stimulation by chewing gum for 10 minutes and after chewing gum for 10 minutes. If this is conducted, the approved IAOMT intra-oral protocol should be utilized. This test is not diagnostic of mercury intoxication, but it does provide data about releases from a person's mouth.

The significance of this information is that science has clearly demonstrated that over 80% of inhaled mercury vapor is absorbed through the lungs, where it is then distributed throughout the body.<sup>33</sup> From a documentation standpoint, intra-oral mercury vapor readings pre-amalgam removal and post-amalgam removal will clearly demonstrate exposure to mercury vapor caused by stimulation from dental amalgam fillings.

#### 6. Blood mercury levels

Whenever possible, any other blood base lines desired should be done at the same time blood samples are taken to determine blood mercury levels. Although blood mercury levels are not diagnostic of chronic mercury toxicity, there is published research showing a decline in blood mercury levels after elimination of mercury-containing dental fillings.<sup>34 35</sup>

#### 7. Mercury levels in saliva

Testing salivary mercury content is relevant because dental amalgam fillings are in the mouth, and they can logically impact the amount of mercury in saliva. One textbook explains, "No mercury has been detected in saliva samples unless there was a mercury vapor exposure. Salivary glands are primary organs of excretion of mercury, and excessive exposure to inorganic mercury can result in salivary gland enlargement as well as excessive salivation....Salivary mercury levels can be much higher than blood mercury levels...."<sup>36</sup>

#### 8. Cysteine and glutathione status

Scientific research is demonstrating that cysteine and glutathione status have a very definite influence on efficiency of immune function.<sup>37 38</sup> This could be of extreme significance to show a variation in blood and/or urine sulfur amino levels pre- and post- amalgam replacement.

## 9. Quicksilver Scientific's Tri-test<sup>39</sup>

Christopher W. Shade, PhD, of Quicksilver Scientific, has patented a new testing technology that specifies which forms of mercury, inorganic or methylmercury, are in the patient's body. It also measures the mercury in blood, urine, and hair, identifying mercury exposures and excretion abilities.

## 10. Mercury challenge or mobilization testing

After establishing a mercury base line, it is extremely important to then evaluate the potential mercury body burden of the individual. Science has established that in most cases, much of the mercury body burden is contained in the kidneys,<sup>40 41 42</sup> while the remaining portion is distributed to the brain, other organs, and glands.

The express purpose of a challenge test is to administer a chelating agent that has been scientifically documented to bind to mercury and cause its excretion from the body. The challenged excretion levels are then compared pre- and post- replacement of amalgam and often several times during a detoxification protocol after replacement.

Several challenge tests are available. At the present time, there are several FDA approved drugs that can be used for this purpose:

- 1) *British Anti-Lewisite (BAL)*, or *Dimercaprol*, is effective and has been used for more than 80 years, but it is known to have many disagreeable and serious side-effects.
- 2) *Penicillamine* has also been used by the medical profession for a great number of years, but it has many side-effects as well.
- 3) *2,3 Dimercaprol succinic acid (DMSA)* is a water soluble derivative of BAL that was approved by the FDA in March of 1991 as a product to remove lead from children. It is also very effective for mercury and has fewer side effects than Dimercaprol, although individuals have been known to have adverse reactions to DMSA as well.

Similarly, in Europe, *2,3 -Dimercapto-1-Propanesulfonic Acid (DMPS)*, manufactured by Heyl of Germany, is extensively used in the treatment of mercury intoxication. It is marketed under the trade name Dimaval in 300 mg capsules for oral use and as a 250 mg injectable preparation.

Dimaval is a water-soluble derivative of Dimercaprol, with fewer side effects. DMPS binds to mercury very aggressively and can be utilized for the mercury mobilization testing.

Some individuals have reported an adverse allergic reaction after receiving DMSA and DMPS. If an individual is allergic or chemically sensitive, the administering physician should test for a possible reaction prior to administering DMSA and DMPS. Notably, some patients with sulfa drug allergies have reported side effects from taking DMSA.

Another problem with DMSA and DMPS is that they will also combine with thiols forming conjugated mixed disulfides. Once conjugated with cysteine or glutathione, its ability to combine with or detoxify mercury and other heavy metals has been compromised. Nevertheless, DMSA and DMPS remain a popular option for chelation.

## **Summary of Commonly Used Detoxification Products and Protocols**

*This summary was compiled largely due to the assistance of a 2013 scientific review by Margaret E. Sears<sup>43</sup> and a 2011 review by Joseph Mercola and Dietrich Klinghardt.<sup>44</sup>*

### **1. Pharmaceutical products**

- *EDTA (ethylene diamine tetraacetic acid)*: FDA approved for chelation of lead, EDTA is often given intravenously to excrete toxins via urine. It was used in a clinical trial.<sup>45</sup>
- *Penicillamine*: This drug, often used for treating rheumatoid arthritis, binds with copper, cadmium, lead, arsenic, and mercury to excrete them in the urine, although DMPS and DMSA are usually preferred as chelators.<sup>46</sup>
- *DMSA (meso-2, 3-dimercaptosuccinic acid)*: Demonstrated to cross the blood-brain barrier in reaching methylmercury, DMSA is orally administered as a means of causing arsenic, lead, and mercury to be excreted in the urine.<sup>47</sup> Some doctors recommend that DMSA only be used after amalgam fillings are removed.<sup>48</sup>
- *DMPS (Sodium 2,3-dimercaptopropane-1-sulfonate)*: DMPS should not be used in patients who still have amalgam fillings, but for those without dental mercury, it is administered to excrete heavy metals<sup>49</sup> in the urine.

### **2. Natural supplements, products, and practices**

- *Chlorella*, a type of algae, has been reported to assist in removing mercury from body tissues and to cause the excretion of mercury through the feces; however, as much as one-third of the population suffer gastrointestinal problems from chlorella.<sup>50</sup>
- *A fibrous diet* has been suggested to lower the levels of mercury in the brain and blood.<sup>51</sup>
- *Sulphur-containing foods* including *garlic*, *cilantro*, and *broccoli* have been said to assist in reducing mercury levels in the body,<sup>52</sup> and *cilantro* is sometimes used with other chelators.<sup>53</sup>
- *Supplements* including *taurine*, *alpha lipoic acid (ALA)*, *N-acetyl cysteine (NAC)*, *glutathione*, and *selenium* have been used with varying success rates and experiences for inducing mercury excretion.<sup>54</sup> *Vitamin E*, *Vitamin C*, *hyaluronic acid*, and *methylsulfonylmethane (MSM)* have also been applied as chelators.<sup>55</sup>
- *Oxidative Stress Relief (OSR)* is a natural supplement made by IAOMT's Dr. Boyd Haley. It was developed to increase glutathione levels for heavy metal detoxification. In spite of the fact that OSR is natural, the U.S. Food and Drug Administration demanded the product undergo a formal approval process, and this resulted in OSR being taken off the market in 2010. OSR has since been renamed *Irminix®* and is in the process of going through clinical trials in Europe and the USA.<sup>56</sup>
- *Sweating* was used historically by Spanish miners to release toxins,<sup>57</sup> and some medical professionals continue to encourage its use to reduce mercury levels.
- *Lymphatic massage*, *exercise*, *clay baths*, *saunas*, and *foot baths* have likewise been recommended as natural ways to detoxify.<sup>58</sup>
- *Spagyric remedies*, which are plant-based medicines, are sometimes used for detoxification.

### 3. Detox Protocols

- *Hal Huggins*, DDS, MS, is considered one of the pioneers in mercury-free dentistry, and he is the author of *It's All in Your Head: The Link Between Mercury Amalgams and Illness*. His protocol involves a dental revision (including removing dental mercury and toxins from root canals) and a number of other changes. According to the protocol, for nutritional changes, “blood chemistry will divulge how much carbohydrate, protein and fat your specific body requires, as well as telling how well you digest these foods. In addition, blood tells us which supplementation (if any) that you need.”<sup>59</sup>
- *Andrew Cutler*, PhD, PE, brought wide-scale attention to the issue of mercury toxicity in his 1999 book *Amalgam Illness* and developed what is commonly referred to as “the Cutler Protocol.” He has described his popular protocol by noting that it “uses alpha lipoic acid (ALA), an over the counter nutritional supplement, and may optionally also use DMSA or DMPS. All are administered orally with adequate frequency to maintain reasonably steady blood levels.”<sup>60</sup>
- *Dietrich Klinghardt*, MD, PhD, has addressed barriers to detoxification including nutritional deficiencies, infections such as Lyme disease, and yeast issues. His protocol uses high protein, mineral, fatty acid, and fluid intake, cilantro, chlorella, garlic, and fish oil to release toxins.<sup>61</sup>
- *Christopher W. Shade*, PhD, is the President and Founder of Quicksilver Scientific, LLC, which offers the Tri-test described above to help establish a baseline. In regards to heavy metal detoxification, Quicksilver offers a variety of supports such as its IMD Intestinal Cleanse, Clear Way Cofactors Phytonutrients, and Nanosphere Glutathione Support.
- *Amy Yasko*, PhD, NHD, AMD, HHP, FAAIM, is the author of *Autism: Pathways to Recovery*, and her work is designed to assist those with “autism and other forms of chronic neurological inflammation.” Based on a personalized test, her protocol “targets genes that need nutritional support for optimal function. Specific foods and supplements are used address areas of genetic weakness, in order to promote the body’s ability to detoxify and heal.”<sup>62</sup>
- A number of other protocols are now also suggesting genetic testing to assist patients in understanding limitations they might have in excreting toxins. One area that is currently receiving attention involves the MTHFR gene (methylenetetrahydrofolate reductase (NAD(P)H)) and its role in detoxification.<sup>63</sup>

### Concluding Remarks

Patients and their health care providers obviously have many options when devising a detoxification plan. Understanding the array of tests, products, and protocols associated with chelation and detoxification allows the dentist to recognize and understand decisions being made and processes taking place as part of each patient’s individualized health plan.

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<sup>1</sup> “Chelate.” The American Heritage® Medical Dictionary Copyright © 2007, 2004 by Houghton Mifflin Company. The Free Dictionary Website at <http://medical-dictionary.thefreedictionary.com/chelates>

<sup>2</sup> Chaitow L. The History of EDTA. Healthy People, Healthy Planet Website. [http://www.healthy.net/Health/Article/The\\_History\\_of\\_EDTA/1815](http://www.healthy.net/Health/Article/The_History_of_EDTA/1815)

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