



Chelation Corner

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Saliva and Fecal Metal Testing: Evaluation of an Unusual Diagnostic Approach

Saliva 'Amalgam' Analysis to Detect Amalgam Exposure

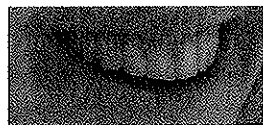
Amalgam fillings are placed in the mouths of millions of Americans on a yearly basis, accounting for about 30% of US fillings. They are cheaper than the alternative composite fillings, and are considered more durable. Amalgam fillings are about 50% mercury, joined with silver, copper, and tin.

Dental amalgams, "contain mercury, which may have neurotoxic effects on the nervous systems of developing children and fetuses," reads a June 2008 Web posting by the Food and Drug Administration (FDA).

That same year, the FDA reversed its opinion on amalgam fillings, considering them safe. The latest news release states: "While elemental mercury has been associated with adverse health effects at high exposures, the levels released by dental amalgam fillings are not high enough to cause harm in patients."¹ Contrary to FDA opinion and knowledge, Norway's health ministry banned amalgam fillings in 2009.² Sweden and Denmark followed.

The controversy remains. How much mercury is released from fillings? Saliva testing provides answers.

Many physicians consider this a controversial test. However, conservative European medical laboratories list saliva "amalgam" testing among standard clinical tests. Sampling protocol and reference ranges have been established, and testing fees for a total of 13 elements are under US\$100.



By comparing saliva before and after a chewing gum test, it is safely assumed that the amount of metals released during the chewing period reflects on the stability of the amalgam fillings. If mercury and other potentially toxic amalgam metals are released excessively, amalgam removal is recommended.

Testing is simple. The patient should not eat or smoke for at least 20 minutes. In the last 10 minutes before testing,

nothing should be consumed, not even water. Before the chew test is started, the patient spits 3 ml of saliva into a test tube. He/she then chews gum for 10 minutes, and during that chewing period all saliva is collected into another test tube. Both samples are analyzed for metal content. Comparing the data from before and during the chewing test (Table 1) allows the physician and dentist to evaluate the patient's dental situation.

Table 1. Source: Micro Trace Minerals Laboratory

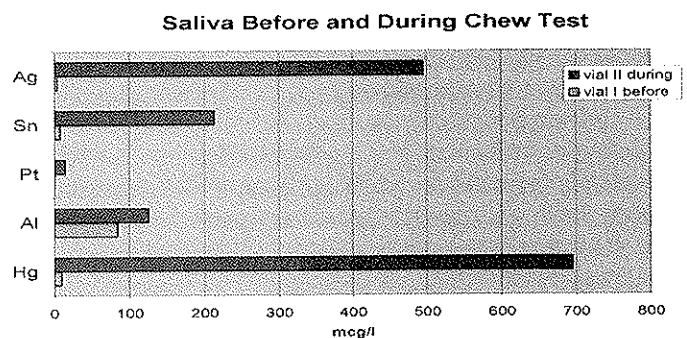


Table 1 shows data from a single patient case study. The dramatic increase seen in the saliva during the chewing phase is a reflection of amalgam metals' being released. The percent increase is astonishingly high:

- silver (Ag): about 500%
- tin (Sn): about 200%
- platinum (Pt): about 10%
- aluminum (Al): 20%
- mercury (Hg): nearly 700%

This demonstrates that amalgam fillings can be a source of metal exposure, and a German field study has supported this often-debated theory on a large scale. P. Krauß et al from the University of Tuebingen enrolled 20 000 subjects



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in a large field study to determine the concentration of total mercury in saliva, and a statistical relationship was found between the mercury concentration in the prechewing saliva and chewing saliva, and the number of amalgam fillings.³

The number of fillings seen in these patients varied with age. The group of 6- to 9-year-olds had about 3 fillings. The group of 30- to 34-year-olds had the highest number, with a mean of 11 fillings. In the older age groups, the number of fillings fell continuously to about 5. The mean number of amalgam fillings was 9, and the median mercury concentration was 11.6µg/l in the prechewing saliva and 29.3µg/l in the chewing saliva, which is considerably higher than reported in most previous publications.

Table 2: Saliva Mercury Concentration Correlated with Number of Amalgam Fillings.³

Fillings	66% range prechewing saliva (µg Hg/l)	66% range chewing saliva (µg Hg/l)	N = number of patients
1	0.2–7.9	0.1–10.1	208
2	0.5–8.6	0.6–16.7	414
3	1.1–12.9	2.2–26.2	588
4	1.8–19.1	3.9–33.8	880
5	2.0–22.8	4.8–40.2	1077
6	2.8–24.7	6.6–49.7	1314
7	3.2–29.3	8.1–54.7	1364
8	4.1–33.6	10.6–63.3	1681
9	4.7–40.0	14.5–73.6	1478
10	5.0–42.0	14.2–80.5	1788
11	5.7–46.6	16.4–89.1	1449
12	5.7–48.1	18.7–94.4	1467
13	6.6–43.7	20.3–97.6	926
14	7.1–54.4	21.3–103.1	873
15	7.6–59.1	22.5–109.8	629
16	6.7–62.2	21.4–113.6	430

Fillings can release a considerable amount of mercury. Not surprisingly, Table 2 demonstrates that the saliva mercury concentration was highest in patients with the most amalgam fillings. The highest mercury release, between 21.4 and 113.6 mcg/L (ppb = 0.02 to 0.113 ppm), was noted in patients with 16 fillings, representing a chewing period of 10 minutes only!

If we consider a chewing period of 30 minutes per day (and most people chew longer than that), these patients would swallow a considerable amount of mercury, namely between 60 and 339 ppb, which equals 0.06 to 0.339 ppm.

How Much Is Safe?

In 2001, the US Environmental Protection Agency (EPA) validated the current reference dose (RfD) for mercury of 0.1 µg per kg (= ppb) of body weight per day. However, the FDA established a higher acceptable daily intake for mercury of 0.4 µg per kg (= ppb) of body weight per day. To make it more confusion, the World Health Organization (WHO; 2003) revised its recommendation for safe intake levels for mercury in food to 1.6 µg per kg of body weight per week.

Considering the WHO's recommendation as safe (and it is the highest RfD), a patient weighing 50 kg could have an oral intake of 80 ppb. If this patient has one or more amalgam fillings, eating fish once per week may not be an option. It could raise his/her mercury intake above WHO's safe limit. According to the Natural Resource Defense Council, fish with the least amount of mercury still contain up to 90 ppb. Large fish such as tuna may contain more than 500 ppb.^{4,5}

Pregnant women, nursing mothers, and very young children are thus cautioned against excessive consumption of fish, but no agency considers an equal or greater amount of mercury intake from amalgam fillings to be a risk factor!

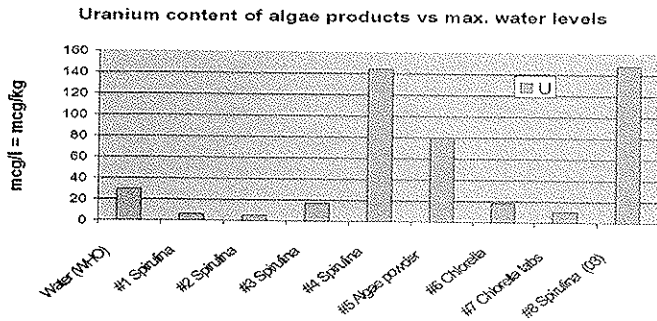
Through saliva testing, we evaluate the release of mercury and other potentially toxic metals. To confirm intoxication, a challenge test with DMPS or DMSA may be used. A urine level of >50 mcg/l following an intravenous DMPS challenge indicates a moderate exposure; a level of >80mcg/L signals a considerate exposure level. For oral DMSA, a urine level of >20mcg/l represents a level of intoxication.⁶

Fecal Metal Analysis

For many toxic metals, fecal (biliary) excretion is the primary route of elimination from the body. Thus, the metal content of fecal matter is a reflection of the dietary metal intake. Certain foods such as fish are high in arsenic or mercury, and fecal testing evaluates how much of the oral metal intake is excreted through normal digestion. Fecal analysis reflects the metal intake from water, food, tins, aluminum foils and cookware, medicine, etc. For example, if we eat fish rich in arsenic and/or mercury, fecal excretion is elevated accordingly.

Thus, fecal metal analysis is an evaluation of the oral metal intake and fecal metal excretion. *Fecal metal analysis does not provide information about a patient's systemic toxic metal burden; it cannot be used to verify systemic intoxication or detoxification.* Fecal metal analysis will only show the concentration of metal that passes through the digestive tract. If we eat uranium-rich algae (spirulina #3 and #4), as shown in Table 3, we can expect fecal concentrations representing the uranium intake. No chelation happened. It is a simple case of metal in and metal out.

Table 3: Uranium Content of Some Algae Products.
Source: Micro Trace Minerals 2006.



Since fecal matter is easily influenced by the oral intake of metals, it does reflect the amalgam metal release. While the toxicological consequences of exposure to mercury from dental amalgam fillings continue to be a matter of debate in many countries, researchers at the Department of Dental Toxicology and the Institute of Environmental Medicine, Karolinska Institute (Stockholm, Sweden) proved that point. Their findings were presented in March 1996 at the 74th General Session of the International Association of Dental Research.⁷

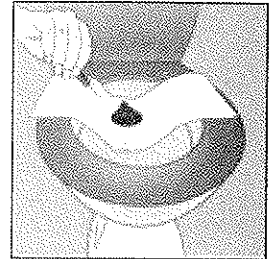
In summary, the researchers obtained data on mercury concentrations in saliva and feces before and after removal of dental amalgam fillings. In addition, mercury concentrations in urine, blood, and plasma were measured. Ten subjects had all amalgam fillings removed at one dental session. Before removal, the median mercury concentration

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in feces of this group was more than 10 times higher than in samples from an amalgam-free reference group of 10 individuals (2.7 vs. 0.23 $\mu\text{mol Hg/kg}$ dry weight, $p < 0.001$).

A considerable increase of the mercury concentration in feces was seen 2 days after amalgam removal (median 280 $\mu\text{mol Hg/kg}$ dry weight), and then followed by a significant decrease. Sixty days after amalgam removal, the median mercury concentration of samples from the "amalgam group" was still higher than in samples from the reference group. In plasma, the median mercury concentration was 4 nmol/L at baseline. Two days after removal, the median mercury concentration in plasma was increased to 5 nmol/L and declined subsequently to 1.3 nmol/L by day 60. In saliva, there was an exponential decline in the mercury concentration during the first 2 weeks after amalgam removal. It was concluded that amalgam fillings are a significant source of mercury in saliva and feces. All samples from the amalgam group showed a considerable decrease in mercury after amalgam removal.

With the help of paper (see picture), sampling of fecal matters is made easy. After feces are collected on the strip of paper,



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less than 2 g are taken with the help of a small spatula. Both sample and spatula are placed in a specific tube for mailing. For metal testing, no refrigeration or overnight shipping is required.

Notes

1. Food and Drug Administration. FDA issues final regulation on dental amalgam [news release]. July 28, 2009. Available at: <http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm173992.htm>.
2. Norway bans amalgam fillings [Web page]. *Medical News Today*. www.medicalnewstoday.com/articles/95121.php.
3. Krauß P, Deyhle M, et al. Field study on the mercury content of saliva. *Toxicol Appl Pharmacol*. May 1997;144. Available at: <http://www.xs4all.nl/~stgvisie/AMALGAM/EN/SCIENCE/tubingen.html>.

4. Food and Drug Administration. Food safety [Web page]. www.fda.gov/Food/FoodSafety.
5. Natural Resource Defense Council. Mercury contamination in fish [Web page]. www.nrdc.org/healtheffects/mercury/guide.asp.
6. Blaurock-Busch E. *Antidota: Chelattherapie Handbuch mit Anwendungsprotokollen*. MTM; 2006.
7. Björkman L, Sandborgh-Englund G, Ekstrand J. Mercury in saliva and feces after removal of amalgam fillings. *Toxicol Appl Pharmacol*. May 1997;144(1):156-162.

Photos: E.Blaurock-Busch

Dr. E. Blaurock-Busch is laboratory and research director at Micro Trace Minerals Clinical Laboratory of Germany and Boulder, Colorado. She is scientific advisor to the IBCMT (International Board of Clinical Metal Toxicology) and the German Medical Association for Clinical Metal Toxicology. She has written books on laboratory diagnostics and chelation.

Calendar

JANUARY 7-9: ANNIE APPLESEED PROJECT'S 3rd ANNUAL EVIDENCE-BASED COMPLEMENTARY AND ALTERNATIVE CANCER THERAPIES CONFERENCE @ Crowne Plaza Hotel in West Palm Beach, Florida. CONTACT: 561-749-0084; <http://www.annieappleseedproject.org/3rdanevcoca.html>

JANUARY 9-10: APPLIED KINESIOLOGY CERTIFICATION COURSE (4 of 8 sessions) with Robert Ciprian, DC in Portland, Oregon. CONTACT: 503-222-5509; <http://standardprocessnw.com>

JANUARY 9-10: AYURVEDIC MEDICINE FOR HEALTH PROFESSIONALS (Block 2) @ Scripps Center for Integrative Medicine in La Jolla, California. Co-sponsored by Scripps Center for Integrative Medicine and InforMED in association with Maharishi Ayur-Veda Association of America. Pre-requisite: Block 1., 16 hours of AMA PRA Category 1 CME Credit. CONTACT: 877-540-6222; MAAA@globalcountry.net; <http://maaa-sandiego.org>

JANUARY 16-17: APPLIED KINESIOLOGY (Session 4) @ Bellevue Community College in Bellevue, Washington (near Seattle) CONTACT: 800-636-6913; biotics@bioticsnw.com

JANUARY 21-24: SCRIPPS CENTER FOR INTEGRATIVE MEDICINE presents 7th ANNUAL NATURAL SUPPLEMENTS: AN EVIDENCE-BASED UPDATE @ Paradise Point Resort in San Diego, California. During this informative and comprehensive CME conference, renowned faculty will present a concise, clinically relevant overview of the latest information on natural supplements and nutritional medicine with an emphasis on disease states. The course provides practical information for health care professionals who make nutritional recommendations or manage dietary supplement use. CONTACT: Scripps Conference Services & CME, 858-652-5400; <http://www.scripps.org/conferenceservices>; med.edu@scrippshealth.org

JANUARY 23-24: DIPLOMATE OF THE AMERICAN BOARD OF CHIROPRACTIC INTERNISTS (Session 11) – Pharmacognosy/Herbal Therapy @ Western States Chiropractic College in Portland, Oregon. CONTACT: Kris, 970-344-1269

JANUARY 23-24: MINERALS-THE MISSING LINK with Michael Dobbins, DC @ Embassy Suites in Bellevue, Washington (near Seattle). CONTACT: 800-292-6699; <http://www.standardprocessnw.com>

JANUARY 30-31: FOUNDATIONS OF FUNCTIONAL NUTRITION – PART 2 @ Olympia Phoenix Inn in Olympia, Washington. Also, APRIL 10-11 in Honolulu, Hawaii. CONTACT: 800-636-6913; biotics@bioticsnw.com

JANUARY 30-31: GROWING THE CIRCLE with Michael Gaeta, DA.c in Idaho Falls, Idaho. CONTACT: 800-292-6699; <http://www.standardprocessnw.com>

FEBRUARY 6: FUNCTIONAL GASTROENTEROLOGY CLASS – a four-part class with Steven Sandberg-Lewis, ND in Vancouver, Washington. Learn how to thoroughly assess and manage all aspects of digestive health using clinical findings, hands-on examinations, and cutting-edge laboratory testing. Parts 2-4 are scheduled for one Saturday in April, June, and September. Certification option includes textbook. Module 1: \$149 w/certification and textbook; \$99 w/o. CONTACT: 503-236-2220 or 503-278-7505; info@sevenwaveswellness.com; <http://www.sevenwaveswellness.com>

FEBRUARY 6-7: APPLIED KINESIOLOGY CERTIFICATION COURSE (5 of 8 sessions) with Robert Ciprian, DC in Portland, Oregon. CONTACT: 503-222-5509; <http://standardprocessnw.com>

FEBRUARY 6-7: FOUNDATIONS OF FUNCTIONAL NUTRITION SEMINAR (Part I) in Olympia, Washington. This seminar is considered by many to be the ultimate system for integrating nutrition into a wellness practice. CONTACT: 800-636-6913; <http://www.bioticsnw.com>

FEBRUARY 19-21: HEALING THE BRAIN @ Hyatt Regency Bellevue in Bellevue, Washington (near Seattle). Speakers include Dietrich Klinghardt, MD, PhD; Eric Braverman, MD; Brian Goldman, MD; herbalist Donald J. Yance, CN, MH (AGH); and lab analysis expert Mark Schauss, MBD. 21 CMEs from Westbrook University (Some state boards consider these AMA Category 1 CMEs.) Pre-Conference workshop: Fundamentals of Autonomic Response Testing. Post-Conference workshop: Hands-on workshop on detoxification and elimination support techniques. CONTACT: Klinghardt Academy of Neurobiology, 303-499-4700; info@kinghardtneurobiology.com; <http://www.kinghardtneurobiology.com>

FEBRUARY 20: DR. CHI'S FINGERNAIL AND TONGUE ANALYSIS WORKSHOP in Orlando, Florida. Teaches healthcare professionals how to detect endocrine, respiratory, cardiovascular, gastrointestinal, autoimmune, and kidney conditions and more. Presented by Chi's Enterprise. CONTACT: 714-777-1542

FEBRUARY 20-21: OREGON CHIROPRACTIC CONVENTION in Oregon. CONTACT: 800-636-6913; <http://www.oregonchiroassoc.org>

FEBRUARY 20-21: CHRONIC CONDITIONS AND PURIFICATION with Michael Gaeta, DA.c in Seattle, Washington. CONTACT: Tisha, 800-292-6699, ext. 17; <http://www.standardprocessnw.com>

FEBRUARY 20-21: NUTRITION RESPONSE TESTING with Darren Schmidt, DC in Coeur d'Alene, Idaho. CONTACT: Ulan Nutritional Systems, 866-418-4801; <http://www.standardprocessnw.com>

FEBRUARY 25-27: INTEGRATIVE HEALTHCARE SYMPOSIUM @ Hilton New York in New York, New York. Speakers include Christiane Northrup, MD; Jeffrey Bland, PhD; Bernie Siegel, MD; James S. Gordon, MD; and Jay Lombard, DO. Sessions focus on women's health, environmental health, leadership and policy, nutrition, and mind and brain health. CONTACT: <http://www.ihsymposium.com>

FEBRUARY 27-28: DIPLOMATE OF THE AMERICAN BOARD OF CHIROPRACTIC INTERNISTS (Session 12) – Chronic Degenerative Disease @ Western States Chiropractic College in Portland, Oregon. CONTACT: Kris, 970-344-1269

FEBRUARY 27-28: VITAMINS-THE HISTORY AND DISCOVERY with Michael Dobbins, DC in Honolulu, Hawaii. CONTACT: 800-292-6699; <http://www.standardprocessnw.com>

MARCH 6-7: APPLIED KINESIOLOGY CERTIFICATION COURSE (6 of 8 sessions) with Robert Ciprian, DC in Portland, Oregon. CONTACT: 503-222-5509; <http://standardprocessnw.com>

MARCH 13-14: APPLIED KINESIOLOGY (Session 6) @ Bellevue Community College in Bellevue, Washington (near Seattle) CONTACT: 800-636-6913; biotics@bioticsnw.com

MARCH 19-20: INTERNATIONAL COLLEGE OF INTEGRATIVE MEDICINE presents HEALTHY BRAIN, HEALTHY BODY – MENTAL WELLNESS IN THE 21ST CENTURY @ Nashville Airport Marriott in Nashville, Tennessee.