Fact Sheet
Scientific Studies Concerning Mercury Dental Fillings

Prepared by the International Academy of Oral Medicine and Toxicology
www.iaomt.org

1. Mercury is a very toxic substance-- more toxic than lead, cadmium, or arsenic.

Sharma, RP; Obersteiner, EJ., Metals and Neurotoxic Effects: Cytotoxicity of Selected Metallic Compounds on Chick Ganglia Cultures, J Comp Pathol, 91(2):235-44 (1981).

2. At least seventeen separate studies have confirmed that dental patients absorb a daily dose of mercury derived from their mercury fillings. Mercury is not rendered chemically inert in dental fillings.

These studies were recently summarized in the following paper: Richardson, G.M., Inhalation of Mercury-Contaminated Particulate Matter by Dentists: An Overlooked Occupational Risk, Human and Ecological Risk Assessment, 9:1519-1531 (2003). A fact sheet on ADA's website says, "Minute amounts of mercury vapor (between 1-3 micrograms per day) may be released from amalgam under the pressure of chewing or grinding."
http://www.ada.org/public/media/releases/0207_release01.asp

3. On average, eighty percent of the mercury inhaled into the lungs is absorbed into the bloodstream.

Kudsk, F.N., Absorption of Mercury Vapour from the Respiratory Tract in Man, Acta Pharmacol. et Toxicol. 23:250-262 (1965).

4. The general population in America absorbs more mercury from dental fillings than from any other source. Studies demonstrate that two-thirds of the mercury absorbed by non-occupationally exposed populations is derived from amalgam fillings.

Aposhian, H.V., et al., Urinary mercury after administration of 2,3-dimercap-topropaane-1-sufonic acid: correlation with dental amalgam score, FASEB J, vol. 6 (April 1992), pp. 2472-2476. See also, Sandborgh-Englund, et al., Mercury in Biological Fluids After Amalgam Removal, J Dent Res, 77(4): 615-24 (Apr. 1998); World Health Organization, Environmental Health Criteria 118: Inorganic Mercury (1991) p. 36; Clarkson, T.W.; et al., Biological Monitoring of Toxic Metals: The Prediction of Intake of Mercury Vapor From Amalgams (1988) p. 256. (“The release of mercury from dental amalgams makes the predominant contribution to human exposure to inorganic mercury including mercury vapor in the general

population."); Lorscheider, FL; et al., Mercury Exposure from Silver Tooth Fillings: Emerging Evidence Questions a Traditional Dental Paradigm, FASEB J., 9:504-8 (1995). ("[D]ental amalgam tooth fillings are the major source of Hg exposure for the general population.")

5. The mercury absorbed from dental fillings exceeds published government toxic thresholds for mercury.

The Agency for Toxic Substances & Disease Registry minimum risk level for mercury is 2.4 µgs/day. (ATSDR, Toxicological Profile for Mercury.) The EPA's reference dose for mercury is 3.84 µgs/day. (U.S. EPA. "Health Effects Assessment Summary Tables: FY-1997 Update" (1997).) Health Canada's tolerable daily intake for mercury is 1.4 ugs/day. (Health Canada, Assessment of Mercury Exposure and Risks From Dental Amalgam: Final Report, Medical Devices Bureau, Environmental Health Directorate.) The World Health Organization, Environmental Health Criteria 118: Inorganic Mercury (1991) p. 36, concludes that persons with mercury fillings absorb 3 to 17 micrograms of mercury per day. This document reflects that the concensus average estimate of 10 µgs absorbed per day, an uptake corroborated by a more recent daily estimate of 12 µgs/day. Skare, I, et al., Human Exposure to Mercury and Silver Released from Dental Amalgam Restorations, Archives of Environmental Health, vol. 49, no. 5, pp. 384-394 (Sept.-Oct. 1994). Levels for some individuals may be as high as 100 µgs/day. Lorscheider, FL; et al., Mercury Exposure from Silver Tooth Fillings: Emerging Evidence Questions a Traditional Dental Paradigm. FASEB J., 9:504-8 (1995).

6. A specific no-observed-effect level (NOEL) cannot be established, meaning that no level can be established at which mercury does not adversely affect the body.

World Health Organization, Environmental Health Criteria 118: Inorganic Mercury (1991) p. 36.

7. Peer-reviewed studies have established that adverse health affects have been associated with mercury vapor derived from amalgam fillings.

Summarized in: Lorscheider, FL; et al., Mercury Exposure from Silver Tooth Fillings: Emerging Evidence Questions a Traditional Dental Paradigm. FASEB J., 9:504-8 (1995).

Ziff, M.F., Documented Clinical Side-Effects to Dental Amalgam, Advanced Dental Research, 6:131-4, 1992. An extensive list of diseases that have been linked to amalgam in the peer-reviewed scientific literature, including periodontal disease (gum disease).
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1292453&dopt=Abstract

8. Mercury is transferred from a mother to her fetus during pregnancy and is transferred post-natally through breast milk.

Vimy, M.J.; Takahashi, Y.; Lorscheider, F.L., Maternal-fetal distribution of mercury (203 Hg) released from dental amalgam fillings, The American Physiology Society, 0363-6119/90 R939-945.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=2331037

Vimy, M.J.; Hooper, D.E.; King, W.W.; Lorscheider, F.L., Mercury from Maternal "Silver" Tooth Fillings in Sheep and Human Breast Milk, Biological Trace Element Research, 56, 1997.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9164660&dopt=Abstract

9. The developing fetus and young children are disproportionately affected by mercury exposure, because many aspects of development, particularly brain maturation, can be disturbed by the presence of mercury.

Goldman LR, Shannon MW, Technical Report: Mercury in the Environment: Implications for Pediatricians. American Academy of Pediatrics: Committee on Environmental Health. Pediatrics (2001) Jul;108(1):197-205.

10. Mercury derived from mercury fillings may impair kidney function.

Boyd, N.D.; Benediktsson, H.; Vimy, M.J.; Hooper, D.E.; Lorscheider, F.L., Mercury from dental "silver" tooth fillings impairs sheep kidney function, The American Physiological Society, 11: 1010-1014, 1991.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1928419&dopt=Abstract

11. Mercury has been linked to Alzheimer's Disease.

Ehmann, et al., Brain Trace Elements in Alzheimer's Disease, Neurotoxicology, 7(1):195-206 (Spring 1986); Thompson, et al., Regional Brain Trace-element Studies in Alzheimer's Disease, Neurotoxicology, 9(1):107 (Spring 1988); Vance, Trace Element Imbalances in Hair and Nails of Alzheimer's Disease Patients, Neurotoxicology, 9(2):197-208 (Summer 1988); Wenstrup, et al., Trace Element Imbalances in Isolated Subcellular Fractions of Alzheimer's Disease Brains, Brain Res, 12;533(1): 125-31 (Nov. 1990); Cornett, et al., Imbalances of Trace Elements Related to Oxidative Damage in Alzheimer's Disease Brain, Neurotoxicology, 19(3):339-45 (June 1998); Mutter, Alzheimer Disease: Mercury as a Pathogenetic Factor and

Apolipoprotein E as a Moderator, Neuroendocrinol Lett. 2004; 25(5):275-283. (“Inorganic mercury [found in dental amalgam] may play a major role [in the pathogenesis of Alzheimer’s Disease.”]) Pendergrass, J. C., et al., Mercury Vapor Inhalation Inhibits Binding of GTP to Tubulin in Rat Brain: Similarity to a Molecular Lesion in Alzheimer's Disease Brain. Neurotoxicology 18(2), 315-324 (1997); Pendergrass, J.C., Inhibition of Brain Tubulin-Guanosine 5'-Triphosphate Interactions by Mercury: Similarity to Observations in Alzheimer's Diseased Brain, Metal Ions in Biological Systems V34, Mercury and Its Effects on Environment and Biology, Chapter 16. Edited by H. Sigel and A. Sigel (1996); Duhr, E.F., et al., HgEDTA Complex Inhibits GTP Interactions With The E-Site of Brain b-Tubulin, Toxicology and Applied Pharmacology 122, 273-288 (1993); Leong, CCW, et al., Retrograde Degeneration of Neurite Membrane Structural Integrity of Nerve Growth Cones Following In Vitro Exposure to Mercury, Neuroreport, vol.12, pps. 733-737 (2001); Duhr, E.; Pendergrass, C.; Kasarskis, E.; Slevin, J.; Haley, B., Hg2+ Induces GTP-Tubulin Interactions in Rat Brain Similar to Those Observed in Alzheimer's Disease, Federation of American Societies for Experimental Biology (FASEB). 75th Annual Meeting. Atlanta, GA 21-25 April 1991. Abstract 493; Palkiewicz, P.l; Zwiers, H.; Lorscheider, FL, ADP-Ribosilation of Brain Neuronal Proteins Is Altered by In Vitro and In vivo Exposure to Inorganic Mercury, Journal of Neurochemistry 62: 2049-2052, 1994. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?md=Retrieve&db=PubMed&list_uids=8158153&dopt=Abstract

12. Mercury has been linked to Parkinson’s Disease.

Ngim, C., Epidemiologic Study on the Association between Body Burden Mercury Level and Idiopathic Parkinson’s Disease, Neuroepidemiology, 8:128-141 (1989).

13. Mercury released from dental "silver" fillings provokes an increase in mercury and antibiotic resistant bacteria in oral and intestinal flora.

Summers, A.O.; Wireman, J.; Vimy, M.J.; Lorscheider, F.L.; Marshall, B.; Levy, S.B.; Bennett, S.; and Billard, L. "Mercury released from dental "silver" fillings provokes an increase in mercury and antibiotic resistant bacteria in primates oral and intestinal flora," Antimicrobial Agents and Chemotherapy, 37: 825-834, 1993; http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8280208; See also, Wireman, J.; Liebert, C.A.; Smith, T.; and Summers, A.O., Association of mercury resistance with antibiotic resistance in the gram-negative fecal bacteria of primates, Applied Environmental Microbiology, 63/11: 4494-4503, Nov 1997. http://aem.asm.org/cgi/content/abstract/63/11/4494

14. Animal studies demonstrate that exposure to mercury vapor can induce

autoimmunity.

Hultman, P; et al., Adverse Immunological Effects and Autoimmunity Induced by Dental Amalgam and Alloy in Mice, FASEB J, 8:1183-90 (1994); Warfvinge, et al., Systemic Autoimmunity Due to Mercury Vapor Exposure in Genetically Susceptible Mice: Dose-Response Studies, Toxicol Appl Pharmacol, 132:299-309 (1995).

15. Mercury causes adverse health effects in dentists and dental personnnel.

Echeverria, et al., Neurobehavioral Effects from Exposure to Dental Amalgam HgE: New Distinctions Between Recent Exposure and Hg Body Burden, FASEB J. 12, 971-980 (1998); Ngim, CH; et al., Chronic Neurobehavioral Effects of Elemental Mercury in Dentists, Brit J Indust Med, 49:782-90, 1992. Gonzalez-Ramirez, D; et al. Sodium 2,3-Dimercaptopropane-1-Sulfonate Challenge Test for Mercury in Humans: II. Urinary Mercury, Porphyrins and Neurobehavioral Changes of Dental Workers in Monterrey, Mexico. J Pharmocol Exper Therap, 272(1):264-74 (1995); Echeverria, D; et al., Behavioral Effects of Low-Level Exposure to HgE Among Dentists. Neurotoxicol Teratol, 17(2):161-8 (1995); Shapiro, I.M., et al., Neurophysiological and neuropsychological function in mercury-exposed dentists. The Lancet 1, 1147-1150 (1982); Uzzell, B.P., et al., Chronic low-level mercury exposure and neuropsychological functioning. J of Clin and Exper Neuropsych. 8, 581-593.
http://www.fasebj.org/cgi/content/full/12/11/971
16. The National Academy of Sciences estimates that 60,000 newborns a year could be at risk of learning disabilities because of mercury their mothers absorbed during pregnancy. Mercury in the tissues of fetuses and infants (11-50 weeks of life) correlates significantly with the number of dental amalgam fillings of the mother.

Drasch et. al., “Mercury Burden of Human Fetal and Infant Tissues,” European Journal of Pediatrics (August 1994).

17. IAOMT's science contributed to Germany's ban on mercury fillings for women and children.

Germany's Ministry of Health decided to ban the use of mercury fillings in women and children in that country, following the International Academy of Oral Medicine and Toxicology conference in Düsseldorf in 1992.

Members of the dental profession had asked for an opportunity to present evidence of mercury fillings' safety. This conference consisted of 25 presenters and two moderators who are experts in mercury. The peer-reviewed conclusions supported the German ban on exposure of children and women of childbearing age to mercury from mercury fillings.

Seven representatives of the IAOMT participated in the conference, giving peer-reviewed presentations as follows:

F.L. Lorscheider, "Mercury Exposure from 'Silver' Dental Fillings: Current Research Findings about Uptake, Tissue Distribution, and Pathophysiology."
D.J. Pleva, "Mercury Release From Dental Amalgam."
D.C. Kennedy, "Biocompatible Restorative Dentistry,"
davidkennedy-dds@cox.net
B.E. Haley & J.C. Pendergrass, "Mercury-EDTA Complex Specifically Blocks Brain b-Tubulin-GTP Interactions: Similarity to Observations in Alzheimer's Disease," behaley@uky.edu
M.F. Ziff, "Dental amalgam: Status Quo, Political Aspects, International Situation."
J.V. Masi, "Corrosion of amalgams in restorative materials: the problem and the promise," jmasi@wnec.edu

18. Mercury vapor released by fillings is routinely measured in dentists' offices.

The Arizona Instrument Co. manufactures and sells a device that measures mercury vapor releases, the Jerome Mercury Vapor Analyzer. This device is used in dental offices nationwide and routinely records mercury vapors released from mercury fillings in the dental offices in which it is used.
http://www.azic.com/products_431.aspx

The American Dental Association recommends that its members purchase such a device to determine their exposure to the vapor released by mercury fillings.
http://www.ada.org/prof/resources/pubs/jada/reports/report_mercury.pdf
The Jerome Mercury Vapor Analyzer is also widely relied on by government agencies such as Brookhaven National Laboratory and the U.S. Environmental Protection Agency. See for example
http://www.bnl.gov/esh/shsd/ih/PDF/IH75530.pdf

19. There is more mercury in dental fillings than in all other products sold in America.

The U.S. Environmental Protection Agency states that 55% of all mercury in commerce today in the United States - an estimated 1,088 tons of mercury - resides in Americans' dental fillings, which have a typical lifespan of 10 years. An additional 34 tons of mercury is added in Americans' dental fillings every year. United States EPA International Mercury Market Study and the Role and Impact of US Environmental Policy 2004, referenced in Nov. 30, 2004 presentation by Linda Barr, EPA Office of Solid Waste, "EPA's Draft Mercury Use Reduction Program." See

http://www.epa.gov/region5/air/mercury/meetings/Nov04/barr.pdf

20. The U.S. government has never tested mercury fillings for safety.

The U.S. Food and Drug Administration (FDA) regulates the constituents of dental filling materials, not mixed dental amalgam, the product used as a dental restorative material. Because mercury fillings were in use prior to passage of the 1976 Medical Devices Act, manufacturers were not required to present any evidence of safety and effectiveness, as is required of new materials.
http://www.cdc.gov/oralhealth/factsheets/amalgam.htm

See also Washington State Department of Health, "Amalgam Dental Fillings."
http://www.doh.wa.gov/ehp/oehas/amalgam_dental_fillings_12-2003.htm