

Oral galvanism and Electromagnetic Fields (EMF)

factors along with mercury's high volatility and

extreme toxicity in significant exposure levels and

oral effects from amalgam fillings.

B. Windham (Editor)

Contents

- 1 *Oral galvanism and Electromagnetic Fields (EMF): factors along with mercury's high volatility and extreme toxicity in significant exposure levels and oral effects from amalgam fillings* 1

- 1 *Oral galvanism and Electromagnetic Fields (EMF): factors along with mercury's high volatility and extreme toxicity in significant exposure levels and oral effects from amalgam fillings*

Oral galvanism and Electromagnetic Fields (EMF): factors along with mercury's high volatility and extreme toxicity in significant exposure levels and oral effects from amalgam fillings.

B. Windham (Ed.)

Having dissimilar metals in the teeth (e.g.-amalgam, or gold and mercury, or stainless steel and mercury) causes galvanic action, electrical currents, and much higher mercury vapor levels and levels in oral tissues. (1-11, 30) The amount of mercury released into saliva has been found by large studies to be about 1.5 to 1.9 micrograms per liter for each additional amalgam filling (26). The amount of mercury released by a gold alloy bridge over amalgam over a 10 year period was measured to be approx. 101 milligrams (mg)(60% of total) or 30 micrograms (μg) per day (7), and other studies have found similar results (4). Average mercury levels in gum tissue near amalgam fillings are about 200 ppm, and are the result of flow of mercury into the mucous membrane because of galvanic currents with the mucous membrane serving as cathode and amalgam metals as anode (1-4). Concentrations of mercury in oral mucosa for a population of patients with 6 or more amalgam fillings taken during oral surgery were 20 times the level of controls (14), and levels in root tips of 41 ppm (5). Amalgam also releases significant amounts of silver, tin, and copper which also have toxic effects, with organic tin compounds formed in the body being even more neurotoxic than inorganic mercury. Amalgam containing zinc produced higher galvanic currents (3b).

Mercury and other metals accumulate in the oral cavity in fibroblasts, macrophages, and multinuclear giant cells of connective tissue, in blood vessel walls, along nerve sheath fibres, in basement-membranes of mucosal epithelium, striated muscle fibres, along collagen bundles and elastic tissue, in acini of salivary glands, and in tooth roots and jaw bones (5, 11). Such mercury including that in the commonly formed amalgam tattoos moves to other parts of the body over time in significant amounts and more rapidly than the other metals. Macrophages remove mercury by phagocytosis and the mercury moves to other parts of the body through the blood and along nerves (5). Most dentists are not aware of the main source of amalgam tattoos, oral galvanism, where electric currents caused by mixed metals in the mouth take the metals into the gums and oral mucosa, accumulating at the base of teeth with large fillings or metal crowns over amalgam base (1-5). Such metals are documented to cause local and systemic lesions and health effects, which usually recover after removal of the amalgam tattoo by surgery (5fghi). The high levels of accumulated mercury also are dispersed to other parts of the body.

Amalgam fillings produce electrical currents which increase mercury vapor release and may have other harmful effects (1-14, 38). These currents are measured in micro amps, with some measured at over 5 micro amps. A clinic with considerable experience dealing with problems of oral galvanism found that currents over 5 microamps usually cause significant health problems such as headaches, migraines, dizziness, nausea, etc. which was eliminated when amalgam fillings were replaced.. The central nervous system operates on signals in the range of nano-amps, which is 1000 times less than a micro amp (38). The metals also have electrical potentials which can be measured in millivolts (mV).

One clinical study determined that electrical potential differences of over 50 mV were pathological (9b), causing galvanism, leukoplakia, oral lichen planus, or toxic or allergic reactions to restorations (9a, 1-8). In most subjects with amalgam fillings, potential differences of more than 50 mV are present between restorations (9a), with potentials ranging from -417 mV to +150 mV. Negative potentials may be more pathological than positive ones. The average potential for metal crowns and bridges was 154 mV and for brace brackets was 71 mV (9a).

Negatively charged fillings or crowns push electrons into the oral cavity since saliva is a good electrolyte and cause higher mercury vapor losses (11, 1-6). Patients with autoimmune conditions like MS, or epilepsy, depression, etc. are often found to have a lot of high negative current fillings (11). The Huggins total dental revision (TDR) protocol calls for teeth with the highest negative charge to be replaced first (11). Other protocols for amalgam removal are available from international dental associations like IAOMT (45) and mercury poisoned patients organizations like DAMS (46). For these reasons it is important that no new gold dental work be placed in the mouth until at least 6 months after replacement.

Some studies have also found persons with chronic exposure to electromagnetic fields (EMF), microwaves, or MRIs to have higher levels of mercury exposure and excretion (33c, 38, 48). The post MRI saliva mercury levels for a sample of patients was on average 31% higher after MRI than before (48). Such fields are known to induce current in metals and would increase the effects of galvanism. EMF is also documented in animal and human studies to cause cellular calcium efflux and affect calcium homeostasis (39, 40), which may be a factor in the reduction of melatonin levels caused by EMF exposure in animal and human studies (40, 41). In studies on chicks this had significant adverse effects on viability of embryos and chicks. Melatonin is known to be protective against mercury and free radical activity, as well as regulating the circadian rhythm cycle and sleep cycle. EMF exposure lowers melatonin production and disrupts the sleep cycle (41). Since mercury is known to have some of these same effects and EMF exposure increases mercury exposure in those with amalgam, it is not clear in humans the relative role of the causality mechanisms. Occupational exposure to higher levels of EMF have also been found in many studies to result in much higher risk of chronic degenerative neurological conditions such as ALS (42), Alzheimer's Disease (43, 33c), as well as Leukemia and Cancer (44, 47, 33c). Pooled analysis of 3,247 cases of childhood leukemia in Europe, North America and New Zealand published last year found increased rate of leukemia in those with high EMF exposures, over 4 microgauss (47a). Studies in UK found that one in 200 British children are exposed to high levels of electromagnetic radiation in the home and that this could be doubling their risk of leukaemia (47). Since EMF causes increased mercury exposure in those with amalgam, and mercury is also known to cause these conditions, again it is not clear the relative importance of the factors since the studies were not controlled for mercury levels or number of amalgam fillings.

Studies have shown that mercury in the gums such as from root caps for root canaled teeth or "amalgam tattoos" result in chronic inflammation, in addition to migration to other parts of the body (5, 10, 15). Mercury, tin, and silver from amalgam fillings can be seen in the tissues as amalgam "tattoos", which have been found to accumulate in the oral mucosa as granules along collagen bundles, blood vessels, nerve sheaths, elastic fibers, membranes, striated muscle fibers, and acini of minor salivary glands (5, 10). Dark granules are also present intracellularly within macrophages, multinucleated giant cells, endothelial cells, and fibroblasts. There is in most cases chronic inflammatory response or macrophagic reaction to the metals (5, 30), usually in the form of a foreign body granuloma with multinucleated giant cells of the foreign body and Langhans types. Mercury levels are often over 1000 ppm near a gold cap on an amalgam filling due to higher currents when gold is in contact with amalgam (8, 9c, 11, 12, 13). Similar levels as high as 5000 ppm have been found by German oral surgeons in jaw bone under large fillings or gold crowns (37). These levels are among the highest levels ever measured in tissues of living organisms, exceeding the highest levels found in chronically exposed chloralkali workers, those who died in Minamata, or animals that died from mercury poisoning (29). The FDA Action Level for mercury in fish or

food is 1 ppm. Warnings are given at 0.5 ppm, and the EPA health criterion level is 0.3 ppm. Some of the oral effects of mercury that have been documented include gingivitis, oral lesions, pain and discomfort, burning mouth, “metal mouth”, chronic inflammatory response, leukoplakia, lichen planus, autoimmune response, oral cancer, trigeminal neuralgia, allergic reactions, etc.(4, 5, 9a, 11, 15, 19, 22, 23, 25, 26, 30-35)

The component mix in amalgams has also been found to be an important factor in mercury vapor emissions. The level of mercury and copper released from high copper amalgam is as much as 50 times that of low copper amalgams (16). Studies have consistently found modern high copper non gamma-two amalgams have greater release of mercury vapor than conventional silver amalgams (17-21). While the non gamma-two amalgams were developed to be less corrosive and less prone to marginal fractures than conventional silver amalgams, they have been found to be unstable in a different mechanism when subjected to wear/polishing/ chewing/brushing: they form droplets of mercury on the surface of the amalgams (3, 23, 24). This has been found to be a factor in the much higher release of mercury vapor by the modern non gamma-two amalgams. Recent studies have concluded that because of the high mercury release levels of modern amalgams, mercury levels higher than Government health guidelines are being transferred to the lungs, blood, brain, CNS, kidneys, liver, etc. of large numbers of people with amalgam fillings and widespread neurological, immune system, and endocrine system effects are occurring (25, 26, 27, 28).

Dental amalgam fillings have been documented by medical lab tests and Government agencies to be the *largest source*¹ of mercury in most people who have amalgam fillings (49). Amalgam fillings are often also the largest source of organic mercury in people who have amalgam fillings, since bacteria in the mouth and intestines converts other forms of mercury to methyl mercury (31c, 49). A 2009 study found that inorganic mercury levels in people have been increasing rapidly in recent years (50b). It used data from the U.S. Centers for Disease Control and Prevention’s National Health Nutrition Examination Survey (NHANES) finding that while inorganic mercury was detected in the blood of 2 percent of women aged 18 to 49 in the 1999-2000 NHANES survey, that level rose to 30 percent of women by 2005-2006. Surveys in all states using hair tests have found dangerous levels of mercury in an average of 22% of the population, with over 30% in some states like Florida and New York (50c).

References

(1) N.Nogi, “Electric current around dental metals as a factor producing allergic metal ions in the oral cavity”, Nippon Hifuka Gakkai Zasshi, 1989, 99 (12):1243-54; & Kucerova H, Dostalova T, Prochazkova J, Bartova J, Himmlova L. Influence of galvanic phenomena on the occurrence of algal symptoms in the mouth. Gen Dent. 2002 Jan-Feb;50 (1):62-5; & Toumelin-Chemla F, Lasfargues JJ. Unusual in vivo extensive corrosion of a low-silver amalgam restoration involving galvanic coupling: a case report. Quintessence Int. 2003 Apr;34 (4): 287-94;

(2) A.J. Certosimo et al, National Naval Dental Center, “Oral Electricity”, Gen Dent, 1996, 44 (4):324-6; & B.M.Owens et al, “Localized galvanic shock after insertion of an amalgam restoration”, Compenium, 1993, 14 (10), 1302, 1304, 1306-7; & Cheshire, William P., Jr. The shocking truth about trigeminal neuralgia. New England Journal of Medicine, Vol. 342, June 29, 2000, p. 2003 (correspondence); & Raue H., “Resistance to therapy; Think of tooth fillings”, Medical Practice, vol. 32, n.72, p.2303- 2309, 6 Sept 1980

(3) R.H. Ogletree et al, School of Materials Science, GIT, Atlanta, “Effect of mercury on corrosion of eta Cu-Sn phase in dental amalgams”, Dent Mater, 1995, 11 (5):332-6; & Walker RS, Wade AG, Iazzetti G, Sarkar NK. Galvanic interaction between gold and amalgam: effect of zinc, time and surface treatments. J Am Dent Assoc. 2003 Nov; 134 (11):1463-7.

(4) Pistorius A, Willershausen B. Biocompatibility of dental materials in two human cell lines. Eur

¹**Informative:** “Dental Amalgam Mercury Solutions”.

J Med Res. 2002 Feb 21;7 (2):81-8; & R.D.Meyer et al, "Intraoral galvanic corrosion", *Prosthet Dent*, 1993, 69 (2):141-3; & J Pleva, *J Orthomol Psych*, Vol 12, No.3, 1983 & *J. Of Orthomol. Medicine* 1989, 4:141- 148. & "Mercury-A Public Health Hazard", *Reviews on Environmental Health*, 1994, 10: 1-27;

(5) (a) A. Buchner et al, "Amalgam tattoo of the oral mucosa: a clinicopathologic study of 268 cases", *Surg Oral Med Oral Pathol*, 1980, 49 (2): 139-47;& (b) M. Forsell et al, Mercury content in amalgam tattoos of human oral mucosa and its relation to local tissue reactions. *Euro J Oral Sci* 1998; 106 (1):582-7; &(c) Weaver T, Auclair, PL; Amalgam tattoo as a cause of local and systemic disease? *Oral Surg. Oral Med. Oral Pathol.* 1987;63:137-40; (d) Kissel SO, Hanratty JJ. Periodontal treatment of an amalgam tattoo. *Compend Contin Educ Dent.* 2002 Oct;23 (10):930-2, 934, 936.

(6) M.D. Rose et al, Eastman Dental Institute, "The tarnished history of a posterior restoration", *Br Dent J* 1998;185 (9):436; & Johansson E, Liliefors T, "Heavy elements in root tips from teeth with amalgam fillings", Department of Radiation Sciences, Division of Physical Biology, Box 535, 751 21 Uppsala, Sweden

(7) Matts Hanson. Amalgam hazards in your teeth,. Dept of Zoophysiology., University of Lund, Sweden.*J. Orthomolecular Psychiatry*, Vol12 No 3 Sept 1983, 194-201;& Lorscheider & Vimy, "Mercury Exposure from silver fillings", *The Lancet* Vol 337; may 4, 1991; & (c) Jackson GH, Quantitative analysis of Hg, Ag, Sn, Cu, Zn and trace elements in amalgam removed from an abutment tooth underneath a gold alloy bridge that had been in vivo for nine plus years, www.ibiblio.org/amalgam/

(8) S. Olsson et al, "Release of elements due to electrochemical corrosion of dental amalgam" *J of Dental Research*, 1994, 73:33-43; & T.Till et al, "Mercury Release from Amalgam Fillings and Oral Dysbacteriosis as a Cause of Resorption Phenomena" *Zahnarztl Welt/Reform (ZWR)*, 1978:87; 1130-1134.

(9) (a) Muller A.W., Van Loon LA, Davidson CL. Electrical potentials of restorations in subjects without oral complaints. *J Oral Rehabil.* 1990 Sep;17 (5):419-24, & Momoi Y, et al; Measurement of galvanic current and electrical potential in extracted human teeth", *J Dent Res*, 65 (12): 1441-1444;& (b) Inovay J, Banoczy, J. (1961) The role of electrical potential differences in the etiology of chronic diseases of the oral mucosa. *Journal of Dental Research*, 40, 884; & (c) K.Arvidson, "Corrosion studies of dental gold alloy in contact with amalgam", *Swed. Dent. J* 68: 135-139, 1984; & Lemons JE et al, Interoral corrosion resulting from coupling dental implants and restorative metallic systems, *Implant Dent*, 1992, 1 (2):107-112; & Skinner, EW, *The Science of Dental Materials*, 4th Ed.revised, W.B.Saunders Co., Philadelphia, p284-285, 1957;

(10) Raue H., "Resistance to therapy; Think of tooth fillings", *Medical Practice*, vol. 32, n.72, p.2303- 2309, 6 Sept 1980

(11) Hal Huggins, *Its All in Your Head*, 1997; & (a) Huggins HA, Levy, TE, Uniformed Consent: the hidden dangers in dental care, 1999, Hampton Roads Publishing Company Inc; & *Proceedings: ICBM Conf. Colorado*, 1988; & S.Ziff, *Dentistry without Mercury*, 8th Edition, 1996, Bio-Probe, Inc., ISBN 0-941011- 04-6.

(12) H.Freden et al, "Mercury in gingival tissues adjacent to amalgam fillings", *Odontol Revy*, 1974, 25 (2): 207-210;& H Reden, *Odontol Revy*, 25, 1971, 207-210

(13) C.Malmstrom, M.Hansson, M. Nylander, Conference on Trace Elements in Health and disease. Stockholm May 25-1992;

(14) B. Willershausen et al, "Mercury in the mouth mucosa of patients with amalgam fillings", *Dtsch Med Wochenschr*, 1992, 117:46, 1743-7.

(15) V. Nadarajah et al, "Localized cellular inflammatory response to subcutaneously implanted dental mercury", *J Toxicol Environ Health*, 1996, 49 (2): 113-25.

- (16) Brune D, et al; Gastrointestinal and in vitro release of copper, cadmium, indium, mercury and zinc from conventional and copper-rich amalgams. *Scand J Dent Res.* 1983 Feb;91 (1):66-71; & "Metal release from dental materials", *Biomaterials*, 1986, 7, 163-175.
- (17) C. Toomvali, "Studies of mercury vapor emission from different dental amalgam alloys", *LIU-IFM-Kemi-EX 150*, 1988; & D.B.Boyer, "Mercury vaporization from corroded dental amalgam" *Dental Materials*, 1988, 4:89-93
- (18) A.Berglund, "A study of the release of mercury vapor from different types of amalgam alloys", *J Dent Res*, 1993, 72:939-946;
- (19) H. Lichtenberg, "Mercury vapor in the oral cavity in relation to the number of amalgam fillings and chronic mercury poisoning", *Journal of Orthomolecular Medicine*, 1996, 11:2, 87-94.
- (20) V. Psarras et al, "Effect of selenium on mercury vapour released from dental amalgams", *Swed Dent J*, 1994, 18:15-23;
- (21) L.E. Moberg, "Long term corrosion studies of amalgams and Casting alloys in contact", *Acta Odontol Scand* 1985, 43:163-177; & L.E. Moberg, "Corrosion products from dental alloys", Published Dissertation, Stockholm, 1985.
- (22) T. Weaver et al, An amalgam tattoo causing local and systemic disease; *Oral Surg Oral Med Oral Pathol* 1987; 63 (1):137-40; & J.P.McGinnis et al, Amalgam tattoo: use of energy dispersive X-ray analysis as an aid in diagnosis; *J Amer Dent Assoc* 1985; 110 (1): 52-4;
- (23) Pleva J, "Dental mercury - a public health hazard", *Rev Environ Health* 10 (1):1-27 (1994); & J Pleva, *J Orthomol Psych*, Vol 12, No.3, 1983 & *J. Of Orthomol. Medicine* 1989, 4:141- 148.
- (24) P.E. Schneider et al, "Mercury release from Dispersalloy amalgam", *IADR Abstrats*, #630, 1982; & N.Sarkar, "Amalgamtion reaction of Dispersalloy Reexamined", *IADR Abstracts* #217, 1991; & N.K. Sarkar et al, *IADR Abstracts* # 895, 1976; & R.S.Mateer et al, *IADR Abstracts* #240, 1977; & N.K.Sarkar et al, *IADR Abstracts*, #358, 1978; & N.W. Rupp et al, *IADR Abstracts* # 356, 1979.
- (25) H.J. Lichtenberg, "Elimination of symptoms by removal of dental amalgam from mercury poisoned patients", *J Orthomol Med* 8:145-148, 1993; & "Symptoms before and after removal of amalgam", *J of Orth Med*, 1996, 11 (4):195-
- (26) Dr. P.Kraub & M.Deyhle, Universitat Tubingen-Institut fur Organische Chemie, "Field Study on the Mercury Content of Saliva", 1997 <http://www.uni-tuebingen.de/KRAUSS/amalgam.html>; (20,000 people tested for mercury level in saliva and health status/symptoms compiled); & Monaci F et al, Concentrations of major elements and mercury in unstimulated human saliva. *Biol Trace Elem Res.* 2002 Dec;89 (3):193-203.
- (27) Public Statement: BBC Panorama Program on Dental Amalgam: "The Poison in Yo Monaci F, Bargagli E, Bravi F, Rottoli P. Concentrations of major elements and mercury in unstimulated human saliva. *Biol Trace Elem Res.* 2002 Dec;89 (3):193-203. ur Mouth", June 1994. by World Health Organizaition Scientific Panel Members: Dr. Lars Friberg-chairman, Dr. Fritz Lorscheider, Professor of Medical Physiology, Univ. Of Calgary; Dr. Murray Vimy, Professor of Oral Biology and Dental Medicine, Univ. Of Calgary Medical School. Dr. Vasken Aposhian, Dept. Head, Molecular and Cellular Biology, Univ. Of Arizona; Dr. David Eggleston, Univ. Of California, researcher on mercury in the brain; Dr. Boyd Haley, Univ. Of Kentucky reasearcher on mercury in the brain and Alzheimer's Disease Dr. Gustav Drasch, Univ. Of Munich, reaearcher on mercury in brains of dead infants and fetuses; Dr. D. Echeverria, Neuro-Toxicologist, researcher on reproductive problems and birth defects in dental workers; Batelle Center for Public Health Reseach, Seattle, Wash.
- (28) B. Windham, Annotated Bibliography: Exposure and Health Effects Related to Mercury/ Amalgam and Clinclal Results of Amalgam Replacement;2002. (over 2000 medical study references

and 60,000 clinical cases followed by doctors) www.home.earthlink.net/~berniew1/amalg6.html

(29) C.F. Facemire et al, "Reproductive impairment in the Florida Panther", *Health Perspect*, 1995, 103 (Supp4):79-86.

(30) Fisher et al, *J Oral Rehab*, 11:399- 405, 1984; & Goldschmidt et al, *J. Perio. Res.*, 11:108-115, 1976 ; & Zander *JADA*, 55:11-15, 1957; & App, *J Prosth Dent* 11:522-532, 1961; & Trott and Sherkat, *J CDA*, 30:766-770, 1964; & Sanches Sotres et al, *J. Periodo.* 140: 543-546, 1969; & Turgeon et al., *J CDA* 37:255-256, 1972; & Trivedi and Talim, *J. Prosth. Dentistry*, 29:73-81, 1973

(31) (a) Association between oral lichenoid reactions and amalgam restorations, Pezelj-Ribaric S, Prpic J, Miletic I, Brumini G, Soskic MS, Anic I. *J Eur Acad Dermatol Venereol.* 2008 Nov;22 (10):1163-7. Epub 2008 Apr 3; & (b) E.R.Smart et al, "Resolution of lichen planus following removal of amalgam restorations", *Br Dent J* 178 (3):108-112, 1995 (12 cases); & H.Markow," Regression from orticaria following dental filling removal.; *New York State J Med*, 1943: 1648-1652; & G. Sasaki et al, "Three cases of oral lichenosis caused by metallic fillings", *J. Dermatol*, 23 Dec, 1996; 12:890-892; & J.Bratel et al, "Effect of Replacement of Dental Amalgam on OLR", *Journal of Dentistry*, 1996, 24 (1-2):41-45 (161 cases); & (c) A Dunsche et al, "Oral lichenoid reactions associated with amalgam: improvement after amalgam removal." *British Journal of Dermatology* 2003 Jan;148:1:70-6; & Guzzi G, Minoia C, Pigatto PD, Severi G. Methylmercury, amalgams, and children's health. *Environ Health Perspect.* 2006; 114:149; & Guzzi G, Minoia C, Pigatto PD, Lucchiari S, Severi G. Mercury and dental patients: toxicology, immunology and genetic connection. *Toxicol Letters*; 2005; 158S: S239.

(32) A. Skoglund, *Scand J Dent Res* 102 (4): 216-222, 1994; and 99 (4):320-9, 1991 (40 cases); & P.O.Ostman et al, "Clinical & histologic changes after removal of amalgam", *Oral Surgery, Oral Medicine, and Endodontics*, 1996, 81 (4):459-465; & S.H.Ibbotson et al, "The relevance of amalgam replacement on oral lichenoid reactions", *British Journal of Dermatology*, 134 (3):420-3, 1996; (270 cases); & L. Wong and S. Freeman, Oral lichenoid lesions (OLL) and mercury in amalgam fillings, *Contact Dermatitis*, Vol 48 Issue 2 Page 74 - February 2003.

(33) Y.Omura et al, Heart Disease Research Foundation, NY, NY, "Role of mercury in resistant infections and recovery after Hg detox with cilantro", *Acupuncture & Electro-Therapeutics Research*, 20 (3):195-229, 1995; & "Mercury exposure from silver fillings", *Acupunture & Electrotherapy Res*, 1996, 133- ; & Omura, Yoshiaki; Abnormal Deposits of Al, Pb, and Hg in the Brain, Particularly in the Hippocampus, as One of the Main Causes of Decreased Cerebral Acetylcholine, Electromagnetic Field Hypersensitivity, Pre-Alzheimer's Disease, and Autism in Children; *Acupuncture & Electro-Therapeutics Research*, 2000, Vol. 25 Issue 3/4, p230, 3p

(34) R.L. Siblingrud, "Relationship between dental amalgam and health", *Toxic Substances Journal*, 1990b. 10:425-444; & "Effects on health following removal of dental amalgams", *J Orthomolecular Med*, 5 (2): 95-106, & "Relationship between amalgam fillings and oral cavity health" *Ann Dent*, 1990, 49 (2): 6-10, (86 cured)

(35) Redhe, O. Sick From Amalgam R-Dental Ab, Frejavagen 33, S-79133 Falun, Sweden (in Swedish)(100 cases).

(36) M. Daunderer, *Handbuch der Amalgamvergiftung*, Ecomed Verlag, Landsberg 1998, I SBN 3-609-71750-5 (in German)

(37) Schiwara, H.-W. (Medical Laboratory) *Arzte fur Laboratoriumsmedizen*, D-28357 Bremen; & *Heavy Metal Bulletin*, 1999, No. 1, p28.

(38) F.Schmidt et al, "Mercury in urine of employees exposed to magnetic fields", *Tidsskr Nor Laegeforen*, 1997, 117 (2): 199-202; & Sheppard AR and EisenbudM., *Biological Effects of electric and magnetic fields of extremely low frequency.* New York university press. 1977; & Ortendahl T W, Hogstedt P, Holland RP, "Mercury vapor release from dental amalgam in vitro caused by magnetic

fields generated by CRT's", *Swed Dent J* 1991 p 31 Abstract ; & Bergdahl J, Anneroth G, Stenman E. Description of persons with symptoms presumed to be caused by electricity or visual display units—oral aspects. *Scand J Dent Res.* 1994, 102 (1):41-5.

(39) Aldinucci C; Palmi M; Sgaragli G; Benocci A; Meini A; Pessina F; Pessina GP. The effect of pulsed electromagnetic fields on the physiologic behaviour of a human astrocytoma cell line. *Biochim Biophys Acta* 2000, 11;1499 (1-2):101-108.

(40) Pablos MI; Agapito MT; Gutierrez-Baraja R; Reiter RJ; Recio JM. Effect of calcium on melatonin secretion in chick pineal gland I. *Neurosci Lett* 1996 Oct18;217 (2-3):161-4; & Nikaido SS; Takahashi JS. Calcium modulates circadian variation in cAMP-stimulated melatonin in chick pineal cells. *Brain Res* 1996 15;716 (1-2):1-10; & Youbicier-Simo BJ; Boudard F; Cabaner C; Bastide M. Biological effects of continuous exposure of embryos and young chickens to electromagnetic fields emitted by video display units. *Bioelectromagnetics* 1997;18 (7):514-23 ;

(41) Juutilainen J; Stevens RG; et al; Nocturnal 6-hydroxymelatonin sulfate excretion in female workers exposed to magnetic fields. *J Pineal Res* 2000 ;28 (2):97-104; & Akerstedt T; Arnetz B; Ficca G; Paulsson LE; Kallner A. A 50-Hz electromagnetic field impairs sleep. *J Sleep Res* 1999 Mar;8 (1):77-81

(42) Savitz DA; Checkoway H; Loomis DP. Magnetic field exposure and neurodegenerative disease mortality among electric utility workers. *Epidemiology* 1998 Jul;9 (4):398-404; & Savitz DA; Loomis DP; Tse CK. Electrical occupations and neurodegenerative disease: analysis of U.S. mortality data. *Arch Environ Health* 1998 Jan-Feb;53 (1):71-4; & Johansen C; Olsen JH. Mortality from amyotrophic lateral sclerosis, other chronic disorders, and electric shocks among utility workers. *Am J Epidemiol* 1998 Aug 15;148 (4):362-8; & Davanipour Z; Sobel E; Bowman JD; Qian Z; Will AD. Amyotrophic lateral sclerosis and occupational exposure to electromagnetic fields. *Bioelectromagnetics* 1997;18 (1):28-35.

(43) Sobel E; Dunn M; Davanipour Z; Qian Z; Chui HC. Elevated risk of Alzheimer's disease among workers with likely electromagnetic field exposure. *Neurology* 1996 ;47 (6):1477-81; & Sobel E, Davanipour Z. Electromagnetic field exposure may cause increased production of amyloid beta and eventually lead to Alzheimer's disease. *Neurology.* 1996 Dec;47 (6):1594-600; & Sobel E; Davanipour Z; Sulkava R; Erkinjuntti T; Wikstrom J et al; Occupations with exposure to electromagnetic fields: a possible risk factor for Alzheimer's disease. *Am J Epidemiol* 1995 Sep 1;142 (5):515-24.

(44) London SJ; Bowman JD; Sobel E; Thomas DC; Garabrant DH; Pearce N; Bernstein L; Peters JM. Exposure to magnetic fields among electrical workers in relation to leukemia risk in Los Angeles County. *Am J Ind Med* 1994 Jul;26 (1): 47-60; & Caplan LS; Schoenfeld ER; O'Leary ES; Leske MC. Breast cancer and electromagnetic fields—a review. *Ann Epidemiol* 2000 Jan;10 (1):31-44;

(45) International Academy of oral Medicine and Toxicology, "A Scientific Response to the American Dental Association Special Report and Statement of Confidence in Dental Amalgam, IAOMT, POB 608531, Orlando, 32860-8531, <http://emporium.turnpike.net/P/PDHA/mercury/asr.htm>; & IAOMT, Protocol for Mercury/Silver Filling Removal, <http://emporium.turnpike.net/P/PDHA/mercury/iao>

(46) Amalgam/mercury poisoned patients organizations, DAMS: Assoc. Of Dental Mercury Patients-U.S., <http://www.amalgam.org>;

(47) Rob Edwards and Duncan Graham-Rowe. "Electrical connection" *New Scientist* 6 March 2002; & Dr. Mae-Wan Ho, National Radiological Protection Board (NRPB), "Electromagnetic Fields Double Leukemia Risks" 2002; & Richard Doll et al, Cancer Studies Unit, Oxford Univ., March 2002;

(48) Mercury release from dental amalgam restorations after magnetic resonance imaging and following mobile phone use. *Pak J Biol Sci.*, 2008 Apr 15; 11 (8): 1142-6, Mortazavi SM, Daiee E, Yazdi A, Khiabani K, Mood MB, et al.

(49) Documentation of exposure levels from amalgam fillings, review, BWindham (Ed), www.flcv.com/dam.

(50) U.S. Centers for Disease Control, National Center for Health Statistics, NHANES III Study (thousands of people's health monitored), www.flcv.com/NHanes3.htm³ 1; & www.mercola.com/article/mercury & Review: cancer related to mercury exposure, B. Windham (Ed) www.flcv.com/cancerhg.htm⁵ ; & (b) Laks, Dan R. Assessment of chronic mercury exposure within the U.S. population, National Health and Nutrition Examination Survey, 1999-2006. *Biometals*. August 2009; & Laks, D.R. et al, Mercury has an affinity for pituitary hormones, *Medical Hypotheses*, Dec 2009; & (c) An Investigation of Factors Related to Levels of Mercury in Human Hair, Environmental Quality Institute, October 01, 2005,

www.greenpeace.org/raw/content/usa/press/reports/mercury-report.pdf⁶.

<http://www.greenpeace.org/usa/assets/binaries/addendum-to-mercury-report>

²**Informativo:** "Dental Amalgam Mercury Solutions".

³**Internet:** "<http://www.flcv.com/NHanes3.htm>".

⁴**Internet:** "http://www.mercola.com/article/mercury/no_mercury.htm".

⁵"...[gaiainet.org/eng/vital/medoral/fatosmer/cancerhg.htm](http://www.gaiainet.org/eng/vital/medoral/fatosmer/cancerhg.htm)".

⁶**Internet:** "<http://www.greenpeace.org/raw/content/usa/press/reports/mercury-report.pdf>".