MEDICAL SCIENTISTS REPORT HARMFUL EFFECTS TO DENTAL AMALGAM!

At the 1992 Annual Meeting of the Society of Toxicology, held in Seattle on 24 February, medical scientists reported five studies demonstrating adverse health effects of mercury exposure from dental amalgam fillings. These findings are so important that the abstracts of their presentations, as published in The Toxicologist, Vol. 12, No. 1, February 1992 are herein repeated in their entirety:


In terms of the number of exposed individuals, the most prevalent source of deliberate mercury (Hg) exposure is almost certainly dental amalgam. Dental amalgam releases mercury vapor, which is absorbed by the lung and distributed systemically, concentrating in brain, kidney and fetal tissue. Implications of this Hg exposure are unclear, and recent Government panels have concluded that no scientific studies definitely link amalgam Hg to human disease states. However, these panels emphasize that more research is required to characterize adequately the risk of amalgam Hg exposure. This symposium will present recent research assessing the toxicity of low level, chronic Hg vapor exposure, with special emphasis on Hg exposure from dental amalgam. Since inhalation exposure to Hg vapor from any source can be expected to produce identical effects, we will broaden our consideration of this issue to consider both laboratory animal and epidemiologic studies of chronic, low-level Hg vapor exposure. The speakers will provide background information on Hg vapor toxicity, toxicokinetics, and critical target organs; present recent animal and human studies on amalgam Hg distribution and associated cell injury; report recent animal studies examining the developmental effects of prenatal exposures to Hg vapor; and present epidemiological evidence or reproductive toxicity among dental assistants occupationally exposed to amalgam Hg.

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**ABSTRACT #243: OVERVIEW OF MERCURY VAPOR TOXICITY, TOXICOKINETICS AND CRITICAL TARGET ORGANS.** TW Clarkson. University of Rochester School of Medicine. Rochester, NY.

The toxicology of inhaled mercury will be reviewed with special emphasis on humans. Mercury vapor is a monatomic gas that is soluble in organic solvents. Thus it rapidly penetrates cell membranes and crosses important diffusion barriers in the body such as the blood-brain barrier and the placenta. Once inside the cell, it is oxidized to divalent inorganic mercury. Evidence will be presented that the catalase-hydrogen peroxide pathway is responsible for oxidation of mercury vapor. It is believed that divalent inorganic mercury is the proximate toxic species.

Severe signs and symptoms of human poisoning have been known for centuries. Today we are concerned with more subtle damage to the brain, the kidneys and the immune system. Effects on the immune system may be
produced by direct effects of divalent inorganic mercury on immunocompetent cells. Dramatic strain differences in the immune responses have been observed.

**ABSTRACT #244: MERCURY FROM AMALGAM TOOTH FILLINGS: ITS TISSUE DISTRIBUTION AND EFFECTS ON CELL FUNCTION.** FL Lorscheider, AO Summers, PO Magner and MJ Vimy. University of Calgary, Faculty of Medicine, Alberta, Canada & University of Georgia, Department of Microbiology, Athens, GA.

The daily absorbed Hg dose from dental amalgam is greater than the total daily dose from all other non-occupational Hg sources in the environment or the diet (WHO. Environ. Hlth. Criteria. 118, 1991, pg.36). The systemic uptake and organ distribution of amalgam Hg has been demonstrated in both sheep (FASEB J. 3:2641, 1989; Am. J. Physiol. 258:R939, 1990) and monkey (FASEB J. 4:3256, 1990). Several laboratories are examining the effects of Hg (including Hg from amalgams) on kidney and brain cell functions, and on normal oral and gut bacteria. Amalgam Hg impairs sheep kidney function (Am. J. Physiol. 261(30), in press, 1991) and the progress of parallel human clinical studies will be discussed. Amalgam Hg also markedly increases the proportion of Hg-resistant bacteria in the primate mouth and intestine (Physiologist. 33:A116, 1990) and these bacteria demonstrate increased resistance to common antibiotics. Reports from other laboratories now implicate Hg in the etiology of brain dysfunction (FASEB J. 5:A456, 1991) and suggest that dental amalgam Hg may be a significant source (Brain Res. 533:125, 1990). Based on experimental evidence to date, the potential pathophysiological effects of Hg exposure from dental amalgam warrant continued investigation.

**ABSTRACT #245: PRENATAL EXPOSURE TO MERCURY VAPOR: EFFECTS ON BRAIN DEVELOPMENT.** M Berlin, J Hua, B Logdberg, and K Warvinge. University of Lund, Institute of Environmental Medicine, Lund, Sweden.

Two collaborating groups in Sweden perform studies on the effect of mercury vapor on fetal brain development, Berlin et al., University of Lund, and Dencker et al., University of Uppsala. The team in Lund exposes timed pregnant squirrel monkeys to mercury vapor 1 mg/m³ for 3 hours and 6 hours per day 5 days a week. Early abortion, premature birth, low birth weight with a perinatal death have been observed. The fetal blood content of mercury was raised dramatically at the end of the pregnancy exceeding that of the mother at delivery by a factor of at least 5. The content of mercury in mother and offspring as well as brain morphology of offspring will be accounted for. Dencker et al have exposed rats during gestation to 1 mg mercury/m³. Behavioral studies of the offspring have revealed persistent deviation from the controls and also after neonatal exposure to 50 mcg/m³. **BIO-PROBE COMMENT: The monkey data also showed selective concentration of mercury in the nucleus basalis of Meynert. University of Kentucky researchers have previously shown strikingly high levels of mercury in the nucleus basalis of victims of Alzheimer’s disease and concluded that a probable source for the mercury was amalgam dental fillings. Of great significance in the Dencker study is that the neonatal exposure levels closely parallel the average intra-oral mercury vapor readings obtained in human amalgam bearers.**

**ABSTRACT #246: REDUCED FERTILITY AMONG DENTAL ASSISTANTS WITH OCCUPATIONAL EXPOSURE TO MERCURY.** A Rowland, D Baird, C Weinberg, D Shore, C Shy, and A Wilcox. National Institute of Environmental Health Sciences, Research Triangle Park, NC.

In order to identify women eligible for a study of the effects of mercury vapor on fertility, screening questionnaires were sent to 7000 registered dental assistants in California. The final eligible sample of 418 women, all of whom had become pregnant during the previous four years, were interviewed by telephone. Detailed information was collected on mercury handling practices and the number of non-contracepting menstrual cycles it took women to become pregnant. Dental assistants not working with amalgams served as unexposed controls.

Work practices and office characteristics known to elevate levels of mercury vapor were used to create a mercury hygiene scale. Women who prepared 30 or more amalgams per week and had three or more poor mercury hygiene factors took longer to become pregnant. The fecundability (probability of conceiving in any given menstrual cycle) of this high exposure group was only 50% of that for unexposed women (95% C.I.=0.4-0.6) after controlling for age, smoking, race, frequency of intercourse, history of pelvic inflammatory disease, year the attempt began, and occupational exposure to cold sterilants, x-rays, and unscavenged nitrous oxide. No relationship was found between the number of amalgam surfaces in a woman’s own mouth and her fertility. **BIO-PROBE COMMENT: This is clearly the most exhaustive and complete study conducted on this issue and directly contradicts the position of the ADA.**
DRAMATIC EVENTS IN GERMANY!

On 2 February 1992, the Bundesgesundheitsamt (Federal Department of Health) of Germany banned the manufacture and sale of one form of dental amalgam (gamma-2 or "conventional" amalgam). The ban was a direct result of scientific information provided by the International Academy of Oral Medicine and Toxicology (IAOMT), which is now considered to be the scientific authority on the subject in Germany. Dr. Graeme Hall, representing the IAOMT, has provided government agencies and the German media with the scientific documentation and has appeared on national television in Germany. He has also been called upon to consult with insurance companies, manufacturers, and the German Courts. Numerous anti-amalgam articles have appeared in the German press.

The publicly proclaimed response of the German Dental Association was that mercury was locked into the amalgam and not available to enter the bodies of the patients. This position, directly contrary to the published science, was assailed by the IAOMT and the very prestigious Max Planck Institute, who also questioned the Bundesgesundheitsamt's position that the non-gamma-2 amalgams were safer than the gamma-2 amalgams.

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VICTORY IN WASHINGTON STATE!

In the state of Washington, the Dental Disciplinary Board has the power to pass regulations controlling the practice of dentistry in the state. On 13 September 1991, the Board presented a proposed regulation that declared the replacement of clinically serviceable dental amalgam fillings because of their mercury content to be unethical and a punishable offense (the wording was strikingly similar to the new section in the Principles of Ethics and Code of Professional Conduct of the American Dental Association).

In October the Board expanded taxpayer funds to provide pro-amalgam testimony from two "experts". Members of the IAOMT and ADAMS were present at the meeting and demanded that the Board provide for testimony from anti-amalgam authorities. This testimony was provided at the November meeting by Dr. Murray Vimy and Dr. Douglas Schwartzendruber.

As a result of the information provided at the November meeting, the Dental Board was obliged to re-word the proposed directive and state: 1) It was clear that their previous position that the safety of dental amalgam had been scientifically established was unjustified, and; 2) there is a scientific difference of opinion about adverse health effects to mercury exposure from amalgam.

The Dental Board restated their regulation into two parts in December. The second part would require dentists to inform patients of the scientific difference of opinion before removing clinically serviceable amalgam fillings. The Board eliminated this section when it realized that it would oblige dentists to inform patients before placing amalgam fillings.

The remaining part of the regulation forbade dentists from removing mercury/silver amalgam fillings for the treatment of medical conditions. The IAOMT and ADAMS went to work again, providing the Board with the documentation connecting dental amalgam to Lichen Planus (a medical condition) and the medical research to be presented at the forthcoming Society of Toxicology meeting in Seattle. The Dental Board dropped the final proposal in early February.

These events constitute a great victory. We extend our appreciation and congratulations to the dedicated and courageous members of the IAOMT and ADAMS in Washington.

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"INFORMED CONSENT" PASSES CALIFORNIA SENATE!

In several states, attempts have been made to attain "informed consent" legislation. This would require dentists to inform patients of mercury exposure from dental amalgam fillings before they are placed. The power and influence of the American Dental Association and its state constituents has always succeeded in defeating this efforts.

The first breakthrough came in early February when the California State Senate passed an "informed consent" bill for the use of dental amalgam, presented by Senator Diane Watson. The bill (SB 934) must still be approved by the State Assembly and the Governor, but the action represents a significant victory in the process to provide dental patients with their due rights.
ACETYL-CYSTEINE - CHEMICAL NAME N-ACETYL-L-CYSTEINE (NAC).

NAC is a compound with mucolytic (destroying or dissolving mucus) properties.

The major use of NAC in clinical toxicology has been the treatment of "Tylenol®" overdose, [acetaminophen (paracetamol)].

N-acetylcysteine forms L-cysteine, cystine, L-methionine, glutathione (GSH), and mixed di-sulfides. L-methionine has also been used for treatment of acetaminophen overdose. L-methionine also forms cysteine leading to glutathione and other di-sulfides. The major difference between the two being that NAC stimulation of cysteine and glutathione is much greater than L-methionine.(1) The importance of this aspect in relation to treatment, as well as detoxification is becoming very apparent from the research. Although little research has been done on the use of NAC for heavy metal detoxification, it does have some efficacy for this purpose. However, most researchers feel that DMSA and DMPS are much more effective chelating agents for heavy metal ions and as a consequence do not see spending time and effort on this aspect. This fact notwithstanding, it is apparent that NAC offers some great potential for use in conjunction with DMSA, DMPS, and other detoxication protocols. Primarily because of its ability to greatly augment plasma and red blood cell glutathione and cysteine.

It is a well documented fact that mercury has a great affinity for thiols [sulfhydryl (-SH sulfur- hydrogen)]. Because of this attraction to sulfur bearing molecules in the body, mercury has the potential of depleting or inhibiting normal sulfur metabolism and biochemical functions. One of the phenomenon's research is revealing is that in many major disease states there is or has been a depletion of GSH i.e., viral diseases typically associated with cancer, such as AIDS and viral hepatitis B, and various respiratory diseases.(2) The concentration of cysteine in the plasma (10-20 uM) is very low in comparison with the concentrations of all other protein-forming amino acids.(3) It also appears that the supply of extracellular cysteine influences strongly the intracellular level of glutathione and also the activity of the transcription factor NFkB that regulates the expression of several immunologically relevant genes. In vitro experiments with macrophages and lymphocytes indicate that cysteine plays an important regulatory role between these cell types. Further, the cysteine supply is impaired directly or indirectly in several pathologic conditions that are associated with immunodeficiencies including AIDS. With regard to the HIV-1 virus it was found that cysteine and NAC inhibited replication in a dose-dependent fashion.(4) Of particular interest to dentists will be the results of an on-going chemoprevention trial that is using combined administration of NAC and retinol palmitate in patients being treated for carcinoma of the larynx, oral cavity, and lung.(5)

In an experiment with rats exposed to mercury vapor histological lesions like alveolar edema, hyaline membranes and sometimes fibrosis was observed. The lesions were more significant after two hours of exposure and about 50% of the animals died within two weeks. NAC treatment increased survival time and the percentage of living animals. Lung superoxide dismutase was lower than in the non-treated animals indicating an antioxidant effect of NAC. Mercury levels were decreased in blood and lung, suggesting some chelating effect of NAC.(6)

In another experiment using rats, mercuric-chloride induced nephrotoxicity, as measured by functional and biochemical parameters, was evaluated in rats at different kidney non-protein sulphydryls (NPS) levels. Renal function (clearance) and biochemical measurements were impaired when the animals were treated with HgCl2. Values were highly impaired when the kidneys were NPS-depleted and were improved when NPS pools were previously increased although they were not similar to control values. Diethyldmaleate (DEM) induced a 75% NPS diminution one hour after administration. DEM treatment promoted a higher accumulation of HgCl2 in both kidney and liver while NAC treatment reduced significantly the metal content in these organs. These data suggest a positive relationship between mercury content and organ injury. It also demonstrated that mercury content increased while NPS levels decreased. NPS may play a role in HgCl2 detoxification and thus avoids mercury accumulation and mercury effects.(7)

In addition to its ability to lower lipoprotein(a), NAC may also influence atherogenesis by other mechanisms. Oxidative modification of low-density lipoprotein (LDL) by endothelial cells or macrophages can lead to atherogenesis. LDL which has been oxidatively modified may also promote atherogenesis by other means, including its inherent cytotoxic properties, and by inhibition of endothelial-cell growth factor production. The process of cell-mediated oxidation of LDL is initiated by superoxide, which may be produced by arterial smooth muscle cells in a process involving the uptake of L-cysteine and the reduction and liberation of a thiol. Reoxidation of this thiol could lead to the generation of superoxide. In addition to its function as a sulphydryl donor, NAC is a free oxygen radical scavenger, and inhibits human monocyte
superoxide generation and chemotaxis. Therefore, NAC may influence atherogenesis by several mechanisms.\(^8\)

Science has documented well the variety of symptomatology attributable to inhalation of mercury vapor. It is evident from the vast spectrum of potential benefits that may accrue from adequate levels of cysteine and glutathione, to overcome and reverse mercury-driven symptomatology, that NAC's unique ability to greatly increase cysteine and glutathione levels make it a likely candidate for inclusion in any detoxification program.

In this regard an interesting fact emerges from the research involving the use of NAC or methionine and activated charcoal for acetalaminophen toxicity. NAC and methionine will adsorb to the charcoal and should not be used at the same time.\(^{1,9}\) This raises the very interesting point of whether GSH or other sulfur amino acids will adsorb to activated charcoal? Pending some research to the contrary, it would appear that the prudent coarse in any mercury detoxification protocol using both sulfur containing supplements and activated charcoal, would be to separate taking them by two hours.

Another positive aspect related to the use of NAC is that research with human volunteers has shown that it does not deplete trace metals i.e., calcium, magnesium, iron, zinc or copper when given orally.\(^{10}\)

NAC is available from in capsule form from Cardiovascular Research (800-888-4585), Thorne Research (208-263-1337), Nutricology (800-545-9660). Twin Labs brand supplements has it under the name NAC which would make it available in most health food stores. Squibb has a prescription product called Mucomyst, which is a 10% or 20% acetylcysteine solution. It can be given orally as a 5% (weight/volume) solution in a soft drink or as a nebulized solution inhaled three to four times daily. Absorption of NAC occurs rapidly after oral administration of doses of 100-600 mg. Although adverse reactions are rare, they do occur, especially after repeated high doses (nausea/vomiting and diarrhea). Someone should research the possibility of using Mucomyst in a nebulized solution during removal of amalgam fillings. It may reduce any adverse effects experienced by the subset of patients extremely sensitive to mercury.

REFERENCES


URINE MERCURY MOBILIZATION/CHELATION CHALLENGE TEST

Dorland's Medical Dictionary defines the word chelate as follows: To combine with a metal in complexes in which the metal is part of a ring. By extension, a chemical compound in which a metallic ion is sequestered and firmly bound into a ring within the chelating molecule. Chelates are used in chemotherapeutic treatments for metal poisoning.

The primary method of diagnosing mercury toxicity at this point in our high-tech world rests almost entirely on the subjective evaluation of symptomatology. Replacement of mercury dental implants with non-mercury dental implants that results in amelioration or clearance of symptomatology is not proof in a...
court of law that mercury or mixed metals were involved at all. Work is in progress on the development of a porphyrin profile test for mercury which may have the ability of linking symptoms specifically to mercury. (For an excellent evaluation of all the technology see Queen & Company’s Vol 5, #1, Mercury-Free News, 719-598-4968). There is however, something that can be done to confirm or establish mercury body-burden and that is the Challenge Test using DMSA (meso-2,3-dimercaptosuccinic acid) or DMPS (2,3-dimercapto-1-propane-sulfonic acid).

DMSA has been approved by the FDA for use in the U.S. as a chelating agent for lead poisoning in children. The product is Chemet® marketed by McNeil Pharmaceuticals. It is my understanding that Chemet® costs approximately $300.00 for 10 grams. DMSA is also available from Canaca by prescription (must have a prescription from a Canadian dentist or physician). The Canadian price is approximately $50.00 for a 10 gram bottle of 100 mg capsules. Available in Canada from Kripps Pharmacy 604-687-2564). The other pharmacy in Canada is only providing succinic acid and not meso-2,3-dimercaptosuccinic acid. The July, 1988 FDA ruling "Pilot Guidelines Chapter 971." makes it legal for an individual to import a drug, that is considered as safe in other countries, but is not available in the U.S. The fact that the FDA has now approved DMSA and McNeil has a use patent for the U.S. does not preclude an individual from bringing in the drug for their own use.

The manufacturer of DMPS is the Heyl Co. of Germany and clinical trials are now in progress at two locations in the U.S. and one in Mexico to develop data acceptable to the FDA for approval. DMPS (trade name Dimaval®) is available in the water soluble injectable form used for IV or IM administration, and in capsule form for oral use. It is my understanding that the oral capsule form is extremely expensive if you are able to find a source for it in Germany who will ship it to you.

Dr. Max Daunderer in Munich, Germany, a toxicologist specializing in mercury toxicity from amalgam dental fillings, specializes in using IV DMPS for a Mercury Challenge Test. His basic protocol is: 1) A sample of spontaneously voided urine (50 ml) is taken. 2) Immediately afterwards DMPS is injected IV (4 mg/kg of body weight). 3) After 30 minutes, a second urine sample is taken. Dr. Daunderer then has the urine samples analyzed for mercury, copper and tin. The data provides a baseline on the metals evaluated and the levels after challenge, thus indicating the chelatable pools and body burden. Recent evaluations of DMPS done in Finland used essentially the same protocol taking a urine sample just before and then injecting IV immediately after. During the 30 minutes after administration of DMPS the patients were required to drink 500 ml water and all urine excreted during that time was collected. On some patients, a 24 hour urine was collected after administration of DMPS. In all of the subjects tested, DMPS caused a large increase (range 6-614 times) of mercury excretion correlated to creatinine levels. In nine symptom-free dental personnel tested there was an 89-fold increase; in 38 patients regarding themselves as suffering from amalgam disease, the increase was 128-fold; and in 11 patients who had their amalgams replaced 2 months to 5 years previously the increase was 43-fold.

A physician in Massachusetts has utilized DMPS under a research protocol. Some of his results were: 62 year old woman pre-challenge 24 hr mercury was 5 ppb. Post DMPS 24 hr urine was 900 ppb; 34 year old woman, pre-challenge 4 ppb and post-challenge 500 ppb; 43 year old male, pre-challenge 6 ppb and post-challenge was 75 ppb.

A paper presented at the May 31-June 3, 1989 meeting of the European Association of Poison Control Centers by Schiele et al. used oral DMPS in their study. 300 mg DMPS were given orally in a single dose to 30 individuals without occupational exposure to mercury and to some workers with past exposure to metallic mercury. The basal mercury urine (HgU) was below the upper normal-limit of 5 ug/24 hr. After DMPS HgU of those without prior mercury exposure increased 5-10 fold of the basal values in most subjects, but in some there were up to 20 fold increase with a maximum of 80 ug/24 hr. The increases seemed to depend mainly on the actual number of amalgam-fillings. Some of the workers with previous occupational exposure had increases of 20 fold with the maximum being 750 ug/24 hr.

With the IV use of DMPS it appears that blood levels peak within 30 minutes which appears to be the basis for the urine sample at that time. The advantage of taking the 30 minute post DMPS sample is the simplification for the patient. It also appears that this does not effect the challenge results when compared to the 24 hour collection.

Molin and colleagues did a study evaluating the mercury mobilization capabilities of a single 300 mg dose of DMPS given orally. The subjects were 10 workers with moderate occupational exposure to elemental mercury vapour, 8 dentists with slight exposure, 18 matched controls, and 5 subjects without amalgam
fillings. In the workers, DMPS increased the 24-hour urinary mercury excretion by a factor of 10; in the dentists 5.9; in the controls, 5.3; and in the amalgam-free subjects, 3.8. Of the mercury excreted during the 24 hours, 59% appeared during the first 6 hours. Close, although non-linear, associations were found between mobilized mercury and the pre-mobilization mercury levels in plasma and urine, but not with the duration of occupational exposure or the rough estimate of the integrated function of blood levels vs time. The authors felt that the data indicated that mercury mobilized after a single DMPS dose in close connection with exposure is mainly an index of recent exposure and is not significantly affected by slow body pools or long-term exposure. (It is obvious from the conclusions of this paper that there exists a serious disagreement with regard to exactly what chelation mobilized mercury actually reflects. One thing of extreme importance, regardless of where the mercury is coming from, depletion of mercury body-burden universally caused an improvement in previously existing symptomatology.

Goyer in Casarett and Doull's Toxicology, provides the following information on DMPS: "DMPS is effective in removal of both inorganic and methyl mercury, probably because it is not lipophilic like BAL and does not penetrate tissues but removes extracellular metal (Gabard 1976). The important point is that it does not increase the concentration of metal in the brain and reduces organ concentration of metal including the kidney. It may also be effective in removal of copper, nickel, and cadmium immediately after exposure but not from tissue stores."

DMSA has been used extensively by many patients who have had their amalgams replaced to detoxify and clear symptomatology. The dosage of DMSA recommended by McNeil and discussed in most research reports on the use of DMSA is 30 mg/kg/day administered orally every four to six hours (10 mg/kg three times a day). If taken in this manner a 24 hour urine should be collected for evaluation of mercury content. The procedure would be to have the patient take a spontaneous urine sample of 50 ml as the base-line urine mercury. Then start the DMSA and collect all urine excreted over the next 24 hours. DMSA peaks in the blood in approximately two-three hours.

A recent paper by Roels et al. outlined the results of a DMSA challenge to male subjects occupationally exposed to mercury vapor (alkaline battery and chloralkali plants). The participants in the study took a two gram dose of DMSA and through urine collection in different containers for different time periods, the authors were able to determine that 50-70% of the DMSA stimulated mercury excretion occurred in the first 8 hours. The DMSA study was performed on three groups of male workers: (1) a control group of 16 workers occupied in a chemical plant (mean age 37.6; range 23-49) and who had never been engaged in processes with compounds containing mercury; (2) a group of 16 workers currently exposed to mercury vapor in a chloralkali plant (mean age 34.9; range 21-58) who were given DMSA on three different occasions; (3) a group of 11 workers previously exposed to mercury vapor in an alkaline battery factory (mean age 33; range 27-41) and who, at the time of the DMSA study, had been removed from exposure to mercury vapor for at least two years. Each study group showed significantly higher urine mercury (HgU) after DMSA administration than before. Group 1 HgU before DMSA mean 4.1, after DMSA HgU mean was 8.3. Group 2 HgU before DMSA mean 184, after DMSA HgU mean was 793. Group 3 HgU mean before DMSA was 10.4 and after DMSA the mean HgU was 31.1. The authors conclude from their study that DMSA significantly stimulates the urinary excretion of mercury. However, based on the results of various animal studies the authors consider it likely that DMSA chiefly removes mercury from the kidney where they indicate 80% of the body burden in humans is stored.

According to Apostian, DMSA is distributed in an extracellular manner and indicates that when DMSA is given orally to humans, it forms mixed disulfides with L-cysteine. In addition, L-cysteine after DMSA administration forms this mixed disulfide in preference to forming L-cystine. He also indicates that DMSA in blood is found in disulfide linkage with plasma protein. No DMSA in any form is found in the red blood cells. Based on the information of Apostain, it would appear that concurrent supplementation of NAC when taking DMSA would enhance the effectiveness of DMSA by augmenting available Cysteine and GSH. Another aspect that should be considered is the fact that there is evidence indicating that DMSA does cause some depletion of zinc. Existing protocols have suggested that zinc be supplemented after the complete course of DMSA has been administered. However, a recent paper by Flora and Tandon investigated the ability of zinc to enhance the efficacy of chelating drugs used in lead intoxication and to also reduce the resulting zinc imbalance. Simultaneous zinc supplementation increased lead elimination by Ca disodium EDTA and DMSA. The body zinc status was also maintained as reflected by urinary, blood and tissue levels of zinc. As lead and mercury react similarly in many instances, it would seem reasonable
to assume that supplementation with zinc during DMSA administration for mercury detoxification would also increase mercury excretion and maintain zinc balance.

Mercury in the brain is primarily attributable to mercury vapor. A great array of neurological and psychological signs and symptoms result from the effect of mercury in the brain. One of the most common questions we are constantly confronted with relates to how do you detoxify the brain? How do you reduce the mercury content of the brain? Unfortunately, there is no clear answer to the question. Some animal studies with DMPS showed a diminution of brain mercury content. Conversely, other studies could not reproduce this reduction. Dr. Daunderer maintains that DMPS brings mercury out of the brain for excretion. Except for autopsy studies the only data that can presently confirm the ability of any chelating agent to remove mercury from the brain has to be that derived from animal studies. Based on the animal studies and the clinical observations of the effectiveness of DMPS in reducing symptomatology, it would appear that DMPS does in fact have some effect on brain mercury levels.

The applicability of DMPS based on human data (case reports) is summed up in a monograph by Jekat and Kemper as follows: Acute poisoning by inorganic mercury, organic mercury, metal mercury, mercury vapour, chromium (VI), antimony. Chronic poisonings by inorganic mercury, organic mercury, metal mercury, mercury vapor, and lead. On the basis of animal studies DMPS is indicated in acute and chronic poisonings by arsenic, cobalt, copper, and gold.

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FORUM

International Academy of Oral Medicine & Toxicology, Spring Scientific Session and Board Meeting
Date: 16-17 May, 1991.
City: Arlington, Virginia.
Site: Key Bridge Marriott Hotel. 1401 Lee Highway. Arlington, VA 22209. (703) 524-6400.
Room Rates: $75.00 per night (Specify IAOMT).
Saturday Program:
Murray J. Viny, D.M.D. will present the latest research related to dental mercury, published and in-progress at the University of Calgary Medical School. Paul Rubin, D.D.S. will address environmental aspects of mercury effluent from dental offices. Bill Marcus, Ph.D., Chief Toxicologist of The Office of Drinking Water, U.S. Environmental Protection Agency, will discuss the carcinogenicity of fluoride. In addition, efforts are underway to have speakers from the FDA and EPA to address aspects of the dental mercury issue.