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MORE NEW RESEARCH - AMALGAM MERCURY HARMS DENTAL PERSONNEL!

In the last issue of the Bio-Probe Newsletter [Vol. 11(1), Jan 1995], a new study demonstrating neurobehavioral damage in dental personnel caused by exposure to amalgam mercury was reported [Gonzalez-Ramirez, D. et al. Sodium 2,3-dimercaptopropane-1-sulfonate challenge test for mercury in humans: II. Urinary mercury, porphyrins and neurobehavioral changes in dental workers in Monterrey, Mexico. J Pharmacol Exp Therap. 272:264-274, 1995]. The abstract that follows reflects another study, that has just been published, showing these adverse neurobehavioral effects in United States dentists[this study was supported by the American Dental Association and the National Institute of Dental Research].

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Echeverria, D; Heyer, NJ; Martin, MD; Naleway, CA; Woods, JS; Bittner, AC, Jr.

Behavioral Effects of Low-Level Exposure to Hg^0 Among Dentists.

Neurotoxicology and Teratology. 17(2):161-168, 1995.

ABSTRACT:

Exposure thresholds for health effects associated with elemental mercury (Hg^0) exposure were examined by comparing behavioral test scores of 19 exposed (mean urinary Hg =36 ug/l) with those of 20 unexposed dentists. Thirty-six ug Hg/l is 7 times greater than the 5 ug Hg/l mean level measured in a national sample of dentists. To improve the distinction between recent and cumulative effects, the study also evaluated porphyrin concentrations in urine, which are correlated with renal Hg content (a measure of cumulative body burden).

Subjects provided an on-site spot urine sample, were administered a 1-hr assessment consisting of a consent form, the Profile of Mood Scales, a symptom and medical questionnaire, and 6 behavioral tests: digit-span, symbol-digit substitution, simple reaction time, the ability to switch between tasks, vocabulary, and the One Hole Test. Multivariate regression techniques were used to evaluate dose-effects controlling for the effects of age, race, gender and alcohol consumption. A dose-effect was considered statistically significant below a p value of 0.05.

Significant urinary Hg dose-effects were found for poor mental concentration, emotional lability, somatosensory irritation, and mood scores. Individual tests evaluating cognitive and motor function changed in the expected directions but were not significantly associated with urinary Hg. However, the pooled sum of rank scores for combinations of tests within domains were significantly associated with urinary Hg, providing evidence of subtle preclinical changes in behavior associated with Hg exposure.

Coproporphyrin, one of three urinary porphyrins altered by mercury exposure, was significantly associated with deficits in digit span and simple reaction time. The porphyrin pooled sums of rank scores were as sensitive as the urinary Hg analyses within the cognitive and motor domains but were less sensitive for the overall battery of tests.

The reported effects were detected among dentists with a mean urinary Hg level of 36 ug/l, which lies between the proposed biologic thresholds of 25 and 50 ug Hg/creatinine, suggesting the need for a more comprehensive study to determine the threshold of adverse biologic effects.

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MERCURY A HEALTH HAZARD TO DENTAL PERSONNEL - YES OR NO?

These two recently published studies (D. Gonzalez-Ramirez, et al., 1995 and D. Echeverria, et al., 1995) present a singular dilemma to the dental profession, which has steadfastly claimed that patients could not possibly be harmed by amalgam mercury since dental personnel suffer no adverse mercury effects.

A number of previous studies had already presented evidence of neurologic damage in dental personnel. Shapiro and associates [Shapiro, IM; et al. Neurophysiological and neuropsychological function in mercury-exposed dentists. Lancet, 1(8282):1147-1150, 1982.] and Uzzell and associates [Uzzell, BP; et al. Chronic low-level mercury exposure and neuropsychological functioning. J Clin Exp Neuropsych. 8(5): 581-593, 1986.] had already demonstrated reduced nerve conduction velocities in dentists exposed to mercury, as determined by X-ray fluorescence of mercury in the wrist and head.

In 1992, Ngim and associates evaluated 98 dentists and 54 controls who were not dentists [Ngim, CH; et al. Chronic neurobehavioral effects of elemental mercury in dentists. Br J Ind Med. 49(11):782-790, 1992]. Dentists exposed to air concentrations of 16.6 ug Hg/m^3 were found to have poorer performance in mood, motor speed (finger tapping), visual scanning (trail making), visuomotor coordination and concentration (symbol-digit), digit span, logical memory, and visual reproduction. The dentists also had a higher aggression score than the controls.

It is interesting to note that the Echeverria team found a significant effect in dentists for behavioral parameters, including poor mental concentration, emotional lability, somatosensory irritation, and total mood scores. It is also notable that the Echeverria group stated that "urinary Hg levels provide a more reliable estimate of recent exposure/dose" than do air mercury concentrations (used in the Ngim, et al. study).

As far back as the 1960's, mercury toxicology experts had determined that levels of mercury in urine (and blood) were not valid indicators of body burden or toxic effects of mercury. This has been repeatedly confirmed through the years [NIOSH-1973, USEPA-1984, WHO-1991]. It has even been formally acknowledged by the American Dental Association and the National Institute of Dental Research [NIDR/ADA. Workshop: Biocompatibility of metals in dentistry. JADA, 109:469-471, 1984].

The Gonzalez-Ramirez, et al. study investigated the correlation of neurobehavioral effects to urine mercury levels before and after administration of DMPS, a mercury chelating agent. They found that the adverse neurobehavioral effects of complex attention, a psychomotor task, mood and symptoms correlated to urine mercury levels after administration of DMPS, but not before. The findings in the Echeverria study might have been even more dramatic had the DMPS-challenge technique been utilized.

Consideration of the previous knowledge of the urine mercury levels might have been interesting in yet another context. It is quite possible that the control group of dentists may have had considerably higher body burdens of mercury than the levels revealed by simple urine measurement, without the benefit of DMPS-challenge. If so, then the utilization of a control group in the Echeverria study that did not include dentists, as was performed in the Ngim study, may have revealed even more dramatic effects in dentists.

One thing is certain, the Gonzalez-Ramirez and the Echeverria studies present data that demonstrate adverse neurobehavioral effects on dental personnel, a development in the amalgam controversy that is certainly uncomfortable for the dental profession.

There are other published studies that have demonstrated non-neurological adverse effects to mercury in dental personnel. These studies primarily addressed adverse reproductive effects and have been well publicized in a number of review documents.

Why then, does the dental profession continue to declare that dental personnel suffer no adverse effects from dental mercury and what defense is offered to counter the extensive documentation to the contrary? The position of organized dentistry has been based on two factors; the American Dental Association's (ADA) Morbidity/Mortality reports, published in the ADA Journal (JADA), and the 1985 study by Brodsky and associates, also published in JADA [Brodsky JG, et al. Occupational exposure to