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*The International Academy of Oral Medicine and Toxicology (IAOMT)*

*Domestic Policy Subcommittee*  
*Oversight and Government Reform Committee*  
*Tuesday, July 8, 2008*  
*2154 Rayburn HOB*  
*2:00 p.m.*

*"Assessing State and Local Regulations to Reduce Dental  
Mercury Emissions"*

For more than a decade the I.A.O.M.T. has been concerned with the environmental impact of dental amalgam mercury because of its extreme toxicity. Environmental scientists label it a "Persistent Bioaccumulative Toxin" (PBT), and as such it is important to reduce it from the environment by eliminating its source, wherever possible.

Current estimates indicate that the dental profession uses about 40 tons of mercury per year in the fabrication of mercury ( "silver" or amalgam ) dental fillings. These fillings are a mixture of 50% elemental mercury and 50% powdered alloy ( silver, copper , tin & zinc). Even after combined, placed and hardened into tooth fillings, these mixtures emit mercury vapor continuously for decades and are the major contributor of mercury to human body burden. EPA requires that the excess unused newly mixed "scrap" amalgam be handled as a toxic waste disposal hazard, just as it does the amalgam particles resulting removing old mercury fillings.

There are four major routes by which dental mercury may come into contact with the environment:

1. DENTAL CLINIC WASTEWATER [6.5 tons per year]

Dental offices have been shown by many studies to be significant contributors of mercury to the environment. The process of either placing or removing mercury fillings generates a slurry of mercury-rich amalgam waste which is vacuumed into the chairside suction unit. Most of it passes right through the chairside screens or traps, which capture only the larger particles. Facing no other obstacles, this slurry passes directly into the dental office wastewater and out to the environment. According to a recent study commissioned by the American Dental Association [1] **6.5 tons of mercury are released to waste water treatment plants annually by 133,059 dentists in the United States.** This equates to approximately 230 milligrams of mercury per dentist per workday and **represents more than 50% of total mercury entering wastewater treatment facilities.**

A report released in 2002 by the National Association of Clean Water Agencies (NACWA) [2] indicated that **dental clinics are the single largest source of mercury in our nation's wastewater.**

Levels of mercury measured in dental office wastewater far exceed local limits for discharge by "small quantity generators" of hazardous waste. Because wastewater treatment facilities are not designed to process or handle heavy metals, most of the mercury settles out into the sludge, or "biosolids" as wastewater is treated. These biosolids are usually incinerated or used as fertilizer, the mercury content going directly into the environment.

Amalgam separators exist which capture 95% to 99% of the mercury from the wastewater before leaving the dental office. Studies in the United States, Canada and Europe have shown that when such devices are installed in dental offices community-wide there is a significant drop in mercury entering the wastewater treatment plants. Such studies have led to recommendations or regulations in several European countries that all dental offices install mercury separating equipment.

The I.A.O.M.T., recognizing the scientific validity of the statements above, and recognizing that the dental profession has the opportunity and obligation to eliminate or reduce this environmental hazard, urges all general dentists to install effective mercury separator equipment. We support efforts by municipal agencies to make this a regulatory requirement, since efforts toward voluntary compliance by dental associations have failed. We have for years urged all our IAOMT Academy members to take a leadership role and install such equipment without delay.

#### 2. AIR DISCHARGE [1 ton per year]

Mercury vapor has also been measured [3] in air vented from the central vacuum systems to the outside of the dental office. An estimated one ton of mercury vapor per year finds its way into the atmosphere through this route in the US. **There is currently no known technology to prevent this form of pollution.**

#### 3. AMALGAM IN HUMAN CADAVERS [3 tons per year]

If mercury fillings are not removed from a patient's mouth and disposed of ecologically before death, the mercury contained in them will eventually find its way into the environment. It may contaminate the earth and ground water if the person is buried and it will contaminate the atmosphere if the body is cremated. A mercury flow worksheet developed for EPA [4] estimated that in 2005 over 3 tons ( 6613 pounds ) of mercury were released to the environment in the U.S. from crematoria.

#### 4. HUMAN WASTE [5.7 tons per year]

Published studies [5 & 6] have concluded that each and every amalgam bearer excretes an average of 100 micrograms of mercury per day in his/her urine and feces. That

amounts to 8.5 tons of mercury entering the environment annually in the US. Assuming 2/3 of this mercury is derived from dental fillings [7] then 5.7 tons of dental mercury annually are flushed directly into our wastewater. **There is no known technology to prevent this form of pollution nor are there any regulations over this domestic waste.** 100% of this mercury ends up in the environment.

The above 4 routes of mercury entering the environment combine for **at least 16 tons of mercury annually from dental fillings. Less than half of that total- the 6.5 tons from dental office wastewater - can be captured by Best Management Practices and Amalgam Separators in dental offices- and then only if mandatory.** Of the total mercury currently used in all products in the U.S., our EPA estimates that mercury fillings comprise 55% of that total repository- or over **1,000 tons of mercury implanted in the teeth of Americans nationwide!** Assuming a 10-15 year average durability of those mercury fillings in patients' mouths, this enormous reservoir of mercury will be continuously flushed into the environment for decades to come.

## Amalgam Separators and Dental Amalgam Best Management Practices

Sewer utilities may be required to reduce the levels of heavy metals in their bio-solids, the material that is removed from the sewer as solids. These solids are sent to farmlands as a soil nutrient enhancer, are deposited in landfills, or they are incinerated. If the biosolids contain too much mercury the farmers will not accept them and the utility company may have to pay to dispose of them. If it is incinerated it liberates mercury in its most toxic form - elemental mercury vapor. Therefore these utilities, in order to operate economically and meet their own discharge limits, are looking to place the responsibility on the largest contributors, the dentists.

Organized dentistry has responded by establishing 'Best Management Practices' or (BMP's) for managing hazardous waste. Historically these practices have had disappointing participation by dentists when purely voluntary . For example, in the Seattle/King County area of Washington State, after five years of promises from the local dental society and efforts from King County Hazardous Waste, less 2.5% of offices ( 25 out of 1000 ) had complied [8]. After regulations were passed, it's now close to 100%. *Currently* 11 states and various municipalities have replaced their voluntary programs with mandatory regulations (which include amalgam separators) resulting in nearly 100% compliance. In those states and municipalities where amalgam separators are required there has been a 50% reduction in the amounts of total mercury -from all sources- entering the wastewater treatment plants.

It should also be noted that many dental clinics are now using a different type of vacuum pump system than was used in the past. The new more common type ("dry", or "turbine") uses no extra water and does not have a vacuum filter at the pump. Therefore when clinics do not install an amalgam separator, yet switch to a turbine vacuum pump, there will actually be an increase in the amount of amalgam and mercury discharged to the sewer.

When considering whether amalgam separator installation should be voluntary or mandatory, program managers should consider information published in the Fall edition of the ADA Professional Product Review (2007, 4:1). There it was reported that a "survey of [ADA Clinical Evaluator Panel] members shows that relatively few panel members own an amalgam separator or plan to purchase one" [9]. Various manufacturers produce amalgam separators which remove 95%-99% of the mercury from dental office wastewater. Their costs - ranging from a few hundred to a few thousand dollars to purchase - are reasonable , especially in comparison with the costs for most other dental equipment.

The biggest challenge for many dentists and regulators regarding separators will be understanding, testing and certification of separator models , and who is properly accredited to perform these functions. There are ISO guides and standards [10] to help insure that these functions are performed well and fairly, but they have to be required by the regulators to be implemented. Given the complexities with ISO testing, certification and accreditation a centralized (possibly set up nationally) separator model review is necessary to avoid the difficult and duplicative effort of each and every regulatory jurisdiction in the US being faced with evaluating separators.

## CONCLUSION

I have been practicing dentistry for 35 years - the last 26 without using mercury fillings. I stopped using them when I discovered that the mercury was not 'locked in' the amalgam, as I'd been told in dental school. I purchased an amalgam separator approximately 15 years ago when I discovered that this technology was commercially available. As a health professional, I feel ethically bound to err on the side of caution in matters of health for my patients, my staff, my dental colleagues and my environment. To place a mixture containing 50% mercury - the most neurotoxic element known on earth - within inches of a child's brainstem and assume it to be harmless is **at best** counterintuitive. To release this same pollutant into the environment is irresponsible when simple and available technology exists to reduce that release by over 95% . **But that still leaves more than half of the dental derived mercury that is dumped into the water supply that remains beyond our ability to capture.**

We all remember

the character the Mad Hatter from Alice in Wonderland. This character was based on the historical observation of people who made felt hats in Danbury Connecticut in the 1800's. The workers ( hatters ) used mercury nitrate to shape the hats. These hatters frequently suffered from 'shakes', hallucinations and dementia ('madness') due to that mercury exposure . The hat makers stopped using mercury in 1943! **It is high time for dentistry to stop the madness !** Until dentistry joins the rest of the 21st century health care profession and abandons its use of mercury there will be no effective environmental solution to the dental mercury crisis.

Respectfully submitted,

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Past President, IAOMT

[1] Vandeven, J. and McGinnis, S.L. , An Assessment of Mercury in the Form of Amalgam in Dental Wastewater in the United States , *Water, Air and Soil Pollution*, 2005, 164, 349-366

[2] Association of Metropolitan Sewerage Agencies (now the National Association of Clean Water Agencies) . Mercury Source Control & Pollution Prevention Program Evaluation: Final Report. March 2002 (Amended July 2002)

[3] Rubin, P.G. and Yu, Ming-Ho "Mercury Vapor in Amalgam Waste Discharged from Dental Office Vacuum Units" *Arch Env Health*, 51:4 335-337 , 1996

[4] Cain, A. Mercury Flow Workbook, US EPA, Region 5, Excel Spreadsheet, January 2006

[5] Skare I. & Engqvist A. Amalgam Restorations - An Important Source of Human Exposure of Mercury and Silver. *Lakartidningen* 15: 1299-1301, 1992

[6] Skare I., Engqvist A.: NIOH, *Arch. Env. Health*, 1994 Sep-Oct; 49(5): 384-94

[7] Aposhian, H.V. et al, Urinary Mercury After Administration of 2,3-dimercaptopropane-1-sulfonic acid: Correlation with Amalgam Score *FASEB Journal*, Vol. 6, pp2472-2476, April 1992

[8]"Management of hazardous dental wastes in King County, 1991-2000" by Gail Savina, *Hazardous Waste Program* Oct 5, 2000, page 14. As of March, 2000, the cumulative # of units installed over a target dental population of 1000 offices was 25 units.

[9] The ADA Clinical Evaluator Panel is a volunteer group of ADA members who contribute feedback for the clinical input segments of the ADA Professional Product Review program. More on the ADA Clinical Evaluator Panel can be found at <http://www.ada.org/prof/resources/pubs/ppr/ace.asp>

10] For more information, see [www.ansi.org](http://www.ansi.org) the website for the American National Standards Institute. Look under "Accreditation Services", and then click on "Product Certification Accreditation".

A direct link

is:[http://www.ansi.org/conformity\\_assessment/accreditation\\_programs/accreditation\\_certification\\_programs.aspx?menuid=4](http://www.ansi.org/conformity_assessment/accreditation_programs/accreditation_certification_programs.aspx?menuid=4)