

# Navy Dentistry Goes Green

## Managing Mercury in Dental Treatment Facilities

**SILVER AMALGAM HAS** been used as a dental filling material for over 150 years. Amalgam has enabled dentists to save countless teeth and improve the health and quality of human life. Although dental amalgam contains mercury, repeated studies have shown that amalgam is safe and stable in the human body. However, when amalgam fillings are removed or replaced, small amounts of mercury are released into the environment.

Mercury is a potent neurotoxin that persists in the environment and can exist in several forms including elemental, inorganic and organic. It is the organic form (particularly methyl mercury) that causes the most concern. Mercury released into lakes, rivers and streams can be converted to organic mercury by the action of microorganisms in sediments. The newly formed organic mercury can enter the food chain reaching elevated concentrations in aquatic organisms, aquatic plants, fish and animals. Currently, 45 states have issued fish consumption advisories due to elevated mercury levels.

The United States Environmental Protection Agency (U.S. EPA) has identified mercury as one of 31 priority chemicals to be eliminated or substantially reduced through the National Waste Minimization Program. Virtually all local publically owned water treatment facilities have strict mercury limits outlined in their wastewater discharge permits. Many host countries have similar discharge limits.

While the bulk of human-caused mercury emissions come from combustion sources (mostly from the burning of coal



Contents of an amalgam capsule shown prior to mixing.

*Medical Photography Department,  
Naval Health Clinic, Great Lakes, IL*

to produce electricity), regulators have started looking at the release of mercury from dental offices. To help manage the amount of mercury in the dental-unit waste stream, the Naval Institute for Dental and Biomedical Research (NIDBR) has joined with the Naval Facilities Engineering Command (NAVFAC)—Atlantic Division.

### Dental Amalgam Waste Issues

Mercury released from dental offices can affect several different environmental media. The placement and removal of amalgam fillings can contaminate wastewater with mercury. The process of removing existing amalgam

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fillings is the biggest concern due to the production of very fine particulate. Fine particles are more difficult to remove from wastewater. Dissolved mercury can also be found in wastewater in the form of dissolved elemental and ionic species. Moreover, the removal of amalgam fillings can release mercury vapor directly into the atmosphere.

The procedure used to mix amalgam filling material in the dental office can generate mercury containing solid waste. This waste needs to be managed in an environmentally suitable way. The plastic capsules used to mix the amalgam powder with liquid mercury can contain substantial amounts of residual mercury. Used capsules need to be collected for proper disposal or recycling.

Disposing of used capsules in office waste and ordinary trash is not appropriate since in some locations this waste is incinerated and can release mercury vapor to the atmosphere. For the same reason, extracted teeth with amalgam fillings should not be disposed of in hazardous waste (red) bags: potentially infectious medical wastes are routinely autoclaved (sterilized) or incinerated.

To help Navy dental clinics manage mercury-containing amalgam waste, NIDBR has developed a web site that contains practical information and helpful resources. The web site was produced by NIDBR with funding from the U.S. EPA. The web site contains a link to a video presentation of dental amalgam waste best management practices produced by NIDBR and the American Dental Association (ADA). This video was distributed to all Navy dental treatment facilities in the form of a DVD. Additionally, NAVFAC

and NIDBR have collaborated with the Navy and Marine Corps Public Health Center to produce an amalgam waste fact sheet. (See our resources sidebar for information on accessing the web site and the fact sheet.)

### Amalgam Separators

A key component of the NIDBR and NAVFAC pollution prevention program is the installation of amalgam separators in Navy dental treatment facilities. These devices separate mercury-containing waste from the wastewater that leaves

dental treatment facilities. Authority to install these systems comes from the Bureau of Medicine and Surgery (Bureau of Medicine and Surgery (BUMED) instruction 6260.30a).



Amalgam waste on a vacuum line valve from a dental clinic. Medical Photography Department, Naval Health Clinic, Great Lakes, IL

One type of central amalgam separator being installed in Navy dental treatment facilities. SolmeteX, Inc. (used with permission)



## A key component of the NIDBR and NAVFAC pollution prevention program is the installation of amalgam separators in Navy dental treatment facilities.

A growing number of state and municipal agencies require the installation of amalgam separators in all dental treatment facilities that place and/or remove amalgam restorations. Currently, nine states and several municipalities require separators. In October 2007, the ADA included amalgam separators in their best management practices, facilitating the trend of separator installations.

NIDBR and NAVFAC are installing two broad types of amalgam separating equipment. Advanced central

separators are located in utility rooms near the dental vacuum equipment. These central systems treat all the wastewater in this central location and remove mercury-containing amalgam particulate as well as dissolved mercury species. A second type of separator being installed is a chairside filtration system: this system is attached to the chair and removes particulate mercury (down to 0.5 micrometers in diameter). The chairside system has the advantage of protecting downstream plumbing from contam-

ination by mercury-containing waste. NIDBR studies have shown that mercury can build up in vacuum lines in substantial concentrations. The chairside systems were tested and found to be extremely efficient, removing 99.6 percent of the particulate-based mercury in the wastewater. In some locations both chairside and advanced central separators are installed. In these locations, the chairside systems protect the downstream plumbing and prolong the service life of central systems.

### NIDBR and NAVFAC Receive Award from the US EPA

**IN RECOGNITION OF** their work on managing mercury releases from Navy dental treatment facilities, NIDBR and NAVFAC received a National Partnership for Environmental Priorities (NPEP) award from the U.S. EPA in October 2008. NIDBR joined NPEP in December 2003 with a goal of installing amalgam separation equipment in all continental U.S. Navy dental treatment facilities. The NPEP Achievement Award was presented to NIDBR and NAVFAC upon completion of this goal. NIDBR and NAVFAC are currently in the process of expanding the installation program to overseas dental treatment facilities.

Susan Bodine, assistant administrator, U.S. EPA (far left) and Matt Hale, director of the U.S. EPA Office of Solid Waste (far right) give a NPEP award to Mark Stone, NIDBR, and Khoi Nguyen, NAVFAC, for their work in removing mercury contaminated waste from Navy dental facilities.

*U.S. EPA*



## Resources

- **Best Management Practices for Amalgam Waste (ADA, October 2007)**

Available at [http://www.ada.org/prof/resources/topics/topics\\_amalgamwaste.pdf](http://www.ada.org/prof/resources/topics/topics_amalgamwaste.pdf)

- **Dental Mercury Web Site**

Available at <http://www.dentalmercury.com>  
Site includes NIDBR/ADA Dental Amalgam Waste Best Management Practices video. Video also available on DVD/CD-ROM from: The Naval Institute for Dental and Biomedical Research, 310A B Street, Building 1-H, Great Lakes, IL 60088.

- **BUMED Instruction 6260.30A**

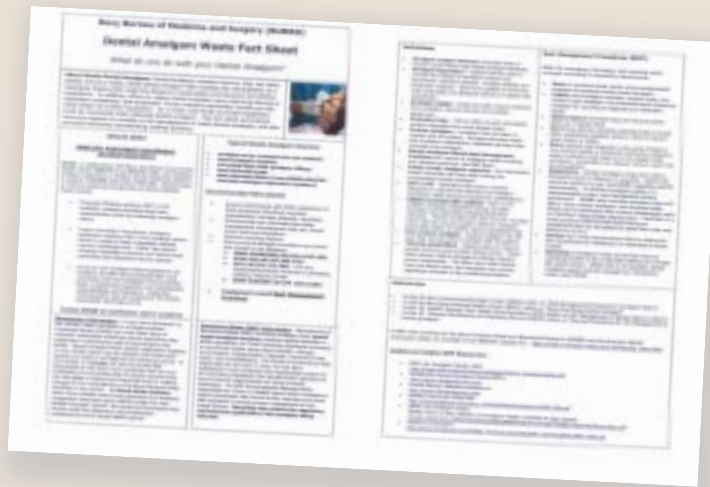
Available at <http://navymedicine.med.navy.mil/Files/Media/directives/6260.30A.pdf>

- **Defense Reutilization and Marketing Office Memo on the Collection of Amalgam Waste**

Available at <http://www.nmcphe.med.navy.mil/downloads/ep/EQ/DRMO%20memo%20on%20amalgam%20recycling.pdf>

- **Dental Amalgam Waste Fact Sheet**

Available at <http://www.nmcphe.med.navy.mil/Downloads/ep/EQ/Dental%20Amalgam%20Waste%20Fact%20Sheet%20PK.pdf>



NIDBR designed chairside amalgam separator. This system is being installed in Navy dental treatment centers worldwide.

*Medical Photography Department, Naval Health Clinic, Great Lakes, IL*

All the separation systems installed in Navy facilities have passed the International Organization for Standardization standard 11143 amalgam separator protocol. After several years of research and development, a disposable chairside system is now becoming available and offers the promise of easier maintenance. [↓](#)

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