

Dental Mercury Reduction Review and Regulatory Update

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Introduction

Mercury emissions are decreasing in Minnesota waters thanks in part to the stewardship of the Minnesota Dental Association (MDA) in its efforts supporting the collection and recycling of dental amalgam solids. This article is a brief history of that work and that commitment dating back to 1990.

Basis for Action, and Action Initiated

Natural mercury emissions contribute approximately 25% to 33% of all airborne mercury transport.¹ Energy production, primarily from coal-fired plants, accounts for more than 50% of domestic man-made mercury airborne emissions per the EPA.² The balance of domestic mercury airborne emissions primarily occurs from waste management incinerators — i.e., municipal solid waste combustion, as well as combustion emissions from landfills, medical waste incineration, and other sources.

Amalgam is a heavy metal alloy upon which gravity works naturally. In a “Physico-chemical Properties of Dental Wastewater” study, Cailas et al³ estimated that 90% of the waste particles generated were larger than 10 microns and hence could be captured in common filter traps. In another wastewater study, Drummond et al⁴ estimated that approximately 75% of the amalgam waste solid is captured in chairside traps, and that

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of the other 25%, all but one percent will settle within 24 hours. Thus gravity sedimentation works well for small, dense, heavy-metal particulate amalgam waste.

Dental amalgam is highly insoluble in water and generally insoluble in sewer wastewater as well.⁵ Amalgam waste will not release mercury unless the waste is subject to extreme conditions such as high heat incineration or unusual chemical conditions.

The Regulatory Update Chart for mercury reduction relates to the main Saint Paul Metropolitan Council Environmental Sciences (MCES) wastewater treatment plant. This 2003–2013 MCES chart for the Metropolitan area tracks mercury

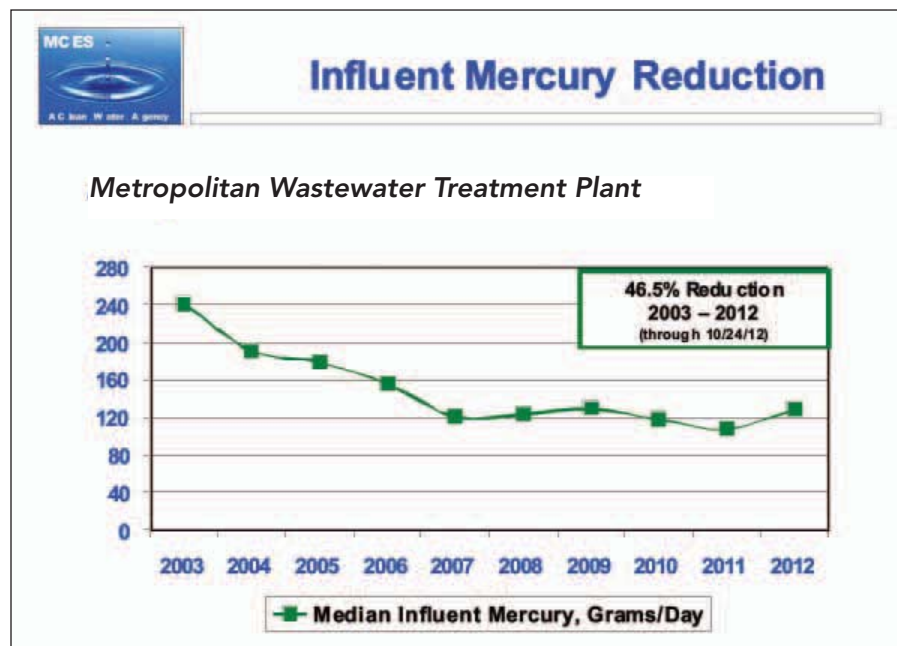
emissions from the main wastewater sanitary plant, noting that there has been a 46.5% reduction in the median mercury emitted. The Median Influent Mercury has dropped from 240 grams per day to about 120 grams a day. Thus the mercury reduction of 120 grams per day calculates to an annual reduction of 97 pounds, or nearly 100 pounds.⁶ While a considerable portion of this decrease is attributed to the installation of dental amalgam separators, reduction of other industrial and household mercury sources should be noted as well.

The Northeastern District Dental Society and Western Lake Superior Sanitary District Co-operative Project

Back in the early 1990s, the Western Lake Superior Sanitary District

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Practice Management

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Co-operative Project (WLSSD) and MCES publicly owned wastewater incinerator and treatment plants were under regulatory pressure to reduce mercury emissions. The WLSSD of Duluth received particular regulatory attention due to the fact that Lake Superior is the headwaters of the Great Lakes, just as Itasca is the headwater of the Mississippi River.

With this as its impetus, in 1992 WLSSD invited representatives of the Northeastern District Dental Society to find solutions to environmental dental waste concerns in a collaborative, non-threatening fashion. Dr. Jim Westman of Duluth, co-representative for NEDDS, and Mr. Tim Tuominen of the WLSSD met to discuss issues regarding dental amalgam in wastewater. Through their collaboration, Dr. Westman authored *Recycling Amalgam and Keeping it Simple*⁷, which appeared in 1997. This mutual co-operation also included table clinics and in-office instruction.

Dr. Westman and Mr. Tuominen subsequently authored an oft-cited seminal work, "Amalgam Waste Management – Issues and Answers", published in 2000 in *Northwest Dentistry* and elsewhere. Their published pieces served as local and state models around the country.

Later, the American Dental Association would ask Dr. Westman to join them as an authority on amalgam waste for the ADA Scientific Affairs Committee.

The WLSSD and Northeastern District Dental Society later encouraged voluntary use of amalgam separator filters that captured 99%

of amalgam particles as per the ISO 11143 Standard⁸ and applied for state grants to install such apparatus. Co-operation continued. Grants were awarded, in part by the MPCA, and in December 2003 51 of 53 dental offices in the WLSSD area had amalgam separators installed. The two dental practices without separators were pursued to encourage them to volunteer for the program. The January 30, 2004 WLSSD report noted mercury reductions, thanks in part to amalgam separators.⁷ While considerable mercury reduction of

WLSSD numbers can be attributed to dental amalgam curtailment efforts, other commercial and household mercury abatement efforts have contributed to mercury emission decreases as well.

The MDA/MCES Partnership

The Twin Cities membership component of the Minnesota Dental Association recognized a stewardship to reduce amalgam solids in

wastewater and to reduce dental waste in general.

In an effort to analyze the load of mercury from dental amalgams going into the sanitary sewer system, the Minnesota Dental Association (MDA) and the Metropolitan Council Environmental Sciences (MCES) partnered to study the effectiveness of amalgam separators in wastewater in 1998.⁸ Thus the partnership between the MDA and MCES was established.

The two 1998 MCES studies concluded amalgam separators were effective in removing amalgam solids from dental wastewater. Solids not captured by amalgam separators

ultimately were incinerated at the MCES treatment plant. This resulted in fewer dental amalgam solids reaching the sanitary sewer and thus a smaller release of mercury into the environment. Further, a reduction in mercury alloys into the treatment plants or landfills meant less mercury to collect in our lakes and rivers.

In 1999, the MDA House of Delegates established the Ad Hoc Amalgam Waste Committee. In 2001, the name changed to the Environmental Health and Personal Safety Committee, which it remains today. Drs. Jim Westman and Daniel Shaw were the original co-chairs of this entity.

In 2001, a task force for implementation of amalgam separators would extend from the MDA and MCES to include related agencies and companies: waste recyclers, the Minnesota Pollution Control Agency (MPCA), the Minnesota Technical Advisory Board, plumbing installers, and dental supply companies.

In 2002, the MDA House of Delegates unanimously passed a resolution to implement a voluntary amalgam separator program throughout the state under the guidance of Dick Diercks, then MDA Executive director; MDA staff member Loren Hansen; Dr. Jim Westman; Dr. Scott D. Lingle, then president of the MDA, and others. Mr. Peter Bell chaired the Metropolitan Council at the time. The resulting 15-page booklet describing the MDA efforts, *Re: Amalgam Recovery. Take Preventative Action Now. Capture Amalgam So It Doesn't Release Mercury*, is still available on the MDA website.

The 2002 Voluntary MDA Amalgam Separator Program pre-empted formal state legislation. This collaboration between private dental practices and regulatory agencies serves as a model for other dental regions and states to emulate.

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Dental offices located in the seven Metro counties, did, however, need to meet the ISO 11143 standard. In 2012, the MPCA assumed amalgam separator standards per ANSI/ ADA specification no. 108 with addendum.

In 2003, the Minnesota Chapter of American Public Works awarded the MDA and MCES a Technical Innovation Award for the Voluntary Dental Office Amalgam Separator Program.⁹ Since this program began, mercury loadings at the Metro plant have dropped by slightly more than 50%. MCES recognizes that there are sources other than amalgam by which mercury enters the wastewater treatment system, and it has been working since 1994 to identify and minimize all mercury sources. However, given the timing of the significant decline in influent loadings at the Metro plant and that of the amalgam separator installations, MCES feels confident that the reductions are largely due to the separator installations.¹⁰

In October of 2007, the ADA followed the lead of the MDA and published the ADA guide *Best Management Practices for Amalgam Waste*.¹¹

Dr. Westman, the “Answer Man”, and the MDA’s Loren Hanson teamed up on behalf of the ADA Council on Scientific in 2011. They helped with evaluations on amalgam separators at the ADA Professional Product Review’s Forum at that year’s ADA Annual Session in Las Vegas.¹²

The MDA rewarded stewards for shepherding the dental community further into the environmental movement regarding best management practices for waste. Among others, Dr. Jim Westman received the MDA President’s Award in 2004, and Dr. Scott Lingle received its Outstanding Service Award in 2005. In January of 2005, Loren Hanson of the MDA stepped in for absent the Tim Tuominen to present Jim

We Continue

Amalgam Separators have been installed in 730 offices in the metro area as part of the dental mercury reduction program as noted in a 13 June 2013 MCES Industrial Forum.

Westman the Sally Gibson Award. This St. Louis River Alliance award was for Jim’s work as a member of the Northeastern District Dental Society with the WLSSD and for help in a Best Management Practices Guide regarding dental waste posted statewide to dentists. Jim’s efforts significantly reduced the amount of mercury in the WLSSD’s effluent. Dr. Westman received the MDA’s Outstanding Service Award in 2011.

All the Pieces in Place

Processing and recycling companies form the final piece in the environmental movement. Dental amalgam separators, amalgams, amalgam plastics and filters, fixer, film, and spent lead need to be legally disposed of in accordance with best management practices as determined by the ADA, MDA, and MPCA.

Results created by the partnership of the MDA, MCES, MPCA, and amalgam waste processors have resulted in reduced mercury emissions.

The Land of Sky Blue Water

“We do not inherit the earth from our ancestors, we borrow it from our children” is a Native American proverb. The word “Minnesota”, translated from Ojibwa, means “sky-tinted waters” or “sky blue waters”. Let us continue to keep the waters sky blue for all our children. ■

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References

1. Westman J, Tuominen T. Amalgam waste management – issues and answers. *Northwest Dent* Mar-Apr 2000.
2. www.epa.gov 2005 National Emissions Inventory.
3. Cailus MD, Ovsey VG, Mihailova C, Naleway C et al. Physico-Chemical Properties of Dental Wastewater. Water Environment Federation 67th Annual Conference and Exposition; October 1994.
4. Drummond JL, Cailus MD, Ovsey V, Stone M et al. Dental Waste Water: Quantification of Constituent Fractions. Report released by the University of Illinois: Chicago & Champaign-Urbana, IL and Great Lakes Dental Research Institute, Great Lakes Dental Naval Research Institute, Great Lakes, IL USA; 1994.
5. Westman J, Tuominen T. Amalgam waste management – issues and answers. *Northwest Dent* Mar-Apr 2000.
6. 120 grams daily reduction times X 365 days calculates to 96.55 pounds of annual mercury reduction.
7. Recycling amalgam and keeping it simple. *Northwest Dent* 1997 July-Aug;76(4): 19-24.
8. ISO 11143 Certification is a certified amalgam separation device that captures pieces of dental amalgam containing mercury and prevents the particulates from being discharged into wastewater systems.
9. pdf/WLSSD Voluntary Mercury Reduction Progress Report. www.pca.state.mn.us/index.php/view-document.html?gid=11673
10. Evaluation of amalgam removal equipment and dental clinic loadings to the sanitary sewer. December 2001. Metropolitan Council Environmental Services and Minnesota Dental Association. Peter Berglund, MCES. Richard W. Diercks, MDA. MCES Report No. 01-509.
11. Open Channel News MCES Industrial Waste & Pollution Prevention Issue no. 15 December 2003.
12. Open Channel News MCES Industrial Waste & Pollution Prevention Issue no. 26 August 2007.
13. ADA 2007 Best Management Practices http://www.ada.org/sections/professionalResources/pdfs/topics_amalgamwaste_brochure.pdf.
14. ADA news 2011 educational forum <http://www.ada.org/news/6546.aspx>.