

MAXIMIZING VOLUNTARY REDUCTIONS IN DENTAL
AMALGAM MERCURY

Reduction in Mercury Discharges

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Brief Summary Report, November 2007



Environmental Assistance Center

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SUMMARY OF FINDINGS

The use of voluntary best management practices for dental amalgam in the study area dental offices resulted in a measurable and significant reduction in mercury load to the influent wastewater of the treatment plants.

PROJECT OVERVIEW

The purpose of the study was to determine whether significant reductions in mercury discharges from dental offices could be achieved through voluntary best management practices (BMPs). Funding was provided by the U.S. Environmental Protection Agency and the American Dental Association (ADA). Springfield, Missouri was selected for the pilot study based on interest and commitment of staff resources from the Springfield Public Works Department and the Greater Springfield Dental Society (GSDS). The University of Missouri Extension's Office of Waste Management (now Environmental Assistance Center) provided administration and coordination for the project.

Influent and effluent samples were collected at Springfield's two wastewater treatment plants on a bi-weekly basis for 16 months. This included four months of sampling prior to intervention in the form of training dental offices to implement amalgam waste best management practices (BMPs). Samples were collected by Springfield Sanitary Services chemists following EPA Method 1669 and analyzed for total mercury using EPA Method 1631.

Intervention

Intervention consisted of a ½-day training course provided to area dentists on best management practices for dental amalgam. The eighty dentists and dental office staff that attended represented 54 local dental offices and 11 dental offices from other parts of Missouri. Participants received a DVD, wall poster with best management practices, a brochure of other available resources, and articles including:

- Dental mercury hygiene recommendations
- ADA Guidelines on Amalgam Accumulations in Dental Office Plumbing
- Summary of Recent Study of Dental Amalgam in Wastewater
- Missouri Dept. of Natural Resources determination of status and options for various types of dental waste
- List of amalgam recyclers

Those who completed the training course received 4 continuing education credits from the Greater Springfield Dental Society (GSDS), and dentists that did not attend or send staff to the training course received information and training materials via mail.

Questionnaire

A questionnaire was distributed to Springfield dentists by the GSDS and Environmental Assistance Center in February 2006 to collect baseline data on amalgam use and

management practices as reported by Springfield area dentists. The questionnaire was adapted from a national survey of dental office practices conducted by the ADA. The questionnaire was sent to 123 dentists and there were 48 responses, or a 39% return rate.

A follow up survey to dentists was distributed to 254 members of the Greater Springfield Dental Society (GSDS) in February 2007 to measure any changes in management practices after the education efforts as reported by area dentists. The response rate was 76 dental offices or 30%. A comparison with the results of the first questionnaire provided insight into changes in the practices of Springfield dentists that were likely the result of voluntary best management practices.

RESULTS OF WASTEWATER AND BIOSOLID ANALYSIS

Dr. Fred Eichmiller, ADAF Paffenbarger Research Center

Biosolid

Concentration data was collated from analysis of dried biosolid mixed from both treatment plants. The results showed that overall levels were very low and there was no statistical difference in mercury levels of treated biosolid before and after the intervention.

Influent wastewater

Influent water was sampled using a grab sample technique at each central plant collecting point and analyzed for mercury concentrations using the 1631 method. The concentrations were converted to mass units of mg/day by multiplying the sample concentration by the average daily flow rate recorded at the treatment plant on the day of sampling. The mass loading of wastewater influent for the NW plant with only a few dental offices showed a 34% reduction in mercury after the BMP training, but this reduction did not reach statistic significance. A similar analysis done for influent wastewater entering the SW treatment plant where the number of dental offices was approximately thirty times greater and this analysis showed a highly significant 96% reduction in the influent daily mass of mercury after the introduction of BMPs.

Effluent wastewater

Effluent water was sampled using a grab sample taken at each plant discharge point and analyzed for mercury concentrations. Sampling was done on the same days as the influent water sampling. The concentrations were again converted to mass units of mg/day by multiplying the sample concentration by the average daily flow rate recorded at the treatment plant on the day of sampling. The mean daily load of mercury in effluent water showed no difference between before and after the BMP training intervention for either treatment plant.

Conclusions

- The practice of BMPs in the area dental offices resulted in a measurable and significant reduction in mercury load to the influent wastewater of the treatment plants.

- The practice of BMPs in the dental offices did not result in a measurable change in biosolid mercury levels.
- The practice of BMPs in dental offices did not result in a measurable change in mercury load to effluent treatment water.

RESULTS OF QUESTIONNAIRE

Environmental Assistance Center, University of Missouri

The comparison of responses on reported dental amalgam management practices before and after intervention showed indications that the BMP training and education efforts may have succeeded in changing some behaviors.

Amalgam Use

Dental amalgam use decreased 5% from the year before.

Amalgam Capsules

All dentists using amalgam used pre-capsulated amalgam. There was no increase after training in the percentage of dentists that reported using a variety of capsule sizes to minimize waste. A significant decrease in improper disposal of capsules in regular waste was observed after the training and education, while a significant increase occurred in dentists setting amalgam capsules aside for pickup by an amalgam recycler.

Scrap Amalgam

BMPs advocate the recycling of excess scrap amalgam. The collection and recycling of scrap increased significantly after BMP training while the improper disposal decreased.

Medical Waste

Medical waste incinerators are a leading source of mercury emissions. The BMPs advise dentists to avoid placing amalgam in containers with medical waste. There was a slight increase in the amount of amalgam scrap being disposed of as medical waste after the BMP training. This finding may indicate a need for additional education to dental office staff and a need for better labeling and instruction from medical waste management companies.

Chair-side Traps

The BMPs recommend capturing and recycling amalgam wastes in chair-side traps. There was a reported increase in the use of chair-side traps from the year before and a significant decrease in the practice of disposing of trap contents with regular waste

Vacuum Pump Filters

Most of the respondents reported using vacuum pump filters. Many dentists in the BMP training course were unaware that the filter and its contents could be recycled together, and that filters could be replaced at a cost of about \$6-\$7. There was an increase in pump filter users who reported placing filter contents in a container with medical waste, and a slight increase in placing filter contents in a container for pickup by an amalgam recycler. There was also a reported decrease in the practice of placing filter contents in with regular office waste

Extracted Teeth

There was significant increase in dentists reporting that they disinfected the teeth and set them aside for an amalgam recycler. .

Amalgam Recycling

Since last year, there were an increased number of dentists who reported using an amalgam recycler. More dentists reported that their recycler also picks up medical waste.

Nearly half of dentists who reported using an amalgam recycler said they pay less than \$25 per month for the service. A smaller number of dentists who use an amalgam recycling service claim that the recycler picks up amalgam waste at their office, while more than one-third reported shipping via US mail, UPS, or other shipping service. A majority of dentists who recycle amalgam reported that the recycler provides packaging material, shipping labels and shipping manifests

Deterrents to Amalgam Recycling

The majority of dentists reported that they were *not* prevented from recycling due to the inability to locate a recycler in their area, locate a recycler to pick up small quantities of dental amalgam waste, find a method for shipping waste, or by the cost of recycling amalgam.

Knowledge of BMPs

The majority of dentists reported being familiar with the ADA's Best Management Practices. In regards to staff training in BMPs, there was a large increase in dentists reporting that they had provided this training. There was also an overall increase in the understanding of best management practices after training.

Amalgam Separators

The majority of responding dentists did not use amalgam separators. There was a slight increase over the study period in the number who did report using a separator. Amalgam separators are not required in Missouri or in Springfield so it was assumed that very few would be in use.

Bulk Mercury

The overwhelming majority of dentists reported having no bulk mercury on the premises.

Conclusions

- The education and training provided to area dental offices resulted in an overall increase in the use and understanding of BMPs.
- There were significant increases in the recycling of used amalgam capsules and scrap amalgam, and corresponding decreases in the disposal of these wastes as regular trash.
- Amalgam recyclers are providing more services to area dentists, including the recycling of lead foil, filters, and amalgam-containing teeth.

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