

# Managing silver and lead waste in dental offices

ADA COUNCIL ON SCIENTIFIC AFFAIRS

Organized dentistry's heightened awareness of environmental issues led the ADA Council on Scientific Affairs to develop recommendations on proper management of silver and lead wastes. The recommendations in this report are general in nature and are intended to promote good waste management practices. This report provides guidance on proper disposal of dental materials and equipment that contain silver or lead. However, some states and localities have specific requirements for disposal of silver and lead that may be applicable to dental offices. Dentists are advised to check with their state or local dental societies for further information.

**The recommendations in this report are general in nature and are intended to promote good waste management practices.**

## SILVER IN RADIOGRAPHIC FIXER SOLUTIONS

Used fixer solution contains silver. Dental offices generate a very small amount of silver waste relative to other photographic processing facilities. According to one source, a batch-replenished processing of 450 size 2 dental films and eight 35-millimeter film strips, each 250 mm long, yields 830 milliliters of used fixer solution with a silver concentration of 10.90 grams per liter.<sup>1</sup> Silver concentrations in used fixer solutions generally range from 8 to 12 g/L.<sup>2</sup>

Silver in used fixer solutions is in the form of silver thiosulphate complexes, which are extremely stable and have very low dissociation constants. There is virtually no free silver ion (Ag<sup>+</sup>) in used fixer solutions.<sup>3</sup> Wastewater treatment processes convert the silver thiosul-

**Background.** The heightened awareness within organized dentistry of environmental issues led the ADA Council on Scientific Affairs to develop recommendations on proper management of silver and lead wastes.

**Overview.** This council report provides recommendations on managing silver waste (in used fixer solution) and lead waste (in used intraoral film packets, lead aprons and lead collars) through recycling.

## Conclusions and Practice

**Implications.** These recommendations are intended to provide guidance to practitioners in ensuring responsible disposal of wastes generated by dental offices and in minimizing the release of potential pollutants into the environment.

phate into mostly silver sulfide, which settles in the sludge.<sup>4</sup> The effect of silver on aquatic life depends on the form of silver. In one aquatic life toxicity study using fathead minnows, silver thiosulphate was more than 17,500 times less toxic and silver sulfide was more than 15,000 times less toxic than free silver ion (Ag<sup>+</sup>).<sup>5</sup>

It is generally accepted that silver in used fixer solutions has little, if any, adverse environmental effect. Nevertheless, wastewater agencies in some areas impose limits on silver in wastewater and, in some cases, mandate pretreatment (such as through a silver recovery cartridge), recycling or disposal as hazardous waste.

## Recommended fixer solution

**recycling options.** There are several options for disposing of used fixer solution. The Council on Scientific Affairs recommends choosing one of the following recycling options:

- Use an in-office silver recovery unit (metallic replacement or electroplating system) to remove silver from used fixer solutions and recycle the used cartridge. An example of the metallic replacement system is the Kodak Chemical Recovery Cartridge (Eastman Kodak, Rochester, N.Y.). For laboratories that process

large amounts of radiograph film, the silver recovery process may yield a return when the collected silver is sold to a refiner. For most average-sized dental offices, the silver recovered in a recovery cartridge will not be enough to cover refining costs or to return any credit. However, the use of a silver recovery cartridge can provide an easy and economical way to comply with municipal discharge regulations. Silver also can be recovered from small batches of fixer by pouring the solutions into a silver recovery cartridge.<sup>2</sup>

- Use a pickup-and-recycle service for the used fixer solution.
- Drop off used fixer solution at a designated silver waste drop-off location, if one is available in your area.
- Send used fixer solution to a silver-reclaiming facility.
- Send used fixer solution to a medical radiology laboratory or a commercial photographic processing laboratory if an agreement is made with these facilities.
- Contact the manufacturer or distributors of the fixer solution. Some offer a “take-back” policy for used fixer solutions if the solutions are purchased from them.

#### LEAD FOIL IN INTRAORAL RADIOGRAPH FILM PACKETS

Lead foil in intraoral film packets should be collected and recycled through a licensed facility. At least one intraoral radiograph film manufacturer provides a lead foil recycling service.<sup>6</sup>

#### USED LEAD APRONS AND COLLARS

The Council on Scientific Affairs recommends the use of lead aprons and lead collars to minimize patient exposure to radiation.<sup>7</sup> Lead aprons and lead collars that are no longer used should be disposed by the use of a recycler licensed to handle lead waste.

#### CONCLUSION

This report provides general guidance to practitioners on the proper disposal of dental materials and equipment that contain silver or lead. Dentists should be aware, however, that some states and localities might have specific requirements for disposal of silver and lead wastes. Dentists are advised to check with their state or local dental societies to determine whether there are any such requirements in their areas that pertain to dental wastes.

In response to a heightened awareness of environmental issues, the Council encourages dentists to manage silver waste (in used fixer solution) and lead waste (in used intraoral film packets, lead aprons and lead collars) through recycling. These recommendations are intended to provide guidance to practitioners in ensuring responsible disposal of wastes generated

by dental offices and in minimizing the release of potential pollutants into the environment. ■

Address reprint requests to American Dental Association, Council on Scientific Affairs, 211 E. Chicago Ave., Chicago, Ill. 60611.

1. Eastman Kodak. Management of photographic wastes in the dental office. Rochester, N.Y.: Eastman Kodak; 1990. Document N 417 1-90.

2. Kodak Environmental Services. Waste management guidelines for dental products. Available at: “[www.kodak.com/global/en/corp/environment/kes/pubs/pdfs/N417.pdf](http://www.kodak.com/global/en/corp/environment/kes/pubs/pdfs/N417.pdf)”. Accessed July 1, 2003.

3. Cooley AC, Dagon TJ, Jenkins PW, Robillard KA. Silver and the environment. *J Imaging Technol* 1988;14(6):183-9.

4. Lytle PE. Fate and speciation of silver in publicly owned treatment works. *Environ Toxicol Chem* 1984;3:21-30.

5. LeBlanc GA, Mastone JD, Paradise AP, Wilson B, Lockhart HB, Robillard KA. The influence of speciation on the toxicity of silver to fat-head minnow (*Pimephales promelas*). *Environ Toxicol Chem* 1984; 3:37-46.

6. Kodak Environmental Services. Dental lead recycling. Available at: “[www.kodak.com/US/en/corp/environment/kes/recycling/dental.jhtml](http://www.kodak.com/US/en/corp/environment/kes/recycling/dental.jhtml)”. Accessed July 1, 2003.

7. ADA Council on Scientific Affairs. An update on radiographic practices: information and recommendations. *JADA* 2001;132:234-8.

The use of a silver recovery cartridge can provide an easy and economical way to comply with municipal discharge regulations.