Safety Is More Than Infection Control

Appropriate infection control protects the health of patients and the dental team. We designate considerable resources to ensure the prevention of disease transmission. Other, perhaps less obvious hazards also present themselves in the dental office. Chemicals, gases and x-rays may be undetectable yet carry the potential for causing harm if the user does not institute control and monitoring measures. The products we use may harm the environment unless the user observes suitable storage and disposal practices. A comprehensive dental office safety program incorporates patient, occupational and environmental safety concerns as part of the overall quality assurance effort and the 2006 OSAP Annual Symposium addressed some of these issues.

Radiation safety
The use of x-rays, which is a form of ionizing radiation, has long been a concern in healthcare. In extreme cases, radiation has the ability to cause malignant disease (e.g., Japanese atomic bomb survivors and early researchers such as Madame Curie). The therapeutic advantages of x-rays include the ability to diagnose and treat disease and locate foreign objects in the body without invasive surgery. In dentistry, x-rays are necessary in the diagnosis of dental caries, periodontal disease, abnormalities and other diseases of the oral cavity and surrounding structures. However, there are precautions essential to the safe use of dental x-rays. These precautions include:

- proper installation and maintenance of machinery,
- shielding,
- use of high speed film or digital technology,
- elimination of unnecessary exams,
- keeping an adequate distance from the active beam,
- where appropriate, exposure monitoring.

Although it is possible to monitor x-ray exposure using dosimeter badges, the key to eliminating unnecessary exposure is in following the precautions described above. Because of the potential risk to the fetus, the National Council on Radiation Protection (NCRP) recommends monitoring for all pregnant workers who operate x-ray devices. Badges that measure exposure are available through laboratory and safety supply companies. When using these monitoring badges, follow the instructions for use carefully. Improper use of the badges may result in inaccurate results and unnecessary investigation. Monitor as a baseline, and repeat monitoring if equipment or procedures change, but not as a routine except where local regulations dictate.

Nitrous oxide
Nitrous oxide as a mild anesthetic and analgesic in dental care is an important element in the treatment of fearful patients. Although reports in the literature in the past raised concerns regarding potential harmful effects of nitrous, the evidence that exists for reproductive toxicity indi-

continued on page 2

Learning Objectives

After reading this article, the reader should be able to:

- understand the hazards and methods of protection for x-ray exposure in the dental office.
- determine suitable precautions for the safe use of nitrous oxide for patient anesthesia/analgesia.
- prevent the inappropriate discharge of chemical wastes into the environment.
Safety Is More Than Infection Control

continued from front cover

cates high doses of unscavenged nitrous oxide present the hazard. This bears little resemblance to the use of nitrous oxide in modern dental practices. In spite of the low risk, there are precautions that are reasonable and effective.

First, ensure that the room in which nitrous is used has adequate ventilation. Avoid recirculating room air and consider supplementing ventilation with oscillating fans. All units should have scavenging systems to remove waste gases expelled from around the mask and from the patient’s exhalation. The systems should have a failsafe mechanism that will not allow the administration of nitrous oxide without a safe mix of oxygen. Check unit hoses and masks frequently for cracks that have the potential to result in leakage into the air around the dentist and assistant. As a precaution, consider using nitrous oxide monitoring badges to determine if you are receiving more than the recommended exposure limits. In some states, there may be regulations regarding the levels of exposure to nitrous oxide in the workplace. Check with your state Occupational Safety & Health Administration (OSHA) plan to determine what, if any, requirements exist in your state.

Chemical waste management

The practice of dentistry requires the use of numerous chemical products and materials. Some of these result in a chemical waste product that may require special storage, handling, labeling and disposal procedures. Characteristics that define regulated waste include those items that are toxic, flammable, corrosive or reactive. The local regulatory agency (e.g., state or county) determines exact dis-

charge limits.

The most common hazardous waste materials in dental offices include amalgam, elemental mercury, x-ray fixer and films, some cements, lead foil, germicides and used acids or flammable materials. Always follow local requirements for labeling, storage, treatment and disposal of hazardous waste. Generally, this requires the use of a licensed company to assist in these efforts, particularly treatment and disposal. Some products, such as amalgam, are exempt from the hazardous waste regulations if the office recycles the metals rather than discards.

Amalgam is a hazardous waste because of the mercury content. Many waste treatment facilities do not have the technology to remove mercury before discharging to the lakes, streams and other bodies of water where it may contaminate fish. Amalgam has come under increasing scrutiny by regulatory agencies and in some locations it is now necessary for dentists to install amalgam separators. Check with your local regulatory agencies or state dental association to determine if you must use an amalgam separator in your location.

— OSAP
Compliance Corner

NIOSH

"Exposure monitoring should be the first step in developing work practices and worker education programs, since measurements of N₂O are needed to determine the type and extent of controls that are necessary. Follow the guidelines below to minimize worker exposures:

- Monitor for N₂O when the anesthetic equipment is installed and every 3 months.
- Include the following types of monitoring:
  - Leak testing of equipment
  - Monitoring of air in the worker’s personal breathing zone
  - Environmental (room air) monitoring
- Prepare a written monitoring and maintenance plan for each facility that uses N₂O. This plan should be developed by knowledgeable persons who consider the equipment manufacturers’ recommendations, frequency of use, and other circumstances that might affect the equipment.

Perform air monitoring by gas-bag sampling or real-time sampling. When real-time sampling is conducted to obtain personal exposure data, attach the sampling train to the lapel of the worker on the side closest to the patient; N₂O concentrations in this location are most representative of those in the worker’s breathing zone. Diffusive samplers (referred to as passive dosimeters) are commercially available and may be useful as initial indicators of exposure."

From: Controlling Exposures to Nitrous Oxide During Anesthetic Administration NIOSH ALERT: 1994 DHHS (NIOSH) Publication No. 94-100

Glossary

**Analgesic:** Drug that alleviates pain without causing loss of consciousness.

**Anesthetic:** Medication that stops feeling, including pain. This can be a partial or complete loss of sensation, with or without the loss of consciousness.

**Corrosive:** Substance that disintegrates, or wears away materials gradually by chemical reaction.

**Flammable:** Substances capable of ignition when exposed to other elements (e.g., heat).

**Reactive:** Chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shock, pressure, or temperature.

**Reproductive toxicity:** Adverse effects on the male and female reproductive systems.

**Regulated waste:** Waste that due to characteristics that present an unacceptable hazard to people or the environment, requires special storage, labeling, handling and disposal methods.

**Scavenging system:** Device (assembly of specific components) that collects and removes the excess analgesic gases from the breathing circuit.

**Toxic:** Capable of causing injury or death, especially by chemical means; poisonous.
Putting It All Together

Safety for radiation, nitrous oxide and hazardous waste in dental offices

Following are steps to help increase the level of safety for staff and patients in dental settings.

Radiation

Equipment and procedures
- Observe the ALARA principle of using exposures that are as low as reasonably achievable
- Tailor the nature and extent of radiographs to the patient’s age, dental status and dental history, rather than as a routine part of periodic examinations
- Use film, film-intensifying screen combinations and other image receptors with maximum sensitivity (speed)
- Use rectangular collimation tube or collimating plate whenever possible
- Use a kilovolt peak in the range of 70-100 kVp
- Use film holders that coincide (e.g., rectangular for rectangular beam) with the collimated beam for periapical and bitewing x-rays
- Perform equipment maintenance at regular intervals
- Consider using digital radiographs, which use less radiation to create images

Operator and patient
- Stand at least six feet from the patient
- Stand in a location out of the path of the x-ray beam during exposure

- Use dosimetry badges for pregnant workers and for other workers where required by law
- Consider installing additional barriers if workers experience a workload of more than 1,800 milliampere seconds per week
- Use leaded thyroid collars and aprons for the patient whenever possible, particularly for children (except for panoramic radiographs due to interference with the image)
- Use the appropriate exposure ranges (milliamperage and time) for the technique (do not overexpose and underprocess x-rays)
- Inquire about regulations for radiation and radiological health in your state and ensure compliance with all relevant requirements

Reference
ADA Council on Scientific Affairs. An update on radiographic practices: information and recommendations. JADA (132)2;234-238. February 2001

Nitrous oxide

Equipment
- Use audible alarm for O₂ and N₂O failure
- Avoid recirculating room air
- Supplement ventilation with oscillating fans

- Inspect reservoir bag tubing for leaks, cracks or tears
- Periodically return equipment to manufacturer for evaluation and maintenance
- Inspect connections and fittings for leaks periodically
- Evaluate scavenging methods with gas spectrophotometer
- Monitor breathing zone of personnel with dosimetry badge

Hazardous waste

Planning and training
- Maintain hazard communication plan
- Train personnel in hazardous chemical handling procedures, personal protection equipment usage, understanding Material Safety Data Sheets

Amalgam best management practices
- Use precapsulated alloys
- Recycle used capsules
- Collect and recycle non-contact amalgam
- Disinfect and recycle extracted teeth containing amalgam
- Use disposable side traps
- Train staff in mercury spill clean-up procedures

— OSAP

Ask OSAP

Q: A dental assistant in our practice is planning a pregnancy and worries that taking x-rays may be harmful to the fetus. Should she refrain from taking x-rays until after the baby is born?

A: When using proper safety precautions it is considered safe for pregnant women to operate x-ray machines. If you are not doing so already, purchase dosimetry badges to ensure that radiation exposures do not exceed the lowest safe limits. Personnel should never remain in the room during activation of the x-ray machine. Bracing the patient or holding films is not appropriate for x-ray operators. All workers should be at least six feet from the x-ray tube and should position the patient in such a way as to direct the active beam away from personnel.

Do you have an inquiry about infection control, occupational health, or practice safety? Ask OSAP. Send your questions to office@OSAP.org
Hazard Classification of Dental Waste Materials

Numerous processes and products used in dentistry result in the generation of a waste product that is not allowed to be discharged to the sewer, landfill or septic system. These materials may be toxic, flammable, corrosive or reactive. If not discarded appropriately these products can threaten fish in the lakes, streams and oceans, or contaminate the groundwater that runs beneath and/or through our landfills. The chart below provides a representative list of products that are hazardous waste in dentistry.

<table>
<thead>
<tr>
<th>Process/Product</th>
<th>Waste Material</th>
<th>Hazard Classifications</th>
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<tbody>
<tr>
<td>X-ray developing</td>
<td>Fixer</td>
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<td></td>
<td>Developer</td>
<td>T, C</td>
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<td>Lead foil film backing</td>
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<td>Disinfectants/sterilants</td>
<td>Glutaraldehyde</td>
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<td>Formaldehyde</td>
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<td>Phenylphenol</td>
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<td>Ethanol</td>
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<td>Dental restorations</td>
<td>Amalgam</td>
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<td>Phosphoric Acid</td>
<td>C</td>
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<td>Laboratory and miscellaneous</td>
<td>Pickling solution (for gold restorations)</td>
<td>C, T</td>
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<td></td>
<td>Alcohol (Isopropyl or Ethanol)</td>
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<td>Chloroform</td>
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<td></td>
<td>Hydrogen Peroxide</td>
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Key: T = Toxic  C = Corrosive  F = Flammable  R = Reactive

Note: Contaminated spill clean-up materials are also hazardous waste and fall into the same category as the hazardous material they contain.

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Topical Internet Resources

National Institute for Occupational Safety and Health Nitrous Oxide Safety Resources: http://www.cdc.gov/niosh/topics/nitrousoxide; http://www.cdc.gov/niosh/nitoxide.html

Note: In the OSAP Surface Disinfectant Reference Chart - 2006 (May ICIP), OSAP inadvertently left out a reference to Palmero Health Care's DisCide ULTRA Wipes. DisCide ULTRA Wipes should have been listed in the "Quaternaries Dual or Synergized Plus Alcohol" category; EPA # 10492-4; product is ready to use (RTU); TB claim is 1 minute. The corrected reference is listed on the OSAP website. OSAP apologizes for the oversight.
To help practices stay on track, OSAP provides this calendar listing typical schedules for periodic maintenance, record-keeping, and infection control activities. This schedule is intended only to serve as a guide. Proper practices, procedures, and maintenance schedules can vary according to the kinds of products used, the practice type, and patient volume. Always follow the device or equipment manufacturer’s instructions for maintenance and infection control.

### JULY 2006

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<td>Check fire extinguisher operating pressure</td>
<td>Foil test ultrasonic cleaners</td>
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<td>Update chemical inventory; discard expired supplies, drugs</td>
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If you wish to obtain one (1) hour of continuing education (CE) credit, complete the following test by selecting the best answer and fax or mail it to the OSAP Central Office for grading. Please include a check or credit card to cover handling charges. Pending satisfactory results (at least seven out of ten), you will be issued a letter for one (1) CE credit hour. OSAP is recognized by the American Dental Association as a CERP Provider. For more information, call OSAP at 800-298-6727 (410-571-0003).

1. Nitrous oxide is considered an:
   a. analgesic  
   b. anesthetic  
   c. both  
   d. neither

2. Scavenging systems for nitrous oxide provide:
   a. exposure monitoring  
   b. the proper mix of oxygen and nitrous  
   c. a seal around the patient’s nose  
   d. removal of waste gases

3. Which of the following is not a defining characteristic of hazardous chemical waste?
   a. radioactivity  
   b. flammability  
   c. reactivity  
   d. toxicity

4. Exact discharge limits for regulated waste are determined by:
   a. dental societies  
   b. state and local regulatory agencies  
   c. OSHA  
   d. NIOSH

5. Which agency regulates exposure to nitrous oxide (in states where regulations exist)?
   a. OSHA  
   b. EPA  
   c. State dental boards  
   d. NIOSH

6. Which type of medication results in a partial or complete loss of sensation, with or without loss of consciousness?
   a. sedative  
   b. analgesic  
   c. anesthetic  
   d. NSAID

7. A hazardous waste that is capable of causing injury or death through poisoning is called:
   a. corrosive  
   b. flammable  
   c. reactive  
   d. toxic

8. A substance that disintegrates, or wears away materials gradually by chemical reaction is called:
   a. corrosive  
   b. flammable  
   c. reactive  
   d. toxic

9. The ALARA principle relates to:
   a. radiation safety  
   b. chemical safety  
   c. nitrous oxide safety  
   d. infection control

10. Scrap amalgam is a ____________ waste.
    a. corrosive  
    b. flammable  
    c. reactive  
    d. toxic

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MAIL TO: OSAP CE • P.O. Box 6297 • Annapolis, MD 21401 • USA • FAX TO: 410.571.0028
In many offices, the darkroom or daylight loader is a weak link in the infection control program. The traditional method for x-ray processing is as follows: Drop the exposed film(s) into a clean disposable cup. Remove your gloves and wash your hands. Transport the cup to the darkroom and don clean gloves. Open each film packet and spill the film onto a clean paper towel. Dispose of the wrapper and lead foil in the appropriate containers. Remove your gloves and feed each film into the developer. This method, although effective, can be difficult and time consuming, resulting in poor compliance. There is another way to reduce cross contamination, save time and save money.

Consider using barrier-coated film packets. In this method, one carefully removes the clean x-ray packet from the barrier cover (without touching film packet inside barrier) in the operatory and discards the barrier. Collect clean exposed films in a cup and take to the darkroom or daylight loader, which is now a clean environment. Use bare hands to process clean film packets. There is no need for extra gloves and there is a significant savings in time. Here is a method to calculate the cost saving.

- Regular film: 150/pack at a cost of $42.95/pack = $0.29/film.
- Barrier film: 100/pack at a cost of $46.25/pack = $0.46/film.
- Per 100: Regular films = $29, and the barrier films = $46.

Therefore, although the barrier coated films cost $17 more per pack to purchase, the savings come in the manner of use.

If you assume your chair time is worth $8.30/minute you only have to save 2.05 minutes per hour to pay for the barrier-coated packets. By eliminating several steps in the darkroom, you can easily save that much time using barrier-coated films.

In the end, using the barrier-coated films when exposing and developing radiographs saves time, money and ultimately reduces cross-contamination in the darkroom.

**Martin R. Mendelson, DDS**

Dr. Mendelson is the Director of Education at Americus Dental Labs. He is an adjunct clinical faculty member of Nova Southeastern University, is a member of the National Speaker’s Association and an OSAP member since 2005.