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

► describe the infection control considerations when evaluating advanced technologies or equipment for purchase;
► list the Centers for Disease Control and Prevention (CDC) recommendations related to equipment asepsis;
► list suggested infection control procedures for various advanced technology dental equipment;
► express the importance of following manufacturer’s directions concerning the infection control aspects of dental technologies and devices.

High-tech Infection Control

Have you ever struggled with learning how to use a piece of high-tech equipment? Once you understood the technical basics did you feel a bit frustrated as you tried to incorporate this new equipment into your daily busy schedule? Implementing changes in equipment and procedures can create stressful situations; it is especially critical to incorporate the correct infection control protocols to ensure patient and staff safety.

Examples of high-tech chairside equipment requiring infection control considerations include rotary handpieces, ultrasonic and piezo scalers, computers, CAD/CAM and other intra-oral cameras, extra-oral cameras, radiography equipment, curing lights, microscopes, waterline cleaning equipment, air-abrasion units and lasers.

Consider what infection control procedures are needed to make each piece of equipment safe for use. Some devices become contaminated from use in a patient's mouth. Others may not be used in the mouth but may be held or touched with contaminated gloved hands.

Always follow the manufacturer’s infection control recommendations for devices and equipment. The manufacturers understand materials compatibility issues and, especially if they are OSAP members, they also should understand microbial kill claims and will recommend the appropriate procedure to render the device or equipment safe for use. In many cases if these procedures are not followed carefully, the equipment warranty and patient and office staff safety may be jeopardized. See Putting It All Together on pages 2-4 for more details.

Learning Objectives

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

1. Topic Overview
2. Putting It All Together
3. Putting It All Together (continued)
4. Communicate and Educate Around the World
5. Did You Know?
6. Roadmap to OSAP Glossary
7. Continuing Education
8. Bright Ideas

Contents
Putting It All Together

Equipment Evaluation

Dental facilities generally undertake some degree of product evaluation prior to making purchases of high-tech devices or equipment. Infection control considerations should be a part of this evaluation process. At the June 2009 OSAP Symposium in Plano, TX, Dr. Jennifer Harte (Director of Professional Services, AF/SG Consultant for Infection Control, USAF Dental Evaluation & Consultation Services) discussed high-tech equipment asepsis and reminded us of some general considerations when evaluating products or equipment for purchase.

General considerations when evaluating products or equipment for purchase.

- Is the product cost-effective?
- Is it easy to use?
- Are instructions clear and easy to follow?
- Are the product claims reasonable and scientifically validated?
- What precautions are needed to use the product safely?
- What are the disposal requirements?
- Does it meet related regulatory requirements?

Infection Control Management of Equipment

Whenever possible avoid contamination of the equipment. This can sometimes be accomplished by covering it with a moisture-impermeable barrier or by handling the equipment only after donning fresh gloves. When contamination does occur always choose heat sterilization over chemical sterilization or disinfection when possible. Chemical sterilization cannot be monitored and disinfection can lead to a lower level of microbial kill. If an item cannot be covered or sterilized by heat or liquid chemicals between uses, don’t use it!

CDC Guidelines Related to Dental Equipment

Equipment-related recommendations from the CDC\(^2\) include:

- Clean and heat-sterilize critical and semi-critical items before each use.
- Clean and heat-sterilize handpieces and other intraoral instruments that...
can be removed from the air and waterlines of dental units between patients.

- Follow the manufacturer’s instructions for cleaning, lubrication, and sterilization of handpieces and other intraoral instruments that can be removed from the air and waterlines of dental units.

- Use heat-tolerant or disposable intraoral devices whenever possible (e.g., film-holding and positioning devices). Clean and heat-sterilize heat-tolerant devices between patients. At a minimum, high-level disinfect semicritical heat-sensitive devices, according to manufacturer’s instructions.

- Do not surface-disinfect or use liquid chemical sterilants or ethylene oxide on handpieces and other intraoral instruments that can be removed from the air and waterlines of dental units.

- For digital radiography sensors use Food and Drug Administration (FDA)-cleared barriers and clean and heat-sterilize, or high-level disinfect, between patients, barrier-protected semicritical items. If the item cannot tolerate these procedures, then at a minimum protect with an FDA-cleared barrier and clean and disinfect with an Environmental Protection Agency (EPA)-registered hospital disinfectant with intermediate-level (i.e., tuberculocidal claim) activity, between patients. Consult with the manufacturer for proper disinfection and sterilization methods of digital radiology sensors and for protection of associated computer hardware.

- No specific recommendation is offered regarding practices to reduce dental personnel exposure to laser plumes/surgical smoke when using lasers in dental practice. See “Laserers” later in this article for further information.

How to Manage Some High-tech Equipment

Handpieces: Follow the CDC guidelines and pay particular attention to the manufacturer’s directions for cleaning and sterilization of high-speed handpieces and low-speed motors and attachments.

These instructions usually vary from one manufacturer to the next. Some electric handpiece attachments can be steam sterilized at or below 275°F (135°C) after lubricating and wiping with isopropyl alcohol. If a handpiece or attachment that enters the mouth cannot be heat sterilized, don’t use it!

Air abrasion equipment: The hand-held portions and the nozzle are sterilizable. Provide the patient with safety eyewear and apply a rubber dam or protect adjacent teeth and gingiva with a resin. The chairside assistant should use the high-volume evacuator to remove the excess aluminum oxide abrasive.

Lasers: There are different types of lasers. For example, one diode laser used for removal of soft tissue has a heat sterilizable fiber, an autoclavable fiber storage spool and disposable tip covers for the handpiece. One erbium laser for hard or soft tissue removal has autoclavable tips and handpiece sleeves. During laser surgery a smoke byproduct (plume) is released and may contain particles, gases, tissue debris, viruses, bacteria and offensive odors. A concern is that the aerosolized infectious materials may reach the operator and assistants. However, the effect on dental personnel of such an exposure has not been adequately evaluated, so this is an unresolved issue for the CDC. Nevertheless the CDC has mentioned the following practices to reduce exposure to laser plumes/surgical smoke2 including use of:

- standard precautions (e.g., use high-filtration surgical masks and possibly face shields;
- central room suction units with in-line filters to collect particulate matter from minimal plumes;
- dedicated mechanical smoke exhaust systems with a high-efficiency filter to remove substantial amounts of laser-plume particles.

Cameras: Intraoral cameras are either covered to prevent contamination or an outer sheath is heat sterilized (e.g., using a dry-heat sterilizer). Follow the manufacturer’s directions. Avoid contamination of extraoral cameras by handling only with clean hands or fresh powder-free gloves.

Lights: Hand-held lights used for oral cancer screening may become contaminated by handling, so a plastic barrier (that does not cover the output light) can be used or the handle may be disinfected. Some also may have a disposable cap to prevent contamination of the end closest to the patient’s mouth. Curing light handles may be barrier protected or disinfected. Some curing lights have a sealed casing or are made of a “one-piece” stainless steel that is water resistant and allows for easy cleaning and disinfection.

Microscopes: Chairside microscopes need to be kept free of contamination. Barrier protect the maneuvering handles during use and cover the scope when not in use to avoid dust build-up.

Computer systems: One study used a 5-second wipe with six different disinfectants (sodium hypochlorite, isopropyl alcohol, water-based phenolic and 3 quaternary ammonium compounds) to decontaminate inoculated computer keyboards.3 All six, as well as a water
Communicate and Educate

When new technology and equipment is purchased for the office, be sure to include infection control information in the training sessions regarding use of the item as well as its decontamination. This training is extremely important, for in some cases one “slip-up” could seriously damage the item. For example using a steam autoclave rather than a dry heat oven to sterilize certain intraoral camera sheaths could destroy the sheath. Also using dry heat to sterilize most high-speed handpieces can destroy the turbine seals. Sometimes DVDs or video tapes are provided for training about newly purchased equipment, but these don’t allow for questions and answers. Just like in the required Occupational Safety and Health Administration (OSHA) blood-borne pathogens training, a mechanism for questions and answers needs to be available. Having an equipment company representative on-site or available on the phone to assist with or provide the training can be highly beneficial.

Put It All Together

continued from page 3
control, were effective in removing or killing 95% of the test bacteria (*Pseudomonas aeruginosa*, *Staphylococcus aureus* or vancomycin-resistant *Enterococcus*). No functional or visible damage to the keyboards was observed after 300 disinfection cycles. Touch screens should be cleaned following the manufacturer’s directions. This usually involves wiping with a soft cloth moistened with a recommended cleaning agent followed by wiping with a clean soft cloth until dry. See Did You Know for further information about keyboards and mice.

I believe we should consider infection control on three levels: Macro-Meso- and Micro-infection control. Too often we tend to see infection control only at the Meso level (between individuals) and we forget about the Macro level (between geographical entities in dentistry such as from one office through the dental laboratory to another dental office, or from one dental office to another through a service technician).

Even more important is the Micro level (between microorganisms) where one strain of microorganism can get an antibiotic resistant gene from another microorganism or pathogenic and virulent genes can be spread between microorganisms.

The development of antibiotic resistance and the close relation between antibiotic resistance and global economy and prosperity is a big issue at present. Modern society with its many achievements in health and welfare are simply not possible without antibiotics. However, “overkill” through the over-prescription of antibiotics has been called one of the world’s most pressing public health problems.

In Sweden it has been shown that dentistry prescribes a lot of antibiotics for prophylactic intentions – despite the lack of evidence-based studies on the results vs. side-effects. This has also been reported in several articles in the US. In Sweden dentistry accounts for almost 25% of all antibiotics prescribed in outpatient care. If true in Sweden, figures are probably the same in many countries.

Unfortunately, every time a person takes antibiotics, sensitive bacteria are killed, but resistant germs may be left to grow and multiply. Repeated and improper uses of antibiotics are primary causes of the increase in drug-resistant bacteria.

Misuse of antibiotics jeopardizes the usefulness of essential drugs. Decreasing inappropriate antibiotic use is the best way to control resistance.

Docent Mikael Zimmerman
Karolinska Institute
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Did You Know?

Your dental colleagues may not be the only ones sharing your keyboard...

According to a study published last year in the American Journal of Infection Control, about 60% were staphylococci. On average, uncovered keyboards/mice had ten-fold greater numbers of bacteria than those covered. Yeast, gram-positive streptococci, filamentous rods, and gram-negative bacteria were present primarily on the uncovered keyboards/mice.

While these data suggest that keeping keyboards and mice covered is important, covers may slow down typing and sometimes causes typing errors. Bagging keyboards also can preclude heat from dissipating.

New options to prevent cross-contamination of computer keyboards and mice include flat, smooth, touch-sensitive keyboards that claim to be easily cleaned and disinfected. The top surface is made of glass lending itself to easy cleaning. The keyboard also has right, left and tracking mouse “buttons” eliminating the need for a separate mouse. Also available are washable keyboards and mice claimed to be completely submersible and dishwasher safe.

OSAP does not endorse products. The mentioning of these items is for informational purposes only.

What’s Wrong With This Picture?

Can you identify any breach in infection control and safety procedures in this photo?

Check your answers below.

1) Head rest is not placed in correct position
2) Wrist resting is not comfortable
3) The patient is not wearing eye protection

Answers:

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OSAP thanks the following companies that help to underwrite each issue of this special series of Infection Control In Practice in 2009.

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Enriching the lives of dental professionals by providing simple and creative solutions.

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Midmark ► midmark.com
Midmark Corporation, A provider of innovative solutions that work for you.

Miele ► miele.com
Developed specifically to clean dental instruments and accessories and to reduce the risk of infection by providing high-level disinfection.

NorthBay/Bioscience ► nbbs.com

Palmero Health Care ► palmerohealth.com
DisCide Ultra Spray & Wipes • DisCideXRA Hand Wipes • TelAseptic Wipes • Barriers • Safety & Disposable Eyewear.

Patterson Dental ► pattersondental.com
Dental’s most trusted partner for service, supplies, equipment and technology.

PDI, The healthcare division of Nice-Pak ► pdipdi.com
Live a healthier life with clinically proven products that safely clean, disinfect and control disease infection.

SciCan ► sci-can.com
SciCan Inc., the final word in all dental instrument reprocessing.

Septodont ► septodontusa.com
Septodont, providing better dentistry through pain control, restoratives and infection control products.

SmartPractice ► smartpractice.com

SPSmedical Supply Company ► spsmedical.com
Sterilization monitoring (spore tests), chemical indicators/integrators and packaging products (wrap and pouches).

Sultan Healthcare ► sultanhealthcare.com
Products to complete the cycle of infection control.

TotalCare ► kerrtotalcare.com
Offering high-quality infection prevention products to protect staff and patients in the dental operatory.
Roadmap to OSAP

If you have received this newsletter from a friend or associate, you can access other helpful resources and timely information on infection control and safety by becoming a member of the OSAP community.

**Member resources include:**
- Topical updates such as recent information on Novel Influenza A(H1N1)Virus
- Written responses to your IC questions (“Ask OSAP”)
- Surface disinfectants chart
- Free online CDC Guidelines course
- Weekly and monthly online IC news round-ups
- Infection control training course - January 11-14, 2010 in Atlanta, GA
- Annual infection prevention symposium - June 10-13, 2010 in Tampa, FL
- Infection Control Educator’s Kit
- Free downloads of mission trip IC guide, traveler’s guide and **much more**!

**Member registration is easy.**
Online at [www.osap.org](http://www.osap.org) or by phone: 1-800-298-OSAP (6727) within the U.S. or 1-410-571-0003 outside the U.S.

**Current membership levels:**
- Individual member (within the U.S.) $110
- Web-only member (anywhere) $100
- Corporate memberships are welcome; please contact OSAP for more information.

Glossary

**Air abrasion:** A process whereby compressed air carries small particles of aluminum oxide through a handpiece nozzle to remove tooth structure or restorative material.

**Laser:** Light Amplification by Stimulated Emission of Radiation.

**Critical items:** The category of medical devices or instruments that cut or otherwise penetrate bone or soft tissue, providing them with access to the bloodstream or normally sterile unexposed tissues; so named because of the substantial risk of acquiring infection if such an item is contaminated.

**Cross-contamination:** The spread of microbes from one person to another.

**Semi-critical items:** The category of devices or instruments that contact but do not penetrate mucous membranes.

Links to Resources


7. Seal Shield. [http://www.sealshield.com](http://www.sealshield.com)
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 the 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 (1-410-571-0003).

For each item, pick the best answer.

1. When decontaminating a new dental equipment item what should be done first?
   a. Clean the surface with isopropyl alcohol   b. Heat sterilize it
   c. Submerge it in a chemical sterilant for one hour   d. Review the manufacturer’s directions for the proper asepsis procedures

2. Computer keyboards and mice are important pieces of equipment in most dental facilities. Which of the following statements is incorrect?
   a. Covering keyboards can reduce the number of bacteria that adhere to them
   b. Computer mice have not been demonstrated to harbor bacteria
   c. Bacteria have been isolated from every surface sampled of computer equipment in a dental clinic
   d. Flat, smooth, touch-sensitive keyboards that are more easily cleaned and disinfected can help prevent cross-contamination of pathogens

3. What does the CDC say should be done with critical and semi-critical instruments before each use?
   a. Clean with hot soapy water   b. Clean and heat sterilize
   c. Clean and disinfect   d. Clean and sterilize in a liquid sterilant

4. What are the possible consequences of not following the manufacturer’s directions for decontamination and sterilization of a dental equipment item?
   a. Damage to the equipment   b. Invalidation of the warranty
   c. Decreased safety for patients   d. a, b and c

5. What two agencies are well known for providing information about hazardous chemicals?
   a. OSHA and NIOSH   b. FDA and ADA
   c. OSHA and ADA   d. EPA and ADA

6. If a reusable item used in patients’ mouths cannot be barrier protected or sterilized by heat or liquid chemicals, what should be done?
   a. Don’t use it
   b. Clean it thoroughly before each use
   c. Clean it thoroughly before each use but inform the subsequent patient that the item is not sterile
   d. Clean it thoroughly before each use but get a written consent from the subsequent patient to use it

7. What does the acronym LASER stand for?
   a. Light Adapted Sensory Energy Recovery   b. Lite Analgesia Stored by Electric Reflection
   c. Limited Analog for Secured Everlasting Radon   d. Light Amplification by Stimulated Emission of Radiation

8. Who conducted the study describing computer keyboard disinfection?
   a. Rutala et al.   b. Watson and Crick
   c. CDC   d. Miller and Palenik

9. What small particles are used in air abrasion?
   a. calcium carbonate   b. aluminum oxide
   c. copper sulfate   d. iron oxide

10. Why has the CDC not made a specific recommendation about protection of dental healthcare workers from laser plumes?
    a. Lasers have never been used in dentistry
    b. Laser plumes never occur in the human mouth
    c. Laser plumes do not contain microbes
    d. The effect on dental personnel of exposure to laser plumes has not been adequately evaluated

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Bright Ideas

Hazardous Materials Training
There is a lot of useful information about hazardous materials from OSHA that can serve as a basis for in-service training at a designated staff meeting. For example, the web site Hazardous and Toxic Substances at http://www.osha.gov/SLTC/hazardoustoxicsubstances/index.html includes information on how to recognize hazardous and toxic substances in the workplace and gives examples of possible solutions to workplace hazards. OSHA also has a Draft Model Training Program for Hazard Communication at http://www.osha.gov/dsg/hazcom/MTP101703.html.

Another informative site is from the CDC’s National Institute for Occupational Safety and Health (NIOSH) at http://www.cdc.gov/niosh/topics/chemical-safety/. It provides information on chemical safety in a Pocket Guide to Chemical Hazards with data on hundreds of chemicals. It also offers Chemical Safety Cards that summarize essential health and safety information on chemicals. This site provides links to OSHA’s Hazard Communication Standard; the hazardous chemical database at the National Library of Medicine; information on personal protective equipment, respirators and Material Data Safety Sheets. Posters and signs as visual aids for training about hazardous chemicals are available commercially.

Chris Miller and Denise Sabol
ICIP Staff

Please forward this issue of ICIP to other dental professionals involved in infection control and safety.