In CONTROL Fact Sheet

NUMBER 14 **Updated August 2011**

Instrument Processing: Sterilization and Storage

Introduction

Patient-care items (e.g., dental instruments, devices, and equipment) are categorized as critical, semicritical, or noncritical, depending on the potential risk of transmitting infection if the item becomes contaminated during use.

Categories of patient-care items

Category	Definition	Examples in Dentistry	Comments
Critical	Penetrate soft tissue, contact bone, enter into or contact the bloodstream, or other normally sterile tissue.	Surgical instruments, periodontal scalers, scalpel blades, surgical dental burs	Have the greatest risk of transmitting infection—clean and heat sterilize.
Semicritical	Contact mucous membranes or non-intact skin, but will not penetrate soft tissue, contact bone, enter into or contact the bloodstream, or other normally sterile tissue.	Dental mouth mirror, amalgam condenser, reusable dental impression trays, dental handpieces*	Have a lower risk of transmission—clean and heat sterilize. If a semicritical item is heat-sensitive, it should, at a minimum, be processed with high-level disinfection.
Noncritical	Contact with intact skin	Radiograph head/cone, blood pressure cuff, facebow, pulse oximeter	Pose the least risk of transmission of infection—clean and disinfect or use disposable barrier protection.

*Although dental handpieces are "by definition" considered a semicritical item, they should always be heat-sterilized between uses and not high-level disinfected.

Sterilization vs. Disinfection

Sterilization is a procedure that destroys all microorganisms including large numbers of resistant bacterial spores, which are the most difficult microorganisms to kill. Disinfection destroys microorganisms by physical or chemical means and is less lethal than sterilization.

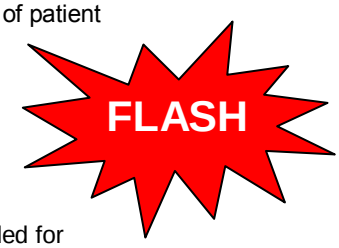
Commonly Used Heat Sterilization Methods

Method[1]	Advantages	Disadvantages/Precautions
Steam Under Pressure (Autoclave) *via moist heat under pressure*	• Can be used with packaged items • Penetrates fabric- and paper-wrapped packs • Time-efficient and reliable	• May leave instruments wet, causing them to rust • May damage some plastics • May dull certain sharp items • Do not use closed containers
Dry Heat *via heated air*	• Can be used with packaged items (special packaging materials may be indicated) • Items are dry after cycle • Doesn't rust instruments • Reliable	• May require a longer processing time (static-air sterilizers) • Damages most plastics • Melts or destroys some metal or solder joints • Chars fabric and paper
Unsaturated Chemical Vapor (Chemiclave) *via hot formaldehyde vapors under pressure*	• Can be used with packaged items • Doesn't rust instruments • Items dry quickly after cycle • Time-efficient and reliable	• May require special ventilation • Fabric/cloth wraps may absorb chemicals • Damages certain plastics • Special solutions required • Do not use closed containers

Modified from: US Department of Health and Human Services. Practical Infection Control in the Dental Office, 1993 and Miller CH, Palenik CJ, Infection Control and Management of Hazardous Materials for the Dental Team, 2005.

[1]All sterilization equipment and products should be cleared by the Food and Drug Administration (FDA). Always follow manufacturer instructions for cycle times, loading procedures, and maintenance.

Flash Sterilization (Immediate-Use Steam Sterilization)



"Flash" or "fast" steam sterilization is defined as a process designed for the steam sterilization of patient care items for immediate use. Currently, the time required for flash sterilization depends on the type of sterilizer and the type of item (i.e., porous vs. non-porous items). A flash sterilization cycle usually operates at higher temperatures for shorter times. The flash sterilization cycle is preprogrammed to a specific time and temperature setting established by the manufacturer based on the type of sterilizer control (e.g., gravity displacement, pre-vacuum). To allow immediate contact with the steam in the short cycle, the instrument is usually unwrapped. However, if manufacturer instructions permit, certain types of packaging materials may be used. If flash sterilizing critical instruments (e.g., surgical instruments) intended for immediate use, they must be handled aseptically during removal from the sterilizer and transport to the point of use (e.g., transported in a sterile covered container). Flash sterilization should be used only in carefully selected clinical situations when certain conditions are met.

DO	DON'T
- Clean and dry instruments before the flash sterilization cycle. **- Use mechanical, chemical, and biological indicators for each flash sterilization cycle.** **- To avoid contamination and thermal injury, allow instruments to dry and cool in the sterilizer before they are handled.**	**- Do not use flash sterilization for reasons of convenience, as an alternative to purchasing additional instrument sets, or to save time.** **- Do not package or wrap instruments used during flash sterilization unless the sterilizer is specifically designed and labeled for this use.** **- Do not flash-sterilize implantable devices.**

Processing Heat-Sensitive Items

There are very few items that cannot be heat sterilized between patients. Heat-tolerant or disposable alternatives are available for the majority of items used in dentistry. If heat-sensitive items must be used, they can be sterilized by using a low-temperature sterilization method such as ethylene oxide. Because this type of sterilization equipment is not available in USAF facilities, liquid chemical germicides (e.g., hydrogen peroxide based products, peracetic acid) can be used to either high-level disinfect or sterilize the heat-sensitive items. If liquid chemical germicides must be used for instrument processing, manufacturer instructions must be followed closely to ensure the effectiveness of the process and the safety of dental health-care personnel. To sterilize an item with a liquid chemical germicide it could take up to 12 hours, while high-level disinfection times are much shorter. (See below for additional disadvantages.) When used correctly chemicals used for high-level disinfection or sterilization are effective, however the process cannot be verified with biological indicators (i.e., spore tests). Therefore, use of liquid chemical solutions is not an acceptable substitute for heat sterilization and must only be used when a heat-tolerant or disposable instrument is not available.

Chemical sterilant: chemicals used for the purpose of destroying all forms of microbial life including bacterial spores.
High-level disinfection: a disinfection process that inactivates vegetative bacteria, mycobacteria, fungi, and viruses but not necessarily high numbers of bacterial spores. The FDA further defines a high-level disinfectant as a sterilant used under the same contact conditions except for a shorter contact time.

Liquid Chemical Germicides Used for Chemical Sterilization or High-Level Disinfection

Advantages	Disadvantages
+ Can sterilize items that would be damaged by heat	- Less reliable than heat methods - Very time-consuming - Has a limited use-life - Is expensive in the long run - Cannot be spore tested for effectiveness - Toxic fumes may require special ventilation - Personal protective equipment required during use - Cannot be used with packaged items - Items must be rinsed off with sterile water - May rust or corrode instruments

Storage
Instrument processing requires numerous steps, so care must be taken to avoid contamination of the instruments upon completion of the process. All sterile supplies and instruments (reusable or single-use disposable) should be stored in a manner that preserves the integrity of the package. All packages must be examined carefully before use to ensure that the barrier wrap has not been compromised during storage.

DO	DON'T
- Allow packages to dry in the sterilizer before handling to avoid contamination. **- Store sterile items and dental supplies in clean, dry, and dust/lint-free areas with limited access—covered or closed cabinets are recommended.** **- Follow medical treatment facility (MTF) guidelines when storing clean and sterile materials. (In the absence of MTF guidance store clean and sterile materials at least 8 to 10 inches above the floor, 18 inches below the ceiling, and 2 inches from the outside walls.)** **- Keep like items together (i.e., sterile with sterile and clean with clean).** **- Implement stock rotation practices (e.g., "first in, first out") with older items being used first.**	**- Do not store sterile supplies or patient-care items under the sink (or any location where they may become wet), on the floor, windowsills, or any area other than designated shelving or cabinets.** **- Do not store sterile items with items not intended for clinical use (e.g., office supplies, cleaning supplies).** **- Do not use shipping cartons to dispense sterile or clean patient treatment items in dental operatories, laboratories, instrument processing, and supply areas.** **- Do not handle sterile packages unnecessarily to avoid contamination.**

TEST YOUR KNOWLEDGE ABOUT STERILIZING DENTAL INSTRUMENTS

1. The three most common methods used for sterilizing dental instruments include:
a. steam, dry heat, flash sterilization.
b. steam, unsaturated chemical vapor, liquid chemical germicides.
c. steam, dry heat, unsaturated chemical vapor.
d. dry heat, unsaturated chemical vapor, liquid chemical germicides.

2. Do not use flash (immediate-use) sterilization for reasons of convenience, as an alternative to purchasing additional instrument sets, or to save time.
a. True
b. False

3. Which of the following is true regarding storage policies for sterile and clean items?
a. To avoid contamination, allow packages to dry in the sterilizer before handling.
b. Do not store sterile supplies or patient-care items under the sink.
c. Do not use shipping cartons to dispense sterile or clean patient treatment items in dental operatories, laboratories, instrument processing, and supply areas.
d. a and c
e. a, b, c

Selected References and Additional Resources (Updated August 2011)

Association for the Advancement of Medical Instrumentation, American National Standards Institute. Comprehensive guide to steam sterilization and sterility assurance in health care facilities. ANSI/AAMI ST79-2010 and A1:2010. Arlington, VA: Association for the Advancement of Medical Instrumentation, 2010.

CDC. Guidelines for infection control in dental health-care settings – 2003. MMWR 2003; 52(No. RR-17):1–66.

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USAF Guidelines for Infection Control in Dentistry.

Answers: 1)c; 2)a; 3)e