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Sterilization and Disinfection of Dental Instruments

According to the Centers for Disease Control, dental instruments are classified into three categories depending on the risk of transmitting infection. The classifications of critical, semicritical and noncritical are based on the following criteria:

1) **Critical** instruments are those used to penetrate soft tissue or bone, or enter into or contact the bloodstream or other normally sterile tissue. They should be sterilized after each use. Sterilization is achieved by steam under pressure (autoclaving), dry heat, or heat/chemical vapor. Critical instruments include forceps, scalpels, bone chisels, scalers and surgical burs.

2) **Semi-critical** instruments are those that do not penetrate soft tissues or bone but contact mucous membranes or non-intact skin, such as mirrors, reusable impression trays and amalgam condensers. These devices also should be sterilized after each use. In some cases, however, sterilization is not feasible and, therefore, high-level disinfection is appropriate. A high-level disinfectant is registered with the U.S. Environmental Protection Agency (EPA) as a "sterilant/disinfectant" and must be labeled as such.

3) **Non-critical** instruments are those that come into contact only with intact skin such as external components of x-ray heads, blood pressure cuffs and pulse oximeters. Such devices have a relatively low risk of transmitting infection; and, therefore, may be reprocessed between patients by intermediate-level or low-level disinfection. An intermediate-level disinfectant is EPA-registered as a "hospital disinfectant" and will be labeled for "tuberculocidal" activity (e.g., phenolics, iodophors, and chlorine-containing compounds). A low-level disinfectant is EPA-registered as a "hospital disinfectant" but is not labeled for "tuberculocidal" activity (e.g., quaternary ammonium compounds). The tuberculocidal claim is used as a benchmark to measure germicidal potency. Germicides labeled as "hospital disinfectant" without a tuberculocidal claim pass potency tests for activity against three representative microorganisms: *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Salmonella choleraesuis*

Processing Instruments

All critical and semicritical dental instruments that are heat stable should be sterilized after each use by steam under pressure (autoclaving), dry heat, or chemical vapor. Before sterilization or high-level disinfection, instruments should be cleaned so that any debris is removed. Enzymatic and non-enzymatic solutions facilitate instrument cleaning. Heavy-duty gloves should be worn when handling contaminated instruments. Instruments should soak in water or disinfectant/detergent as soon as possible after use to prevent drying of debris. Instrument cassettes and mechanical cleaning (e.g., ultrasonic cleaners) may be used to reduce direct handling of contaminated instruments. Applying rust inhibitors will protect instruments from corrosion that may result from autoclaving. Packaging rinsed and dried instruments before sterilization protects them from contamination after they are removed from the sterilizer and during transport chairside or to storage.

Sterilization is recommended for all high-speed dental handpieces, low-speed handpiece components used intraorally and reusable prophylaxis angles. It is important to follow the manufacturers' instructions for cleaning, lubrication and sterilization procedures to ensure the effectiveness of the sterilization process and the longevity of these instruments. High-speed and low-speed handpieces produced today are heat tolerant, and many older heat-sensitive models can be retrofitted with heat-stable components.

Biological Indicators. Proper functioning of sterilization cycles should be verified by periodic use of spore tests called biologic indicators. Biologic indicators consist of highly resistant bacterial spores of *Bacillus* (*Geobacillus*) *stearothermophilus* (used to monitor steam and unsaturated chemical vapor sterilizers) or *Bacillus subtilis* (used for monitoring the dry heat sterilizer).

The CDC recommends that all sterilized implantable devices be quarantined until the results of biological monitoring are known.

Chemical Indicators. Chemical indicators (in the form of tape, strips, tabs and special markings on packaging material) indicate exposure to heat. Heat-sensitive chemical indicators that change color after exposure to heat do not guarantee sterilization but should be placed inside each pack, and on the outside of each pack when the internal indicator is not visible from the outside, to identify packs that have been processed through the heating cycle. Chemical indicators also should be placed in the center of a load of unwrapped instruments.

Flash Sterilization. Flash sterilization is a method for sterilizing unwrapped instruments for immediate use. This cycle operates at a higher temperature for a shorter period of time than the normal sterilization cycle. The CDC* recommends that flash sterilization **not** be used routinely in the dental office to sterilize patient instruments—this process should only be used in unavoidable situations.

"Cold Sterilization." In all dental and other health-care settings, indications for the use of liquid chemical germicides to sterilize instruments (i.e., "cold sterilization") are limited. For heat-sensitive instruments, this procedure may require up to 10 hours of exposure to a liquid chemical agent registered with the EPA as a "sterilant/disinfectant." Instruments sterilized in this manner should be rinsed with sterile water, dried and placed in a sterile container (if not used immediately).

Contact time is the single important variable distinguishing the sterilization process from high-level disinfection with FDA-cleared liquid chemical sterilants. The FDA defines a "high-level disinfectant" as a sterilant that is used under the same contact conditions as sterilization except for a shorter immersion time.

*Centers for Disease Control and Prevention. Guidelines for infection control in dental health care settings—2003. MMWR 2003; 50(No. RR-17).

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Instrument Processing Table

Precleaning and cleaning solutions	
Enzymatic solutions	Removes blood and other proteinaceous material
Non-enzymatic solutions	Removes non-specific debris
Mechanical cleaners	Washers/disinfectors or ultrasonic cleaners
Rust Inhibitors	Retards corrosion of carbon steel
Sterilization Packaging Material	
Cassette	Perforated metal or plastic/resin container used to house instruments
Paper/plastic pouch	For steam or unsaturated chemical vapor sterilizers and for storage of sterile instruments Have built-in chemical indicator
Nylon tubing	For steam or dry heat sterilizers and for storage of sterile instruments
Wrap	For wrapping instruments and cassettes
Heat sealer	For sealing nylon tubing
Sterilizers	
Steam autoclave	Uses steam under pressure to sterilize 250°F to 273°F (time varies depending on size of load and autoclave) Good penetration of heat into packages Causes corrosion Requires drying time
Oven-type dry heat sterilizer	Uses dry heat at 320°F for 1-2 hr No corrosion
Rapid heat transfer-type dry heat sterilizer	Uses circulated dry heat 375°F for 6-20 min
Unsaturated chemical vapor sterilizer	Uses unsaturated chemical vapors from formaldehyde and alcohol 273°F for 20 min No corrosion
Chemical Indicators	
Integrators for steam	Chemical indicators that change color or form after certain steam sterilizer conditions (temperature, time presence of steam)
Process indicator	Chemical indicator that changes color very soon after exposure to a certain temperature
Biological Monitoring	
Mail-in spore testing service	Tests adequacy of sterilization cycle Required weekly or monthly (depending on state) Tests are mailed to dental office where they are processed and sent back to testing service for analysis
In-office spore testing system	Test contains spore strips, culture tubes and proper incubator system

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