In Practice
Dentistry’s Resource for Infection Control and Safety

Demystifying Disinfectants
 Shedding light on choosing and using germicides in dental infection control

Through its surveys and logs of questions submitted via osap.org, OSAP tracks the infection control and safety interests and needs of the dental profession. In all the tallies, one topic consistently ends up near the top of the list: disinfectants.

The array of available products makes choosing what’s best for your practice a daunting task. Each year more and more surface disinfectants appear in the marketplace. Yet despite the increasingly crowded commercial arena, there remains no single best choice for dental facilities. Instead, dental professionals are presented with a growing field of different yet appropriate formulations for managing operatory surfaces and heat-sensitive instruments.

Searching for the ideal disinfectant
The perfect disinfectant has broad-spectrum antimicrobial activity; it destroys virtually all forms of microorganisms from easily inactivated viruses, vegetative bacteria, and fungi, through the more resistant virus families, mycobacteria, and bacterial endospores. It exhibits residual biocidal activity and acts quickly, so contact times aren’t a burden. To simplify and speed the turnaround process, the ideal disinfectant is unaffected by the presence of blood or sputum and doesn’t lose its effectiveness in the presence of hard water. It’s not only nontoxic, nonirritating, and hypoallergenic, but it’s also nonstaining and compatible with every surface and material found in the dental office. It’s easy to use, and it never leaves a film or residue on treated surfaces. It’s economical, it has a lengthy shelf life, and it doesn’t smell like a harsh disinfectant.

No products on the market today meet every request on our list, but that doesn’t mean that practices are left without options. Make a list of the characteristics of your practice and, in order of importance, the performance characteristics you want in the disinfectants you use. Comparing your list with the advantages and disadvantages of today’s disinfectants (see page 5) will help you make the right choice.

Clean it first
All disinfectants on today’s market lose their efficacy in the presence of bioburden and debris. Whether disinfecting or heat-sterilizing, blood, exudate, and even residual dental materials left on environmental surfaces or instrument tips protect organisms from the disinfection or sterilization process. As such, all instruments and surfaces must be cleaned prior to further processing. Cleaning removes organic matter (such as blood and tissue) and other debris. continued on page 2
OSHA Compliance

continued from front cover

that can interfere with sterilization or disinfection. It also reduces the number of microorganisms present.

Maintaining surfaces

Although separate cleaners and disinfectants certainly may be used, experts agree that chemical agents that can do both are the most efficient approach to surface asepsis in dental practices. Iodophors, water-based germicides containing multiple phenolic agents, sodium hypochlorite preparations, synergistic quaternary ammonium compounds, and halogen-based agents are some good cleaner-disinfectants. See page 4’s “Putting It All Together” column for instructions on how to spray-wipe-spray clinical contact surfaces.

Of course, barrier-protecting contamination-prone surfaces before patient treatment eliminates the need for between-patient cleaning and disinfection. Surface barriers are an especially effective and time-saving option for clinical contact surfaces that are difficult to clean.

Instrument processing

Heat-sterilization (via autoclave, chemical-vapor sterilizer, or dry heat) remains the preferred method of reprocessing instruments used intraorally. Today, all critical dental instruments (that is, those that penetrate skin or mucosa or contact open tissue) are either heat-stable or disposable; similarly, most instruments that contact the oral mucosa (semicritical dental instruments) either are able to withstand repeated heat sterilization or are available as single-use disposables.

For those few heat-sensitive items used intraorally (e.g., photographic cheek protectors, some radiographic positioners, curing light guards), chemical reprocessing is an option. Used as directed, chemical sterilants destroy all microbial life, including bacterial endospores, on treated instrument surfaces. At weaker dilutions and/or shorter contact times, these agents also are used for high-level disinfection, which inactivates all microorganisms except endospores. Chemical sterilization typically requires lengthy contact times that are impractical for busy dental offices. Further, many of these chemical agents are toxic, acting as an irritant to the eyes, skin, and respiratory tract. Personal protective equipment must always be in place when working with these chemicals. To minimize fumes, a lid should always be used on containers holding immersed instruments.

Modified CDC/Spaulding Classification of Contaminated Surfaces

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
<th>Relative Risk of Disease</th>
<th>Reprocessing</th>
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</thead>
<tbody>
<tr>
<td>Critical surfaces</td>
<td>Penetrate tissue; contact open tissue (hand instruments, cutting instruments, scaler tips)</td>
<td>High</td>
<td>Heat-sterilize, or use single-use disposables</td>
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<tr>
<td>Semicriticial surfaces</td>
<td>Contact mucosa (hand instruments, mouth props, curing light guards, cheek protectors)</td>
<td>Intermediate</td>
<td>Heat-sterilize; use single-use disposables; or high-level disinfect (for heat-labile items)</td>
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<tr>
<td>Noncritical surfaces with intraoral contact</td>
<td>May contact skin and/or mucous membranes of dental personnel or patients after fabrication, handling, or repair (impressions, prostheses)</td>
<td>Low</td>
<td>Thorough rinsing followed by intermediate-level disinfection</td>
</tr>
<tr>
<td>Noncritical surfaces with no intraoral contact</td>
<td>Contact with unbroken skin (e.g., blood-pressure cuffs, nitrous-oxide face masks)</td>
<td>Low</td>
<td>Sanitize with detergent (sufficient in absence of visible blood or saliva); follow with intermediate-level disinfection (if visibly contaminated); or barrier protect</td>
</tr>
<tr>
<td>Environmental surfaces: patient care</td>
<td>Usually contact dental personnel but not patients (dental unit surfaces, lab and x-ray equipment)</td>
<td>Very low</td>
<td>Sanitize with detergent (sufficient in absence of visible blood or saliva); follow with intermediate-level disinfection (if visibly contaminated); or barrier protect</td>
</tr>
<tr>
<td>Environmental surfaces: housekeeping</td>
<td>Rarely contact dental personnel or patients (floors, walls, countertops)</td>
<td>Minimal</td>
<td>Sanitize with detergent (sufficient if no visible blood or saliva is present); when blood is present, follow with intermediate-level disinfection</td>
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Compliance Corner

ADA American Dental Association infection control guidelines address appropriate disinfectants for dental practices. See www.ada.org/prof/prac/issues/topics/iccontrol/ic-recs/index.html for current recommendations.

CDC The Centers for Disease Control and Prevention’s “Recommended Infection-control Practices for Dentistry, 1993” outlines appropriate disinfectant criteria and choices for dental applications. The recommendations are available at www.cdc.gov/oralhealth/guidelines.htm

EPA The Environmental Protection Agency regulates pesticides, including intermediate- and low-level antimicrobial agents, under the statutory authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). A list of registered antimicrobial pesticides can be found at www.epa.gov/opppad001.

OSAP For guidance on classifying operatory surfaces, go to www.osap.org/resources/ICguide97.htm.

Glossary

Common disinfectant and disinfection terminology

Cleaning Physically removing debris to reduce the number of microorganisms present and remove organic matter that can interfere with disinfection or sterilization

Clinical contact surfaces Environmental surfaces that are touched by contaminated hands, instruments, or items, or by spatter during treatment

Disinfection Destroying or irreversibly inactivating most species of pathogenic microorganisms to a number that poses no threat of disease

High-level disinfectant Destroys or inactivates all microbial life, except bacterial endospores, with extended contact (usually three to ten hours); used to reprocess heat-labile instruments that contact but do not penetrate patient tissues

Intermediate-level disinfectant Destroys M. tuberculosis var. bovis, hydrophilic and lipophilic viruses, fungi, and vegetative bacteria; used for disinfecting clinical contact surfaces

Low-level disinfectant Destroys certain viruses and fungi; may be used in dentistry for general housecleaning purposes (washing floors, walls)

Hospital disinfectant Has demonstrated efficacy against Staphylococcus aureus, Salmonella choleraesuis, and Pseudomonas aeruginosa

Housekeeping surfaces Surfaces that are not contacted with contaminated materials during treatments, or surfaces that are not contacted with hands or instruments in the course of patient care (e.g., floors, walls)

Personal protective equipment Clothing or equipment worn such as exam gloves, utility gloves, masks, goggles or face shields, and fluid-resistant gowns

Reuse life The period of time a germicide solution should remain effective as it is used and reused

Shelf life How long a product may be stored prior to use

Surface barrier A fluid-impermeable covering placed over a surface before it is likely to become contaminated

Tuberculocidal Inactivates M. tuberculosis var. bovis, a highly resistant benchmark microorganism; inactivation of this sturdy organism implies consistent inactivation of less resistant microbial families (such as bacteria, fungi, and viruses)

Sterilant Chemical agent that can destroy all microbial life, including highly resistant bacterial endospores, when used according to the directions on the product label

Use life The period for which a disinfectant remains effective after its original container is opened

Infection Control In Practice is a resource prepared for clinicians by the Organization for Safety & Asepsis Procedures with the assistance and expertise of its member-contributors. OSAP is a nonprofit, independent organization providing information and education on infection control and occupational health and safety to dental care settings worldwide.

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Putting it All Together

With the right instructions, proper use of chemical disinfectants is as easy as 1-2-3.

Surface disinfection

Preparation
1. Before seating the patient, cover surfaces that are difficult to disinfect with fluid-impervious material. This protects surfaces from contamination and eliminates the need for time-consuming between-patient disinfection. Simply remove, discard, and replace contaminated barriers.
2. Read the disinfectant’s label and directions for use, paying special attention to the agent’s antimicrobial activity, its pre-cleaning ability, and the contact time required for disinfection.
   - Choose an EPA-registered, tuberculocidal disinfectant
   - Use an antimicrobial product that both cleans and disinfects. Such a product provides some antimicrobial protection during the cleaning process, helps remove debris spattered during the cleaning procedure, and minimizes the number of products required for surface maintenance.
   - For agents requiring dilution prior to use, use water rather than alcohol.
3. Don heavy-duty utility gloves, mask, protective eyewear, and protective clothing to guard against contact with contaminants and chemicals during cleaning and disinfection. Eyewear is especially important when mixing solutions or scrubbing surfaces with a brush. Masks help to minimize inhalation and prevent direct mucous membrane contact with chemicals and contamination from spatter.

Process
1. First clean the surface by spraying it with cleaner/disinfectant and vigorously wiping with paper towels. For disinfectants with poor cleaning ability, use a separate detergent-based cleaner. Hold paper towels behind surfaces while applying the cleaner to catch overspray. Use a brush on surfaces that do not come visibly clean with wiping.
2. Spray the precleaned surface with disinfectant, using towels to reduce overspray. Allow the surface to remain moist for the contact time recommended by the manufacturer.
   - If the surface is still wet when ready to seat the patient, wipe it dry with clean towels. If the surface will contact the patient’s skin or mouth, rinse off residual disinfectant with water.

Instrument processing

Preparation
1. Don appropriate personal protective equipment — heavy-duty utility gloves, mask, protective eyewear, and fluid-resistant gown — when preparing, using, and discarding solutions.
2. Follow the manufacturer’s instructions for preparing/activating, using, and disposing of solution. Label storage containers with an expiration date consistent with the chemical’s stated use life (see the product’s label for information on use life).
3. Place a cover on the use container. Label it with the name of the chemical, an expiration date based on the date prepared and the solution’s reuse life (see the product’s label for information on reuse life), and any other relevant information relating to the office’s hazard communication program for the safe use of chemicals.
4. Periodically test the solution’s concentration using commercially available test kits or strips (contact the sterilant/disinfectant manufacturer for the proper test kit). Replace solution when indicated based on label instructions or concentration test results, and/or when the solution is visibly dirty or the level is low.
5. Cover the container and allow instruments to remain in the solution for the entire contact time recommended on the label.
6. Handle processed instruments aseptically. Use sterile tongs and rinse processed items thoroughly with sterile water, then dry with sterile towels.
7. If items are not to be used immediately, place them in clean packaging material.

Process
1. Thoroughly clean contaminated dental instruments. Automated cleaning methods are preferred (e.g., via an ultrasonic cleaner or instrument washer/washer-disinfector). Limit handscrubbing to those items that were not sufficiently cleaned during the automated process.
   - If handscrubbing is necessary, always wear heavy-duty utility gloves and other personal protective equipment. Use a long-handled brush, and scrub instrument tips below the waterline to minimize spatter.
2. After cleaning, thoroughly rinse instruments under running tap water and carefully dry them.
3. Separate heat-sensitive semicritical instruments from those to be heat-processed.
4. Place items to be chemically processed in a perforated tray or pan, then place the pan in the solution to fully immerse all instruments. Alternatively, use tongs to place the instruments in the solution without splashing.
5. Cover the container and allow instruments to remain in the solution for the entire contact time recommended on the label.
6. Handle processed instruments aseptically. Use sterile tongs and rinse processed items thoroughly with sterile water, then dry with sterile towels.
7. If items are not to be used immediately, place them in clean packaging material.
8. Periodically test the solution’s concentration using commercially available test kits or strips (contact the sterilant/disinfectant manufacturer for the proper test kit). Replace solution when indicated based on label instructions or concentration test results, and/or when the solution is visibly dirty or the level is low.
   - When replacing solution, discard all of the solution in the use container, clean with detergent, rinse with water, dry, and refill the container with fresh solution.
**EPA-registered surface disinfectants for dentistry**

<table>
<thead>
<tr>
<th>Category/Active ingredient</th>
<th>Contact*</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorines</td>
<td>2-10 min 20°C or 25°C**</td>
<td>economical; rapid, broad-spectrum activity; tuberculocidal; effective in dilute solution</td>
<td>diluted solutions must be prepared daily; cannot be reused; corrosive to some metals; may destroy fabrics; may irritate skin and other tissues; chlorine dioxide is a poor cleaner</td>
</tr>
<tr>
<td>Complex phenols</td>
<td>10 min 20°C or 25°C**</td>
<td>broad-spectrum activity; residual activity; effective cleaner and disinfectant; tuberculocidal; compatible with metal, glass, rubber, and plastic</td>
<td>extended exposure may degrade some plastics or leave etchings on glass; many preparations are limited to one day of use; may leave a residual film on treated surfaces</td>
</tr>
<tr>
<td>Dual/synergized quaternary ammonium compounds</td>
<td>6 or 10 min 20°C**</td>
<td>broad-spectrum activity; tuberculocidal; hydrophilic virus claims; low toxicity; contains detergent for cleaning</td>
<td>readily inactivated by anionic detergents and organic matter; can damage some materials</td>
</tr>
<tr>
<td>Iodophors</td>
<td>10 min 20°C</td>
<td>broad-spectrum activity; tuberculocidal; relatively non-toxic; effective cleaner and disinfectant; residual biocidal action</td>
<td>unstable at higher temperatures; may discolor some surfaces; inactivated by alcohol and hard water; must be prepared daily; dilution and contact times are critical</td>
</tr>
<tr>
<td>Phenol-alcohol combinations</td>
<td>10 min 20°C or 25°C**</td>
<td>tuberculocidal; fast-acting; residual activity; some inhibit the growth of mold, mildew, and other fungi</td>
<td>may cause porous surfaces to dry and crack; poor cleaning capabilities</td>
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<tr>
<td>Other halogens</td>
<td>5 min 20°C</td>
<td>fast-acting; tuberculocidal; supplied in tablet form for simple dilution; requires minimal storage space</td>
<td>for use on hard surfaces only; chlorine smell</td>
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**FDA-cleared instrument immersion disinfectants for dentistry**

<table>
<thead>
<tr>
<th>Category/Active ingredient</th>
<th>Classification</th>
<th>Contact time(s)</th>
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<tr>
<td>Glutaraldehyde 2.4% - 3.4% alkaline and acidic formulations**</td>
<td>Sterilant</td>
<td>6-10 hrs at 20°C, 22°C, or 25°C**</td>
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<tr>
<td>Hydrogen peroxide, 7.3%</td>
<td>Sterilant</td>
<td>6 hrs at 20°C</td>
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<tr>
<td>Ortho-pthalaldehyde, 0.55%</td>
<td>High-level disinfectant</td>
<td>12 min at 20°C</td>
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<td>Synergistic solutions</td>
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<tr>
<td>1.12% glutaraldehyde and 1.93% phenol/phenate</td>
<td>Sterilant</td>
<td>12 hrs at 25°C</td>
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<tr>
<td>7.35% hydrogen peroxide and 0.23% peracetic acid</td>
<td>Sterilant</td>
<td>3 hrs at 20°C</td>
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**Note:** Glutaraldehydes and simple quaternary ammonium compounds should not be used for surface disinfection in dentistry. High-concentration alcohols (ethyl alcohol or isopropyl alcohol of at least 70%) should be used on precleaned surfaces.

* Contact time/temperatures for tuberculocidal activity

** Varies by active ingredient or disinfectant brand
## Calendar

### SEPTEMBER 2002

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<th>SUNDAY</th>
<th>MONDAY</th>
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To help practices stay on track, OSAP provides this calendar listing typical schedules for periodic maintenance, recordkeeping, 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.

### OCTOBER 2002

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<th>SUNDAY</th>
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For a monthly dental office calendar you can customize to best meet the needs and schedules in your practice, visit osap.org/calendars/index.htm. (Adobe Acrobat Reader required.)
If you wish to obtain one (1) hour of continuing-education (CE) credit, complete the following test 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 through the Academy of General Dentistry and the Dental Assisting National Board. AGD Approved National Sponsor, FAGD/MAGD credit, 10/23/93 to 12/31/05.

1. _______________ are among the active ingredients in commercially available instrument immersion disinfectants.
   a. Complex phenols  
   b. Synergized quaternary ammonium compounds  
   c. Hydrogen peroxide and peracetic acid  
   d. Sodium bromide and chlorine

2. Which federal agency regulates surface disinfectants?
   a. Centers for Disease Control and Prevention  
   b. Environmental Protection Agency  
   c. Food and Drug Administration  
   d. Occupational Safety and Health Administration

3. Which federal agency regulates sterilant/high-level disinfectants?
   a. Centers for Disease Control and Prevention  
   b. Environmental Protection Agency  
   c. Food and Drug Administration  
   d. Occupational Safety and Health Administration

4. Phenol-alcohol-based disinfectants demonstrate excellent cleaning ability.
   ○ True  ○ False

5. For surfaces that are difficult to clean, _______________ is a suitable and time-saving option.
   a. barrier protection  
   b. spray-wipe-spray  
   c. replacing hard-to-clean equipment with items that are easier to clean  
   d. immersion disinfection

6. The term “______________” describes how long a germicide may be stored prior to use.
   a. reuse life  
   b. shelf life  
   c. use life  
   d. expiration date

7. A _______________ is an environmental surface that is touched by contaminated hands, instruments, or items, or by spatter during treatment.
   a. semicritical surface  
   b. critical surface  
   c. clinical contact surface  
   d. housekeeping surface

8. Which of the following is considered a housekeeping surface?
   a. floor  
   b. walls  
   c. countertop  
   d. all of the above

9. Instruments that have been high-level disinfected should be rinsed with sterile water and dried with sterile towels.
   ○ True  ○ False

10. Chemical baths used for high-level instrument disinfection or chemical sterilization should be monitored for potency.
    ○ True  ○ False

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Let's face it: A dental practice's chemical inventory can look like the stock room of a college chem lab.

“In my own office and in offices I've visited, I've seen chemicals continually misused,” said Milwaukee-based clinician and infection control consultant Dr. Mary Quinn.

“Go into your cabinets and read all the labels of the chemicals you stock,” she suggests. “Then start asking yourself some questions.” For example, she cites, What is each solution's intended use? Is there overlap? Can one solution do the work of two? Are workers in our office using each product as directed? Are the solutions we’re using appropriate for their applications in our practice?

One common area of “solution confusion” involves instrument holding (i.e., placing instruments in solution to keep bioburden and other debris moist until they can be cleaned later). “In a number of practices, I've seen glutaraldehyde used as a holding solution,” she recounts. “Glutaraldehyde is a great high-level immersion disinfectant for instruments, but it's expensive, and because of the fumes it generates, it should only be used in a closed container.” It’s also a fixative, which means it can bind bioburden to instrument surfaces and actually make cleaning more difficult. Further, if staff fail to rinse instruments prior to ultrasonic cleaning, the issue of a “mixed solution” arises, possibly creating equipment and disposal concerns.

“If the purpose of a holding solution is solely to keep instruments moist,” Dr. Quinn explains, “then an inexpensive detergent-and-water solution is just as appropriate for short-term soaking.”

For any solution in the dental office, always keep label information in mind. “Know what you’re using, why you’re using it, how it should be used, and what precautions you need to take to use it safely,” she summarizes.

“If you don’t need three different solutions in your practice, don’t use three different solutions. Stocking solutions you really don’t need will only create confusion among new employees and increase the chance for misuse.”

Mary Quinn, DDS, is a private practitioner in Milwaukee. A former dental infection control consultant and past member of the OSAP Board of Directors, she has been involved in OSAP since 1990.