The Dental Professional’s Guide to Surface Management

Infection control and prevention practices are extremely important in any oral health care setting. Dental Health Care Personnel (DHCP) have a responsibility to keep themselves, as well as patients and other staff, safe from infection. To do this, minimum standards must be met in order to prevent the transmission of infectious agents. Many state boards of licensure have regulatory standards for infection control in dental settings, including clinical disinfection. As the requirements can differ greatly from state to state, it is always a good idea for DHCP to check with their licensing agency.

This guide includes information that all DHCP should know about proper surface disinfection. It should be used in conjunction with the always-evolving, evidence-based research literature, Centers for Disease Control and Prevention (CDC) guidelines for infection control, and advice from other infection control associations or reliable health care professionals.

Common Infection Control Terms

- **Bactericidal**: capable of killing bacteria
- **Bioburden**: blood, saliva and other bodily fluids
- **Clinical contact surface**: surfaces that can be directly contaminated by either direct spray from the patient’s mouth and devices used during patient treatment, or by contact with gloved hands
- **Fungicidal**: capable of killing fungi
- **Housekeeping surfaces**: surfaces such as floors, walls and sinks that do not require the same rigorous decontamination procedures as clinical contact surfaces
- **Intermediate-level disinfectant**: an EPA-registered hospital disinfectant with a tuberculocidal claim
- **Kill time**: the amount of time a disinfectant must remain on a surface in order to inactivate the microorganisms its label claims to kill
- **Low-level disinfectant**: an EPA-registered hospital disinfectant without a tuberculocidal claim
- **Precleaning**: removal of bioburden before disinfectants
- **Shelf life**: the amount of time a disinfectant can be left unopened before it expires
- **Sporicidal**: capable of killing bacterial spores
- **Sterilant/high-level disinfectant**: an EPA-registered hospital disinfectant with the ability to inactivate bacterial spores
- **Tuberculocidal**: capable of killing tuberculosis (TB)
- **Use life**: the amount of time you can use an opened and/or mixed disinfectant before it is no longer effective
- **Virucidal**: capable of killing some viruses

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Levels of Disinfection or Sterilization

The "CDC Guidelines for Infection Control in Dental Health-Care Settings—2003" explains that in the United States, liquid chemical germicides (disinfectants) are regulated by the Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA). In health care settings, the EPA regulates disinfectants that are used on environmental surfaces (housekeeping and clinical contact surfaces). The EPA registers environmental surface disinfectants based on the manufacturer’s microbiological activity claims. For the purpose of selecting an appropriate disinfectant for the type of contamination present on a surface, the CDC divides EPA-registered hospital disinfectants into two categories based on the product’s ability to kill the resistant organism, Mycobacterium tuberculosis. Low-level disinfectants will kill lipid and nonlipid viruses and many vegetative bacteria and fungi, but are not tuberculocidal. These products are indicated for surfaces that are not contaminated with blood. Intermediate-level disinfectants will inactivate M. tuberculosis in addition to other less-resistant microorganisms (see Figure 2). Intermediate-level disinfectants are indicated for any blood-contaminated clinical surface. The CDC guidelines suggest that selecting one appropriate product with a higher degree of potency to cover all situations might be more convenient than using separate products for different levels of contamination. The more potent product would be the intermediate-level disinfectant with a tuberculocidal claim. The FDA regulates liquid chemical sterilants/high-level disinfectants (e.g., glutaraldehyde, hydrogen peroxide and peracetic acid) used on critical and semicritical patient-care devices. These products have limited use in dentistry and are not appropriate for use on clinical surfaces; they are used for immersion disinfection/sterilization only.

**Figure 2: Decreasing order of resistance of microorganisms to germicidal chemicals.**

<table>
<thead>
<tr>
<th>Organism</th>
<th>Processing Level Required</th>
<th>Sterilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial spores</td>
<td>FDA sterilant/high-level disinfectant</td>
<td></td>
</tr>
<tr>
<td>Geobacillus stearothermophilus</td>
<td>(=CDC sterilant/high-level disinfectant)</td>
<td></td>
</tr>
<tr>
<td>Bacillus atrophaeus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mycobacteria</td>
<td>EPA hospital disinfectant with tuberculocidal claim</td>
<td>(=CDC intermediate-level disinfectant)</td>
</tr>
<tr>
<td>Mycobacterium tuberculosis (TB)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonlipid or small viruses</td>
<td>EPA hospital disinfectant</td>
<td>(=CDC low-level disinfectant)</td>
</tr>
<tr>
<td>Polio virus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coxsackie virus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhinovirus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fungi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspergillus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Candida</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetative bacteria</td>
<td>EPA hospital disinfectant</td>
<td>(=CDC intermediate-level disinfectant)</td>
</tr>
<tr>
<td>Staphylococcus species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudomonas species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmonella species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lipid or medium-sized viruses</td>
<td>Human immunodeficiency virus</td>
<td></td>
</tr>
<tr>
<td>Herpes simplex virus</td>
<td>Hepatitis B and hepatitis C</td>
<td></td>
</tr>
<tr>
<td>Coronavirus</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Main Factors to Consider When Choosing a Surface Disinfectant

Kill Time
Kill time refers to the amount of time a surface disinfectant must stay wet on a surface in order to effectively inactivate an infectious agent. Always use the longest kill time that the surface disinfectant lists. For example, a surface disinfectant might have a 1-minute HIV kill time and a 10-minute TB kill time. Go by the 10-minute kill time in order to effectively kill all infectious agents that the product claims to kill. (See Section G on page 6.)

Compatibility
Because a surface disinfectant is used between every patient, the surfaces in the operatory are exposed to it regularly. Therefore, it is important to choose a surface disinfectant that is compatible with all of the various surfaces you plan to use it on. A surface disinfectant should not dry out, discolor, corrode or leave a large amount of residue on your surfaces.

Efficacy
A surface disinfectant should effectively inactivate any viruses, fungi or bacteria that may be present during a dental procedure. In most instances, an intermediate-level disinfectant that inactivates TB is recommended for use. There are certain microorganisms associated with particular claims on a product label. Microorganisms that are most difficult to inactivate are more commonly known as “benchmark microorganisms” because anything less aggressive is assumed to have been inactivated, as well. (See Figure 3.) (See Section G on page 6.)

Figure 3: Benchmark Microorganisms

<table>
<thead>
<tr>
<th>Label Claim</th>
<th>Classification of Organism</th>
<th>Microorganism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuberculocidal</td>
<td>Mycobacteria</td>
<td>Mycobacterium tuberculosis</td>
</tr>
<tr>
<td>Bactericidal</td>
<td>Gram-Positive Bacteria</td>
<td>staphylococcus</td>
</tr>
<tr>
<td>Bactericidal</td>
<td>Gram-Negative Bacteria</td>
<td>pseudomonas</td>
</tr>
<tr>
<td>Fungicidal</td>
<td>Fungus</td>
<td>tricophyton mentagrophytes</td>
</tr>
<tr>
<td>Virucidal</td>
<td>Enveloped Virus</td>
<td>herpes simplex</td>
</tr>
<tr>
<td>Virucidal</td>
<td>Nonenveloped Virus</td>
<td>rotavirus</td>
</tr>
</tbody>
</table>

Environment
Many dental practices search for products with a low environmental impact. When considering “green” products, it is important to select those that are equally effective. Always read the manufacturer’s product label to ensure you are using an EPA-registered, hospital-level disinfectant. A few key words manufacturers use to market their products as “green” are listed in Figure 4.

Figure 4: Environmental Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodegradable</td>
<td>Able to be broken down to more basic components (carbon, hydrogen and oxygen) by bacteria, fungi and other simple organisms</td>
</tr>
<tr>
<td>Carbon Footprint</td>
<td>The amount of carbon (CO2) gas, which is primarily responsible for global warming and climate changes, emitted in a year</td>
</tr>
<tr>
<td>Eco-Friendly – “Green”</td>
<td>Refers to low toxicity, ability to be recycled and no VOC emission</td>
</tr>
<tr>
<td>VOC – Volatile Organic Compound</td>
<td>Gases emitted from certain solids or liquids</td>
</tr>
</tbody>
</table>

These key words not only refer to chemical compositions, but also to product packaging options. Cleaners and disinfectants are available in ready-to-use or concentrate form. Both pose different benefits, but concentrate products have less packaging, which reduces shipping weight and costs, ultimately leaving less of a carbon footprint than ready-to-use products on the market.

Cleaning Ability
Cleaning removes debris that may harbor infectious agents from an area, while the disinfection step inactivates them. If a surface is not pre-cleaned, it reduces the effectiveness of the disinfection process. Many, but not all, surface disinfectants are cleaners as well as disinfectants and may be used for both such steps.

Other Factors to Consider
- Odor: It is important to choose a surface disinfectant that is free of any fragrance, which may help reduce the risk of airway irritants.
- Shelf life: Disinfectants usually carry shelf lives, or dates by which the product must be used, that can vary between active ingredients.
- Toxicity: The toxicity category indicates how harmful the product may be to its user or patient. (See Section G on page 6.)
The following information is required to be placed on all disinfectant labels, but individual layouts may change.

Reading Product Labels

A. **Virucidal**
B. **Bactericidal**
C. **Tuberculocidal**
D. **Surface Wipes**

**Hospital & Dental Cleaner / Disinfectant**

**Ready to Use** - Contains Biodegradable Detergent

**KEEP OUT OF REACH OF CHILDREN**

**CAUTION**

See side panel for additional Precautionary Statements.

**ACTIVE INGREDIENTS:**
- n-Alkyl (60% C12, 30% C14, 5% C10, 5% C16) dimethyl benzyl ammonium chloride .......... 0.154%
- n-Alkyl (68% C12, 32% C14) dimethyl ethylbenzyl ammonium chloride .......... 0.154%

**OTHER INGREDIENTS:**

Total ........................................................................................................ 99.692%

**EPA REG. NO 70144-2-51003 EPA EST. 1130-IL-1**

**Storage and Disposal Instructions**

- Do not contaminate this product with food by bringing food in plastic bags to recycling.
- If recycling is not available, discard container in trash as hazardous waste.

**Directions for Use:**

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

This product effectively kills the following microorganisms at room temperature with a 3-minute contact time:
- Acinetobacter baumannii
- Hepatitis B Virus (HBV)
- Hepatitis C Virus (HCV)
- Influenza Virus (IV)
- H1N1 Influenza A Viruses
- Human Immunodeficiency Virus Type 1 (HIV-1) and Type 2 (HIV-2)
- Influenza A Viruses
- Listeria Monocytogenes

- The primary active ingredients listed by weight percentage. Inert ingredients are typically not listed and rather lumped together for a weight percentage.

**Dispensing Directions**

To start fresh, remove cover and discard first wipe. From the center of the wipe end, pull up a wipe corner, twist it into a point and thread it through the hole located on the container cover. Pull through about one inch. Replace cover. Pull out first wipe and tear off at an angle. Remaining wipes feed into the container until next use. When not in use, keep container cap closed to prevent evaporation.

**Cleaning and Disinfecting Instructions**

Use a fresh Opti-Cide 3 Surface Wipe for each surface or article. Use Opti-Cide 3 Surface Wipes for countertops, computer keyboards, telephones, x-ray equipment/surfaces and use sites made of Plexiglas®, plastics (i.e. polycarbonate, polypropylene, polyvinylchloride and polystyrene), baked-on porcelain surfaces, stainless steel and non-porous vinyl.

**Hazardous Ingredients:**

- Caution: Use of this product may be a violation of Federal law.

**Precautionary Statements**

- Hazards to Humans and Domestic Animals
- Physical or chemical hazards statement
- Kill times and shelf life
- Intended use of the product
- Application sites
- Personal protective equipment required
- Environmental hazards statement
- Physical or chemical hazards statement

**Physical or Chemical Hazards**

- Do not use or store near heat or open flame.
- Use in a well-ventilated area.

**Directions for Use:**

- Intended use of the product
- Identifies microorganism the product is effective against
- Application sites
- Personal protective equipment required
- Kill times and shelf life

**First Aid Statement**

- Accidental exposure instructions for the end user and physician

**The Four Most Common Types of Precautionary Statements:**

- Hazards to humans and domestic animals statement
- First aid statement
- Environmental hazards statement
- Physical or chemical hazards statement

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Sprays vs. Wipes
Surface disinfectants are available in spray and wipe form. Both are effective in disinfecting clinical contact surfaces. Whether sprays or wipes are used in the practice depends on the practice’s preference. Keeping both options on hand is wise, as there may be certain instances where one may be more appropriate than the other.

It is important to note that proper disinfection occurs in two parts: cleaning followed by disinfection, regardless of whether the practice is using a spray, or a wipe. To find out if a product is both a cleaner and disinfectant, refer to the front of the product label. Two approaches can be taken to achieve proper disinfection: the “spray-wipe-spray” or “wipe-discard-wipe” method (see “Proper Application of a Surface Disinfectant” on page 11).

Sprays:
- Less expensive
- Able to reach areas wipes cannot access
- Better for disinfecting objects, such as impressions

In many cases, disinfection occurs using sprays or wipes (or both) in conjunction with the use of barriers. The most common surfaces within a dental practice that benefit from barriers are those that are shaped unusually or endure a lot of wear. Examples of these surfaces include handles, headrests, light handles and evacuation handles. Barriers are applied to cleaned and disinfected surfaces prior to a procedure, and are then removed and replaced prior to the next patient. For this reason, using barriers tends to be a more expensive and wasteful option than traditional disinfection, though many find it to be a time-saving convenience.

Wipes:
- More convenient
- Perceived as less noxious to sensitive individuals because they limit the potential for aerosols.

Surfaces in the Dental Care Environment
Surfaces in the dental operatory can be divided into two categories: clinical and housekeeping.

Clinical contact surfaces are those that can be directly contaminated by either direct spray from the patient’s mouth and devices used during patient treatment, or by contact with gloved hands. Clinical contact surfaces may serve as a source of cross-contamination to other instruments, devices, hands and gloves. Some examples of clinical contact surfaces include dental radiographic equipment, countertops, chairside computer components, light handles and switches, and controls on dental units and chairs.

Housekeeping surfaces, such as floors, walls and sinks, do not require the same rigorous decontamination procedures as clinical contact surfaces. The majority of housekeeping surfaces need only be routinely cleaned with a detergent and water. An EPA-registered hospital disinfectant may be used if it is reasonable to suspect that it may contain blood or bodily fluids. Mops and cloths should be cleaned, rinsed and allowed to dry between uses. If there is visible blood contamination, the housekeeping surface should be carefully cleaned, followed by application of an EPA-registered hospital disinfectant.

Housekeeping Surfaces
**Personal Protective Equipment (PPE)**

PPE refers to attire worn by DHCP to prevent direct contact with bodily fluids, such as blood and saliva. PPE should be used any time there is potential for splash, spray or spatter that may contain patient body fluids. It should also be worn while disinfecting the work area or exam room.

**Eye and Face:** Goggles, glasses or face shields prevent spray or aerosol from entering the eyes. Protective eyewear must meet the American National Standards Institute (ANSI) standards for spatter and impact protection.

**Mask:** A surgical mask should properly cover the nose and mouth in order to prevent the inhalation of spray particles or aerosoles in the air.

**Clothing:** Protective clothing, such as a knee-length lab coat or clinical gown, should cover intact and non-intact skin from spray. Gowns must be adequate to prevent spray or spatter of bodily fluids from contacting skin or clothing. The CDC and the Occupational Safety and Health Administration (OSHA) have stated that in most situations, DHCP should wear long sleeves.

**Heavy-Duty Utility Gloves:** Utility gloves prevent the surface disinfectant from coming into contact with hands. Wearing gloves limits the risk of any skin reaction or irritation that its ingredients may cause. Utility gloves also help protect the DHCP from accidental puncture injury when handling used, sharp items during the clean-up process.

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**Proper Application of a Surface Disinfectant**

1. **PPE**
   - Apply proper PPE.

2. **CLEAN**
   - Apply cleaning spray or wipe to remove any visual debris (i.e. bioburden).

3. **DISCARD**
   - Dispose of the wipe/paper towel/gauze that was used to clean the surfaces.

4. **DISINFECT**
   - Apply the disinfectant—often times the same product as used in step 2—and leave it wet for the entire kill time indicated by the manufacturer.
References


References for Test Organisms


Infection Control Resources

American Dental Association
ada.org

American Dental Assistants Association
dentalassistant.org

American National Standards Institute
ansi.org

Centers for Disease Control and Prevention
cdc.gov

Occupational Safety and Health Administration
osha.gov

Organization for Safety, Asepsis and Prevention
osap.org

United States Environmental Protection Agency
epa.gov

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