

SURFACE DISINFECTANTS

THEIR USE IN DENTISTRY & HOW THE SDSs PROTECT YOU

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INFECTION CONTROL CORNER
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LEARNING OBJECTIVES:

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



- compare and contrast disinfectants that are available to the dental setting;
- select a safe and effective product for surface disinfection throughout your clinical areas;
- devise a more efficient system for operatory turnover.

This is the fourth article that I have written on disinfectants for *Inscriptions*, the last time being in 2008 when the Center for Disease Control and Prevention (CDC) released new disinfection and sterilization guidelines.ⁱ These guidelines were primarily written for the medical community and very little referred to dental settings. Many times what works in the hospitals, such as using costly complex devices like Ultraviolet (UV) technology for surface disinfection and ethylene oxide for sterilization, is not manageable in dental facilities



due to reimbursement issues alone. By the way, you can forget about using a \$50,000 UV robot for surface disinfection of a room, you still have to physically wipe down the surfaces first and then there is a kill time of 10 minutes or more. Nothing is easy.

Please be aware that this article only touches the surface of the complex issues of disinfection. Just be thankful that we do not have to deal with such devices as invasive scopes like the hospitals do. I will address what is

practical for use in the dental field to achieve the desired results.

CDC DEFINITIONS

Disinfectant: a chemical agent used on inanimate objects (i.e., nonliving) (e.g., floors, walls, sinks) to destroy virtually all recognized pathogenic microorganisms, but not necessarily all microbial forms (e.g., bacterial endospores). The U.S. Environmental Protection Agency (EPA) groups disinfectants on whether the product label claims “limited,” “general” or “hospital” disinfectant.

High-level disinfection: a disinfection process that inactivates vegetative bacteria, mycobacteria, fungi, and viruses but not necessarily high numbers of bacterial spores. The the U.S. Food and Drug Administration (FDA) further defines a high-level disinfectant as a sterilant used under the same contact conditions except for a shorter contact time.

Hospital disinfectant: a germicide that is registered by EPA for use on inanimate objects in hospitals, clinics, dental offices, or any other medical-related facility.ⁱⁱ

CATEGORIES OF PATIENT CARE ITEMS

Let's review Spaulding's Classifications. In the mid-twentieth century, Dr. Earle H. Spaulding divided patient care items into three categories based on the risk of infection involved in their use. The three categories were critical, semi-critical and non-critical. This system has had universal acceptance in the infection control community, has been refined over the years and still is in use today. I reference these classifications frequently in this column, as they remain the basis for deciding how we treat items in dentistry that are used for more than one patient.

Critical items present a high risk of infection to a patient if the items are contaminated with any microorganism. If the objects enter normally sterile tissue or the vascular system, they should be rendered sterile to prevent disease transmission. These objects should be purchased as sterile, or steam sterilized if possible. Heat sensitive objects can be treated by chemical sterilants, but this presents numerous challenges for the process to be done correctly regarding cleaning, contact time, proper dilution, temperature and pH.

Semicritical items addresses objects which come in contact with mucous membranes; high-level disinfectants may be used to process these items eliminating all microorganisms with the exception of a few bacterial spores.

Noncritical items are items that come in contact with intact skin; cleaning and intermediate or low-level disinfection is necessary if bioburden is present. Risk is only present if the contaminated objects come in contact with mucous membranes or non-intact skin.ⁱⁱⁱ

Since the original Spaulding Classifications, the CDC added another category, **Environmental**, such as walls and floors that would only require cleaning or a low-level disinfectant. In general, the FDA regulates disinfectants for use for critical and semicriti-

cal items and the EPA regulates non-critical and environment disinfectants. So we have to decide what disinfection process we should use for each category. It can be confusing and frustrating to find the right balance.

HISTORY OF DISINFECTATION USE IN DENTISTRY

We started worrying about disinfectant efficacy when in the 1980s, Human Immunodeficiency Virus (HIV) was discovered, a bloodborne disease that at the time had no treatment or cure, so we started moving away from alcohols and looking for a more effective disinfectant.

As usual, dentistry was behind the curve suffering the "trickle-down effect" on what was available to us. A big reason was that if a product was accepted by a hospital, it was a major purchase, whereas a dental representative had to sell his products one office at a time. There was little incentive to do so and to be honest, little

available to market. We were eager to embrace whatever our dental supply rep could provide for us but there wasn't much we had to work with and not a lot of information on what worked. The hospitals were struggling too, and there was little research at the time to guide us. That is why the Centers for Disease Control (CDC) first stepped in and wrote the 1985 Guideline for Handwashing and Environmental Control and then updated it to the evidence-based recommendations, Disinfection and Sterilization in Healthcare Facilities in 2008.

When The Occupational Safety and Health Administration (OSHA) Bloodborne Pathogens Standard^{iv} became law in 1992, it mandated that we use a certain type of disinfectant to kill the Hepatitis B virus (HBV) and HIV. Initially we were required to use a hospital level disinfectant that was tuberculocidal. This meant that the disinfectant would kill *Mycobacterium tuberculosis*, a rather hearty bacteria, and therefore kill the weaker viruses such as HBV and HIV.

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Problem: the tuberculocidal disinfectants were very strong and very toxic to use. In addition, staff was not using these products appropriately. Walls were being wiped down and paint was being removed as a result. Big problem. It took years but finally the healthcare industry, along with the scientists, convinced OSHA that there were products out there that were safer to use and although were not tuberculocidal, were effective in killing the disease-bearing bloodborne viruses.

In addition, we were told that we had to clean everything before we disinfected. And some of the disinfectants were not compatible with cleaners. We had to clean with a different product before we could use the disinfectant which was more work and more confusion.

CHEMICAL DISINFECTANTS USED IN DENTISTRY

Alcohol: 2x2's or 4x4's soaked in alcohol was the main disinfectant used to wipe down an operatory before the '80s. Problem: it sets protein so does not clean well. Plain water does a better job. Hospitals stopped using it as a disinfectant. Dentistry followed several years later.

Chlorine and Chlorine Compounds: Great kill times. Problems: Had to clean first with soap and water and chlorine damaged surfaces very quickly if the wrong concentration was used. Whole operatories were destroyed before personnel stopped using bleach as a surface disinfectant.

Formaldehyde: Used to sterilize instruments. Problem: Toxic, OSHA has exposure limits, fatal if swallowed. If you still have an old Chemclave,

you might want to donate it to the Smithsonian.

Iodophors: Good cleaner and disinfectant. Problem: We had to mix solutions up every day, label our own containers for OSHA Hazard Communication laws, and the solution stained surfaces.

Phenolics: Problems: When combined with alcohol as a popular brand did, it set protein; again water cleans better. Very toxic and also hazardous to the environment. Urban Legend: Heavy use of an aerosol spray phenolic in a California dental practice killed all the fish in the aquarium. Note: Aquariums should not be placed in operatories due to contamination issues, i.e., "fish feces."

Glutaraldehydes: Used for high-level disinfectant and chemical sterilant. Regulated by the FDA. Problem: Time for immersion not monitored easily in a busy practice. The microbial load and wet items can diminish its

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efficacy and render the glutaraldehyde ineffective before its expiration date. Monitoring with test strips along with documentation is required to use it correctly. Use in a well-ventilated area as the fumes are toxic. Best practices today avoid this product by using only single-use items that cannot be steam sterilized.

Quaternary Ammonium Compounds (Quats): The original Quats were developed in the 1930s. These solutions were made up to “sterilize” instruments in containers. Problem: Did not sterilize or even disinfect. Water bugs readily grew in the solution. *Pseudomonas aeruginosa* partied in it. Newer generations of Quats for surface disinfection were developed to be more effective and still are in use today. Some of these Quats recently developed were found to be hard on some dental devices. The shields for Nomads were cracking and breaking when cleaned with Quat products that had a faster kill time. These products have warnings of flammability and toxicity to eyes and skin. Read their warnings on their labels. One manufacturer was proud to announce that their product no longer caused permanent blindness, only temporary. Scary. Read their Safety Data Sheets (SDSs).

Warehouse Clubs

Please note that the definition for the hospital disinfectant is for use in hospitals, clinics, dental offices, and any other medical-related facility. If you are one of those people who buys virtually everything for your practice that you can from these clubs, be careful what you are buying. Two mistakes are easily made about the disinfectants sold there. First, if you read the directions, they indicate that these products are for household use such as kitchens and bathrooms. These cannot be used in your clinical areas; they are not hospital disinfectants. The second mistake is that many people think Clorox is another name for bleach. If it is a Clorox product, it does not necessarily mean that it contains bleach. If it is a wipe, the product is probably a Quat. Read the label.

WHAT CHOICES DO WE HAVE IN DENTISTRY?

As many hospitals are eliminating the use of glutaraldehydes, formaldehydes, phenols and other disinfectants due to misuse and toxicity, I recommend that you also consider these safety measures. Embrace the concept of steam sterilization or single use items for items that enter the oral cavity. In addition, there is a risk management issue in the reuse of disposables intended for single use only. If the item is labeled as disposable and single use only, it should not be used on another patient. It also simplifies things. It eliminates the possibility of processing items incorrectly and exposing employees to toxic chemicals. It also eliminates patient exposure to these disinfectants if not rinsed properly. Did you know that the Arizona State Board of Dental Examiners Infectious Disease Control Inspection check list asks, “Are all items that enter the mouth either disposed of or autoclaved?”^v

Today’s disinfectant requirements are multifaceted. We want a product that is safe and effective. We want something that will be harmless for the user, the patient and the surface being disinfected. We want a fast kill contact time. We want to only apply once, not the spray/wipe/spray we were taught or the wipe/wipe. We want it to protect our patients and us. Look at the SDSs of the products you are using. Are there still hazard warnings for their use and personal protective equipment still required? What are we supposed to use now? Are we at the point where there is such a thing as an ideal disinfectant that was not available in the past?

In the last few years, there has been some rapid developments with products not available to you previously that look like the ideal disinfectant for dentistry and hospital use, e.g., a disinfectant that has been proven to be safe for patients and staff that works quickly and effectively. A win/win. I have been tracking this disinfectant for some time and now there has been enough information available that I

feel confident that I can encourage you to take advantage of this category of disinfectant.

SELECTING THE IDEAL DISINFECTANT

Kill Claims: Does the product kill the most prevalent healthcare pathogens?

Kill Times and Wet-Contact Times:

How quickly does it kill the pathogens? Ideally the disinfectant should kill the pathogens before the required contact time. For example, if you have a disinfectant that kills in five minutes, does it dry before the five minutes and therefore require another application?

Safety: What are the warnings for use? Is it toxic? Is it flammable?

Ease of Use: Is the odor acceptable to staff and patients? Does it clean and disinfect in one step?

Other Factors: Is the cost acceptable? Does it standardize your disinfectant use? Can you use it for different surfaces in different clinical areas without changing to another product?^{vi}

Read the label

WHAT IS IT?

Did you read the whole article or did you just skip to this? I am so excited about this disinfectant. It is Hydrogen Peroxide. This is not the product that you buy in the brown bottle in the drug store. This has been reformulated to be used as a highly safe and effective surface disinfectant in the healthcare field.

IMPROVED HYDROGEN PEROXIDE SURFACE DISINFECTANT

Advantages

- 30 sec -1 min bactericidal and virucidal claim (fastest non-bleach contact time)

- 5 min mycobactericidal claim
- Safe for workers (lowest EPA toxicity category, IV)
- Benign for the environment; non-corrosive; surface compatible
- One step cleaner-disinfectant
- No harsh chemical odor
- EPA registered

Disadvantages

- More expensive than QUAT ^{vii}

When we look at the advantages, it seems perfect. But then look at the expense. It is more expensive. But wait! If you find that it has a faster kill claim, requiring no reapplication before it dries, that is a plus. What about the TB kill time? Remember that we are no longer concerned about killing the TB, just killing the pathogens that are viruses and that happens in a minute or less. This is a product that has NO HAZARD WARNINGS ON ITS SAFETY DATA SHEET. It is gentle on all of your surfaces. You do not have to clean first then reapply. Just wipe once.

The odor is not offensive and it is EPA registered for Hospital Disinfection. You can use this for all your surfaces including operator patient chairs and equipment. By not needing to change to different products, you are increasing your efficiency. In addition if you get the bigger wipes, they come folded, so you can use one side, then the other, then turn them inside out, fold and wipe again. You have four surfaces to use to disinfect and may only need one or two wipes to clean your entire operator. So in the long run, you are saving money. So consider asking your dental supply rep for the hydrogen peroxide product. Better yet, ask for the one that is only .5% hydrogen peroxide. It has a faster kill claim and is easier on your hands than the other hydrogen peroxide that turns your hands white. It smells better too. Yes, I know that you use wipes sometimes without gloves. I have done it myself. These products actually do not require personal protective equipment to use, but you should wear it if you are cleaning up potentially infectious material. The wipes available today come very wet unlike the ones

in the past so I recommend only wipes to use in operator cleanup. I do not advocate spraying chemicals of any kind to expose healthcare personnel to respiratory inhalation. You will need a spray bottle of the product to wet and disinfect impressions but always wear a mask and gloves when doing so.

THE FUTURE

Will there be a faster, safer, cheaper disinfectant for healthcare in the future? Probably. Sounds good to me. In the meantime, check out what you are using now, check their SDSs, and did I say read the label? ■

See references and take the Infection Prevention Corner quiz to earn 1 CEU on the next page (page 30).

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1. When selecting a disinfectant for use in your clinical areas, what do you need to know?
 - A) Is it toxic, is it flammable?
 - B) Does it kill healthcare pathogens in a short amount of time before it dries?
 - C) Is it safe for your equipment, including operatory chairs?
 - D) All of the above

2. Before disinfection of a clinical surface, one must do what?
 - A) Make sure it has phenol in it.
 - B) Read the label of the product you plan to use.
 - C) Buy a household cleaner; it works just as well as a hospital disinfectant.
 - D) Autoclave the object to be disinfected.

3. The use of disinfectant wipes is:
 - A) Not recommended for safety reasons
 - B) Not effective
 - C) A safe and effective method of operatory disinfection
 - D) Not as safe as spraying and vaporizing the disinfectant into the air.

4. An example of a critical item is:
 - A) An explorer
 - B) A patient bib
 - C) The counter top
 - D) The dental chair

5. An example of a non-critical item is:
 - A) A stainless steel impression tray
 - B) The counter top
 - C) The dental chair
 - D) b and c

6. An example of an environmental surface is:
 - A) The operatory wall
 - B) An explorer
 - C) A stainless steel impression tray
 - D) A patient bib

7. All disinfectants used in dentistry must have tuberculocidal claims.
 - A) True
 - B) False

8. The EPA is responsible for all but the following:
 - A) Low-level disinfectants
 - B) Intermediate-level disinfectants
 - C) High-level disinfectants
 - D) Monitoring ground water contamination in the environment

9. The following disinfectant has no SDS warnings
 - A) Hydrogen peroxide
 - B) Phenol
 - C) Quaternary Ammonium Compounds
 - D) Formaldehyde

10. When using a glutaraldehyde for disinfection one should:
 - A) Test and document effectiveness.
 - B) Dry items before immersion.
 - C) Provide adequate ventilation to keep vapors at a safe level.
 - D) All of the above

References from article

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ii Centers for Disease Control and Prevention Oral Health Glossary. <https://www.cdc.gov/oralhealth/infectioncontrol/glossary.htm>

iii Rutala, W, Weber D, and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008, p.10 http://www.cdc.gov/hicpac/pdf/guidelines/Disinfection_Nov_2008.pdf

iv https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=10051&p_table=STANDARDS

v Arizona State Board of Dental Examiners Substantive Policy Statements, March 2015, p 6 <https://dentalboard.az.gov/sites/default/files/Sub%20Policy%20Statements%202015-03.pdf>

vi Rutala, Weber. Infect Control Hosp Epidemiol. 2014;35:855-895

vii "Best" Practices For Disinfection Of Non-Critical Surfaces And Equipment, William A. Rutala, PhD, MPH, Association of Professionals in Infection Control and Epidemiology, Grand Canyon State Fall Conference, October 23, 2015.

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