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SURFACE DISINFECTION | Choosing the Right Disinfectant

INTRODUCTION

Emerging new pathogens, acquired virulence of previously harmless microorganisms, the escalating spread of antibiotic resistance, and an increasing patient population of the vulnerable elderly, are all heightening the importance of infection prevention in healthcare facilities. In dentistry, we hear about infrequent dental-associated outbreaks when they occur, but individual dental patient infections are rarely reported even back to the dental facility, much less make the news or dental journals. As a result, many facilities have not completely internalized the importance of their infection prevention efforts.

There are many instances during each visit where microorganisms may be transferred from patient to staff and staff to patient if proper infection control procedures are not followed. There are also many ways pathogens can be indirectly transmitted from contaminated equipment and surfaces to human hosts. However, with our increasingly vulnerable older patient population and the inability to cure an escalating number of infections, we must refocus on our infection prevention efforts in all healthcare facilities. One of the most easily improved upon infection prevention practices is that of surface disinfection. Observations reveal time and time again the errors in cleaning readily corrected.

THE DISINFECTANT | Selection

Pathogens

Surfaces in the dental facility are readily contaminated with splattered saliva, mucus and blood droplets during most dental procedures. Microorganisms are present in these organic projectiles. Their organic coating serves to protect the associated pathogens while providing bacteria and fungi with a food source enabling them to multiply and form biofilms. Dental known and suspected pathogens are listed in the chart below along with reference to the difficulty level for destroying them.

Looking at splatter dissemination and surface contamination during dental procedures, it is important to note that one milliliter of saliva is estimated to contain over 100 million microorganisms made up of over 600 different species!

***What is reasonable contact time?**

Less time is better and easier for staff to comply with. When you look at the contact time, the product must stay wet for that amount of time in order to meet the stated claims. As an example, if the contact time is 5 minutes and the facility sees 20 patients per day, that equates to 100 minutes per day. As compared to a 2 minute contact time, with 20 patients a day, this equates to 40 minutes a day. This is a time savings of 60 minutes per day.

Therefore, the Centers for Disease Control & Prevention (CDC) requirement for the use of tuberculocidal qualified disinfectants in healthcare is only logical. As seen in Figure 1, a disinfectant proven to kill Mycobacterium tuberculosis will destroy most microorganisms below it in the hierarchy displayed as long as it is used correctly.

Figure 1

	Pathogen Type	Identified Pathogens Exposures Dental Procedure-Associated Infections
Harder to Destroy	Mycobacteria	Mycobacterium tuberculosis (TB)
	Non-Enveloped virus (hydrophilic)	Norovirus (suspected), Rotavirus
	Fungus	Candida spp.[1]
	Gram negative bacteria	Pseudomonas spp.[3], Legionella spp.
	Gram positive bacteria	Staphylococcus spp. (including MRSA)[2], Streptococcus spp.
Easier to Destroy	Enveloped Virus (hydrophobic)	Cytomegalovirus (CMV), Herpes simplex 1 & 2 (HSV), Varicella-zoster (VZV)[3], Human immunodeficiency virus (HIV)[1], Hepatitis (HBV), (HCV), (HDV)[4], Influenza virus

1. spp. is used to denote that several species of the genera (e.g. Pseudomonas) are implicated
2. MRSA (Methicillin Resistant Staphylococcus aureus) – multi-antibiotic resistant staphylococci
3. No reports but occurs in other healthcare environments; suspected in dental
4. HDV can only occur in individual who also have HBV

Selecting the Disinfectant

When evaluating surface disinfectants for your facility, there are many factors to consider. Check the product label for the following:

- Environmental Protection Agency (EPA) registration number
- Labeled as Tuberculocidal disinfectant
- Compatible with a wide range of surfaces, conditions of use and staff who will use it
- Both cleaning and disinfecting properties to help ensure easier inventory management
- Low allergenicity
- Non-offensive or fragrance free
- Easy to use
- Clear, easy-to-follow instructions for use (IFU)
- A reasonable contact time*
- Acceptable storage and disposal requirements
- A reasonable service life and shelf life

Selecting the disinfectant format

After selecting the most appropriate tuberculocidal cleaner/disinfectant, the product format is the next part of the selection process.

- **Pre-saturated wipes:** Surface disinfectant wipes are convenient to use, easy to dispose and typically require less storage space than sprays. Additionally, they offer the advantage of containing the correct amount of disinfectant without any measuring, mixing or diluting. Manufacturer's IFU should be followed as many times they require both a cleaning and disinfecting step. Presoaked wipes are validated for effectiveness at the contact time specified on the label. Those that are EPA registered as cleaner/disinfectants also provide the convenience of having everything needed in the same canister.
- **Ready-to-Use (RTU) Liquids:** Sprays generally deliver large droplets that fall to the surface rather than float on air currents, and thus are not usually an inhalation concern. RTU liquids are convenient, easy to use and help to reach areas that may be difficult to clean and disinfectant. This option is already pre-mixed and ready to use. Staff should consult the IFU to determine what wipes are compatible with the liquid used if wipes are desired. Sprayers continue to be valuable for those hard-to-reach or complicated surfaces that wipes may not reach well.
- **Concentrated Liquid:** This format is the least common in dental, but sometimes utilized as many times it is the most economical choice and can also save on storage/inventory space. Typically, this option is the most labor intensive and has the highest potential for human error as staff must mix the solution in office. As the CDC states in regards to disinfectants, "By law, all applicable label instructions on EPA-registered products must be followed. If the user selects exposure conditions that differ from those on the EPA-registered product label, the user assumes liability from any injuries resulting from off-label use. Failure to follow the specified use-dilution, contact time, method of application, or any other condition of use is considered a misuse of the product and potentially subject to enforcement action under FIFRA." This includes the specifications for water quality, the precise dilution ratio, final pH level, correct storage conditions and expiration date/time compliance for both concentrated and use dilutions. Use dilution containers must bear labels stating when it was diluted, when it expires (usually much sooner than the concentrated version), and instructions for proper use of the disinfectant must be placed on the use container as it appears on the original (specific to the diluted version).
- **Aerosols:** The use of aerosol spray cans for dispersing a disinfectant is not recommended for use in dental or healthcare facilities due to the fine mist of disinfectant that is readily inhaled. After repeated use, this could be detrimental to staff. If used, it is important to carefully observe surface area coverage. Make certain the entire surface is wet and remains moist for the required contact time stated in the IFU.

Selecting a Wipe

Wipes made of cellulose (e.g., gauze, cotton, paper) can absorb or inhibit the active molecular components of several disinfectants. This is a concern whenever a facility is selecting their own wipes for ready-to-use or mixed from concentrated disinfectant formats. When selecting a wipe, make certain the disinfectant manufacturer can provide you with confirmation of the wipe material's compatibility. It is also important to make certain the wipe is sufficiently large and absorptive enough to deliver the disinfectant to a reasonable surface area and stays moist for the contact time stated in the IFU.

Conclusion

Cross-contamination can occur via many different pathways. One that is not addressed as often as it should be is that of surface contamination. Splatter/spray from patients during procedures delivers thousands of droplets each loaded with organic matter and microorganisms. There are many things to consider when selecting a disinfectant, the format in which it is delivered and how it's applied. Because many disinfectants are inactivated by organic matter, surfaces must be cleaned before they are disinfected. RTU cleaner/disinfectant combinations are convenient for their wipe-discard-wipe ease of use. Making certain the disinfectant remains moist on the surface for the contact time identified in the disinfectant's IFU is an important requirement. Selecting the right disinfectant in the appropriate format and confirming the dental staff is in compliance with the manufacturer's IFU ensures the right elements are in place to combat cross-contamination and infection.

Useful tips

- To prevent evaporation, make certain that between uses, the lid is completely sealed and that no portion of the next wipe is hanging outside the seal.
- Do not add leftover disinfectant from the finished canister to the new one.
- Check disinfectant delivery volume of the wipe to make certain its size and composition are adequate to clean or disinfect a reasonable surface area.
- In addition to canisters, presaturated wipes in flat packs are also available for added convenience. The same requirement for secure closure and wipe delivery apply.

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ABOUT THE AUTHOR

Dr. Wava Truscott is President of Truscott MedSci Associates, an independent consulting and education advancement company. Her doctorate in Comparative Pathology is from the University of California, School of Medicine (Davis Campus), emphasizing Microbiology, Immunology and Pathology. She has written numerous articles and book chapters including the microbiology section of the AAMI Sterilization Recommended Practices and the Microbiology section of the recently published IAHCSMM Endoscope Reprocessing Manual. She labored for years with the FDA and ASTM standards organization for reduction of allergenic proteins in natural rubber latex gloves and to ban powdered gloves in healthcare facilities. She has lectured around the world as an advocate for infection prevention and safety in healthcare.

Resources

- Centers for Disease Control and Prevention (CDC) Guidelines for Environmental Infection Control in Health-Care Facilities. Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) 2003; updated February 2017. **Access:** www.cdc.gov/infectioncontrol/guidelines/environmental
- Laheij AMGA, Kistler JO, Beliasakis GN, et al. Healthcare-associated viral and bacterial infections in dentistry. J Oral Microbiol 2012; 4: 17659. **Access:** www.ncbi.nlm.nih.gov/pmc/articles/PMC3375115
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- Organization for Safety & Asepsis Procedures (OSAP) From Policy to Practice: OSAP's Guide to the Guidelines. Annapolis, MD: OSAP; 2004:45-62.
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