



4 THINGS YOU NEED TO CONSIDER BEFORE CHOOSING A DISINFECTANT

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With so many disinfectant products available on the market, choosing a disinfectant that suits a facility's needs and that meets current infection control guideline requirements can be a daunting task. Since the inception of the Accelerated Hydrogen Peroxide® (AHP®) technology in 1998, the focus has been on developing disinfectants that not only meet infection control guideline requirements but also meet key decision making criteria, which are cleaning efficiency, germicidal activity, personal health and safety, environmental sustainability and material compatibility.

While the importance of choosing a disinfectant based on the key decision-making criteria has been in discussion for several years, in 2014, these standards for the selection of the ideal disinfectant were reiterated and validated by two influential and internationally recognized researchers—Rutala and Weber—in an article published in the *Journal of Infection Control and Hospital Epidemiology*. The purpose of these criteria is to assist users in the selection of the optimal disinfectant for use on environmental surfaces and non-critical patient care itemsⁱⁱⁱ. These criteria can and should be leveraged across all areas requiring environmental surface disinfection including the dental industry.

What are the criteria of an ideal disinfectant?

Kill claims

It is a widely believed misconception that more is better. Disinfectant manufacturers will often include numerous pathogens on their product labels in an effort to look more effective. However, instead of focusing on the number of pathogens listed on a product label, disinfectants should be selected based on the most relevant claims^{iv} and should exemplify a broad spectrum of germicidal efficacy. To identify if a disinfectant has a broad spectrum of efficacy, a disinfectant will include efficacy claims against:

- Gram negative and gram positive bacteria such as *Pseudomonas aeruginosa* and *Staphylococcus aureus*
- Enveloped (easy to kill) viruses such as Bloodborne Pathogens (HIV, Hepatitis B or C) and Influenza
- Non-enveloped (more difficult to kill) viruses such as Poliovirus, Adenovirus or Norovirus
- Fungi such as *Trichophyton mentagrophytes*
- Mycobacteria such as *Mycobacterium bovis* or *Mycobacterium terrae*^{vi}.

When cleaning and disinfecting surfaces it is important to consider what pathogens are relevant to patients and the facility. In essence, current best practice guidelines require disinfectants to be labeled as a hospital grade disinfectant (efficacy against *Pseudomonas aeruginosa* and *Staphylococcus aureus*) with efficacy against bloodborne pathogens or instead be labeled as an intermediate level disinfectant with an efficacy claim against mycobacterium^{vii}. While most dental practices are primarily concerned with bloodborne pathogens, one cannot underestimate the importance of using products that carry efficacy claims against non-enveloped viruses.

4 THINGS YOU NEED TO CONSIDER BEFORE CHOOSING A DISINFECTANT

This is particularly important with dealing with emerging pathogens such as MERS or Ebolavirus. In accordance with the EPA's emerging pathogen rule, only disinfectants with proven efficacy against non-enveloped viruses like Poliovirus, Norovirus or Adenoviruses for example, will be given approval for use against emerging pathogens^{viii}. Selecting a disinfectant with a broad spectrum of efficacy is especially important today with the rise of antimicrobial resistant pathogens. While antimicrobial resistance does not equate to chemical resistance, using a disinfectant with a broad spectrum of efficacy will ensure that surfaces are protected against new and emerging pathogens^{ix}.

Contact time and wettability

Many of today's disinfectants evaporate on surfaces before they have a chance to completely kill pathogens. An important characteristic of a disinfectant is the required length of time the solution must remain wet on the surface in order to achieve disinfection, otherwise known as the product's contact time. Ideally, disinfectants should have a realistic and fast-acting contact time as fast contact times provide confidence that the disinfectant is killing prevalent pathogens of concern before the solution can dry^x. While fast contact times are an ideal characteristic of a disinfectant, it is equally as important for disinfectants to remain wet for the entire contact time. Disinfectants should be able to remain wet in one application for the entire contact time listed on the product label. Most aqueous-based products (quaternary ammonium compounds, phenolics, sodium hypochlorite and Accelerated Hydrogen Peroxide[®]) will keep standard surfaces wet for approximately two minutes, while alcohol-containing solutions will dry much faster^{xi}. Furthermore, the inclusion of surfactants within a formulation elongates the wettability of a disinfectant

4 THINGS YOU NEED TO CONSIDER BEFORE CHOOSING A DISINFECTANT

solution. By law, all applicable label instructions on EPA and Health Canada registered disinfectant must be followed^{xii}. Disinfectants that are able to stay wet for the required contact time in one application are more likely to be used correctly, thus increasing user compliance.

Safety

Cleaning and disinfecting products have emerged as a significant risk for users and occupants as chemicals commonly have associated health and safety hazards. Research has indicated the potential of disinfectant products to contribute to respiratory hazards including the onset of asthma or exacerbation of existing asthma. In fact work-related asthma accounts for approximately 16 percent of total reported asthma cases in the US^{xiii}. Additionally, disinfectants have been associated with acute illness reports among workers, primarily affecting the eyes and skin. A 2010 report by the Centers for Disease and Control and Prevention (CDC) highlighted that the most common active ingredients responsible for illness were Quaternary Ammonium Compounds, Glutaraldehyde and Sodium Hypochlorite (bleach)^{xiv}. These occupational human health hazards not only have negative physical implications, but also negative economic impacts both directly and indirectly. Furthermore, disinfectants that are perceived as toxic are less likely to be used correctly, reducing user compliance and increasing the risk of pathogen transmission.

The safety profile of a disinfectant should be a key consideration when evaluating disinfectant products. As per the recommendation set forth by Rutala and Weber, disinfectant products should be non-toxic and should not cause any harm to users, patients and visitors. Facilities where disinfection is required should choose

4 THINGS YOU NEED TO CONSIDER BEFORE CHOOSING A DISINFECTANT

disinfectants with the lowest toxicity and flammability rating, as well as choose products that require the least personal protective equipment to provide protection from exposure to adverse health effects^{xv}.

Ease of use

If a disinfectant is not user friendly, it is more likely that the product will not be used properly. As such, ease of use is a consideration that dental facilities should evaluate before choosing a disinfectant, as the easier a product is to use, the more likely it is for staff to achieve compliance^{xvi}. Ideally, disinfectants should be effective in the presence of organic matter such as blood, and hard water which enables one step cleaning and disinfection verses a two-step process which requires cleaning prior to disinfection^{xvii}. Furthermore, disinfectants should have an acceptable odor, a substantial shelf life, and should have good cleaning properties^{xviii}. To facilitate proper use, disinfectants should be available in multiple formats and should be composed of a durable substrate that will not easily tear, fall apart or dry out quickly. Lastly, some disinfectants like quaternary ammonium compounds are negatively affected by certain substrates or cloths which may retain the active ingredient and not release onto the surface, preventing the disinfectant active from reaching the surface (i.e. quat binding)^{xix}.

The Challenge

With all these criteria in mind, the challenge is finding a disinfectant that does not require trade off or compromise to achieve one or more of the said key disinfectant traits. Significant performance improvements of legacy disinfectant formulations are almost always accompanied by increased hazards and risk, with the most common example being compromising the safety of a product for improved efficacy.

The solution

Optim is a line of EPA- and Health Canada-registered surface disinfectants specifically created for the dental industry. Optim utilizes the globally patented Accelerated Hydrogen Peroxide® (AHP®) technology which does not require tradeoff between germicidal efficacy, contact time, safety and ease of use.

Kill claims

Optim provides broad-spectrum efficacy protecting your facility against pathogens you are most concerned with. Optim has proven efficacy claims against *Pseudomonas aeruginosa* and *Staphylococcus aureus*, *Trichophyton mentagrophytes*, Poliovirus, Adenovirus, Norovirus, HIV and Hepatitis B as well as *Mycobacterium bovis* or *Mycobacterium terrae*. All the efficacy claims listed on Optim labels have been tested and verified by third party EPA- or Health Canada-approved laboratories. Furthermore, the Accelerated Hydrogen Peroxide® technology has been validated by over 30 peer-reviewed clinical studies.

Contact time and wettability

Optim is a one-and-done solution. Optim's short contact times ensures surfaces remain wet for the required contact time, providing comfort and confidence that disinfection has occurred. The AHP® synergy accelerates the speed of disinfection for the Optim line of disinfectants ensuring fast and realistic contact times. The newest Optim product, Optim1, kills main pathogens of concern such as bloodborne pathogens in as quickly as 30 seconds and mycobacteria in only 1 minute. Optim utilizes wetting agents which help elongate wettability on surfaces, ensuring that disinfection can be achieved in a single application. A study by Omidbakhsh studied six different disinfectant chemistries including AHP®, QUAT, QUAT-

4 THINGS YOU NEED TO CONSIDER BEFORE CHOOSING A DISINFECTANT

Alcohol, Phenol, Phenol-Alcohol and Bleach to identify if their listed contact time was reflective of practices used in real life. The results showed that AHP® was the only chemistry that was able to stay wet long enough to reach its required contact time^{xx}.

Furthermore, a recent study by Molinari et al. tested seven different disinfectant products to determine the extent of surface wetness. Of the disinfectants tested, Optim was the only product that was able to remain wet for the duration of the contact time in all four tests^{xxi}. Lastly, a 2015 study by Sattar et al. examined the efficacy of five types of commercially-available disinfecting wipes against two types of common vegetative bacterial pathogens with 10 seconds of wiping where AHP® was found to be not only effective against the test bacteria but was the only disinfectant chemistry that prevented cross contamination to clean surfaces^{xxii}. These studies clearly highlight Optim's ability to achieve disinfection quickly and realistically which ultimately increase user compliance.

Safety

The Optim line of disinfectants have been formulated to be non-toxic, non-irritating and non-respiratory sensitizing, ensuring they will be easier on occupants which results in protocol compliance. Identifying a disinfectant's safety profile can be accomplished by reading the associated product Safety Data Sheet (SDS). In regards to Optim surface disinfectants, the products are not classified under any GHS hazard class meaning there are no physical or health hazards associated with Optim. Furthermore, as per section 2 of the SDS, Hazards Identification, Optim products do not require any signal words, hazard pictograms or hazard statements. In fact, Optim products are rated as a category 5 and do

4 THINGS YOU NEED TO CONSIDER BEFORE CHOOSING A DISINFECTANT

not require any hazard or precautionary pictograms or statements.

Under FIFRA (The Federal Insecticide, Fungicide and Rodenticide Act); Optim is classified as an EPA category 4 which is considered the safest category. These categories are used as a way to classify hazardous chemicals and describe the nature and, if applicable, the degree of hazard of the chemical product^{xxiii}. Additionally, personal protective equipment (PPE) is not required for eye/face, skin or respiratory protection from Optim; however, PPE is always recommend to be used during the cleaning and disinfection process to protect oneself from harmful microorganisms on the surface. Furthermore, Optim products do not utilize any ingredients that are carcinogenic, mutagenic or have reproductive toxicity, giving user confidence that they won't be harmed by their disinfectant if used according to the label directions.

Not only is Optim a more responsible choice for patients and staff, but it is also more environmentally responsible. Optim's active ingredient, hydrogen peroxide, readily degrades into water and oxygen, leaving no active or toxic residues behind on the surface. Lastly, Optim Blue Ready-To-Use liquid (sold in Canada) is EcoLogo certified, indicating that the product has undergone rigorous scientific testing, to prove its compliance with stringent third-party environmental performance standards^{xxiv}.

Ease of use

Optim has been designed to provide ease of use to ensure products are used correctly which will help increase user compliance. All Optim surface disinfectants have been proven effective in a 5 percent soil challenge, thus passing the requirements to be classified as a One-

4 THINGS YOU NEED TO CONSIDER BEFORE CHOOSING A DISINFECTANT

Step surface cleaner disinfectant. Optim utilizes both anionic and non-ionic surfactants within its formulation. Anionic surfactants have superior cleaning abilities as the electrical charge of anionic surfactants interacts better with soil particles allowing for easier soil removal. In addition, non-ionic surfactants help in preventing re-deposition of soils that have been lifted off the surface preventing cross contamination. Lastly, Optim is available in a variety of formats including pre-saturated wipes, ready-to-use liquid, detergent and chemical sterilant (Canada only) for heat-sensitive dental instruments and devices.

Conclusion

Selecting the ideal disinfectant according to Rutala and Weber's criteria may seem like a difficult task, with compromise of certain traits most often being the only solution. However, with Accelerated Hydrogen Peroxide[®] based disinfectants such as Optim, compromise is no longer required. The Optim line of disinfectants have undergone stringent testing by the EPA and Health Canada and as such have been proven to have a broad spectrum of germicidal efficacy, fast contact times, high safety of profile, and ease of use. These traits increase the likelihood that Optim will be used correctly—which will increase user compliance, creating a cleaner and safer environment for patients and staff. ■

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4 THINGS YOU NEED TO CONSIDER BEFORE CHOOSING A DISINFECTANT

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