Selection of the Ideal Disinfectant

Scope:

Dr. William Rutala and Dr. David Weber (University of North Carolina Healthcare, Chapel Hill, N.C.) present a multi-step framework outlining five key criteria that should be used to evaluate healthcare disinfectant solutions for environmental surfaces and noncritical patient care items. The "Key Considerations for Selecting the Optimal Disinfectant for Your Facility" framework was peer-reviewed and published in the July 2014 issue of *Infection Control and Hospital Epidemiology*.

Summary:

The authors argue that proper product selection along with proper product usage are crucial for keeping surface and equipment pathogen-free and reducing cross-contamination and disease transmission. The focus of this paper is product selection, and they summarize 14 properties of the ideal disinfectant, which include fast, broad-spectrum antimicrobial activity; good wetness profile; safety profile; surface compatible; easy to use and economical. While no single product meets all criteria above, their proposed multi-step framework and scoring system was designed to help facilities objectively evaluate healthcare disinfectant solutions. The framework, summarized below in Table 1, outlines the key questions and tradeoffs involved in selecting the best surface disinfectant for a facility's specific needs.

Table 1 – Summary of Disinfectant Selection Framework*

Consideration	Questions to Ask
Kill Claims	Does the product kill the most prevalent healthcare pathogens, including those that: • Cause most HAIs? • Cause most outbreaks? • Are of concern in your facility?
Kill and wet contact times	How quickly does the product kill the prevalent healthcare pathogens? Does the product keep surfaces visibly wet for the kill times listed on its label?
Safety	What is the product's toxicity rating? What is the product's flammability rating? What are the product personal protective equipment (PPE) requirements? Is the product compatible with the common surfaces in your facility?
Ease of Use	Is the product odor considered acceptable? Does the product have an acceptable shelf life? Does the product come in convenient forms to meet your facility's needs (egg, liquids, sprays, refills, multiple wipe sizes)? Does the product work in the presence of organic matter? Is the product water soluble? Does the product clean and disinfect in a single step? Are the directions for use simple and clear?
Other Factors	Does the supplier offer comprehensive training and ongoing education, both in person and virtual? Does the supplier offer 24-7 customer support? Is the overall cost of the product acceptable (considering product capabilities, costs of infections that may be prevented, and costs per compliant use)? Can the product help standardize disinfectants used in your facility?

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* Table adapted from original article.

Key Consideration 1 – Relevant Kill Claims

The authors emphasize that disinfectant products should be effective against the microorganisms that are the most common causes of HAI and outbreaks. The authors recommend that facilities select disinfectants that are EPA-registered to kill as many pathogens listed in Table 2 as possible. In addition to the NHSN and CDC organisms listed in Table 2, the authors highlight organisms required for OSHA bloodborne pathogen compliance. They also explain the hierarchy of microbial resistance to disinfectants and sterilants, and describe advantages and disadvantages of current disinfection chemistries, including alcohol, sodium hypochlorite, improved hydrogen peroxide, iodophors, phenolics and quaternary ammonium compounds. This information can be used by facilities when faced with emerging pathogens, which will not have EPA-registered kill claims on product labels.

Table 2 – Most Prevalent HAI-causing Pathogens

Recommended Organisms (% of HAIs caused)	Why Organisms Are Relevant
Staphylococcus aureus (15.6%) *Escherichia coli* (11.5%) Coagulase-negative *Staphylococcus* (CoNS) (11.4%) *Klebsiella* (8.0%) *Pseudomonas aeruginosa* (7.5%) *Enterococcus faecalis* (6.8%) *Candida albicans* (5.3%) *Enterobacter spp.* (4.7%) *Other Candida spp.* (4.2%) *Enterococcus faecium* (4.1%) *Enterococcus spp.* (3.0%) *Proteus spp.* (2.5%) *Serratia spp.* (2.1%) *Acinetobacter baumanni* (1.8%)	Most prevalent overall contributors to HAIs (NHSN/CDC)
C. difficile Norovirus *Aspergillus* Rotavirus Adenovirus	Most common causes of outbreaks and ward closures or hard to kill, non-enveloped virus
Facility-specific pathogens here, e.g., *Burkholderia cepacia*	Other pathogens of concern in your facility

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Key Consideration 2 – Appropriate Wet-contact and Kill Times

Drs. Rutala and Weber emphasize that a surface must remain wet at least as long as the disinfectant's contact time in order to effectively kill microorganisms. The authors also stated, "Fast kill times are important because they give you confidence that you are killing the prevalent and most common healthcare-associated pathogens before the disinfecting solution can dry or be removed and before patients or staff are likely to retouch the surface." For daily use, the authors recommend using the product label contact times for vegetative bacteria. For outbreak or endemic infection situations, the focus can shift to other organisms, which may require longer contact times or other disinfection chemistries for efficacy.

The authors encourage facilities to prepare formal risk assessments when deviating from manufacturer recommendations (see http://disinfectionandsterilization.org/files/2012/12/SurfDisRiskAssess2011.pdf).

Key Consideration 3 – Safety

The authors note several user and surface safety components. Facilities should pay close attention to toxicity signal word, flammability ratings and personal protective equipment (PPE) requirements when evaluating disinfectants. Secondly, facilities should select surface disinfectants that are compatible with common healthcare surface materials to ensure routine product usage will not cause surface damage.

Key Consideration 4 – Ease of Use

The authors emphasize the connection between ease of use and product usage compliance. They stressed disinfection effectiveness in the presence of organic matter and good cleaning properties to effectively reduce bioburden on surfaces. Additionally, clear directions for use (DFU), acceptable odor profile and availability of multiple product forms can also contribute to compliant usage.

Key Consideration 5 – Other Factors

In addition to the four areas above, Drs. Rutala and Weber mention the following areas that should be considered when evaluating disinfectants:

- Training and support offered by disinfectant manufacturer
- Cost, taking into account product capabilities, infection cost, and cost per use
- Standardization (i.e., minimizing the number of disinfectants used in your facility) to aid in compliance

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