CleanPath

TECHNICAL BULLETIN

ENVIRONMENTAL DISINFECTION

Why Is It Important?

Environmental Disinfection

There is strong evidence that environmental hygiene, the cleaning and disinfection of environmental surfaces, plays a critical role in reducing the risk of HAIs and improving patient outcomes. According to the CDC, transmission of healthcare associated pathogens can often result from healthcare worker hands becoming contaminated through patient care or contact with contaminated environmental surfaces.

Background

- Healthcare Associated Infections (HAIs) continue to be a significant cause of morbidity and mortality world-wide. In the United States, it is estimated that 1 in 25 patients will acquire an HAI during their hospitalization, and in Canada it is estimated that 1 in 9 patients will be impacted.
- There is strong evidence that environmental hygiene, the cleaning and disinfection of environmental surfaces, plays a critical role in reducing the risk of HAIs and improving patient outcomes. According to the CDC, transferal of health care associated pathogens from environmental surfaces to patients is largely via hand contact with the surface.
- The CDC Guidelines for Environmental Infection Control in Healthcare Facilities, states, "Although hand hygiene is important to minimize the impact of this transfer, cleaning and disinfecting environmental services as appropriate is fundamental in reducing their potential contribution to the incidence of health-care associated infections (HAI)."

Why Cleaning and Disinfection is so Important

- Studies have shown that high touch surfaces, such as bed rails, over bed tables, and supply carts, play a role in the transmission of pathogens to susceptible patients.
- This transmission can occur through either a susceptible patient's direct contact with a contaminated surface or through indirect contact, in which a healthcare provider's hands become contaminated by surfaces, and through the course of care, the healthcare provider unknowingly transfers pathogens to a susceptible patient.
- It is estimated that 20-40% of HAIs result from transmission of a pathogen by a healthcare worker after touching either another patient or a contaminated surface.
- Healthcare facilities continue to aim at reducing the risk of HAIs, including improved environmental hygiene.

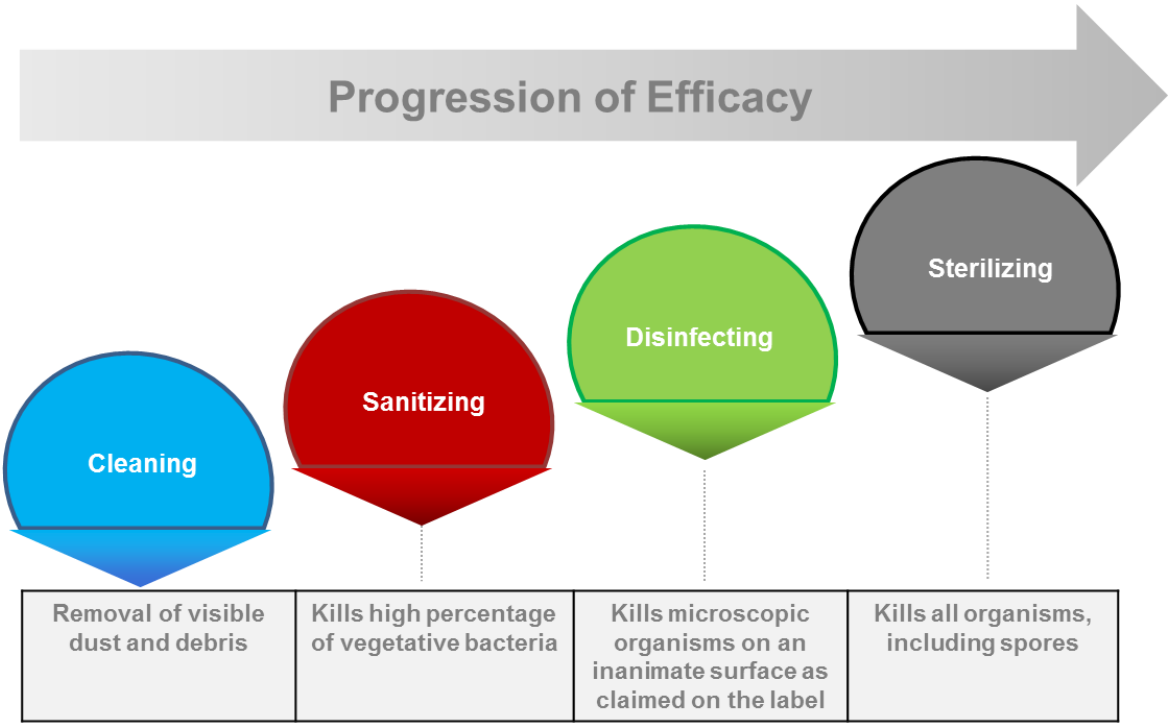
Considerations and Challenges of Proper Cleaning and Disinfection

- Budget constraints
- Cleaning process itself – chemical, tools, procedures, etc.
- Disinfectants that are slow acting, requiring long contact times
- Limited cleaning ability of most disinfectants
- Reduction of efficacy if disinfectants bind with cleaning materials such as microfiber or cotton
- Poor laundering practices that result in cleaning cloths that are less than clean
- Corrosiveness of disinfectants that can cause risk to users or damage to surfaces and fabrics

Sealed Air Diversey Care

Solutions Designed for Healthcare

Efficacy Progression



Definitions

- **Cleaning solution**. Any combination of soap (or detergent) and water, with or without a chemical disinfectant, used to wash or wipe down environmental surfaces such as floors, chairs, bench tops, walls and ceilings.
- **Disinfectant**. Chemical that destroys or inactivates microorganisms. Disinfectants are classified as low-, intermediate- or high-level depending on their ability to kill or immobilize some (low- or intermediate-level) or all (high-level) microorganisms (but not all spores). Phenols, chlorine or chlorine-containing compounds and QUATs are classes of disinfectants frequently used to clean non-critical surfaces such as floors, walls and furniture.
- **Disinfectant cleaning solution**. Products that are a combination of a detergent (soap) and a chemical disinfectant. Not all detergents and disinfectants are compatible. Several combinations are available commercially.
- **Environmental hygiene**. Process of maintaining a clean, healthy and pleasing patient and work environment.
- **Sanitizer**. Chemical that reduces the number of bacterial contaminants to safe levels on inanimate objects based on public health requirements (i.e., a chemical that kills 99.999% of the specific test bacteria in 30 seconds under the conditions of the test).
- **Sterilants**. Chemicals used to destroy all forms of microorganisms, including endospores. Most sterilants are also high-level disinfectants when used for a shorter period of time. Sterilants are used only on inanimate objects (e.g., surgical instruments) that are used in semi-critical and critical areas (e.g., surgery). Sterilants are not meant to be used for cleaning environmental surfaces.

Comparison of Disinfectants

CONSIDERATIONS OF DISINFECTION BY CHEMISTRY

Chemistry Comparison	Speed	EPA Toxicity [1]	CDC Disinfection Level [2]	Health Effects	Exposure	Odor	Compatibility with Cleaning Tools	Compatibility with Surfaces	Favorable Environmental Profile	Pre-cleaning Needed
Bleach (depends on dilution)	1-10 min	Danger	Intermediate	Corrosive to eyes and respiratory irritant	PPE, increased ventilation	Strong	Damages over time - reduces life	May damage	No	Yes
Phenols	10 min	Warning / Danger	Intermediate	Corrosive to eyes and skin	PPE, increased ventilation	Mild	Good	May damage	No	No, One step Disinfectant Cleaner
Quaternary/ Alcohols	2-5 min - may dry before impact	Caution / Warning / Danger	Low/ Intermediate	Nasal irritation, can irritate or burn skin and eyes, flammable	PPE, increased ventilation	Strong	Damage over time - reduces life	May damage	No	Yes
Quaternary Ammonium Compounds	10 min	Caution	Low	Dermatitis and nasal irritation	PPE, proper ventilation	Mild	Quat binding may impair performance	Good	No	No, One step Disinfectant Cleaner
Accelerated Hydrogen Peroxide (depends on formulation)	1-5 min	Caution (Safest Possible)	Low/ Intermediate	None	No special requirements	Mild	Excellent	Good	Yes	No, One step Disinfectant Cleaner

* Although the label claims may be fast, they may be unrealistic because alcohol evaporates quickly from the surface.

[1]EPA Toxicity Categories Require These Warnings:

Signal Word	Category	Oral Lethal Dose
DANGER, POISON (skull and crossbones)	I Highly Toxic	A few drops to a teaspoonful
WARNING	II Moderately toxic	Over a teaspoonful to one ounce
CAUTION	III Slightly toxic	Over one ounce to one pint
CAUTION	IV Relatively non-toxic	Over one pint to one pound

* Based on a 150-pound person

[2]CDC Definition of 3 Levels of Disinfection - means the use of a chemical procedure that eliminates virtually all recognized pathogenic microorganisms but not necessarily all microbial forms (e.g., bacterial endospores) on inanimate objects:

1. High-level disinfection - kills all organisms, except high levels of bacterial spores, and is effected with a chemical germicide cleared for marketing as a sterilant by FDA. Typically not used for generalized disinfecting.
2. Intermediate-level disinfection - kills mycobacterium, most viruses, and bacteria with a chemical germicide registered as a "tuberculocide" by EPA.
3. Low-level disinfection - kills some viruses and bacteria with a chemical germicide registered as a hospital disinfectant by the EPA.

Sources: EPA, http://www.education.nh.gov/instruction/school_health/documents/disinfectants.pdf, MSDS,

Hierarchy for Disinfection Based on Spaulding Classification

More Resistant

More Susceptible

Level	Type of Organism	Organism Examples
Higl Level Disinfection / Sterilization	Spore Forming Bacteria	Clostridium difficile, Bacillis subtilis
Intermediate Level Disinfection	Tubercle Bacilli	Mycobacterium tuberculosis
	Non-enveloped or small viruses	Poliovirus, Coxsackievirus, Norovirus, Rhinovirus
Low Level Disinfection	Fungi	
	Gram positive and gram negative vegetative Bacteria	Pseudomonas, Salmonella, Staphylococcus
	Enveloped (Lipid) or medium Viruses	HIV, HBV, HCV, RSV, Herpes, Myxoviruses, Hantavirus, Cytomegaloviruses

Hospital Grade/ Bloodborne pathogen target

- TB is commonly used as a marker for hard surface disinfection even though it cannot be contracted from surfaces
- Polio is often used as a standard for virucidal activity even though there are no polio cases in developed countries