



# Biosecurity

## Selection and Use of Surface Disinfectants

***Biosecurity is a series of management procedures implemented to prevent the introduction and spread of disease into an environment.<sup>1</sup>***

The U.S. Environmental Protection Agency (EPA) regulates chemical disinfectants under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Under FIFRA, chemical disinfectants are considered to be “antimicrobial pesticides” that are intended for control, prevention, and destruction of pathogenic microorganisms on inanimate objects and surfaces. An ideal disinfectant is one that has a broad spectrum of activity, low toxicity to humans and animals, and is non-corrosive. Few products meet all of these criteria, and disinfection selection depends on the type organism that needs to be inactivated and/or destroyed.<sup>2</sup>

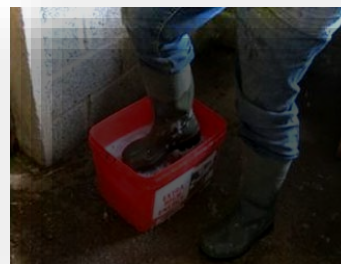
### Selection of a Surface Disinfectant<sup>2</sup>

Selection of an appropriate surface disinfectant is influenced by several factors including the concentration, application methods, contact time, and stability and storage conditions required for the disinfectant to be effective. It is important to consider the following when selecting a surface disinfectant:

- **Characteristics** - A disinfectant should be selected based on the microorganism of interest or primary concern (see the chart on the back of this sheet for examples), as only certain agents are effective against certain microorganisms. Similarly, other characteristics such as accessibility, cost, and safety might be considered during selection.
- **Application Methods** - Even though there are a variety of ways to apply disinfectants, only use the methods described by the product label. The surfaces of contaminated objects and structures can be treated with a disinfectant solution by wiping, brushing, spraying, or misting. Small, portable items may be soaked in a container of the disinfectant. For items that cannot get wet, such as electronics, fumigation might be an option.
- **Contact Time** - Microorganisms that come into contact with disinfection products are inactivated and/or destroyed gradually, not instantaneously. Contact times may vary by the product or method used, and it is important to allow adequate contact time to increase the efficacy of the disinfectant being used.



- **Concentration** - Disinfectants can be purchased and used at different concentration levels depending on the strength of the disinfectant required. When dilution is necessary, always add the disinfectant to water to achieve the desired concentration and follow any specific mixing instructions.
- **Stability and Storage** - Disinfectant product labels may list the shelf life of the concentrated disinfectant product; however, some disinfectants can lose stability quickly after being prepared for use, stored for long periods of time, or left in the presence of heat or light. To maximize stability and shelf life, disinfectants should be stored in cool and dark locations. The use of expired products may result in reduced efficacy.



### Precautions for Surface Disinfectants<sup>2</sup>

The safety of all personnel is paramount when handling, mixing, and applying disinfectants. Most disinfectants can cause irritation to eyes, skin, and/or the respiratory tract. Some disinfectants can cause burns or other injuries if used improperly. All chemical disinfectants have a Material Safety Data Sheet (MSDS) listing the stability and hazards of the product, personal protection needed, as well as first aid information. It is essential that personnel using these products are trained in the proper procedures for handling the disinfectants and have access to the MSDS.

When using surface disinfectants, always:

1. Follow label directions regarding use and safety precautions (especially if diluting the product),
2. Take proper precautions to protect the environment and ensure that no one is injured, and
3. Wear devices and coverings for protecting the hands, skin, nose, mouth, and eyes when indicated by the product.

## Environmental Considerations of Surface Disinfectants<sup>2</sup>

The environment can affect the efficacy of a surface disinfectant and must be considered when selecting a product:

- **Organic Matter** - Removal of all organic matter (e.g. manure, soil, etc.) before applying a disinfectant is essential because organic matter can provide a physical barrier that protects microorganisms from coming into contact with the disinfectant. Application of any disinfectant to a heavy organic load may not be completely effective.
- **Surface Type** - All liquid chemical disinfectants are approved only for use on hard, non-porous surfaces. Do not apply liquid disinfectants to any porous, cracked, uneven, or pitted surfaces because liquid disinfectants might not be as effective; instead, gaseous or vaporous sterilant products should be used to treat these surfaces.
- **Temperature** - Most disinfectants work best at room temperature (70°F or 21 °C). Increasing the temperature of the disinfectant may aid in the destruction of microorganisms; however, it may also accelerate the decomposition of the disinfectant.
- **pH** - The pH of the environment can affect both the microorganism and the efficacy of the disinfectant. The pH can alter the charge on the surface molecules of the microorganisms and it can also change the degree of ionization of the chemical disinfectant. It is important to know the pH of the disinfectant and whether or not it will be acidic or basic enough to decontaminate the desired surface.
- **Water Hardness** - Hard water contains calcium and magnesium which can inactivate or reduce the effectiveness of certain disinfectants. It is important to use a purified water source when diluting and applying disinfectants to contaminated areas.
- **Relative Humidity** - The activity of some disinfectants is influenced by the relative humidity of the environment. It is important to follow in the instructions on the label for the disinfectant in respect to relative humidity.
- **Presence of Other Chemicals** - If more than one chemical disinfectant is being used, it is important to make sure they won't counteract each other and reduce efficacy.

Selecting a Surface Disinfectant <sup>2-4*</sup>								
Disinfectant	Vegetative Bacteria	Viruses (Enveloped)	Viruses (Non-Enveloped)	Mycobacteria	Fungi	Spores	Diseases Susceptible to Disinfectants	Examples of Common Forms
Acids	+	+	-	±	+	±	Foot and Mouth Disease	Acetic and Citric Acid
Alcohols	+	+	±	+	±	-	Avian Influenza <i>Brucella abortus</i> Listeriosis	Ethyl and Isopropanol Alcohol
Aldehydes	+	+	+	+	+	+	Anthrax Avian Influenza <i>Brucella abortus</i> Bovine Tuberculosis Classical Swine Fever Listeriosis	Formaldehyde Glutaraldehyde
Biguanides	+	±	±	±	±	-	Contagious Equine Metritis	Chlorhexidine (Nolvasan®, Virosan®)
Halogen Compounds	+	+	±	±	+	±	Anthrax Avian Influenza Bovine Tuberculosis Classical Swine Fever Botulism Listeriosis	Bleach Chlorine-containing compounds Iodine-containing compounds (Betadine®) Sodium hypochlorite
Oxidizing Agents	+	+	+	+	±	±	Foot and Mouth Disease	Hydrogen peroxide Peracetic acid (Oxy-Sept 333®) Peroxymonosulfate-based products Virkon S®
Phenols	+	+	±	±	±	-	Avian Influenza <i>Brucella abortus</i> Bovine Tuberculosis Classical Swine Fever	Cresols Ethylphenols One-Stroke Environ® Pheno-Tek II® Tek-Trol® Xylenols
Quaternary Ammonium Compounds	±	±	-	±	±	-	Avian Influenza Classical Swine Fever	Alkyl dimethyl ammonium chloride (Roccal®) Alkyl diodecyl dimethyl ammonium chloride Benzalkonium chloride Dialkyl dimethyl ammonium chloride

Effective = +, Variable = ±, Not Effective = -

\*Note: Check with the California EPA to ensure that a product is acceptable for use within the State.

### References

1. FAD PreP/NAHEMS Guidelines: Biosecurity. United States Department of Agriculture Animal Plant Health Inspection Services Veterinary Services. June 2013.
2. Adapted from FAD PreP/NAHEMS Guidelines: Cleaning & Disinfection. United States Department of Agriculture Animal Plant Health Inspection Services Veterinary Services. July 2014.
3. Adapted from Characteristics of Selected Disinfectants. The Center for Food Security & Public Health. 2008.
4. Adapted from Guideline for Disinfection and Sterilization in Healthcare Facilities. Center for Disease Control. 2008.