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Understanding Disinfectant Labels & Safety Data Sheets

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Portions of this article are from Palmero Healthcare's July 27, 2022 article ***"The Surface Disinfectant Label: Informative and Important."*** They have been used with permission.

INTRODUCTION

Environmental surface disinfection has been one of the cornerstones of healthcare infection control since the middle of the 19th Century. After becoming aware of Pasteur's germ theory, Lister looked for ways to prevent germs from entering a wound by creating a chemical barrier—which he called an antiseptic—between the surgical wound and the hospital environment. He began to test his antisepsis theory in the mid-1860's at Glasgow University where he was a Professor of Surgery. His plan was to introduce an "anti-germ" chemical as part of a system to address the problem of post-surgical infections like sepsis and gangrene. Unfortunately, these and other infections often developed even after successful hospital surgeries. The chemical he selected was carbolic acid, a relatively harsh agent which kills microorganisms on contact. Dilutions of this acid were used by surgical staff members to wash their hands and instruments were sterilized in carbolic acid baths. Solutions of carbolic acid were also sprayed into the surrounding environment to reduce the level of germs in the air around the patient.[1] Many of his colleagues were surprised when these applications of the germicide in clinics were successful in lowering the incidence of hospital infections. Fortunately, the evolution of disinfectant chemicals since the 1800's has led to development of antimicrobials that are far less toxic, more stable, and have broader spectrum of activity than carbolic acid. *A representative list of these agents used in healthcare are presented in* ***(Table A)***.

Table A

Evolution of Disinfectants	
Phenolics: Cell protein denaturation	Carbolic acid, Dual phenolics, Dual phenolics + alcohol
Sodium hypochlorite: Formation of hypochlorous acid	Bleach
Quaternary ammoniums: Cationic surface-active agents	Benzalkonium Chloride, Substituted Benzalkonium compds, Dual/multiple quaternary ammoniums; combinations with alcohols
Iodine and Iodophors: Iodination of proteins/formation of protein salts	Tinctures, Povidone iodophors
Alcohols: Dehydration & denaturation of proteins	Isopropyl- and Ethyl- alcohols
Hydrogen Peroxide: Production of destructive hydroxy free radicals	Accelerated and Stabilized hydrogen
Hypochlorous Acid: Oxidizing agent	H+ OCl denature proteins
Combinations of antimicrobial chemicals	

Even though Dr. Lister had to confront both indifference and outright resistance from his colleagues, he might have been flabbergasted with the rigorous governmental process manufacturers of current disinfectants are required to follow before their products are approved to enter the marketplace. The U.S. Congress passed the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) in 1947, which enabled regulation of chemical germicides formulated as sanitizers, disinfectants, or sterilants by the Antimicrobials Division, Office of the Pesticides Program, Environmental Protection Agency (EPA). A series of agreements and laws that went into effect between 1993-2000 amended the roles of EPA and FDA. In general, EPA regulates disinfectants and non-medical sterilants used on environmental surfaces, while the FDA regulates sterilants used on critical or semi-critical devices.[2]

In addition to EPA and FDA requirements, manufacturers must also meet other criteria to ensure that products are safe for workers to use. Congress addressed this issue in 1970 when it passed the Occupational Safety and Health (OSH) Act, leading to the establishment of the Occupational Safety and Health Administration (OSHA) as part of the Department of Labor. This agency enforces workplace standards, guidelines, and requirements to ensure worker safety and minimize occupational health risks. OSHA regulates companies to maintain safe and healthy working conditions, as well as providing training and assistance to employees before doing their jobs. One of the ways this is done is by requiring manufacturers to provide Safety Data Sheets (SDS), formerly known as Material Safety Data Sheets (MSDS) to their customers. SDS are a primary source of information regarding a product's chemical hazards, and also provide information of procedures that should be used concerning workplace safety. Both the EPA and OSHA play vital roles in ensuring that workers in all industries can perform their duties safely when using potentially hazardous chemicals. The following discussion will briefly review how the EPA and OSHA work with surface disinfectant manufacturers to ensure that end users are informed of potential health issues and can safely use products.

EPA & Surface Disinfectants

An important component of EPA's role is requiring manufacturers to submit specific data pertaining to ingredients, antimicrobial efficacy, directions for use, precautionary statements, and other necessary information. The agency then reviews the material and, if the product is approved, issues an EPA-registration number. Manufacturers also must follow EPA's requirements as to what will be included on the registered product's label for consumers. The reader can obtain detailed information for each of these label segments by referring to the EPA Label Review Manual.[3] Understanding that information is essential for maximizing disinfectant effectiveness, as well as making sure end users follow appropriate safety and disposal precautions. *These sections include the following* ***(Table 1)***[3]***.***

Table 1

EPA-Required Components of a Surface Disinfectant Product Label			
(A)	Product Name	(G)	Where Product can Be Used
(B)	Marketing Claims	(H)	EPA Registration Number
(C)	Efficacy Claims	(I)	Instructions for Use
(D)	Toxicity Signal Word	(J)	Storage and Disposal
(E)	Ingredient List	(K)	Precautionary Statements
(F)	Microorganism Kill Claims	(L)	First Aid

Think about the last time you actually read the entire label for disinfectant wipes or sprays used in the practice. Your eyes may have had to focus multiple times before you finished. If you are like many of us who have read an antimicrobial product label, emphasis was primarily focused on the types of microorganisms the chemicals could destroy, and insufficient attention given to its safe use. *Review of a few representative label portions reenforces the importance of stated directions for product use* ***(Table 2)***[3]***.***

Table 2

Representative Label Content and Directions
Only products with EPA registration numbers should be used. The EPA number indicates the product has been reviewed by the EPA and poses minimal risk to humans, animals, and the environment when used in accordance with label instructions
"It is a violation of Federal law to use this product in a manner inconsistent with its labeling"
Precautionary statement: hazardous to humans and domestic animals
Approved by EPA as a pesticide
Which surfaces or fabrics to use the disinfectant on
Cleaning of blood and other body fluids required before disinfection
The microbial kill claims section describes what disease organisms the product is effective against, and under what conditions it was tested against

These and other EPA directions may be best illustrated by reviewing specific sections of a representative EPA-approved surface disinfectant – **Advantaclear Surface Disinfectant Wipes (Figures 1-2)**. *The letters for required EPA inclusions listed in* ***(Table 1)*** *have been embedded in the two figures.*

Figure 1

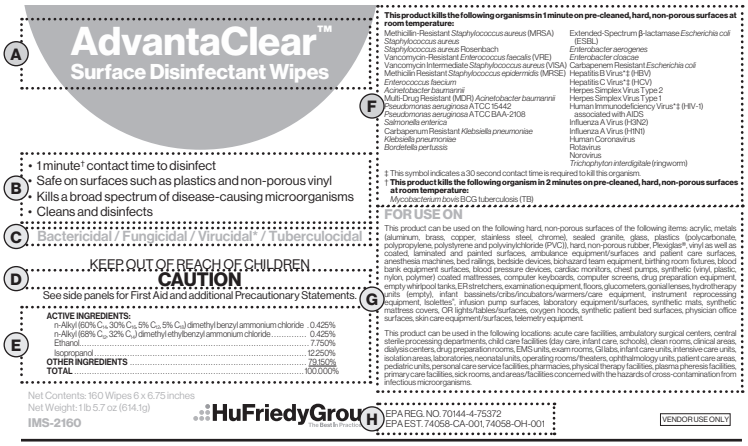
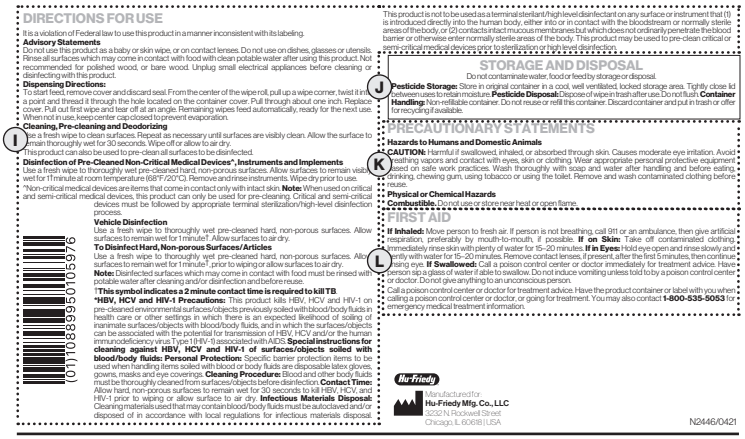


Figure 2



Selection of an environmental surface disinfectant is not necessarily difficult or training intensive. The key is to understand basic criteria applicable for its appropriate use.[4-5] These include:

1. Antimicrobial kill claims for predominant healthcare pathogens
2. Rapid kill times, including appropriate contact times for surface wetness
   - **a.** Review the complete listing of antimicrobial claims from the manufacture
   - **b.** The ability of a disinfectant to remain wet for the appropriate contact time is essential for product evaluation, because the product should not evaporate too quickly, before achieving the necessary antimicrobial action
   - **c.** The shorter the kill contact time, the more likely the chances of maximizing disinfection. It was that long ago when many disinfectants had to remain wet on surfaces for 10 minute to augment kill claims. Many of today's surface disinfectants, however, have EPA approval for 1 or 2 minutes for virtually all of the tested targeted organisms

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3. Safety

a. The disinfectant should be nontoxic and not cause any harm to health care workers and patients when used according to manufacturer's instructions

b. Ancillary materials such as the product's OSHA Safety Data Sheet (SDS) should be in ascertaining safety

A few basic guidelines can assist you in selecting and appropriately using chemical disinfectants. The availability of additional antimicrobials and formulations in the marketplace has also provided health care workers with multiple, sometimes similar choices. Keep in mind that criteria for EPA evaluation and regulation of these types of products have been well established. Understanding what is included on the label can both promote the agent's successful use while also minimizing potential harmful safety problems by misusing the disinfectant.

OSHA & Chemical Disinfectants

OSHA requires workplaces to keep an SDS for each of the hazardous chemicals used in the facility. This allows manufacturers to inform consumers of risks when using or exposed to those agents. SDSs are essential documents which provide guidance related to important safety concerns of hazardous chemicals, such personnel protective equipment (PPE), first aid procedures, properties of the chemical(s), health and environmental hazards, and safety precautions for using and storing the agent. According to the Hazard Communications Standard, SDSs are required to be in a unified format containing 16 sections. ***Table 3*** *provides a summary of each section.*[6-7]

Each section in the SDS has a unique significance. These can also be updated by the manufacturer when there is new information concerning protective measures, product handling, or storage. A question was asked earlier in this article about the last time you completely read through the label for the facility's surface disinfectant. As frequent or infrequent the time when you reviewed the label, it is possible that it has been even longer for checking the accompanying product SDS. In a similar purpose noted with the important characteristics of a disinfectant label, an SDS is designed to help users mitigate potential issues that may arise. Reading both would be time well spent.

Table 3

Chemical Safety Data Sheet | Sections
1. Identification
• Includes the product identifier and the recommended use and restrictions, • Contact information and emergency phone number of the chemical manufacturer
2. Hazard Identification
• Has chemical's classification under OSHA's Hazard Communication (HAZCOM) Standard, as well as identifiers such as a signal word, hazard statements, symbols and precautionary statements • May also be new hazards in this section that were discovered during the classification process.
3. Chemical Composition
• Lists the chemical name, any common names and synonyms, its Chemical Abstracts Service (CAS) number, and any impurities or stabilizing additives which are themselves classified and contribute to the classification of the substance • If the chemical is a mixture, this section will also contain the concentration, or the exact percentage, of all health hazards in that mixture • If a trade secret is claimed, the exact percentage of composition may be withheld from SDS
4. First Aid Measures
• Will vary according to the method of exposure and the effects from being exposed to the chemical
5. Fire-Fighting Measures
• Lists all suitable and non-suitable extinguishing media, the nature of hazardous combustion products, as well as protective equipment to use and precautions for firefighters to take when trying to control the fire
6. Accidental Release Measures
• Explains personal precautions, protective equipment (PPE) and emergency procedures to implement should a release of the chemical occur • Methods to contain and clean up a spill
7. Handling & Storage Instructions
• Outlines safe handling and storage procedures • Also lists other substances that are incompatible with the chemical
8. Exposure Limits & Protective Controls
• Exposure limits can include an OSHA permissible exposure limit (PEL) or an American Conference of Governmental Industrial Hygienists Threshold Limit Value (ACGIH TLV) • Also includes other recommended exposure limits as well as recommended controls and PPE
9. Physical & Chemical Properties
• Includes descriptions of how the chemical looks and smells, the boiling and melting temperatures, the chemical's vapor pressure and evaporation rate, how easily it dissolves, and how heavy it is compared to water
10. Stability & Reactivity
• Describes possibility of hazardous reactions, incompatible materials, hazardous decomposition products and certain conditions to avoid
11. Toxicological Information
• Contains likely methods of exposure to the chemical, symptoms resulting from delayed and immediate exposures, and any measurements of toxicity • Will also indicate if the chemical is considered a carcinogen by OSHA, the National Toxicology Program or the International Agency for Research on Cancer
12. Ecological information (non-mandatory)
• Contains the chemical's ecotoxicity, degradability, bioaccumulation potential, and its mobility in soil
13. Disposal Considerations (non-mandatory)
• Provides guidance on proper disposal practices, recycling or reclamation of the chemical
14. Transport Information (non-mandatory)
• Includes the UN number, the UN proper shipping name, any transport hazard classes, its packing group, environmental hazards such as being a marine pollutant, and any additional precautions to take when transporting in bulk
15. Regulatory information (non-mandatory)
• Identifies the specific safety, health and environmental regulations not listed elsewhere on the SDS
16. Other Information
• Includes date the SDS was prepared or last modified

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