Infection Control Handbook for Schools

Edition 2

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Chapter 1.A. Introduction

Goal and Purpose of the Infection Control Handbook for Schools

This Handbook is designed to provide information that will enable schools to develop and implement effective infection-control practices while minimizing the use of, and exposure to, toxic products. The material is intended to be used by school personnel, including facility managers, head custodians, administrators, nurses, and purchasing agents, when customizing their school program.

The Handbook has been developed over several years by the National Cleaning for Healthier Schools and Infection Control Workgroup, which consists of representatives from the academic, public health, environmental health, medical, and school advocacy communities. The Handbook was updated to include information for the COVID-19 pandemic.

The Workgroup has found that a thorough, ongoing cleaning program is the best strategy to prevent disease transmission, with sanitization and disinfection activities playing only a part of the strategy in very specific situations. Following good cleaning procedures on a daily basis is considered a best practice and will reduce the need for disinfectants as well as the transmission of many diseases.

The purpose of this Handbook is to:

1. Educate the purchasers and users of disinfectants about (a) the health and environmental implications associated with using and misusing these products, (b) when disinfection is necessary, (c) proper disinfecting techniques, (d) the choices of disinfectants, (e) the criteria for selecting safer disinfectants, and (f) proper procedures for protecting the health of product users and building occupants.
2. Provide the tools needed for schools to create their own policies and protocols.
3. Provide information on the differences between cleaning, sanitizing, and disinfecting and when it is appropriate to use each methodology.

Limits of the Handbook

The Handbook provides basic information about the transmission of disease from pathogenic bacteria, fungi, and viruses, as well as related infection-control strategies (of which disinfection is one tool) to frame the discussion of disinfection. Because it does not address specific diseases found in school settings, the Handbook is designed to enhance a school's infection-control program, not replace it.

Diseases and other health conditions that are not controlled through cleaning and disinfection practices in schools—such as sexually transmitted diseases, parasites (worms, scabies, lice), mosquito-borne illness, bites, and so forth—are not addressed in this Handbook. Although the response of many people to an outbreak of parasites is to disinfect, disinfecting is not an appropriate control strategy.

Introduction to the Issue

Protecting public health in a school building is a complicated issue. The time allowed for general cleaning tasks is constantly being reduced because of budget constraints and other competing needs. At the same time, there is a growing belief on the part of parents and school staff that all germs (referred to herein as “microbes”) need to be killed because of infectious-disease outbreaks in schools and other public places. This belief and the lack of time for routine cleaning and hand hygiene leads to the indiscriminate use of sanitizers, disinfectants, and antimicrobial hand products that may pose a hazard to staff, students, and the environment.

The Environmental Protection Agency (EPA), the federal agency that regulates and registers disinfectants and sanitizers, reports that over a billion dollars a year are spent on disinfectants and antimicrobial products. This figure illustrates the enormity of the industry and of product usage.

Disinfectants are not cleaners but antimicrobial pesticides designed to kill or inactivate microbes. Thus, they are not products that should be used indiscriminately. The overuse and misuse of these products is a growing public health and environmental concern. Studies have found that the use of some disinfectant products is creating microbes that can mutate into forms that are resistant to particular disinfectants or that become superbugs.[1–3] Incorrectly using a disinfectant—such as wiping or rinsing the solution off the surface before the recommended contact time, not using the recommended dilution ratio, or using a combination disinfectant/cleaner when there is more dirt on a surface than the disinfectant can handle—may enable the bacteria that survive to mutate into these superbugs.

Understanding the Issue

There is a common misunderstanding in the general public about the role that bacteria, fungi, and viruses play in human health. Many people do not understand that microbes have both beneficial uses and negative impacts. Product manufacturers sometimes design media messages about the proliferation of germs and their potential health affects so as to cause public alarm and increase the desire for antimicrobial products.

In addition, the indiscriminate and interchangeable use of the terms *sanitization* and *disinfection* in some regulatory mandates on the type of products required for specific tasks in health care and early care and education settings often adds to the confusion regarding the level of microbe control that is required. These terms represent different levels of microbe control on different surfaces, and the EPA uses these terms to specify which products can be registered for each use:

Sanitizing – reduces but does not necessarily eliminate all the **bacteria** on a treated surface. Sanitizers do **not** have claims for viruses or fungi. To be a registered sanitizer, the test results for a product must show a reduction of at least:

- 99.9% in the number of **each type of bacteria tested** on non-food-contact surfaces.[3] Examples of non-food-contact sanitizers include carpet sanitizers, air sanitizers, laundry additives, and in-tank toilet bowl sanitizers.
- 99.999% in the number of each type of bacteria tested (within 30 seconds) on most food-contact surfaces.[4] Food-contact sanitizers are used in sanitizing rinses for surfaces such as dishes and cooking utensils, and in eating and drinking establishments.

Disinfecting – destroys or irreversibly inactivates infectious or other undesirable microbes, but not necessarily the spores (reproductive bodies similar to plant seeds) of bacteria and fungi. The number of microbes killed during a disinfecting process will vary, depending on the specific chemical and how it is used.

As a result of these misconceptions, the overuse and inappropriate use of these products poses a daily health risk. School cleaning programs must control the risk of the spread of infectious disease while simultaneously protecting the health of the custodial staff and building occupants from the health effects of using disinfectants made of powerful and sometimes toxic or hazardous chemicals.

Health Issues

It is well documented that disinfectants are associated with both acute and chronic health problems. In a recent study of cleaning products and work-related asthma, Rosenman and colleagues found that 12% of confirmed cases of work-related asthma were associated with exposure to cleaning products. Of these cleaning-related cases, 80% (4 out of 5) were new-onset cases (i.e., the cleaning product exposures caused new asthma in people who had not had it before). Of all the cleaning-related asthma cases, 39% were from medical settings, but 13% were from schools. In all work settings, 22% of those who had work-related asthma associated with cleaning agents worked as cleaners.[4]

Another study found that cleaning-product ingredients reported in work-related asthma cases included irritants such as acids, ammonia, and bleach, and disinfectants such as formaldehyde, glutaraldehyde, and quaternary ammonium compounds (QACs).[5] Emerging science links QACs with reproductive problems as well.[6]

Environmental Issues That Become Health Issues

Residues of disinfectants that are washed down our drains and into our sewage treatment plants and rivers are triggering the growth of drug-resistant microbes. When the sludge filtered from treated sewage is spread on farm fields, high levels of bacteria with antibiotic-resistant genes have been found in soil samples from these fields. The presence of such bacteria may be due to the fact that although QACs kill nearly all microbes when used correctly, when used incorrectly, they can create resistant bacteria at the surviving low levels found in sludge and water samples.[7] The resistant bacteria can result in antibiotic-resistant diseases like methicillin-resistant *Staphylococcus aureus* (MRSA).

Disinfection as Part of a Cleaning for Health Program

This Handbook is designed to be used as part of a Cleaning for Healthier Schools Program that focuses on the thorough cleaning of surfaces, particularly “high-risk” or “high-touch” areas, and on the targeted use of disinfectants and sanitizers for an infection-control strategy:

- High-touch areas: surfaces touched frequently and by a variety of hands over the course of the day. High-touch areas include door handles, faucet handles, handrails, shared desks, push bars, drinking fountains, and so forth. Areas touched by only one person, such as a personal computer keyboard, do not pose the same risk.
- High-risk areas: locations where there is a higher risk for bloodborne incidents, skin contact (MRSA risk), or contact with feces and body fluids. Examples of high-risk areas include the nurse’s office, athletic areas, and childcare centers.

Infection Control: A Three-Pronged Strategy

This strategy provides three methods for integration by the user, based on the most effective and least hazardous methods to use for each situation.

1. **Personal Hygiene Strategies for Microbe Control.** Hand and respiratory hygiene and cough and sneeze etiquette are key personal hygiene strategies that help to reduce the spread of some types of infectious diseases. This infection-control method involves facilitating an education program on hand hygiene that teaches and requires frequent hand washing and proper cough and sneeze procedures. This effort also involves providing hand-washing facilities and adequate time for hand washing. See *Appendix A.5 Understanding Hand Hygiene* for specific information. Posters, free and easily available from the Centers for Disease Control and Prevention (CDC) web site (http://www.cdc.gov/flu/protect/stopgerms.htm), encourage these activities and can be mounted throughout the school as part of an infection-control program.
2. **Managing Airborne Transmission.** Specific microbes such as SARS-CoV-2 may require additional attention to the airborne transmission of the virus. The CDC states that "airborne transmission is infection spread through exposure to those virus-containing respiratory droplets comprised of smaller droplets and particles that can remain suspended in the air over long distances (usually greater than 6 feet) and time (typically hours)."

   The following are accepted strategies in schools to help prevent airborne transmission:

   a. Increase the rating of the Heating, Ventilating and Air Conditioning (HVAC) system filter to a MERV 13A or as close to that as your system will accept.

   b. Increase HVAC air changes to 6-12 per hour.

   c. Install air cleaners/purifiers with High Efficiency Particulate Air (HEPA) filters in classrooms.

   d. Install fans in windows that draw out air.

   e. Open windows and doors to allow for natural ventilation where conditions allow.
3. **Cleaning for Health and Targeted Disinfection.** Comprehensive cleaning programs that use less-toxic products and updated tools and technology can help control the spread of infectious disease. This infection-control method involves removing the majority of the microbes and the conditions they need to survive and thrive. Frequent cleaning of high-touch areas with a third-party-certified (e.g., Green Seal, UL ECOLOGO®, Safer Choice) all-purpose detergent and a microfiber cloth is considered by experts to be sufficient to reduce the number of germs or pathogenic microbes on most surfaces to an acceptable level for public health unless otherwise directed by the CDC.

   Research from the CDC states that large numbers of microorganisms can be removed by "the physical action of scrubbing with detergents and surfactants and rinsing with water."[8] Using high-quality microfiber cloths and mops as part of a cleaning program enhances this process, because studies show that microfiber is superior at capturing microbes.[9]

4. **Disinfecting and Sanitizing for Microbe Control.** This infection-control strategy involves a targeted disinfection and sanitizing program that is designed to address high-risk areas, meet regulatory requirements, and respond to special events, incidents or pandemics in which there is a specific biological hazard. Only trained staff using approved products should perform designated disinfecting and sanitizing tasks.

Recommendations on How to Use the Handbook

When developing a disinfection policy and related work practices, the Workgroup recommends that schools or school districts form or use an existing stakeholder group to explore and customize the materials in the Handbook. A school stakeholder group should include representation, at a minimum, from the administration and from the facilities, nursing, athletic, food service, and teaching staff. Based on the outcome of this collaboration, the school system will need to provide infection-control training, policies, protocols, and posters; a list of approved disinfectants; and a schedule for cleaning and disinfecting. The school should also designate trained staff for specific tasks.

Common Challenges

While providing technical assistance to schools regarding their cleaning programs, members of the Workgroup found a general lack of training in the use of disinfectants. There is also a tremendous amount of pressure from parents and others to use disinfectants because they think this will protect the students and staff from communicable diseases. Following a written protocol can reassure staff, students, and parents that the school is taking the steps necessary to control infectious diseases.

The following challenges may need to be addressed when developing the protocol:

- Confusion on the part of staff about the differences between cleaning, sanitizing, and disinfecting and when to use each type of process and product
- The lack of training for teachers and staff on the correct usage and storage of disinfectants
- The pros and cons of providing teaching staff with school-approved disinfectants
- The lack of information on the effectiveness of third-party-certified cleaners used with microfiber cloths and mops as an alternative to disinfecting

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Chapter 1.B. Handbook Definitions

Terms

Accelerated hydrogen peroxide – hydrogen peroxide in synergy with a blend of commonly used ingredients that accelerate the disinfectant activity.

Acute – health conditions characterized by sudden onset and of finite duration. In addition, they tend to severely restrict the subject's usual daily activities. The sudden-onset health effects—such as rashes, breathing problems, or headaches—are felt or noticed almost immediately, often within minutes or hours after exposure to a product or environment.

Antibiotic – a medicine designed to kill or slow the growth of bacteria and some fungi. Antibiotics are commonly used to fight bacterial infections but cannot fight infections caused by viruses.

Antibacterial – a term used to describe substances that kill or slow the growth of bacteria when treating human and environmental surfaces, including those that aid in proper hygiene. Examples of antibacterial-containing commercial products include hand soaps, gels, and foams, and dishwashing detergents.

Antimicrobial – a general term used to describe substances (including medicines) that kill or slow the growth of microbes. Examples of antimicrobial agents include the following:

- Tetracycline (an antibiotic that treats urinary tract infections)
- Oseltamivir or Tamiflu® (an antiviral that treats the flu)
- Terbinafine or Lamisil® (an antifungal that treats athlete's foot)

Antimicrobial pesticide – any chemical substance that can be used to kill microorganisms. These products are used to disinfect and sanitize, and to reduce the growth or development of microbiological organisms

Antiseptics and germicides – substances used to prevent infection on living tissue by inhibiting the growth of microorganisms. Because these products are used in or on living humans or animals, they are considered drugs and therefore regulated by the Food and Drug Administration.

Asthma – a chronic inflammatory disease that results from a complex interplay between environmental and genetic factors. The disease causes inflammation, with recurrent episodes of wheezing, chest tightness, cough, shortness of breath, and/or difficulty breathing. After asthma develops, the airways of the lungs become more responsive to a variety of stimuli. If left untreated, the resulting inflammation may lead to irreversible changes in the structure of the lung.

Asthmagens – substances capable of causing new-onset asthma. The Association of Occupational and Environmental Clinics (AOEC) has established criteria for determining whether a substance is an asthmagen.

Bacteria – microorganisms that are found on our skin, in our digestive tract, in the air, and in the soil. Most are harmless (nonpathogenic). Many are helpful because they occupy ecological niches (both within our bodies and in the external environment) that could be occupied by harmful (pathogenic) bacteria. These helpful strains keep harmful microorganisms in check. They also help our digestive system to function effectively and stimulate the development of a healthy immune system. Beneficial bacteria are also used in the fermentation process that creates bread, wine, cheese, yogurt, and other foods and beverages.

Bactericide – a pesticide used to control or destroy bacteria, typically in the home, in schools, or on hospital equipment.

Chronic – health conditions in which the onset may not be noticed and characterized by a gradual progression of symptoms or by problems of a more permanent nature resulting from a series of acute conditions. Daily activities may or may not be restricted during any given period, although there is usually a more general series of activity limitations.

Cleaning – the removal of foreign material (e.g., soil and organic material) from surfaces and objects, normally accomplished with detergents or soaps. Cleaning is required prior to disinfection processes for them to be most effective.

Corrosive – a corrosive material is a highly reactive substance that causes obvious damage to living tissue. Corrosives act directly by chemically destroying the tissue (oxidation) or indirectly by causing inflammation. Acids and bases are common corrosive materials and are sometimes referred to as caustics. Typical examples of acidic corrosives are hydrochloric (muriatic) acid and sulfuric acid. Typical examples of basic corrosives are sodium hydroxide (lye) and ammonia.

COVID-19 - an acute respiratory illness in humans caused by the coronavirus SARS-CoV-2, capable of producing severe symptoms and in some cases death, especially in older people and those with underlying health conditions.

Detergent – a substance that aids in the removal of dirt. Detergents act mainly on the oily films that trap dirt particles. Detergent molecules have a hydrocarbon portion that is soluble in oil and an ionic portion that is soluble in water. Bridging the water and oil phases, the detergent acts as an emulsifier, breaking the oil into tiny droplets and suspending them in water. The disruption of the oil film allows the dirt particles to be washed away.

Disinfectant – a chemical or physical agent used on hard inanimate surfaces and objects to destroy or irreversibly inactivate vegetative microorganisms, viruses, and infectious fungi and bacteria, but not necessarily their spores.

Disinfection – a process that is used to reduce the number of viable microorganisms on a surface but that may not necessarily inactivate all microbial agents (e.g., spores and prions).

Efficacy – a measure of the ability to achieve desired results. Disinfectants are registered for their ability to kill certain microbes, and efficacy in this case relates to the percentage of target microbe(s) that are killed or removed.

Endocrine disruptor – an external agent that interferes in some way with the role of natural hormones in the body. Such an agent might disrupt the endocrine system by affecting any of the various stages of hormone production and activity; for example, by preventing the synthesis of hormones, by directly binding to hormone receptors, or by interfering with the natural breakdown of hormones.

Environmental Protection Agency Registration Number (EPA Reg. No.) – a two-part number assigned by the EPA to identify the pesticide product registration (e.g., 1253-79) that must appear on a product's label. The first number is the company number and the second number (after the dash) is the product number.

Fecal coliform bacteria – bacteria found in the intestinal tracts of mammals. When present in water or sludge, it is an indicator of pollution and possible contamination by pathogens.

Fungus – a plant that has no leaves, flowers, or roots. Examples of fungi (or funguses) are mushrooms, molds, mildews, and yeasts.

Microbe – a collective name for microscopic organisms including bacteria (e.g., *Staphylococcus aureus*), viruses (e.g., influenza A and B, which cause the flu and SARS-CoV-2), fungi (e.g., *Candida albicans,* which causes some yeast infections), and some parasites (e.g., *Toxoplasma* species, which cause toxoplasmosis).

Microbial pesticides – microorganisms that are used to kill or inhibit pests such as insects or other microorganisms. Sometimes these microbes are effective simply by increasing in number, using the pests' food supply, and invading their environment.

Microorganisms – bacteria, yeasts, simple fungi, algae, protozoans, and a number of other organisms that are microscopic in size. Most are beneficial, but some produce disease. Others are involved in composting and sewage treatment.

Pandemic – Defined as "an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people."

Pathogen – any organism or infectious agent capable of causing disease or infection.

Pesticide – a substance intended to repel, kill, or control any species designated a "pest," including weeds, insects, rodents, fungi, bacteria, or other organisms. The family of pesticides includes herbicides, insecticides, rodenticides, fungicides, and bactericides.

Pesticide residue – pesticides that may remain on or in the plant, food crop, soil, container, equipment, handler, and so forth, after application of the pesticide.

Quaternary ammonium compounds (QACs or quats) – a family of several hundred chemicals with a similar chemical structure (one positively charged nitrogen atom at the molecule's center) that are known for their disinfectant or detergent properties. Quats are the active ingredients in many disinfectant products used in schools. They are effective against some bacteria, viruses, fungi, and algae. Product labels specify the microbes they target. One example of a QAC is benzalkonium chloride.

Registrant – a pesticide manufacturer that has registered a pesticide product.

Registration – a formal listing with the EPA of a new pesticide before its sale or distribution. The EPA is responsible for premarket licensing of pesticides on the basis of data that demonstrate that there are no adverse health or environmental effects when applied according to approved label directions.

Respiratory sensitizer – a substance that induces hypersensitivity of the airways following inhalation of the substance.

SARS-CoV-2 - Severe acute respiratory syndrome coronavirus 2 is the strain of coronavirus that causes COVID-19, a respiratory illness responsible for the COVID-19 pandemic.

Sanitizer – a product used to reduce (but not necessarily eliminate) microorganisms (usually bacteria) in the inanimate environment to levels considered safe, as determined by public health codes or regulations. Sanitizers include food-contact and non-food-contact products.

Sensitizer – a substance that can produce an allergic reaction in the skin or respiratory tract in some individuals. Skin sensitization is called allergic dermatitis. Respiratory sensitization can include rhinitis (hay fever) and/or asthma. These reactions occur after re-exposure to the same substance after initial sensitization exposure has occurred.

Sterilization – a validated process used to render a surface or instrument free from all viable microorganisms.

Viruses – microorganisms that are smaller than bacteria and cannot grow or reproduce apart from a living cell. They invade living cells and use the cell's chemical machinery to stay alive and to replicate themselves. Thus, to survive and reproduce, they must invade a host cell (animal, human, plant, or bacteria). Virus infections may be spread by way of the air, by contact with surfaces, and by the exchange of body fluids.

Organizations

Centers for Disease Control and Prevention (CDC) – an agency of the US Department of Health and Human Services. Its mission is to "protect America from health, safety and security threats, both foreign and in the U.S." As its name says, this agency provides guidance on preventing and controlling disease.

Food and Drug Administration (FDA) – an organization involved in the regulation of pesticides in the United States, particularly with the enforcement of pesticide tolerances in food and feed products.

Environmental Protection Agency (EPA) – an agency that registers disinfectants and sanitizers in the United States, among other activities.

World Health Organization (WHO) – a specialized agency of the United Nations responsible for international public health.

Regulations

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) – a law enacted on June 25, 1947, that instructs the EPA to regulate (1) the registration of all pesticides used in the United States, (2) the licensing of pesticide applicators, (3) re-registration of all pesticide products, and (4) the storage, transportation, disposal, and recall of all pesticide products.

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Chapter 2. The Science of Infection Control

Introduction

A comprehensive understanding of how microbes move through the environment and into our bodies, and of the roles that cleaning, sanitizing, and disinfecting have in safely preventing our exposure to these microbes provides the foundation for planning infection-control strategies and developing work practices.

What is a microbe?

Microbe is a collective name for microscopic organisms, and includes bacteria (e.g., *Staphylococcus aureus*), viruses (e.g., influenza A and B, which cause the flu), fungi (e.g., *Candida albicans,* which causes some yeast infections), and some parasites (e.g., *Toxoplasma* species, which cause toxoplasmosis).[1] The term *microbe* is used throughout the Infection Control Handbook for Schools when discussing bacteria, viruses, and fungi.

Microbes that can cause disease and/or infection are *pathogens*. Pathogenic microbes may be bacteria, viruses, fungi, or parasites. Enough pathogenic microbes must be present to cause disease.

What types of microbes are there and what is their effect in schools?

Bacteria

What are they? Bacteria are microorganisms that are found "on our skin, in our digestive tract, in the air, in soil, and on almost all the things we touch every day. Most are harmless (nonpathogenic). Many are helpful because they occupy ecological niches (both within our bodies and in the external environment) that could be occupied by harmful (pathogenic) bacteria. These helpful strains keep harmful microorganisms in check. They also help our digestion to function efficiently and stimulate the development of a healthy immune system."[2] Beneficial bacteria are also used in the fermentation process that creates bread, wine, cheese, yogurt, and other foods and beverages.

What illnesses do they cause? Pathogenic bacteria can cause common infections, including food poisoning, acne, sinusitis, ear infections, or more serious diseases such as tuberculosis, whooping cough, staph infection, bacterial pneumonia, and bacterial meningitis. Some bacteria—for example, methicillin-resistant *Staphylococcus aureus* (MRSA), *Clostridium difficile*, and vancomycin-resistant enterococci—have become antibiotic resistant and can cause serious infectious diseases that are hard to treat, such as tuberculosis.

Viruses

What are they? Viruses are microorganisms that are smaller than bacteria, and cannot grow or reproduce without a living host cell (animal, human, plant or bacteria). They invade a living cell and use the host cell's chemical machinery to stay alive and replicate themselves. Viruses may be transmitted to people through the air, by indirect contact with contaminated surfaces, by direct contact with an infected person and with infected body fluids.

What illnesses do they cause? Viruses are responsible for a variety of illnesses, including the common cold (rhinoviruses and human coronaviruses), intestinal and respiratory flu (noroviruses), human immunodeficiency virus (HIV), hepatitis B, hepatitis C, influenza A subtype H1N1 (swine flu) and SARS-CoV-2 (COVID-19).

Viruses do not respond to antibiotics, which makes them more difficult to control.

Fungi

What are they? Fungi are parasites that feed on living organisms or dead organic material, and reproduce by means of spores. Examples of fungi are yeasts, molds, and mushrooms.

What illnesses do they cause? Common fungal infections include ringworm, athlete's foot, and yeast infections such as *Candida* or thrush.

Where do these microbes live in schools?

Microbes live or survive for a time everywhere throughout the school, in the air, in dust, on living things and on soft and hard surfaces.

Common "high-touch" surfaces in schools

High-touch surfaces are those that are frequently touched by a *variety* of hands. A surface such as a desktop that is touched daily by only one student might be touched often, but it is not considered a surface to be managed for infection control because no one else would be exposed to those microbes. Surfaces that might be touched frequently by many different hands and that might be considered high-touch surfaces of concern include but are not limited to:

- Office – a shared computer mouse and keyboard
- Music room – shared musical keyboards and instruments
- Hallways and entrances – security pads, doorknobs, elevator buttons, light switches, door push bars, handrails
- Bathroom/Restroom – faucet handles, toilet handles, towel dispensers, hand dryers
- School bus – doors and railings
- Kitchen and break rooms – handles on coffeepots, microwave doors, refrigerator doors, and vending machines

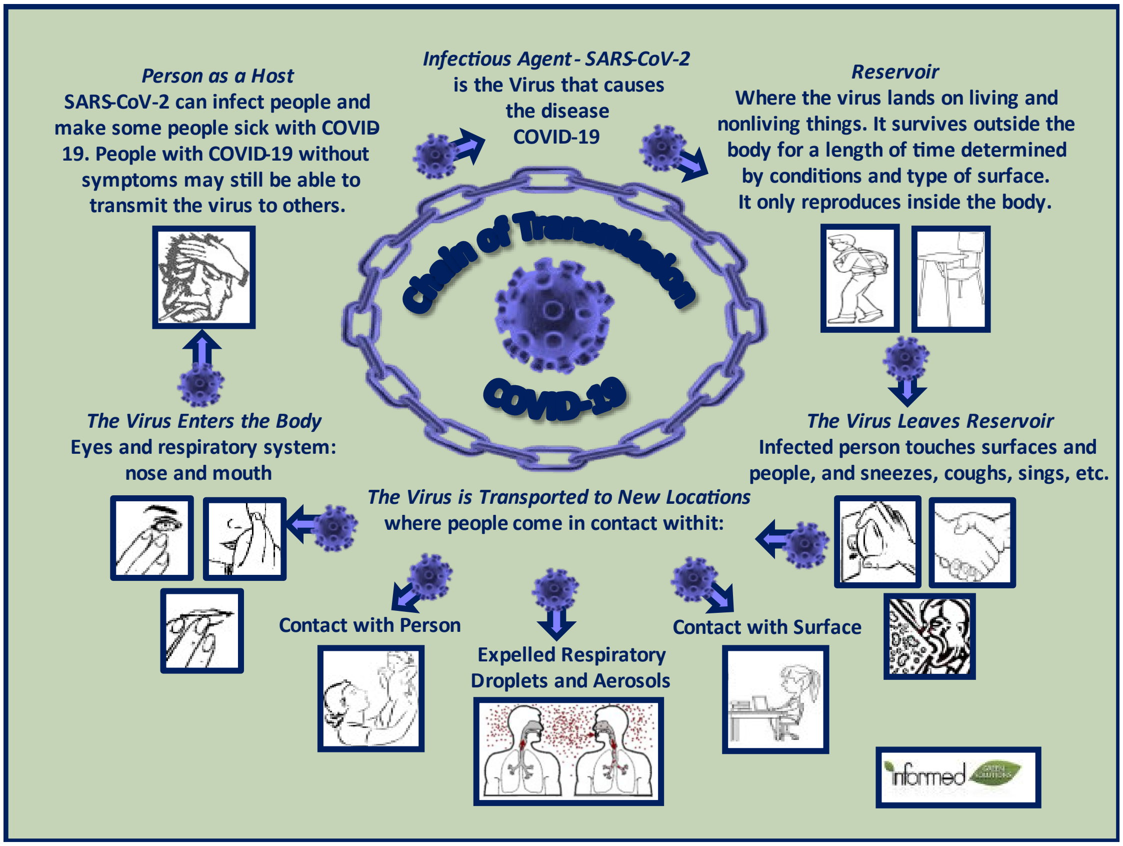
Common "high-risk" areas in schools

Some areas of the school building are of greater concern for possible transmission of disease because there is an increased likelihood of skin-to-skin, object-to-mouth, or fecal-to-oral contact. Also considered high risk are areas where food is prepared, sick or preschool children are cared for, or special events or incidents (such as blood or body-fluid spills) occur. These areas include:

- Athletic departments – gym mats, exercise equipment, shower and locker rooms
- Kitchens – cafeterias, break rooms and prep areas
- Nurses' offices, waiting areas, treatment rooms and isolation areas
- Childcare and preschool centers

How do these microbes make us sick?

The *chain of infection* is a series of events that needs to occur before a person develops an infectious disease.[3] All of these elements must be in place and breaking any of the links of the chain can interrupt the transmission of disease from pathogenic microbes. Below is an example of the Chain of Transmission using COVID-19 as an example.



Infographic created by Lynn Rose

The **reservoir** is the place where microbes live—in humans, animals, soil, food, plants, air, or water. The reservoir must provide the right conditions to meet the needs of the microbes for them to survive and multiply.

One reservoir, which forms on surfaces that are constantly wet, is a biofilm created by bacteria. The bacteria create the right conditions and form a community within a protective shell to increase their ability to survive and proliferate. The biofilm develops within hours after microbes colonize, tightly attach themselves to surfaces, and grow. This shell protects the bacteria from disinfectants, which can kill only the bacteria on the outer layer. Once formed, the bacteria within biofilms are up to 1000 times more resistant to antimicrobials than the same bacteria in suspension (not part of a biofilm).[4,5]

To reach the microbes within the biofilm, friction or some other process such as steam vapor must be used to break down the shell. Microfiber cloths, mops, or brushes can be used to penetrate the biofilm. Key places in schools where biofilms develop are continuously damp or wet areas around sink faucets or drains.

The **source** is the place from which the infectious agent is transmitted to the host. Sources may be animate (living) or inanimate (nonliving). The source is often contaminated by the reservoir. For example, *Legionella* may exist in a school tap-water system, which acts as the reservoir; the humidifier filled with the contaminated tap water may be the source of transmission.

The **pathway** of exposure is the path the organism takes to move through the environment. Possible pathways include:

1. **Air** – Microbes can move through the air in a room, or through the air ducts of a building.
2. **Water** – Microbes can move through water systems.
3. **Surfaces** – Microbes can either land on surfaces from the air, or from contact by an infected person, where they can remain and survive when the conditions are optimal.

A **route** of exposure is the primary way that the infectious agent enters the host (person) and causes disease. The route may be oral (through ingestion), dermal (skin), or respiratory (through inhalation).

The **susceptible host** is the person who may become infected. Not everyone becomes ill after the same exposure to microbes. Our bodies have natural defenses that fight against disease. People who have compromised immune systems are not able to fight infections as well as those who have strong immune systems, and they may be more susceptible to infectious diseases.

Transmission describes the movement of microbes from the source to the host. Spread may occur by one or more of the following different routes of entry:

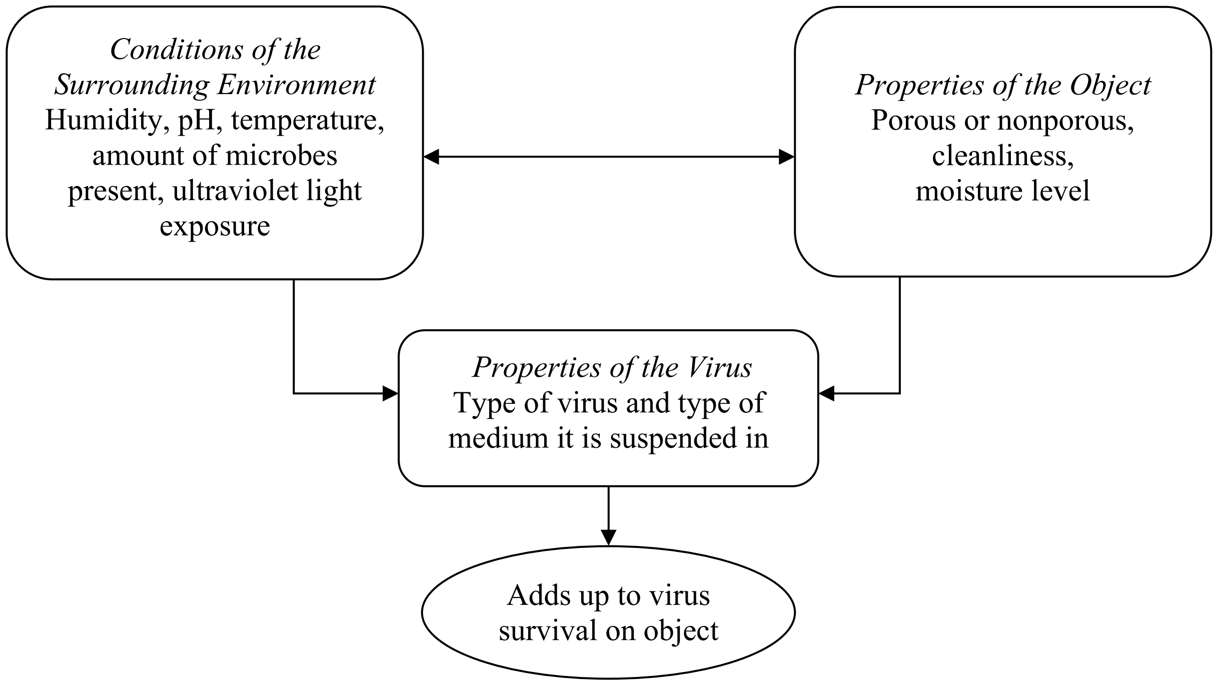
1. **Contact transmission** can happen in one of two ways:
   - Direct – involves body-to-body contact and the physical transfer of microbes from an infected person to a susceptible host (person).
   - Indirect – involves contact of a susceptible host (person) with a contaminated object (usually inanimate).
2. **Droplet transmission** occurs when large particle droplets (>10 microns) containing microbes from an infected person are propelled short distances (three to six feet) through the air and are deposited on a susceptible host's mucous membranes (in the eyes, nose, or mouth).
3. **Airborne transmission** occurs when microbes in airborne droplets (<10 microns) survive after the droplets evaporate, and remain in the air for long periods (hours to days). Depending on the organism, these airborne microbes can remain infectious for days, and when they come in contact with a susceptible host, they can cause infection in the respiratory tract and the mucous membranes of the eyes, nose, or mouth.
4. **Common-vehicle transmission** occurs when a contaminated inanimate vehicle, such as food, water, or equipment, serves as a vector to spread an infectious microbe to multiple persons. An example of common-vehicle transmission would be the spread of salmonella from a lunchroom cafeteria food processor.
5. **Vector-borne spread** occurs when mosquitoes, flies, rats, and other pests transmit infectious microbes.

How long do microbes live outside of the body?

Virus	Lifespan
Hepatitis A	Fecal–oral; can survive for 12 weeks or more depending on environmental conditions. It is killed by heating to 185°F (85°C) for 1 minute.[6]
Hepatitis B	Bloodborne; can survive even in dried blood on environmental surfaces for at least 7 days and still be infectious.[7]
Hepatitis C	Can survive outside the body at room temperature for at least 16 hours and up to 4 days.[8]
HIV	Bloodborne; begins to die off almost immediately after it is outside of the body (exposed to air), although some research reports 3 to 5 hours.[9]
Influenza A	Depending on the environmental conditions, avian influenza virus can survive for 24 to 48 hours, human influenza virus can survive between 9 and 18 hours, and H1N1 can survive between 2 and 8 hours on surfaces.[10]
MRSA	Easily transmissible through a variety of environmental-surface-contact pathways. Routes of exposure can include contact with mucous membranes and open wounds, but the agent can also infect intact skin. These agents can live for several hours to days on inanimate objects under certain environmental conditions.[11]
SARS-CoV-2 (COVID-19)	Depending on environmental conditions, the virus can live in the air for up to 3 hours, on copper for 4 to 8 hours, on glass up to 4 hours, on cardboard up to 24 hours and on plastic and stainless steel up to 72 hours.[12] Research is ongoing for more accurate information.

What influences the survival of microbes outside of the body?

To understand the least-hazardous methods of infection control, it is essential to understand the conditions that permit microbes to survive.[12]



How do we break the chain of infection?

1. ***Will hand washing reduce disease transmission?*** *Yes.* Washing hands properly (with soap, warm water, and friction for 20 seconds) frequently and after exposure to an infected person or object minimizes the opportunity for pathogenic microbes to enter our bodies and will reduce their spread to other people, objects, and surfaces.[13] See *Appendix A.5 Understanding Hand Hygiene*.
2. ***Will respiratory hygiene and cough etiquette reduce disease transmission*?** *Yes.* The Centers for Disease Control and Prevention (CDC) recommend the following steps for infection control:
    a) Cover the nose/mouth with tissue when coughing or sneezing. Coughing into the elbow is an alternative when tissues are not available.
    b) Use tissues, when possible, to capture droplets and dispose of them in a waste receptacle after use.
    c) Encourage coughing or sneezing students/staff to leave a 3-foot buffer between themselves and others for viruses other than SARS-CoV-2.[14]
    d) For SARS-CoV-2 face masks should be worn and a 6- to 12-foot buffer should be left between themselves and others.

3. ***Will cleaning reduce disease transmission?*** *Yes.* Frequent and correct cleaning of high-risk, high-touch surfaces with the proper equipment removes microbes on surfaces and eliminates the conditions (food and water) that some microbes need to survive. Microfiber cloths and mops are able to capture and remove up to 99% of microbes from nonporous surfaces and objects. (See *Chapter 6.C. Using Microfiber Cloths and Mops for Infection Control* for more details.) Steam cleaning machines can also reduce microbes on surfaces, and spray-and-vac machines can remove microbes and their spores.
4. ***Will sanitizing reduce disease transmission?*** *Yes.* Sanitizing is a process used to reduce but not necessarily eliminate all microorganisms from surfaces to levels considered safe as determined by public health codes or regulations. Thus, it can reduce the transmission of some diseases caused by bacteria (not viruses or fungi) on nonporous surfaces under the right conditions. Sanitizing is required by regulation in food service areas and in childcare centers.
5. ***Will disinfection reduce disease transmission?*** *Yes.* Disinfecting is a process that kills or irreversibly inactivates microbes (bacteria, fungi, and viruses) present on a nonporous surface but does not necessarily kill their spores. The product label identifies which microbes a specific disinfectant has been tested to kill or inactivate. Not all disinfectants kill all microbes.

   Different ingredients or combinations of ingredients in disinfectants kill different microbes. Disinfectants are registered and regulated by the Environmental Protection Agency (EPA) as pesticides. Manufacturers submit test data to EPA to document and make "claims" on the label for which microbes the disinfectant can kill.

   Disinfectants are used to destroy or suppress the growth of harmful microorganisms on surfaces. Disinfectants accomplish this by breaking down the microbes' cell walls or by otherwise deactivating them. Therefore, a disinfectant must be selected that works on the specific microbes intended to be killed, or a broad-spectrum product must be selected that works on all of the microbes that might be encountered. Some bacteria and fungi have spores, which act like seeds to ensure the survival of the microbe. Disinfectants may kill the bacteria or fungi, but not necessarily the spores.

   In the case of SARS-CoV-2, the EPA has developed List N that identifies disinfectants that are effective against the virus; see https://www.epa.gov/pesticide-registration/list-n-disinfectants-coronavirus-covid-19.

   Situations that *do require* disinfection include pandemic viruses, accidents involving vomit, feces, body fluid, or blood; some restroom surfaces; and for specific legally required activities in food preparation areas and in childcare settings.

   Disinfectants are *not recommended* for daily use *other than* during a pandemic outbreak, on high-risk surfaces and where required by regulation. The surface will remain disinfected only until the next person or microbe touches that surface. Disinfectants cannot make claims for residual activity. Sanitizers can make claims for residual activity. The only time a disinfectant label would contain a residual claim is when the product is formulated as both a disinfectant and a sanitizer (typically a different contact time, and sometimes at a different concentration). In that case, the claim is only for the bacteria, not the virus.

6. ***Will ventilation reduce transmission?*** *Yes.* There are a range of options to use and enhance existing ventilation systems for microbe control. Options will depend on the type, age and condition of the ventilation system in each space. Adequate ventilation and filter changes on ventilation systems can help break the chain of infection by providing fresh air, by diluting and removing some or all of the infectious airborne microbes, and by filtering some of them out.

   Heating, Ventilation and Air Conditioning (HVAC) filters are rated for what they filter. Using the highest minimum efficiency reporting value (MERV)-rated filter (i.e., with a rating of 13 and above) for the ventilation system will filter out airborne microbes. Not all systems may be able to handle this level of filtration. Find out what your system can handle.

   The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has provided guidance on its web site to address the transmission of the SARS-CoV-2 virus; see https://www.ashrae.org/technical-resources/building-readiness#ecip. The guidance includes how to evaluate HVAC systems in order to optimize existing systems and the highest rated filter the system can handle. Check the existing equipment for MERV compatibility. See *Appendix 6.D: Using Ventilation to Help Reduce Disease Transmission* for more information.

7. ***Will ultraviolet radiation reduce transmission?*** *Yes,* if designed properly. Ultraviolet radiation is categorized by wavelength. The sun emits UV-A and UV-B radiation. UV-C radiation is created by using low-pressure mercury or xenon lamps. UV radiation of specific wavelengths has been known for decades to be an effective germicide. Recently the use of UV radiation as an environmental germicide has expanded in a variety of industries, including water treatment, food preparation, pharmaceuticals, and health care.

   Research has determined UV-C is effective against SARS and MERS, and other forms of coronavirus, but no definitive studies have been published about its effects on SARS-CoV-2 to date.

   The Environmental Protection Agency (EPA) recommends using only the surface disinfectants identified on List N against the virus that causes COVID-19. EPA does not routinely review the safety or efficacy of pesticidal devices, such as UV lights, LED lights, or ultrasonic devices."[3]

   The installation of UV-C radiation bulbs in a ventilation system or in the upper areas of a room can reduce the overall microbe load in the space. This is called Ultraviolet Germicidal Irradiation or UVGI.

   - Pros – The germicidal efficacy can be compared to an increase in ventilation in terms of room air changes per hour.
   - Cons – The costs of installation and operation of UV radiation bulbs have not been fully demonstrated to outweigh the use of an effective ventilation system in schools.

   Direct exposure to UV wavelengths can be a health hazard. Long term exposure to UV-C radiation can penetrate the outer surface of skin and eyes affecting the cells and contributing to additional health issues. Ozone can also be generated by prolonged use of some UV-C devices. Unless the systems are installed and maintained properly by trained and knowledgeable professionals, it is possible that the building occupants and workers could be overexposed to hazardous UV radiation.

Which of these options should be used?

Although microbes are everywhere, most are harmless and many are helpful. The goal of an infection-control program is to prevent the spread of infectious disease by reducing contact with pathogenic microbes. This goal can be safely accomplished through implementing a three-pronged strategy that utilizes the following:

1. ***Personal hygiene strategies for microbe control*** – Hand and respiratory hygiene, including wearing masks and face shields (to protect eyes), and cough and sneeze etiquette, are key components of personal hygiene that help to reduce the spread of some types of infectious diseases.
2. ***Cleaning for microbe control*** – Comprehensive cleaning programs that use less-toxic products and updated tools and technology can help control the spread of infectious disease by *removing* most of the microbes and the conditions they need to survive and thrive.
3. ***Disinfecting and sanitizing for microbe control*** – A *targeted* disinfection and sanitizing program can be designed to address high-risk areas, meet regulatory requirements, and respond to special events such as pandemics or incidents in which there is a specific biological hazard. See *Appendix E: Common High-Touch Points by Location.*
4. ***Ventilation and air treatment strategies*** – These strategies will help address the airborne transmission of an infectious disease. To determine which of the wide range of available options are appropriate will involve assessing existing systems and the configuration of the space and determining available resources. Some options involve optimizing existing systems (e.g., increasing air changes per hour, conducting maintenance, increasing filtration), while other options require some capital investment (e.g., replacing components, adding in UVC), and for others, a major capital investment (e.g., installing HVAC systems).

See *Chapter 1.A. Introduction* for more details on the three-pronged strategy.

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Chapter 3.A. Introduction: Writing a Procedure for Disinfection

The information in this chapter is provided to serve as guide and as a basis in developing a school district's own set of protocols.

An extensive addition to this handbook for the 2021 update was based on the awareness that during the COVID-19 pandemic, many departments who did not traditionally conduct cleaning and disinfecting activities in their department became extensively involved in infection control activities. To do this safely, school districts must determine which departments are using cleaning and disinfecting chemicals, whether they are using appropriate products, whether they are using at the appropriate time and using the appropriate methods, and what safety precautions they are taking. The district should also ensure that departments provide their staff with the safest products, required training and protocols, and assistance and oversight for safe storage and proper disposal of expired and compromised products.

The content of this chapter and the following appendices will enable school districts to work with all involved departments to develop protocols specific to their department. Relevant appendices include:

1. *Appendix D: Cleaning and Disinfecting by School Department Staff*
2. *Appendix E: Common High-Touch Points by Location*

Written procedures should provide guidelines to the following questions:

1. Why disinfect?
2. What surfaces and objects need disinfection?
3. What is the schedule and frequency for disinfection?
4. What are the least toxic and most effective products, processes, and equipment that can be used? How will supply chain issues affect the availability of products and equipment?
5. Who should be doing the disinfecting?
6. What information, training, and personal protective equipment do personnel need to safely do the disinfecting?
7. How to protect workers and building occupants during the disinfection process?
8. What is the proper way to store and maintain disinfectants and equipment?
9. How should expired and compromised disinfectant products and by-products be disposed of?

Chapter 3.B. Choosing the Right Level of Microbe Control

Introduction

Before choosing any type of cleaning or antimicrobial product, it must be determined what "level" of microbe control is most appropriate for the surface or object. See also *Chapter 3.C. Managing Surfaces for Infection Control* to determine which surfaces require microbe control and what types of products can be used on each type of surface.

For a detailed explanation of the following definitions, see *Chapter 1.B. Handbook Definitions*.

Evaluate the Need for Disinfection

There are typically three levels of disinfection in a school building:

1. *Routine disinfection*

   This level of disinfection is used for those areas that the stakeholder team has determined need disinfecting on a regular basis (in addition to cleaning with a high-quality microfiber cloth and an all-purpose detergent). These areas would be evaluated using the following criteria:

   - Certain surfaces and items that are regulated, such as toileting areas and highchairs in preschools and/or food-contact items in food service settings.
   - Areas that are high-risk, such as some surfaces in restrooms, shower and locker rooms, the nurse's office, and some athletic areas.

2. *Incidents* [a]

   - Identify and prepare for these types of events. Work with the administrators in the Nursing, SPED, Facilities and Athletics departments to develop a protocol. These events may include:
     - Outbreaks of contagious disease, such as COVID-19, MRSA, influenza, and other diseases.
     - Incidents involving blood and body fluids, such as fights, nosebleeds, and accidents on the playground or the athletic field.
     - Incidents involving feces, vomit, and saliva, such as in toileting areas in preschool, special education classrooms, etc.
   - Identify the location of incidents for each of the following sectors to provide supplies (e.g., spill kits) and training to relevant staff:
     - Elementary schools
     - Middle and high schools
     - Vocational and technical education
     - Buses/transportation
     - Athletic areas

[a] See also *Appendix A.3. Program Planning Handout: Cleaning for Healthier Schools and Infection Control.*

- o Nurse's office
- o Other

3. *Pandemics*

   Pandemics require the use of regular disinfecting protocols but may also require the addition of site and surface/item specific protocols (e.g., common high-touch points). See *Appendix D. Cleaning and Disinfecting by School Department Staff* for specific areas in each department to consider when developing protocols, and *Appendix E: Common High-Touch Points by Location* for areas and common high-touch points in each department to address.

The three main levels of microbe control in schools are:

1. *General surface cleaning* – physically removes visible dirt, organic matter, viruses, fungi, and bacteria. General surface cleaning is accomplished with water, detergent, and physical scrubbing of the surface. The guiding principle is to *remove* microbes, if possible, rather than kill them (with a sanitizer or disinfectant).[1] In addition, thoroughly cleaning a surface can reduce the need to disinfect because without the nutrients and moisture needed to survive, most microbes cannot survive on a clean and dry surface for very long.

   High-quality microfiber mops and cloths can enhance this process. A study at the University of California Davis Medical Center found that cleaning with a microfiber mop removed up to 99% of microbes.[2] The quality of the microfiber will affect its ability to remove microbes, so select a product with a denier of at least 1.0 or smaller.

2. *Sanitizing* – reduces but does not necessarily eliminate all the **bacteria** on a treated surface. Sanitizers do **not** have claims for viruses or fungi. To be a registered sanitizer, the test results for a product must show a reduction of at least:

   - 99.9% in the number of each type of bacteria tested on non-food-contact surfaces.[3] Examples of non-food-contact sanitizers include carpet sanitizers, air sanitizers, laundry additives, and in-tank toilet bowl sanitizers.
   - 99.999% in the number of each type of bacteria tested (within 30 seconds) on most food-contact surfaces.[4] Food-contact sanitizers are used in sanitizing rinses for surfaces such as dishes and cooking utensils, and in eating and drinking establishments.

3. *Disinfecting* – destroys or irreversibly inactivates infectious or other undesirable microbes, but not necessarily the spores (reproductive bodies similar to plant seeds) of bacteria and fungi. The number of microbes killed during a disinfecting process will vary, depending on the specific chemical and how it is used.

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Chapter 3.C. Managing Surfaces for Infection Control

Introduction

This section discusses key criteria that must be considered when determining whether to disinfect a surface for microbe control.

- Know whether a surface is porous or nonporous. Manufacturers design their antimicrobial products, and the Environmental Protection Agency (EPA) registers them based on surface and use criteria. These different types of surfaces require different types of products and methodology for microbe management.
- Determine whether it is likely that the surface will come in contact with broken skin or mucous membranes. If a surface is contaminated with microbes, but no one is touching it, what would be the point of disinfecting it?
- Consider whether the surface is a type that would allow for the removal of most of the microbes with the use of a high-quality microfiber mops and cloths and a (third-party certified[b]) all-purpose cleaning product to the level of 99% deemed acceptable for the protection of public health, or whether a disinfectant (to kill virtually everything except spores) is needed on those surfaces. See *Chapter 3.B. Choosing the Right Level of Microbe Control* and *Chapter 6.C. Using Microfiber Cloths and Mops for Infection Control*.

Types of Surfaces

There are two types of surfaces, nonporous and porous, that must be taken into consideration when selecting infection-control strategies and products:

- Nonporous surfaces are categorized as food-contact or non-food-contact surfaces.
- Porous surfaces are further categorized as carpet, laundry, or other such surfaces.

Please note that sanitizers are registered by the EPA to be used on specified surfaces. The differences are as follows:[1]

- *Food-contact sanitizers (sanitizing rinses)* are used on surfaces that would come into contact with food. These sanitizers are considered a final rinse. No water rinse following application is allowed.
- *Non-food-contact sanitizers* are used to reduce numbers of bacteria on surfaces that would not come into contact with food.
- *Some products are designed to act as both a sanitizer and a disinfectant,* depending on length of the contact and/or the concentration specified on the label. Many disinfectants that have claims for use on food-contact surfaces must be rinsed with potable water.

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[b] Refers to **cleaning** products that have been certified by EPA's Safer Choice, Green Seal™ or UL ECOLOGO®, organizations that develop standards and provide independent third-party certification of products for environmental and human health criteria. The EPA's Safer Choice and Green Seal certify disinfectants that meet their standards for health and safety.

Surface Management Based on Type of Surface and Extent of Skin Contact

- *Nonporous surfaces* are smooth, non-penetrable surfaces such as floors, walls, and desks that do not allow gases or fluids through.

  These surfaces can be cleaned on a routine basis, with a high-quality microfiber cloth or mop and an all-purpose cleaning product that has been third-party certified as environmentally preferable, to reduce the number of microbes and to eliminate the conditions microbes need to thrive (dirt, oils, and moisture).

  Nonporous surfaces do not need to be disinfected on a routine basis unless there is blood, body fluids, vomit, or feces on these surfaces, or if required by law. When there is an outbreak of an infectious disease, and the surface is touched by a variety of hands, the frequency of cleaning will need to be increased.

  - Floors: Clean with a microfiber mop and a neutral floor cleaner during spring, summer, and fall, and a floor cleaner designed to remove salt in winter. Routine disinfection of floors is unwarranted. Studies have demonstrated that disinfection of floors offers no advantage over regular cleaning and has minimal or no impact on the occurrence of infections. In addition, newly cleaned floors become rapidly re-contaminated from airborne microbes and those transferred from shoes.[2]
  - Walls: Do not need to be disinfected on a routine basis.
- *High-touch surfaces:* Need to be cleaned more frequently with microfiber and an all-purpose cleaner and disinfected during an infectious disease outbreak such as COVID-19. Please see *Appendix E. Common High-Touch Points by Location* for an extensive list of common high touch areas in every type of space. See *Appendix F: EPA's Initiatives During the Pandemic, Including How to Use List N* for searching for disinfectants effective against SARS-CoV-2.
- *Porous surfaces* contain pores that allow fluids and gases to move through them. Porous materials can harbor microbes and also make it harder for antimicrobials to come into contact with the microbes.
  - Types of antimicrobials approved for porous surfaces:
    - Until recently the EPA only approved sanitizers for this purpose.
    - With the appearance of COVID-19, they have included disinfectants for porous surfaces on List N. The types of porous surfaces that disinfectants are approved for on List N include:
      - Laundry
      - Presoak for laundry
      - Hydrogen Peroxide Vapor for use in conjunction with VHP generator
  - The types of porous surfaces to be treated with sanitizers and/or disinfectants include:
    - Carpet - Carpet is a porous material that can provide an ideal environment for the growth of some types of microbes.[4] The moisture and nutrient material that can accumulate in carpet combines to form optimal conditions for some types of microbes to thrive.

Any areas that are treated must be dried within 24 to 48 hours to prevent mold growth. Carpet should not be used in areas where there is a high risk of water damage or blood-related incidents, or if necessary, modular carpet tiles may be used that can be replaced if needed. If carpet needs to be treated:

- use an EPA-registered disinfectant or carpet sanitizer for porous surfaces, or
- use steam cleaning/vapor technologies that sanitize carpets without added chemicals.

- **Laundry**
  - Treating Blood Borne Pathogens - items contaminated with blood *can* be washed. They should be washed separately using an EPA-registered disinfectant laundry product or disinfectant presoak.
    - SARS-CoV-2
      - The WHO[c] recommends that laundry that is contaminated or potentially contaminated with SARS-CoV-2 be washed at the warmest available water setting, between 140–194°F.
      - A non-laundry related study published in the Lancet Microbe suggests that SARS-CoV-2 is highly sensitive to heat.[d] Tests to determine this found that when the temperature was increased to 158°F, the virus became inactive within 5 minutes.
- General Cleaning
  - **Sponges and dishcloths** are not recommended due to the cross-contamination risk and the fact that they can provide an ideal medium for microbial growth. The findings of a study by the University of Arizona on bacteria that were found on cellulose sponges and dishcloths concluded that these items may be an important source of bacterial contamination of surfaces, hands, and foods in home kitchens.[7]
  - Microfiber cloths are an alternative to sponges due to their ability to remove microbes and the conditions they need to thrive and to inhibit microbial growth within their fibers. See *Chapter 6.C. Using Microfiber Cloths and Mops for Infection Control*.

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[c] WHO, *Home care for patients with suspected or confirmed COVID-19 and management of their contacts,* https://www.who.int/publications/i/item/home-care-for-patients-with-suspected-novel-coronavirus-(ncov)-infection-presenting-with-mild-symptoms-and-management-of-contacts

[d] Alex W H Chin, Julie T S Chu, Mahen R A Perera, Kenrie P Y Hui, Hui-Ling Yen, Michael C W Chan, Malik Peiris, *Leo L M Poon, "Stability of SARS-CoV-2 in different environmental conditions," *Lancet Microbe,* April 2, 2020 DOI:https://doi.org/10.1016/S2666-5247(20)30003-3

Consider the Surface Before, During, and After Disinfecting

- *Compatibility of product with surface* – Always check the product label for compatibility because some products can permanently damage surfaces, such as the use of bleach is corrosive on a metal surface.
- *Orientation of surface (horizontal or vertical)* – Consider what application process and equipment would work the best to keep the surface wet long enough to meet the required contact time period.
- *Final treatment of the surface (rinsed, wiped off, or air dried)* – Always read labels for instructions. There are several issues to consider when determining whether to rinse off the disinfectant or sanitizer:
    - Regulatory requirements: Disinfectants and sanitizers have rinse and no-rinse requirements that may depend on their end use.
    - Toxic residue: Product residue left on a surface may be hazardous when it comes in contact with skin. Children have acquired rashes after sitting on a toilet seat that was not rinsed. Rinse all touchable surfaces when the label states that rinsing is required.

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Chapter 3.D. Dispensing Disinfectants

Introduction

Dispensing concentrated products through a dispensing system provides a number of opportunities to improve safety and conserve resources by (1) minimizing waste through accurate dilution rates and the use of concentrates, (2) preventing exposures and spills from product concentrates, and (3) improving efficacy due to accurate dilutions.

The ideal situation is to have a dispensing station that can dispense the disinfectant at the correct concentration. Product vendors will often provide dispensing equipment at no cost if sufficient product is purchased from them.

Preparing to Dispense Products

- *Select the proper dilution rate for the task.* Each disinfectant has a concentration that maximizes its ability to disinfect and for which it has been tested and approved by the EPA. The manufacturer cannot guarantee the effectiveness of the product if it is not diluted according to the rate specified on the label. Adding more of the concentrate to the mixture will not necessarily cause the disinfectant to react more quickly or effectively. In fact, improper dilution of a disinfectant can increase the toxicity, the risk of injury, damage to equipment, contamination of drinking water sources, and the cost. Following the manufacturers' directions for the lowest concentration of disinfectant achieves the highest level of disinfection.
- *Mix only the amount needed.* Some disinfectants lose their effectiveness and must be disposed of within a specified amount of time after mixing. An example is a diluted bleach solution that must be disposed of within 24 hours if not used.

Dispensing Products

- *Without a dispensing station*
    - Use a measuring device and funnel, nozzle, or spigot for dispensing fluids from bulk containers to reduce the chance of spills and overflows. Consider using a ready-to-use product, such as a spray bottle or wipe in certain situations.
    - Thoroughly wash and rinse dispensing equipment after use.
    - Dilute and mix the product in a well-ventilated space.
- *With a non-plumbed dispensing station*
    - These systems use a metered dispensing system that can ensure that only the metered dose of the concentrate is dispensed. The user must then add water separately to the product in the container.
    - Thoroughly wash and rinse dispensing equipment after use.
    - Dilute and mix the product in a well-ventilated space.

- *With a plumbed dispensing station*
    - Calibrate dispensing equipment carefully and often, at least every time a new container of disinfectant is opened. Check the equipment for leaks and malfunctions when calibrating. To prevent waste, calibrate equipment using water instead of the chemical product.
    - Use pumps and spigots to decrease the likelihood of spills and contact with skin.
    - Measure concentrates before adding them to the dilution tank.

Chapter 3.E. Labeling Secondary Containers

Introduction

Secondary or portable containers are those into which chemical products are dispensed and often diluted from an original container or dispensing station. Typically, custodial staff fill trigger spray containers of each product from a dispensing station and put them on a cleaning cart.

When labels are not supplied, fall off or are illegible, these spray bottles are often haphazardly labeled with markers or not labeled at all. They inadequately labeled containers are often found on the cleaning cart or in rooms throughout the building if left by the custodian or distributed to teachers. This practice becomes an accident waiting to happen. In the case of exposure, there is no health and safety information, and the chemical is essentially an unknown.

Vendors can provide labels for spray bottles with all the required product information.

Regulatory Requirements for Labeling Secondary Containers

Antimicrobial products are categorized as both a pesticide and a hazardous product and are regulated under two different laws by two different federal agencies. The following information clarifies each agency's regulatory jurisdiction over the content of a pesticide's product health and safety information:

1. Regulated as an **Antimicrobial Pesticide** – The United States Environmental Protection Agency (EPA) specifies content requirements for antimicrobial pesticide labels under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).

   EPA refers to secondary containers as "service containers" and as "secondary containers."[e] They are similar, but there are some minor differences, and different terms are used in different settings:

   - A secondary container is used to apply and/or store an EPA-registered pesticide that is neither sold nor distributed. Secondary containers are most commonly used in institutional settings for concentrated products that are diluted prior to use.
   - A service container is temporarily filled with an EPA-registered pesticide and used at a site where the pesticide is applied by the applicator.

   EPA does not require secondary containers or service containers to be labeled. However, the product applicator is responsible for following the requirements on the label and complying with other relevant requirements in FIFRA and other statutes.

   IMPORTANT: FIFRA labels approved by EPA pre-empt OSHA's label requirements.

2. Regulated as a **Hazardous Product** – The Occupational Safety and Health Administration (OSHA) specifies content requirements for product hazards, precautions and safety and health information in the Safety Data Sheets (SDS) format under the Global Harmonized System (GHS) portion of the Hazard Communication Standard (HCS), 29 CFR 1910.1200.

[e] EPA, Recommendations for Labeling Secondary and Service Containers, https://www.epa.gov/pesticide-labels/secondary-containers-and-service-containers-pesticides

OSHA refers to secondary containers as "secondary containers," and the label posted on secondary containers as a "workplace label."

IMPORTANT – The Massachusetts Department of Labor Standards (DLS) enforces OSHA for the public sector, including schools, in Massachusetts.

Requirements for Label Content for Secondary Container Under Each Regulation

1. EPA under FIFRA

EPA requires a pesticide's **primary** label (the label on the original container) to serve as the user's guide to applying pesticides to minimize risk and maximize efficacy. The label provides information about how to handle and use pesticide products safely and legally. Pesticide labels are legally enforceable, and all of them carry the statement: "It is a violation of federal law to use this product in a manner inconsistent with its labeling."[f]

Although EPA does not require labels on **secondary** containers of antimicrobial products, EPA notes that OSHA requirements may apply (but does not clarify which requirements).[g] EPA does recommend that the user identify the material in the secondary in the event of a spill to ensure that adequate information is available in case of medical or environmental emergency.

EPA recommends that product applicators provide the following information on secondary container labels for diluted anti-microbial products:[h]

- Product name and EPA registration number.
- Name and percentage of active ingredient. EPA provides the following options for listing the percentage of the active ingredient in the diluted product:[i]

  "The percentage of active ingredient listed on the secondary container may be the same as that declared on the pesticide product (for the concentrate), or if known, the percentage of active ingredient in the end-use dilution."

Takeaway point:
Products at the "ready to use" dilution may appear more hazardous than they really are because EPA allows manufacturers to use safety data and precautionary statements on the secondary label based on the full concentrate. It may have the same information as the primary label.

Also, EPA does not allow a reduced signal word even if the diluted product is less hazardous than the concentrate.

[f] Note that EPA does not recommend that other elements of the FIFRA label, such as directions for use, should be included.

[g] EPA Recommendations for Labeling Secondary and Service Containers, https://www.epa.gov/pesticide-labels/secondary-containers-and-service-containers-pesticides.

[h] EPA Recommendations for Labeling Secondary and Service Containers, https://www.epa.gov/pesticide-labels/secondary-containers-and-service-containers-pesticides.

[i] EPA – response to Label Questions - Should the percentage of active ingredient listed be adjusted to reflect the diluted product? If not, could you provide some information as to why the concentrated product ingredient listing should be reflected on the label of the secondary container? LC09-0275 (05/22/09), https://www.epa.gov/pesticide-labels/pesticide-labeling-questions-answers#logos.

- Signal word and precautionary statements (including First Aid statements) from the registered label (for the concentrate), unless (1) the registrant has acute toxicity data supporting lesser precautionary statements for the diluted product, and (2) alternate directions for the diluted product are indicated on the product label.

  *The secondary container **may have** reduced precautionary language (if supported by dilution-specific acute toxicity data), but **not** a reduced signal word.*

- If the product in the container is diluted, it should be followed by the phrase: "The product in this container is diluted as directed on the pesticide product label."
- The statement: "Follow the directions for use on the pesticide label when applying this product."

2. OSHA Under Hazard Communication Standard (HCS 2012 paragraph 1910.1200 (f) (6), Workplace Labeling)

   The standard requires that secondary containers with **hazardous products** be labeled with a "Workplace Label" and must "provide either all of the required information that is on the label from the chemical manufacturer **or** the product identifier and words, pictures, symbols or a combination thereof, which in combination with other information immediately available to employees, provide specific information regarding the hazards of the chemicals."

   Preprinted "Workplace Label" for spray bottles may be obtained from the distributer or manufacturer. When they are not available, employers can make their own label with the required information.

   IMPORTANT: OSHA Hazard Communication Standard labels are not required when using products regulated by other agencies as noted in the regulations sited below:

   1910.1200(b)(5) - This section does not require labeling of the following chemicals:

   1910.1200(b)(5)(i) - Any pesticide as such term is defined in the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 et seq.), when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Environmental Protection Agency.

Regulatory Clarification: The Massachusetts Department of Labor Standards has clarified that aside from EPA FIFRA superseding OSHA Hazard Communication labeling requirements, all other requirements of OSHA Hazard Communication Standard apply.

Summary Recommendations

When labels for secondary containers are not available, employers can create their own label. The information **recommended** by EPA under FIFRA was geared towards manufacturers for when they make labels for secondary containers and/or for diluted products. End users can use these recommendations to create a secondary label that helps the end user (who may not have access to the original label information) to use the product correctly and as safely as possible.

Please see *Appendix H: Templates for Labeling Secondary Containers of Disinfectants and Sanitizers.* These templates have provided space and prompts to enter the recommended FIFRA information. These templates can be further customized by resizing them on the computer or copier.

Although the Hazard Communication Standard label requirements do not apply to antimicrobial products, EPA does **allow** use of GHS symbols from the Hazard Communication Standard on an antimicrobial product label:

- The hazard pictograms are not required.
- The hazard pictograms are allowed to be used on a primary label.[j]

  They serve as a valuable "at a glance" source of hazard information for the end user.

The EPA does not clearly allow--or prohibit--the use of two other hazard rating systems, the National Fire Protection Association (NFPA) and Hazardous Materials Information Systems (HMIS). For detailed information on these systems, see *Appendix K: Disinfectants - Comparing Information on Pesticide Labels and SDSs.*

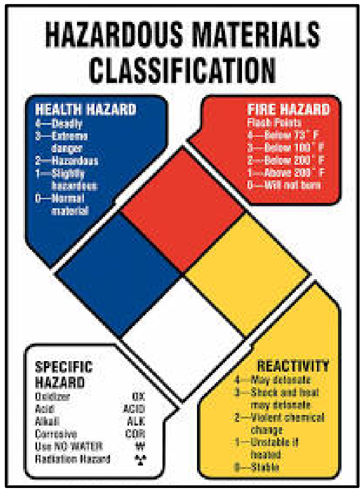
[j] EPA, https://www.epa.gov/pesticide-labels/pesticide-labeling-questions-answers:

Question - Will the Agency allow the use of the GHS explosiveness symbol and the GHS flammability symbol on pesticide labeling? Is use of these symbols limited to NAFTA labels? (LC08-0162; 5/15/08)

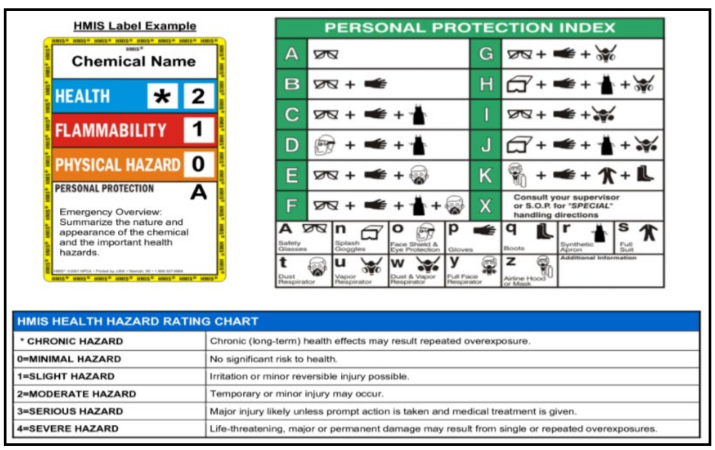
Answer - The Agency will allow the use of the GHS (Globally Harmonized System for Hazard Communication) explosiveness symbol and the GHS flammability symbol on pesticide labeling and it is not limited to NAFTA labels. 40 CFR 156.78 requires warning statements on the flammability or explosive characteristics of pesticide products meeting listed criteria. These statements, as applicable, must remain on labels that choose to in addition use the GHS symbols. Further, 40 CFR 156.78(d)(3) requires a flammability symbol specifically for total release fogger products and offers an example symbol. The GHS flammability symbol is equivalent and may replace the example provided. GHS symbols may be added by a label amendment and may not be added through notification.

Label Templates

Label templates have been created and designed to enable the end user with prompts to fill in the recommended information. See *Appendix H: Templates for Labeling Secondary Containers of Disinfectants and Sanitizers.* One set of label templates contains the GHS pictograms and the NFPA and HMIS rating system information, and one set does not.



NFPA Hazard Rating System



HMIS Hazard Rating System

Chapter 3.F. Precleaning Surfaces and a Discussion on Using Disinfectant/Cleaners

Introduction

The cleaning step prior to disinfecting and sanitizing is often skipped for several reasons, including time constraints, a lack of understanding of the role cleaning has in preparing the surface, how materials on the surface can affect product efficacy, and the requirement for the disinfectant to be in contact with the microbes for a specified amount of time to kill them. This document and *Chapter 3.G. Identifying Factors That Can Compromise Disinfectant Efficacy* provide the reasons why cleaning first makes a difference in efficacy.

The information provided here is to clarify the differences between the product types, when each may be appropriate to use, and what the potential health and efficacy issues are.

Preparing the Surface for Disinfection

- *Why preclean?*
  - For a disinfectant to be effective at killing microbes, all dirt and debris must first be removed from the surface so that the disinfectant can come into contact with the microbes and be absorbed. Soil renders disinfectants less effective because it can hide the microbes, absorb the disinfectant ingredients, and change the chemical nature of the disinfectant.[1]
  - Disinfectants cannot penetrate biofilm. Biofilm develops on wet surfaces over time as bacteria "communicate and colonize with other microbes."[1] The biofilm protects itself with a tough, thick matrix that must be broken down to make the microbes vulnerable. The best way to do this is to brush or scrub with microfiber the surface to which the biofilm is attached.[1] Another way to penetrate the biofilm is to use heat from a steam vapor device.[2]

    Key locations for a biofilm to form are those areas that are wet on a regular basis, such as (1) plumbing under the rims of toilets and urinals, in sinks, and in distribution pipes; and (2) wet areas that surround these locations, such as backsplashes, drain areas, and so forth.
- *Can I use the same product to clean and disinfect?*

  This is not recommended. It is always best to clean first with a detergent and then disinfect with a disinfectant.
  - Disinfectant/cleaner products – Although cleaners do not disinfect and disinfectants do not clean, there are products that are designed and registered by the EPA to clean and disinfect. They contain both a disinfectant and a detergent cleaning agent. All surfaces need to be cleaned first. Two types of products are available:
    - *One-step* cleaner/disinfectants work on surfaces with only a *moderate* amount of organic soil. They can be labeled as a one-step cleaner/disinfectant that is "effective in the presence of 5% body fluids"; however, measuring 5% organic matter or body fluids may be difficult. To reduce the use of hazardous products, use an all-purpose cleaner for the first step.

        - *Two-step* cleaner/disinfectants are *not* "effective in the presence of 5% body fluids" and must be labeled and used only as a two-step process—that is, the product must be used twice, once to clean and once to disinfect.

    - All other disinfectants require that surfaces be precleaned using a detergent (an all-purpose cleaner) until they are free of dirt, grease, oil, and organic substances such as blood. Detergents disperse and remove organic materials and dirt from surfaces, reducing surface tension while increasing the penetrating ability of water. Proper cleaning with high-quality microfiber and a detergent will remove up to 99% or more of infectious material and render the surface visibly clean.

    - Because the cleaning step does not require a disinfectant, it is recommended to use two different products (one to clean and one to disinfect) to reduce the amount of toxic disinfectant used.

- *How will the use of microfiber assist in the disinfection process?*

    - High-quality microfiber cloths and mop heads serve several roles in preparing a surface to be disinfected. In addition to soaking up moisture and removing the nutrients that microbes need to survive, high-quality microfiber with dense fibers can remove microbes and bacterial spores.[1] (See also *Chapter 6.C. Using Microfiber Cloths and Mops for Infection Control*.)

References

1. J. Darrel Hicks, *Infection Control for Dummies.* Westerville, Ohio: International Executive Housekeepers Association, 2008.

2. CDC Cleaning and Disinfecting in School Classrooms. https://www.cdc.gov/coronavirus/2019-ncov/downloads/community/schools-childcare/cleaning-disinfecting-school-classrooms.pdf

Chapter 3.G. Identifying Factors That Compromise Disinfectant Efficacy

Introduction

There are many conditions that can affect how well a disinfectant works to kill microbes. Product-specific guidelines are located on a product's label. A manufacturer can guarantee the effectiveness of its product only if the product's instructions are followed.

The National Cleaning for Healthier Schools and Infection Control Workgroup has consistently observed that in practice, the lack of awareness of how disinfectants work leads to poor practices that result in inadequate disinfection and unnecessary exposure to disinfectants. Ultimately, it also leads to a false sense of security that the microbes have been killed.

Efficacy Criteria

The following factors can reduce the effectiveness of a disinfectant and should be kept in mind when selecting and using products:

- *Type of microbe to be killed.* Each disinfectant has unique properties that target specific microbes. The EPA registers each disinfectant on the basis of the target microbe(s) it is proven to kill. This information can be found on the disinfectant's label.
    - For COVID-19, EPA provides List N Advanced Search Page: Disinfectants for Coronavirus (COVID-19) https://www.epa.gov/coronavirus/list-n-advanced-search-page-disinfectants-coronavirus-covid-19 . See *Appendix F: EPA's Initiatives During the Pandemic Including How to Use List N* on how to find safer products on List N.
- *Material on the surface to be disinfected.* One of the biggest mistakes in disinfecting practices is not cleaning a surface prior to disinfecting. The following materials could affect a disinfectant's efficacy and must be removed prior to disinfecting:
    - Protein-containing material (e.g., food, blood). These materials may absorb and inactivate some disinfectants.
    - Organic matter and soaps. The presence of organic matter and other compounds such as soaps left on the surface due to inadequate washing and rinsing may neutralize some disinfectants.1 An increase in pH improves the antimicrobial activity of some disinfectants (e.g., quaternary ammonium compounds [QACs]), but decreases the antimicrobial activity of others (e.g., hypochlorite [bleach]).
- *Cross-contamination issues.* If disinfecting floors, solutions of disinfectant should be changed for each room where disinfectants are used. See *Chapter 3.H. Preventing Cross-Contamination* for details on the potential for and prevention of cross-contamination. The most effective way to prevent cross-contamination when using a mop and bucket system is using a split bucket or a charging bucket system.
- *The length of time the disinfectant sits in the bucket.* When a solution of disinfectant is used on several rooms over a period of time, efficacy is reduced.
- *Concentration of product.* It is important to choose the proper chemical concentration that is best suited for each disinfection situation. The product is guaranteed by the manufacturer only when used at the concentration listed on the label. Disinfecting

requirements for routine tasks and special-event tasks such as a blood spill may require different strengths of the same product, or another product altogether.

- *Contact time (also known as kill time or dwell time)*. Contact time is the amount of time that the product must be *in contact* with the microbes to kill them. Contact time is specified on the product label and varies from product to product. If the product is not left on the surface for a sufficient amount of time, the manufacturer cannot guarantee that the product will work effectively. This is one of the most common mistakes staff members make when using disinfectants.
- *Appropriate temperature.* The disinfectant must be stored at the correct temperature to maintain its viability and to ensure effective action when it is used. Improper temperatures can degrade a product during storage.
- *Compatibility of the product and the surfaces it is used on.* Not all products are compatible with all surfaces, and using a product that is incompatible can damage the surface. For example, bleach can corrode metal surfaces, and scrubbing with bleach or corrosive (extremely high or low pH) products can remove some coatings on walls or floors. Floor finishes can be damaged or dulled by a disinfectant's pH. Chemical damage is irreversible and can be costly to repair. In most cases, floors do not need to be disinfected.
- *Water hardness.* Some disinfectants, particularly the older formulations of quaternary compounds, do not work well in hard water. The newest quaternary compounds, however, work fairly well in hard water; hence, a quaternary compound formula label might read "effective in 400 parts per million (ppm) hard water."[5]

References

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Resources

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Chapter 3.H. Preventing Cross-Contamination

Introduction

Cross-contamination is the transfer of infectious microbes from one surface, object, or person to another. Preventing this transfer can help minimize the surfaces that need to be cleaned or disinfected for infection control. It is also counterproductive to what a cleaning program is trying to achieve.

Preventing cross-contamination begins with an understanding of where microbes live (a reservoir), how they multiply, and how they move from location to location. See *Chapter 2. The Science of Infection Control* for information on how this "transmission" process works.

This document provides some common cross-contamination scenarios in schools and several strategies and work practices to prevent this from happening.

What are the common reservoirs of microbes that serve as sources of cross-contamination in schools, and what strategies can be used to eliminate them?

- *Reservoir:* A used cleaning cloth or mop head, especially if left soaking in dirty solutions.[1]
- *Strategies:*
  - Launder cloths and mop heads after use and allow them to dry before reuse to minimize the degree of contamination.
  - Replace soiled cloths and mop heads with clean items each time a bucket of disinfectant is emptied and replaced with fresh, clean solution.[1]

- *Reservoir:* A solution of disinfectants, especially if the working solution is prepared in a dirty container, stored for long periods of time, or prepared incorrectly. Gram-negative bacilli (e.g., *Pseudomonas* species and *Serratia marcescens*) have been detected in solutions of some disinfectants (e.g., phenolics and QACs).[1]
- *Strategies:*
  - Prepare disinfectant and detergent solutions in clean containers.
  - Make sufficient cleaning solution for daily cleaning, discard any remaining solution, and dry out the container.
  - Dispose of used solutions immediately.

- *Reservoir:* Contaminated hands or gloves.
- *Strategies* (in order of preference):
  - Wear and wash chemical-resistant gloves each time a mop head or cleaning cloth is changed for a new surface, or when the disinfectant solution is changed.
  - Wear and change disposable chemical-resistant gloves each time a mop head or cleaning cloth is changed for a new surface, or when disinfectant solution is changed.

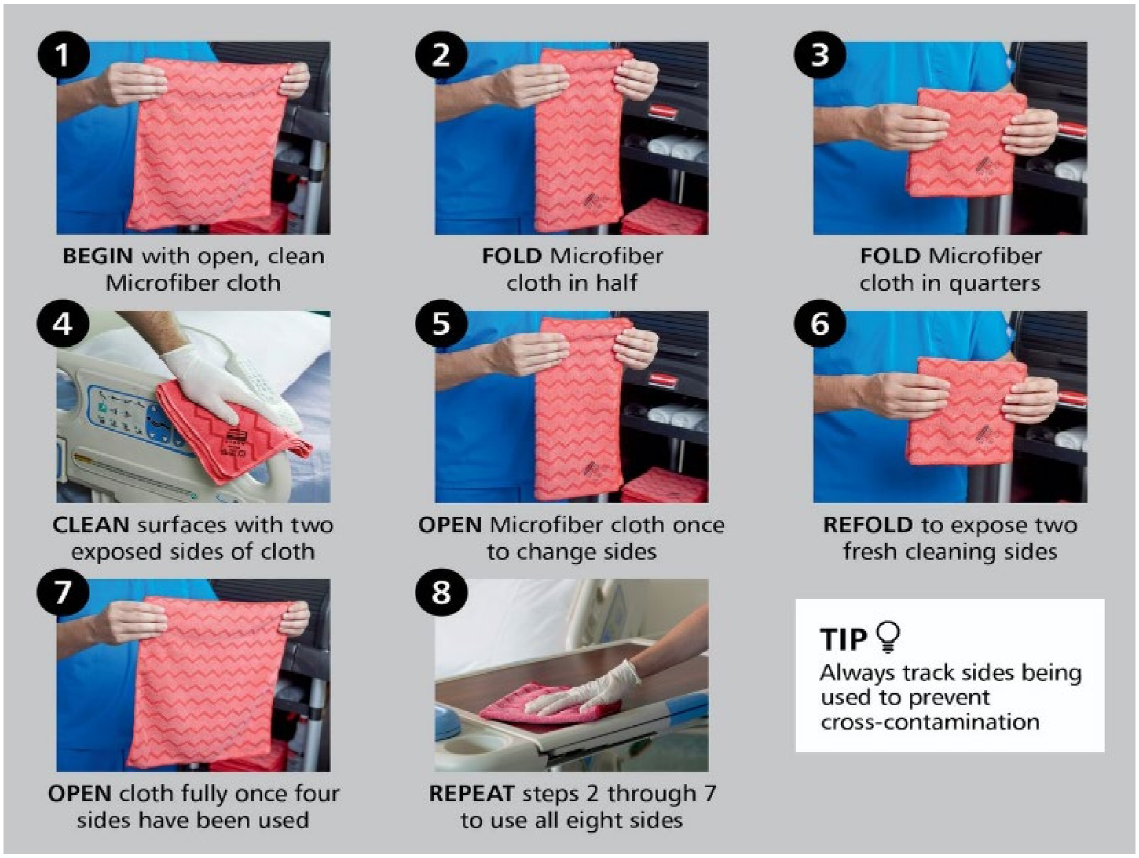
- Wash hands each time a mop head or cleaning cloth is changed for a new surface, or when the disinfectant solution is changed. (If skin exposure is likely, however, chemical-resistant gloves should be worn.)

What tools can be used to prevent cross-contamination?

- *Bathroom plumbing appliances and dispensers:*
  - Sink-faucet handles present one of the greatest risks of cross-contamination in the restroom. Touch-free toilets and faucets eliminate the possibility of making contact with potentially harmful microbes.
  - Touch-free dispensers in the bathroom allow users to touch only the soap or towel they need.
- *Facility equipment:*
  - Entryway walk-off mats trap pollutants such as dust, spores, and allergens before they enter the building and help to keep entryways clean.
  - Hands-free trash cans eliminate touching surfaces.
- *Cleaning and disinfecting equipment:*
  - Mop systems – use systems that require a new mop head or pad for each room. One common system uses a "charging bucket" that contains fresh solution to wet a stack of pads that are used to replace used mop heads. Used mop heads are collected in a separate container.
  - Buckets – use dual-buckets (AKA split buckets) that have separate dirty/clean water compartments.
  - Vacuums – use high-efficiency filtration equipment to prevent the introduction or spread of particulates that may carry microbes into the air while vacuuming.
  - Mops and cloths – use microfiber cloths and mops to capture more dirt and microbes than with paper or cloth towels. See *Chapter 6.C. Using Microfiber Cloths and Mops for Infection Control* for more information.

    Microfiber cloths can either prevent or cause cross-contamination depending on how they are used. The most effective way to prevent cross-contamination is to fold the cloth so that a new side is used for each new surface or when the cloth becomes loaded with soil.

The illustration below is an example of one company's use of the "Eight-Fold" method:



Source: Rubbermaid - https://www.rubbermaidcommercial.com/resource-center/0a1bf96b7165e962e90cb14648c9462d/Cross_Contamination_Prevention/

- No-touch cleaning equipment – this equipment uses automatic chemical metering and injection, an indoor pressure washer, and a wet vacuum to spray down spaces with a cleaning product, then rinse and vacuum the dirty water. If needed, disinfectants can be applied using a spray bottle or other disinfection application equipment. This system eliminates the practice of dipping a dirty mop or cloth into a container of solution.

  An independent study on long-term cost savings conducted by John Walker, president of ManageMen and founder of Janitor University, found that no-touch cleaning equipment reduces restroom cleaning times by as much as 66%.[1] Savings are realized on the product and on labor because these systems use a smaller amount of chemicals and take less time.

- *Color-coded equipment (cloths and mops):*
  - The color-coded system uses different color cloths for different types of spaces. For example, it prevents accidentally reusing a cloth or mop that has been used to clean a bathroom in a kitchen.

- Some facilities managers and building service contractors devise their own color combinations to meet their specific needs, whereas others use the industry-standard color-coding system:
  - red for high-risk areas such as toilets and urinals
  - yellow for low-risk restroom areas including sinks and mirrors
  - blue for all-purpose cleaning (dusting, window cleaning, wiping desks, etc.) in other areas of a facility
  - green for food-service areas
- Some strategies for transitioning to a color-coded system:
  - Post a color-coding chart in an accessible area such as by the time clock, in the locker room, on the cleaning cart, in utility closets, or in other areas.
  - Have enough quantity of each color to prevent employees from using another color (e.g., a red cloth if they run out of blue ones).[3]
  - For color-blind employees, an accommodation can be made by writing on cloths and mops with permanent markers. Several coding systems can be used: “U/T” for urinals and toilets, “S” for sinks and mirrors, and so forth; or “R” for red, “Y” for yellow, and so forth.
- Excerpts from case studies of successful or challenging transitions:
  - San Diego State University switched to color-coded mops in 1991. Before the change, the cleaning crew used the same mops for every task, “so there was no way to tell, other than perhaps by smell, where a mop had been used,” says Johnny Eaddy, Assistant Director of Physical Plant, Business, and Financial Affairs.
  - Some employees may have trouble adjusting to the system of laundering and reusing color-coded products. “After using disposable rags for so long, cleaners may not always remember to throw the cloth in the laundry hamper rather than the trash can.”[3]
  - Custodians can also be assigned tasks based on the color systems. “Our bathroom [cleaning staff] only gets the right colors,” says Jimmy McKiernan, Director of Operations for First Quality Maintenance in New York. “We’re trying to take the guesswork out of it so there’s no way for [them] to mess up.”[2]
  - Custodians at Lynchburg City Schools in Virginia use a specific mop for every task: green for general cleaning, blue for restrooms, white for blood, and pink for stripper.

Practices to Prevent Cross-Contamination[4]

- *Personal protection:*
  - As a friendly reminder, post hand-washing posters throughout buildings to reinforce the importance of clean hands for staff and building occupants. Tell staff to avoid touching their face, skin, or hair with cleaning cloths.
  - Have staff wear chemical-resistant gloves. After removing gloves, custodians should wash their hands with soap and water for 20 seconds.
- *Restrooms:*
  - Ensure that towel dispensers are dispensing properly. When users reach into a dispenser to unclog towels, they contaminate other towels for future users.
  - Install towel dispensers away from sink-splash zones to prevent contamination.
- *Custodial closets:*
  - Keep closets organized and clean so that microbes do not attach themselves to cleaning equipment and spread throughout the building.
  - Segregate tools to prevent them from touching each other. For example, items used to clean a restroom should not be side-by-side with those used in a kitchen.
  - Clean touch points on custodial equipment (e.g., custodial carts, product automatic dilution and dispensing machines, spray bottles and handles on product applicators) when custodians have finished using them for the day.

References

1. L. Sehulster and R.Y.W. Chinn. "Guidelines for Environmental Infection Control in Health-Care Facilities: Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC)." *Morbidity and Mortality Weekly Report* 52, no. RR10 (2003): 1–42. Available at: https://npin.cdc.gov/publication/mmwr-guidelines-environmental-infection-control-health-care-facilities-recommendations
2. J. Walker, *Microbiology for Cleaning Workers Simplified*, ManageMen, 2005 (www.managemen.com).
3. D. Weltin (quoting K. Law CBSE, Georgia area sales manager for Spartanburg, S.C.-based Diversco Integrated Services), "Color-Coding Brooms, Brushes and Mops." CleanLink, Contracting Profits, Operationslog: Hand Tools, September 2007. Available at: https://www.cleanlink.com/cp/article.aspx?id=7480.
4. B. Mollenkamp (quoting N. Fleri, chief of tenant services for World Bank, Washington, D.C.), "Checklist for Policing Pathogens." CleanLink, Houskeeping Solutions, Public Health, Health: Cross-Contamination Common Sense, June 2005. Available at: https://www.cleanlink.com/hs/article.aspx?id=2985.

Chapter 3. I. Storing Disinfectants

Introduction

Disinfectants are usually stored with other cleaning products. This scenario can pose serious safety risks because some disinfectants have ingredients that are very reactive with other chemicals. Products such as bleach can form a toxic gas when mixed with ammonia.

This problem is prevalent in almost all schools, even in those that ban products brought from home. A look under the sink in almost any elementary classroom will reveal hazardous cleaning and disinfectant products stored haphazardly, unsecured, and in dangerous combinations. These common scenarios are accidents waiting to happen.

Disinfectants are pesticides and are not appropriate to store in a classroom where there is no proper secured storage equipment and no designated and trained staff to use them. The recommendations in this section are designed to protect the staff and students in the classroom and the custodial and kitchen staff who use these products as part of their work.

Also of concern is the way that products are stored on custodial carts for use throughout the facility. It is essential that custodians handling these products understand which product combinations are compatible for storage on their carts and in their custodial closets to prevent reactions between incompatible products.

Managing Stock

- Use products on a first-in-first-out basis to reduce the chance of material deteriorating in storage.

Container Management (see also *Chapter 3.E. Labeling Secondary Containers*)

- Keep containers closed when not in use.
- Minimize the transfer of disinfectants from container to container.
- Store disinfectants in original containers, called “primary” containers, whenever possible.

Ensure that all “secondary” containers (e.g., spray bottles) are correctly labeled with the contents and percentage concentration information. See *Appendix H: Templates for Labeling Secondary Containers of Disinfectants and Sanitizers* for customizable label templates.

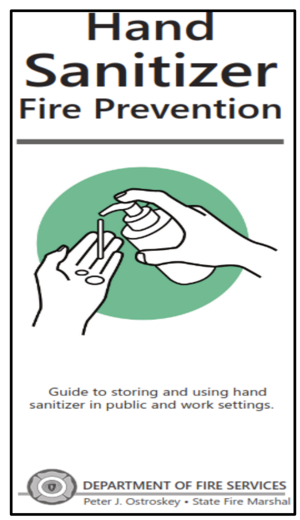
Storage Locations and Conditions

- **Security – Store disinfectants in a secure location out of the reach of students**. Examples are custodial closets and designated product storage areas, *not* classrooms if possible. If disinfectants must be stored in classrooms, follow all directions below and locate in a cabinet that is either secured or out of reach of the students.
- Location – Store disinfectants off the floor and on shelves located below eye level. Some disinfectants are corrosive and can cause severe eye damage and blindness if spilled into the eyes when retrieving off a shelf.
- Environmental Conditions – Store containers in temperature-controlled and well-ventilated storage areas. This can prevent the buildup of chemical vapors.

- Ensuring Product Viability:
  - Some disinfectants (e.g., bleach) lose stability quickly after either being prepared for use or stored for long periods, especially in the presence of heat or light. To maximize product stability, store products in a dark, cool location.
  - Check the expiration date of disinfectants, surface sanitizers and hand sanitizers.
- Preventing Hazardous Reactions Between Products Stored – Store products in compatible hazard categories and maintain a distance between those that are not compatible to prevent a hazardous reaction. Check the disinfectants' SDSs for specific storage compatibility guidelines. In general, hazardous products are separated into the following four hazard categories for storage:
  1. Flammables (e.g., alcohol-based products)
  2. Oxidizers (e.g., bleach, hydrogen peroxide-based products)
  3. Corrosive bases (e.g., QACs)
  4. Corrosive acids (e.g., citric acid– or lactic acid–based disinfectants)

Small chemical-resistant tubs work well if you only have a few items and limited storage space.

- Preventing Fires – Ensure that flammable liquids (e.g., alcohol-based hand sanitizers, disinfectants) are stored properly. Flammable liquids evaporate at room temperature and pose a respiratory exposure and a fire risk.



  The Massachusetts Fire Code 527 CMR 1.00 governs the storage of flammable liquids based on the types and amounts. The addition of large quantities of hand sanitizer during the pandemic may require a permit or a license from your local fire department. The State Fire Marshal provides a bulletin on requirements for hand sanitizer at the following link: https://www.mass.gov/doc/hand-sanitizer-fire-prevention/download. This bulletin provides guidance on location of dispensers and permit requirements.

  Examples of regulatory requirements:
  - Some flammable liquids require storage in a flammables cabinet when they exceed a certain quantity.
  - Flammable liquids and oxidizers (e.g., bleach) are required to be stored in separately because of effect that oxidizers can have when they come in contact with a

combustible or flammable substance. The reaction will depend on the concentration and stability of the oxidizer. In case of a fire, oxidizers can:[k]

- speed up the development of a fire and make it more intense,
- cause substances that do not normally burn readily in air to burn rapidly, and
- cause combustible materials to burn spontaneously without the presence of obvious ignition sources such as a spark or flame.

Spill Control and Inspection

- Prepare for an incident by stocking spill clean-up supplies, including absorbents, tools, personal protective equipment, etc.
- Clean up spills immediately. See the product SDS from the product distributor/manufacturer and the product label for spill-response guidelines.
- Use drip pans under spouts to catch and contain drips.
- Check containers regularly for leaks, breaks, rust, or other corrosion. If a leak or break occurs, transfer the product to another properly labeled compatible container.

Storage - Product Compatibility

- Store disinfectant and cleaning products by hazard categories to prevent hazardous reactions. Common disinfectant ingredients are sorted into these hazard categories:

<u>Acids</u> – lactic acid, citric acid, hydrogen peroxide, Peroxyacetic Acid, some alcohol based products

<u>Bases</u> – quaternary compounds, some alcohol based products are slightly above corrosive

<u>Flammables</u> – alcohol (quantities may require a flammables cabinet)

<u>Oxidizers</u> – bleach, hydrogen peroxide, hypochlorous acid

- Store disinfectants in compatible containers, on compatible shelving, and with compatible products as specified on the product's SDS and label. These precautions are particularly important for storing bleach and quaternary compounds because they can corrode metal containers and shelving, causing the shelving to collapse.

[k] Canadian Center for Occupational Health and Safety, https://www.ccohs.ca/oshanswers/chemicals/oxidizing/oxiziding_hazards.html#:~:text=Oxidizing%20materials%20can%3A,without%20the%20presence%20of%20obvious.

Chapter 3.J. Disposing of Disinfectant and Biological Waste

Introduction

This section addresses the following types of waste:

1. Biological waste (a biohazard) that is produced from cleaning up an incident
2. Used disinfectant solution
3. Chemical waste (a chemical hazard) that results from disposal of a disinfectant product concentrate or diluted solution

This section does not address waste generated from management of COVID-19. PPE, tissues, etc. are not regulated under regulatory definitions of biological or hazardous waste. It is still important to manage this type of waste carefully.

It is important to understand and follow the disposal instructions on the disinfectant's label. Because disinfectants are designed to kill microbes, the disposal of undiluted disinfectants may adversely affect a wastewater treatment plant (WWTP) or septic system that relies on biological digestion of waste by beneficial microbes. These beneficial microbes may be killed by the disinfectants. The handling and disposal of some biohazardous waste is regulated and must be managed by the guidelines referred to in *Appendix A.4. Regulatory Categories and Definitions of Waste*.

The chemical residue left in a container may also pose a hazard, and the label may provide requirements for "triple rinse" before disposal. Also, concentrated disinfectants are a regulated hazardous waste and must be managed by the guidelines referred to in *Appendix A.4. Regulatory Categories and Definitions of Waste*.

Disposal of Solid Waste

The following items can be disposed of in the trash. A safe practice is to double-bag these wastes and dispose of them immediately in the Dumpster.

- Small bandages such as Band-Aids™ are generally NOT considered biohazardous because they do not release blood.
- Sanitary napkins are generally NOT considered biohazardous because they do not release blood.
- Diapers are NOT considered hazardous waste unless there is visible blood.
- Other body fluids without visible blood are NOT considered hazardous waste.

Disposal of Biohazardous Waste

- *Blood spill waste*

  Free flowing blood must be placed in a red biohazard bag with the biohazard symbol.

  - Designate an area for biohazardous storage and pickup.
  - The transport of infectious waste is regulated by local Boards of Health, the Massachusetts Department of Telecommunications and Energy or state agencies, and by the U.S. Department of Transportation, and must be done by a licensed agency.

If the blood is not free flowing, it can be disposed of as solid waste.

- A safe practice is to double-bag it and dispose of it immediately in the Dumpster.

- *Sharps and sharps disposal containers*
  - Store sharps with points down in a rigid, puncture-proof sharps container.
  - Bring the sharps container to the spill site to prevent having to carry contaminated sharps through the building.
  - Dispose of the sharps container when three-fourths full.
  - Check with the local Health Department, Solid Waste District or Department of Public Works (DPW) for disposal requirements and options.

Disposal of Hazardous Waste

Concentrated disinfectant that has expired or is designated for disposal may be considered hazardous waste. The local WWTP, DPW, the Massachusetts Department of Environmental Protection (MassDEP), or other appropriate agencies can provide instructions for safe and legal disposal. Concentrates poured down the drain may kill populations of microbes in septic tanks and in WWTPs that are designed to use the microbes to break down waste, thus interfering with these biological processes. MassDEP requires hazardous waste to be disposed of as follows:

- Hazardous waste must be stored separately from hazardous products, in a secured labeled area, and in compatible categories. A fact sheet, "Summary of Very Small Quantity Generator (VSQG) Requirements," on the requirements for storing hazardous waste, is available at https://www.mass.gov/doc/summary-of-very-small-quantity-generator-vsqg-requirements/download
- A container of a hazardous product is considered empty if it has an inch or less of product in it and can be disposed of as trash. Although a legal option is to close the lid, double-bag the container, and dispose of it immediately in the Dumpster, a best practice would be to bring the product that remains in the container to a municipal hazardous waste collection site for safe disposal. One exception is if the product is designated as *acutely hazardous waste* (extremely toxic or reactive and with a Hazard Code H) which must always be disposed of as hazardous waste.

Sources

1. Massachusetts Department of Public Health, *105 CMR 480.000 Minimum requirements for the Management of Medical or Biological Waste.* Available at: http://mhoa.com/wp-content/uploads/2019/05/MHOA-Medical-Biologic-Waste-April-2019.pdf.
2. Massachusetts Department of Environmental Protection, *310 CMR 19.000 Solid Waste Management.* Available at: https://www.mass.gov/regulations/310-CMR-19000-solid-waste-facility-regulations.
3. Massachusetts Department of Environmental Protection, *310 CMR 30.000: Hazardous Waste.* Available at: https://www.mass.gov/files/documents/2019/12/17/jud-lib-310cmr30.pdf.
4. U.S. Department of Labor, Occupational Safety and Health Administration, Occupational Safety and Health Standards, Toxic and Hazardous Substances, *1910.1030: Bloodborne Pathogens.* Available at: https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1030

Chapter 3.K. Taking Precautions: Using Personal Protective Equipment

Introduction

Disinfectants are antimicrobial pesticides, and exposure to them can and should be prevented. Consider using less-toxic products and processes that have fewer requirements for personal protective equipment (PPE) and other safety measures.

The OSHA Hazard Communication Standard requires employers to provide training to their employees on the use of required PPE. These PPE requirements are listed on the product label and on the product's SDS. If the SDS provides only general information on the type of PPE required (e.g., protective glove), contact the manufacturer listed on the SDS to request more specific information as to exactly what type of glove materials or respirator cartridge is required.

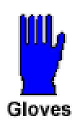
In some circumstances, one type of PPE can protect you from more than one hazard. One example is using PPE to protect hands from biological hazards when cleaning up waste from an incident involving blood, vomit, or feces. In addition to the barrier protection that gloves provide for the biological hazard, an important consideration is to also protect hands from the chemicals used to disinfect the surface after the spill is removed. Thus, nitrile chemical-resistant gloves can be used for both purposes. Ready-made spill kits for blood clean-up may need to be supplemented if they include only barrier gloves and not chemical-resistant gloves for using the disinfectant.

Why Wear PPE?

Cleaning, sanitizing, and disinfecting products can pose several health and safety hazards. Some examples:

- Some disinfectants have an extremely high pH and are corrosive to skin, eyes, and mucous membranes, and can cause skin burns, permanent eye damage and blindness. They can also cause occupational asthma and trigger asthma reactions.
- Disinfectants can be absorbed through the skin into the bloodstream, where they travel throughout the body and into target organs where they can cause health impacts.

What types of PPE are available to protect employees when using cleaning, sanitizing, and disinfecting products?

Type	Specifications	Comments
	The type of mask needed is determined by the chemical being used. Dust, particulate, and surgical masks do not prevent a product's chemical vapors from penetrating the mask. Chemical vapors require a mask material or cartridge designed to prevent penetration of vapors.	The mask should fit well, without any leaks. Use of a respirator requires a "fit test" to ensure that it fits correctly. It also requires the School District to have a respirator program, a medical exam for each employee who wears a respirator, etc. A template for a respirator program to help you develop this program is available on the Department of Labor Standards website: https://www.mass.gov/doc/respiratory-program
	Goggles are tight-fitting eye protection that completely covers the eyes, eye sockets, and the facial area immediately surrounding the eyes. They provide protection from impact, dust, and splashes. There are two types: 1. Chemical splash goggles 2. Safety glasses for dust and particulates	Some goggles will fit over corrective lenses. Some goggles are designed to be used as both chemical splash goggles and safety impact resistant glasses.
	Criteria to select chemical-resistant gloves: 1. Type of chemicals being handled 2. Nature of contact (total immersion, splash, etc.) 3. Duration of contact 4. Area requiring protection (hand only, forearm, arm) 5. Size and comfort	Gloves have a "break-through" time, at which point they are no longer protective. Disposable gloves are thinner than reusable gloves, and it must be determined whether they can withstand immersion in a chemical for any length of time. Do not reuse disposable gloves.

Type	Specifications	Comments
 Boots	Chemically resistant depending on the type of chemical being used. Slip resistant. Cut resistant.	Some chemicals can penetrate certain footwear materials. Also, some safety footwear is designed to protect from more than one hazard. An example is a safety shoe that is worn in food service where it must be: • slip resistant because of wet and greasy floors, • cut proof because of knifes used in food prep, and • chemical resistant due to the dispensing of corrosive sanitizers.
 Protective Apron	Chemically resistant depending on the type of chemical being used.	There are some materials that are resistant to a number of chemicals. Work with a vendor to select a material that protects against the maximum possible number of chemical hazards that you work with.

What activities require use of PPE?

Conduct a PPE Assessment and consult the product's SDS to determine requirements. As an example of a PPE Assessment, the following PPE Assessment template is modified and shortened from a two-page template from the Massachusetts Department of Labor Standards (DLS) to only include PPE required for cleaning and other custodial maintenance products in schools. Several types of PPE assessment templates, including the one for schools, are available at https://www.mass.gov/service-details/safety-programs-for-the-public-sector. Schools can modify the template on the DLS website for use in other school departments.

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PERSONAL PROTECTIVE EQUIPMENT

The following equipment is required in this department: SCHOOL CUSTODIAN

This hazard assessment was conducted by: ____________________ Date: ____________________

Task	Safety glasses 	Goggles 	Gloves 	Disposable N95 Masks 	Ear plugs 	Closed-toe shoes 	Slip-resistant Overboots 	Fall protection 
Cleaning floors, Cleaning bathrooms, Cleaning classrooms			✓			✓		
Cleaning science labs, custodian does not handle open containers of science chemicals			✓			✓		
Cleaning blood spills, vomit, feces, or urine			✓ Disposable	as needed for odor		✓		
Mix cleaning products in janitor closet			✓			✓		
Floor machine			✓ as needed			✓		
Bring trash to dumpster			✓ as needed			✓		
Floor stripping with a product that has a corrosive pH			✓ Nitrile or neoprene			✓		
Floor treatment with a product that is neutral pH			✓			✓		
Pickup syringes left in fields, playgrounds, etc.			✓ Puncture resistant			✓		

When should PPE be worn?

If an employee could…	then…
have contact with infectious materials and hazardous chemicals	Chemical-resistant gloves are required (nitrile can be used for most products if it is not submerged into a chemical concentrate for a prolonged period)
be splashed in the face	a mask and/or face shield is required
be splashed on the body	a chemical resistant apron is required
step in it and track it around	foot protection is required

What type of training on PPE should the school provide to employees?

Employers are required to train each employee who must use PPE on the following:

- When PPE is necessary
- What kind of PPE is necessary
- How to properly put on, adjust, wear, and take off PPE
- Limitations of PPE
- Proper care, maintenance, useful life, and disposal of PPE

How should employees maintain PPE?

- Check the equipment for damage before and after use.
- Clean reusable PPE after every use in accordance with manufacturer's instructions.
- Use disposable PPE only once. Throw it away when compromised and after use.
- Store PPE in a clean place. Respirator cartridges must be stored in a sealed bag to prevent them from absorbing contaminants while in storage.
- Avoid contaminating the skin when taking off PPE.
- Try not to contaminate items and surfaces with contaminated PPE.
- Inform a supervisor of the need to repair or replace PPE.

What information would be helpful to provide in an at-a-glance format to employees?

Due to the complexity of reviewing, interpreting, and remembering important guidance on an SDS, it can be helpful to lift out the key information from the SDS and label to complete and post or provide the following chart to employees. This chart can used as a training exercise in a Hazard Communication training and can also help with comparing the health and safety hazards of products. It is not a replacement for providing or having employees review the SDSs.

Headings include product name, product type, pH of concentrated product (as the concentrate may require PPE that the diluted solution may not), pH of the diluted product (if applicable), health, flammability, and reactivity from the HMIS and NFPA rating systems (which may not always be available on the SDS), PPE required and storage requirements.

Product Name	Product Type	pH Concentrated Product	pH Diluted Product	NFPA and HMIS			Eyewear Splash Goggles	Gloves	Apron	Storage Groupings and Shelf Material*
				Health	Flammability	Reactivity				

The example below is an excerpt from a completed chart from a food service department that had to coordinate storage of their antimicrobials with their other cleaning products.

Cleaning and Sanitizing Products - Storage and Use Safety Chart for School Nutrition Department											
Note: Please review the SDS for each product prior to using these chemicals. This chart only provides some of the SDS information to guide the use of PPE.											
Product Name	Product Type	pH Concentrated Product	pH Diluted Product	NFPA and HMIS			Eyewear Splash Goggles	Gloves	Apron	Storage Groupings and Shelf Material*
				Health	Flammability	Reactivity				
MP-32	Multi-Purpose Cleaner	4.5 to 5.1	6.5 to 7.5	No information	0	Although there is no reactivity rating, this product contains a reactive	goggles	nitrile	chemically resistant	Must store separately by itself on non-wood shelf. Can use a plastic tub or tray underneath if needed.
Ready to Use Sanitizer	Sanitizer	7 – comes in a ready to use form		1	0	0	goggles	nitrile		Is a corrosive and should store in plastic, not metal
Steramine	Food Contact Sanitizer	7 to 9	7 although it has a neutral Ph, it's corrosive	1 - dilution 2 – concentrate				nitrile for handling tablets	chemically resistant	Can store on a plastic, painted wood or painted metal surface
*Note about shelf material – you can place products on a plastic tray or in a tub if you have incompatible shelving material or if you are not sure.										

Sources

1. Executive Office of Labor and Workforce Development, Division of Occupational Safety, "Right To Know Law." Available at: https://www.mass.gov/files/documents/2016/08/uf/ma-rtk-employer-manual.pdf.

   (Authors' note: The law has changed for the public sector compliance requirements with the Massachusetts Right to Know law. The public sector must now follow OSHA's Hazard Communication Standard instead of the Right to Know Law. On March 9, 2018, Governor Baker signed a bill that amends M.G.L. chapter 149 §6 ½. The law was updated to clarify employee safety requirements in public sector workplaces and is enforced by the Department of Labor Standards (DLS). Another change since the initial publication of this handbook is the Division of Occupational Safety is now named the Massachusetts Department of Labor Standards.)

2. Executive Office of Public Safety and Security, Public Safety Agencies, Massachusetts Department of Fire Services, Office of the State Fire Marshal, *527 CMR 10.00 and 527 CMR 14.00: Board of Fire Prevention Regulations.* Available at: https://www.mass.gov/files/documents/2017/10/11/527cmr1.pdf.

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Chapter 3.L. Preparing to Respond to a Chemical Exposure

Introduction

Some antimicrobial products require the provision of an emergency eyewash facility to provide a fifteen-minute flush.

A school's protocol should address the location, selection, installation, maintenance and testing of emergency eyewash and shower equipment. To minimize the number of emergency eyewash stations required:

- Use products that do not require their use, such as water-based (nonflammable) and neutral pH (noncorrosive) products.
- Implement engineering controls to reduce the potential for exposure; for example, the use of closed or automatic chemical-dispensing systems, splash guards, or long-handled spraying and cleaning tools.
- Centralize facilities for storing and dispensing concentrated flammable and corrosive products.

If an eyewash station is not available in the area where the concentrated disinfectant is dispensed, a diluted, a ready-to-use disinfectant product may be a better choice (if it does not require the use of an eyewash or PPE).

Plumbed Emergency Wash Stations: Eyewash and Emergency Deluge Shower

- *Regulatory citations*
  - For corrosives: OSHA Emergency Eyewash and Showers 29 CFR Part 1910.151(c)
  - For corrosives and flammables: 527 CMR 1.00: Massachusetts Comprehensive Fire Safety Code
- *General requirements for emergency wash stations*

  This equipment should be installed and operational prior to staff and student use, handling, and storage of hazardous materials.[1]

  All eyewashes and showers should meet American National Standards Institute (ANSI) standard Z358.1-2014. Guardian Equipment, a company that makes eyewash stations, has created a very comprehensive compliance checklist to help meet the ANSI/ISEA standard Z358.1-2014. It is available free online at https://www.gesafety.com/downloads/ANSIGuide.pdf.

  The following items are just some of the key requirements:

  - Location – The station should be located within approximately fifty feet or a ten-second walk of the hazard and be easily accessible.[1]
  - Water temperature – should be kept between 70°F and 90°F.[1] Please note that the ANSI standard range is between 60°F and 100°F.
  - Signage – should be posted that indicates the location of each type of equipment, "Emergency Shower" and/or "Emergency Eyewash." Each sign should be at least 70

square inches and printed in contrasting colors such as red and white or green and white.[1] It must be kept unobstructed to ensure that it is always visible.

- Alarm – When possible, the emergency wash system should trigger an alarm when activated to alert other people that there is an emergency.
- Hands-Free – The system should have a mechanism that enables it to stay on, allowing the hands to be free for cleaning off chemicals.
- Testing – Staff should activate equipment weekly to help prevent any buildup of rust and/or scale.

- *Deluge shower additional requirements*
  - Water flow should be 30 gallons per minute.[1]
  - Equipment should be always available, with the pull chain easily accessible.
- *Eyewash station additional requirements*
  - The station should treat both eyes at the same time.
  - Must provide a continuous flow of 0.4 gallons per minute for 15 minutes.[1]
  - There are three types:
    1. Plumbed (best option): there are standalone units that are typically installed as part of the room construction or when a space is renovated or converted. There are also attachments available for converting existing faucets to an eyewash. They allow for continued use of the faucet until the eyewash is needed. They are a very affordable alternative. Evaluate these attachments to be sure they are ANSI rated.
    2. Gravity-fed (portable): no plumbed unit with a 15-minute flush. May require solution to be changed due to the potential for the water to become contaminated. Some unit provide a preservative to be used with water to create a solution. Some units are sealed and have a longer shelf life. All solutions must be monitored for the expiration date.
    3. Handheld (portable): no plumbed unit with a 3-minute flush. This option is not a substitute for the required 15-minute flush. They can be used to minimize damage before accessing a plumbed eyewash station. In addition, the water in portable eyewashes can become contaminated and must be replaced.[2]

References

1. Executive Office of Public Safety and Security, Public Safety Agencies, Massachusetts Department of Fire Services, Office of the State Fire Marshal, *527 CMR 10.02: Board of Fire Prevention Regulations*. Available at: https://www.mass.gov/files/documents/2018/01/29/527cmr1.pdf.
2. OSHA Laboratory Safety Guidance. https://www.osha.gov/Publications/laboratory/OSHA3404laboratory-safety-guidance.pdf.

Chapter 3.M. Assigning Roles and Responsibilities and Educating School Staff

Introduction

After the school district has developed protocols, it needs to select the person(s) responsible for each aspect of the infection-control program. Staff members should receive training for their own responsibilities as well as know what the other staff members' designated responsibilities are. This practice will enable them to contact a trained staff person with the proper supplies and knowledge to do the assigned task. In addition to training, it is helpful for staff members to have written materials and reminders such as guidance documents, posters, and memos to reinforce policies and procedures.

The following section provides some suggested roles and responsibilities that can be assigned to school personnel so that they may participate appropriately in the infection-control program. These roles and responsibilities may be customized for each school or district.

Post written procedures for disinfectant use

- Identify locations for posting the procedures.
- Post guidelines and posters.
- Develop a system to revise the procedures and update staff when conditions, equipment, and products change, and when there is a new infectious disease.

Determine roles and responsibilities of staff and custodians

Every school district will have its own systems. In general, the Workgroup has observed the following designations of responsibilities within the school system:

Department/ Staff	Policy	Training	Purchasing*	Use	Incident Response
Administration	Assign roles and responsibilities	Ensure that a training program is in place	Approve purchasing policy and criteria		Review reports
Facility Manager	Assign custodial roles and responsibilities	Organize training for custodians and possibly coordinate training with other departments	Participate in developing purchasing criteria, vendor selection, product ordering and distribution of PPE, cleaning, and disinfecting products, BBP spill kits and equipment for syringe pickup	Oversee custodial adherence to protocols	Disposal of spill waste Follow-up to exposures to chemicals and BBPs

Department/ Staff	Policy	Training	Purchasing*	Use	Incident Response
Custodian	Implement policy	Attend training	Inventory supplies (PPE, cleaning supplies, spill kits, etc.)	Use products routinely and for incidents	Secure site, clean up, and complete report
Athletics Director	Assign and oversee staff roles and responsibilities	Organize training	Order disinfectant	Oversee staff use	Secure site, clean up or call custodian to clean up, and submit report
Nursing Department Director	Oversee nurse roles and responsibilities, and coordinate policy with an Exposure Control Plan	Organize nurse training as part of BBP, infection control, or orientation training	Participate in developing purchasing criteria, product selection and ordering	Oversee nurse use and information dissemination to school staff	Oversee nurse response
Nurses	Implement policy	Attend training Train classroom and office staff	Inventory supplies (PPE, disinfectants, spill kits)	Use products routinely and for incidents	Provide medical assistance and follow up BBP exposure
Food Service Staff	Assign and oversee staff roles and responsibilities	Organize training — independently or as part of other food-service training	Participate in developing purchasing criteria, vendor selection, and product ordering and distribution	Director: oversee staff use Staff: use products routinely and for incidents	Secure site, clean up or call custodian to clean up, and submit report
Transportation Staff	Assign and oversee staff roles and responsibilities	Organize training, either independently or as part of other transportation training	Order and distribute BBP spill kits	Use disinfectant for incidents, and routine cleaning and disinfection of the buses	Director: follow up BBP exposure Driver: secure site, clean up, and submit report Other personnel: clean and disinfect buses
Human Resources	Follow workers compensation requirements and any union contract language	May review training required or provided as part of a claim			May require claim paperwork to be completed

* Determine whether all disinfectants will be ordered through one department or whether each department will order its own disinfectant. If the Facilities Department has a dispensing station, consider using it to provide products for all departments who can use the same formulation.

Determine who is responsible for daily and special-incident disinfection and sanitization tasks

The list below provides a brief sampling:

Frequency	**Staff Examples**
Throughout the day	Typically, staff members perform sanitization/disinfection tasks that are required throughout the day. • Nurses – disinfect after use of equipment and in between patient visits • Food service – sanitize as part of the food preparation and clean-up routine • Preschool teachers – use antimicrobials after diapering, for mouthed toys, etc. • Special education department – use antimicrobials after diapering, for mouthed toys and equipment, floor mats and therapeutics • Athletics department – use antimicrobials on wrestling mats to prevent transmission of MRSA • Custodians – use antimicrobials in showers to prevent fungal and bacterial infections
Once a day	• Custodians – disinfect toilet seats and handles, handles on doors and product dispensers, shower floors and handles, etc.
Special circumstances	Disinfectants are generally used for special circumstances. • Nurses – blood spill, vomit • Food service – blood spill • Preschool/classroom teachers – toileting accident, blood spill, vomit • Custodians – blood spill, toileting accidents, vomit • Bus driver – blood spill, toileting accidents, vomit • Athletics – blood spill, toileting accidents, vomit

Work with departments to determine what each department's needs are and help problem solve the challenges they face when implementing protocols

Due to the expansion of infection control activities throughout all school departments during the pandemic, the following documents were designed to provide department specific guidance for departments to customize:

Appendix D: Cleaning and Disinfecting by School Department Staff

Appendix E: Common High-Touch Points by Location

Sources

1. EPA Greening Your Purchase of Cleaning Products: A Guide For Federal Purchasers. Available at: https://www.epa.gov/greenerproducts/greening-your-purchase-cleaning-products-guide-federal-purchasers.
2. Environmentally Preferable Janitorial Cleaning Products For Commercial Applications. Available at: https://www.bomaoeb.org/files/appendix-environmentally-preferable-janitorial-cleaning-products.pdf
3. McDonnell, G., Russell, A.D. "Antiseptics and Disinfectants: Activity, Action, and Resistance." *Clinical Microbiology Reviews* 12, no. 1 (1999):147–79.
4. Responsible Purchasing Network. Cleaners/Disinfectants. Available at: http://www.responsiblepurchasing.org/purchasing_guides/cleaners/index.php

Chapter 4.A. Introduction

One of the key strategies in reducing the use of toxic products is to prevent their purchase. Purchasing the safest products as part of an infection control program will help prevent exposures to both pathogens and hazardous products.

The documents in this chapter can be used to identify hazardous ingredients in products; to compare cleaning and disinfecting equipment, supplies, and less-toxic products; and to select the best methods for applying the products.

How to Begin

Work with facility managers, custodial supervisors, and custodial staff to identify current products that concern them due to performance, air quality, toxicity, hazards, storage requirements, etc. Also, involve them in choosing and trying out the new, safer products. It may be difficult for staff to buy in to new products or a new program if they do not understand why they must give up any products that have previously worked well for them.

Check in with the Human Resources Department to determine if staff have reported any concerns or had incidents with existing products.

Consider one or more of the following processes to identify ad switch to less hazardous alternative products and equipment:

1. A phased-in approach: Replace products as they are used up and replace equipment when the old equipment is no longer operable.
2. End-of-year/contract switch: Start working with the school's existing vendor to evaluate the current program and set up a pilot with new items, or start with new products from a new vendor, when old contracts expire and new contracts begin.
3. Begin with a new system: Initiate the purchase of preferred equipment, supplies, and products as part of a larger purchasing process for a new area or building. Many schools are using this approach when seeking Leadership in Energy and Environmental Design (LEED, a green-building certification system) or the Collaborative for High Performance Schools (CHPS) credits for a Green Housekeeping Plan.

There is no correct way to begin; each situation is unique. It may take time to explore vendors, products and equipment. Some schools start with one or more products; others replace products for a floor or a whole building or a department.

Possible Phases of the Switch

The switch often starts with obtaining one third party-certified concentrate that can be diluted as an all-purpose cleaner for the following tasks:

- restroom cleaning
- carpet spotter/extraction
- glass and window cleaning
- neutral floor cleaning

The next phase of the switch might be to obtain third-party-certified, specialty cleaning products:

- disinfectants and sanitizers
- heavy-duty cleaners
- wax strippers and baseboard strippers
- floor sealers and finishes
- hand soaps
- graffiti removers
- metal and stainless-steel cleaners
- scale removers
- whiteboard cleaners

The Environmental Protection Agency's Design for Environment program is certifying disinfectant products that meet its standards for safer products. See *Chapter 4.B. Comparing Disinfectants: Comparison Chart for Hard-Surface Disinfectants Registered by the Environmental Protection Agency* and *Appendix B.5. Selecting Disinfectants for Hard Surfaces: Checklist* for more information on selecting disinfectants.

Using Microfiber

The most effect system for implementing a microfiber program is to establish a long-term, sustainable laundering system. There are in-house and outsourced options to explore:

- In house – there are several options:
  - Washing by hand and hanging to dry.
  - Using an existing on-site washing machine in one of the other school departments, typically food service. Items can be hung to dry or machine dried on a low setting.
  - Installing a washing machine. There are two options, one stationary and one portable:
    - Small residential washing machines – this would require identifying a suitable location with electricity and a water source and drain.
    - A small portable, affordable unit designed just for microfiber that fits into custodial closets – these are filled and drained manually or automatically. They can be located to discharge the wash water into a sink or drain.
- Laundering service – typically has 2 options:
  - District purchases the items and the service launders them.
  - The service owns the items and launders them.

Microfiber needs laundering after each use. It must be washed separately from other laundry as it picks up fibers from other materials, clogging the pores.

- Use only mild detergent.
- Do NOT use bleach, dryer sheets, or fabric softener.

Resources

Consider using the Massachusetts Operational Services Division (OSD) Environmentally Preferable Products (EPP) program and contracts when exploring options for purchasing products, supplies, equipment, and cleaning and disinfecting services, including microfiber laundering. Five other states, including New Hampshire, Rhode Island, Vermont, New York, and Connecticut, have joined Massachusetts in adopting these contracts.

The OSD has contracted with vendors for many EPPs related to cleaning and disinfecting work. The OSD screens products, supplies, equipment and services for cost, performance, and environmental health and safety criteria, and requires that vendors provide training and technical assistance on the use of the products.

The Director of the EPP Program is an excellent resource regarding these contracts. Contract managers for each specific contract can provide information on how to use them and can help problem solve if there are issues with the vendor's services or products. The link https://www.mass.gov/environmentally-preferable-products-epp-procurement-programs goes to the main page of the EPP program, where there are links to all of the EPP initiatives and contracts.

Other states may have their own environmentally preferable purchasing contracts. For resources on products and equipment that have been certified by third-party organizations to be environmentally preferable, see *Appendix B.1. Green Product Certification and Labeling: Quick Reference.*

Think Long-Term

Although some of the new supplies and technologies may cost more at the beginning, the hidden or long-term savings should be considered. These savings include life-cycle costs, improved performance, and the savings from reduced injuries, time, and labor. *Chapter 6.C. Using Microfiber Cloths and Mops for Infection Control* provides information on the amount of savings available over time by using microfiber supplies.

Chapter 4.B. Comparing Disinfectants: Comparison Chart for Hard-Surface Disinfectants Registered by the Environmental Protection Agency

This chart was designed to provide "at-a-glance" information comparing the most common types of disinfectants used in school settings and the most current, less-hazardous alternative products on the market today. Because the market rapidly changes, with new products constantly emerging, a blank chart at the end of this section is provided for use in comparing products not listed here.

One important tool that will help in the selection of the least-toxic disinfectant is the Environmental Protection Agency's (EPA) Design for the Environment (DfE) logo for Antimicrobial Pesticide Products. Products must be registered with EPA's Office of Pesticides Program and meet the DfE Standard in order to qualify for the DfE logo. See notes below. Approved products and active ingredients are posted at the EPA web site: https://www.epa.gov/pesticide-labels/design-environment-logo-antimicrobial-pesticide-products.

Another certifying agency is Green Seal, an independent third-party certifier of cleaning and other products; see https://greenseal.org/certified-products-services.

There is a *Notes* section at the end of the chart that provides additional information on the criteria used to compare the disinfectants.

TIP FOR USING ALL DISINFECTANTS

Best practices advise pre-cleaning all surfaces before disinfecting.

New information on SARS-CoV-2, the virus that causes COVID-19, is being released daily. Check the Toxics Use Reduction Institute's website (www.TURI.org) for updates on COVID-19 related information.

Disinfectants Comparison Chart									
	AVOID		**USE WITH CAUTION**				**PREFERRED**		
Disinfectant Characteristics	**Bleach - sodium hypochlorite**	**Quaternary Ammonium Compounds – QACs or Quats**	**Thymol****	**Hydrogen Peroxide (H_2O_2) and Peroxyacetic Acid (PAA)**	**Hypochlorous Acid in Tablet Form*****	**Hypochlorous Acid Generated on Site*****	**Hydrogen Peroxide**	**Ethanol**	**Citric Acid**
Status of DfE review* (see below)	Will not pass DfE screen	Will not pass DfE screen	Will not pass DfE screen	H_2O_2 and PAA have passed the DfE screen individually, but not together	Has not been evaluated using the DfE screen	Has not been evaluated using the DfE screen	Active ingredient has passed DfE screen	This product has passed DfE screen	CleanCide has passed DfE screen
Product description	EPA-registered chlorine bleach (use only EPA-registered products for disinfecting)	Names of individual QACs include - Benzalkonium chloride, Alkyl dimethyl benzyl ammonium chlorides, Benzyl-C12-18-alkyldimethyl, chlorides, Didecyl dimethyl benzyl ammonium chlorides	Benefect® is an EPA registered product with natural disinfecting characteristics	Oxycide Daily is an EPA registered disinfectant/sanitizer using a combination of hydrogen peroxide and peroxyacetic acid Some products using this combination of active ingredients use high levels of (15% active) peroxyacetic acid	EPA registered disinfectant and sanitizer, bleach alternative Generated from sodium dichloro-isocyanurate tablets	EPA registered disinfectant, bleach alternative Generated by a combination of salt, acid and water electrolyzed in an application device on site	EPA registered hydrogen peroxide product in synergy with a blend of commonly used detergent ingredients	EPA registered ethanol-based mixture designed to disinfect hard surfaces and sanitize soft surfaces	EPA registered disinfectants formulated for hard, nonporous surfaces
CDC disinfection level*	Intermediate-level disinfectant	Low-level disinfectant	Intermediate-level disinfectant	High-level disinfectant	Low to high-level disinfectant depending on the product	Low-level disinfectant	Product-specific low- or intermediate-level disinfectant	Product-specific low- or intermediate-level disinfectant	Product-specific low- or intermediate-level disinfectant

Disinfectants Comparison Chart									
	AVOID		**USE WITH CAUTION**				**PREFERRED**		
Disinfectant Characteristics	**Bleach - sodium hypochlorite**	**Quaternary Ammonium Compounds – QACs or Quats**	**Thymol****	**Hydrogen Peroxide (H_2O_2) and Peroxyacetic Acid (PAA)**	**Hypochlorous Acid in Tablet Form*****	**Hypochlorous Acid Generated on Site*****	**Hydrogen Peroxide**	**Ethanol**	**Citric Acid**
EPA Acute toxicity category*	Category I	Category III	Category IV	Category III or IV, product specific	Category III	Category III	Category III or IV, product specific	Category IV	Category IV
Storage	If used for disinfecting purposes, bleach in concentrate form should not be stored longer than 3 months	Stable in storage	Stable in storage 2-year shelf life	Store concentrate in a well-ventilated place Keep container tightly closed Store away from other materials	Stable in storage Shelf life up to 5 years for the product in tab form, 3 to 7 days in solution	Stable in storage Tablets/capsules for some products have a 3-year shelf life Read product label	Stable in storage 2-year shelf life	Stable in storage 3-year shelf life	Stable in storage
Effectiveness	Effective against most bacteria and some viruses Some products are registered as effective against the virus causing COVID-19, HIV, HBV, H1N1, MRSA, and TB Read product label for specific claims	Generally effective against a broad spectrum of microbes, including MRSA and H1N1, but typically not proven effective against spores Read product label for effectiveness against TB and the virus causing COVID-19 or check the EPA's List N	Effective against a broad spectrum of microbes including H1N1, TB, and MRSA Read product label for specific claims against the virus causing COVID–19 or check the EPA's List N	Effective against a broad spectrum of microbes including C.Diff, norovirus, and the virus causing COVID–19 Read product label for specific claims	Generally effective against a broad spectrum of microbes including H1N1, MRSA, HCV and HBV, and HIV Effective against the virus causing COVID-19	Generally effective against a broad spectrum of microbes including H1N1, MRSA, and HIV Read product label for specific claims against the virus causing COVID–19 or check the EPA's List N	Effective against a broad spectrum of microbes, including H1N1, norovirus, MRSA, and the virus causing COVID-19 Read product label for specific claims, including effectiveness against TB	Effective on hard and some soft surfaces against a broad spectrum of microbes including HCV and HBV, HIV, H1N1, MRSA, and the virus causing COVID-19 Read product label for specific claim	Effective against a broad spectrum of microbes including H1N1, MRSA, HIV, HBV, HIV, and the virus causing COVID–19 Read product label for specific claims

Disinfectants Comparison Chart									
	AVOID		USE WITH CAUTION				PREFERRED		
Disinfectant Characteristics	**Bleach - sodium hypochlorite**	**Quaternary Ammonium Compounds – QACs or Quats**	**Thymol****	**Hydrogen Peroxide (H_2O_2) and Peroxyacetic Acid (PAA)**	**Hypochlorous Acid in Tablet Form*****	**Hypochlorous Acid Generated on Site*****	**Hydrogen Peroxide**	**Ethanol**	**Citric Acid**
Contact time* **For examples** *Read product labels for recommended contact times*	30 second –10 minute contact time for virus causing COVID-19	Generally 10-minute contact time for virus causing COVID-19	10-minute contact time	3 minutes for virus causing COVID–19 5 minutes for other microbes.	1 minute to 10 minutes (depends on concentration and the microbe)	Generally 5-10 minute contact time	30 seconds to 10-minute contact time, 1 minute contact time for virus causing COVID–19	30 second contact time for virus causing COVID–19	5 minute contact time for virus causing COVID–19
Health effects	Mixing with ammonia, QACs, and other acidic products can create poisonous gas[1] Corrosive to eyes and skin[2] Generates chlorine gas when in use, which is a respiratory irritant and an asthmagen	Can cause contact dermatitis and nasal irritation Certain QACs (including benzalkonium chloride, dodecyl-dimethyl-benzyl ammonium chloride, and lauryl dimethyl benzyl ammonium chloride) are respiratory sensitizers and associated with asthma	Skin sensitizer	The combination of hydrogen peroxide and peroxyacetic acid (peracetic acid) has been found to cause the initial onset of asthma in some individuals while triggering asthma symptoms in others. Caution would suggest avoiding products that contain the combination of these ingredients.	Mixing with ammonia, QACs, and other acidic products can create poisonous gas May cause eye, skin and respiratory irritation Generates chlorine gas, which is a respiratory irritant and an asthmagen, when in use	Mixing with ammonia, QACs, and other acidic products can create poisonous gas Force of Nature has been third-party certified by GreenSeal to meet environmental and human health criteria for safer products (See notes)	DfE has approved hydrogen peroxide as an active ingredient meeting the Safer Choice standards (See below)	DfE has certified this and other products using ethanol as the active ingredient as meeting the Safer Choice standards (See below)	DfE has certified this and other products using citric acid as the active ingredient as meeting the Safer Choice standards (See below)

[1] Agency for Toxic Substances & Disease Registry, Managing Hazardous Materials Incidents, "Medical Management Guidelines for Calcium Hypochlorite/Sodium Hypochlorite." Available at: http://medbox.iiab.me/modules/en-cdc/www.atsdr.cdc.gov/substances/toxsubstance.asp_toxid=192.

[2] The Clorox Company, Safety Data Sheet, "Clorox Regular-Bleach." Available at: https://www.thecloroxcompany.com/wp-content/uploads/cloroxregular-bleach12015-06-12.pdf

Disinfectants Comparison Chart									
	AVOID		USE WITH CAUTION				PREFERRED		
Disinfectant Characteristics	**Bleach - sodium hypochlorite**	**Quaternary Ammonium Compounds – QACs or Quats**	**Thymol****	**Hydrogen Peroxide (H_2O_2) and Peroxyacetic Acid (PAA)**	**Hypochlorous Acid in Tablet Form*****	**Hypochlorous Acid Generated on Site*****	**Hydrogen Peroxide**	**Ethanol**	**Citric Acid**
Environ-mental Effects *Note: all active ingredients are toxic to aquatic life in sufficient quantities and concentrations*	Very toxic to aquatic organisms	Very toxic to aquatic organisms See the product SDS Associated with antimicrobial resistance	Toxic to aquatic organisms	Toxic to aquatic organisms	The product is considered harmful to aquatic organisms	The product is not considered harmful to aquatic organisms or to cause long-term adverse effects in the environment	Some toxicity to aquatic organisms Some products using this technology have been approved by DfE to meet environmental and human health criteria (see below)	This product has been approved by DfE to meet environmental and human health criteria (see below)	Citric acid, in the concentrations found in antimicrobial cleaning products, is not known to have any aquatic toxicity or other environmental risks.
Exposure controls*	PPE and/or increased ventilation should be used	Requires PPE and proper ventilation	No special requirements; regular ventilation is adequate	One product example, Oxycide Daily Disinfectant Cleaner, requires no special protective equipment when diluted following label instructions Concentrate requires eye protection, gloves and a respirator	Requires PPE and increased ventilation	PPE and/or increased ventilation should be used for some products; regular ventilation is adequate for others See SDS for individual products	No special requirements; regular ventilation is adequate	No special requirements	No protective equipment is needed under normal use conditions.

Disinfectants Comparison Chart									
	AVOID		**USE WITH CAUTION**				**PREFERRED**		
Disinfectant Characteristics	**Bleach - sodium hypochlorite**	**Quaternary Ammonium Compounds – QACs or Quats**	**Thymol****	**Hydrogen Peroxide (H_2O_2) and Peroxyacetic Acid (PAA)**	**Hypochlorous Acid in Tablet Form*****	**Hypochlorous Acid Generated on Site*****	**Hydrogen Peroxide**	**Ethanol**	**Citric Acid**
Additional disadvantages	May damage floor finishes, carpets, clothing, and other fibers when used in higher concentrations Has an unpleasant odor Must be stored separately from ammonia and flammable products Rinsing is required in applications where direct skin or oral contact can occur (e.g., children's toys)	Thorough rinsing required See product label for specifics	Not widely available through vendors Strong odor	Concentrate requires special handling and storage	May cause skin irritation in some people Oxidizer	May cause skin irritation in some people Oxidizer	Rinsing is required if direct skin or oral contact can occur (e.g., children's toys)	Flammable	May be mildly irritating to skin and eyes

Disinfectants Comparison Chart									
	AVOID		**USE WITH CAUTION**				**PREFERRED**		
Disinfectant Characteristics	**Bleach - sodium hypochlorite**	**Quaternary Ammonium Compounds – QACs or Quats**	**Thymol****	**Hydrogen Peroxide (H_2O_2) and Peroxyacetic Acid (PAA)**	**Hypochlorous Acid in Tablet Form*****	**Hypochlorous Acid Generated on Site*****	**Hydrogen Peroxide**	**Ethanol**	**Citric Acid**
Additional Advantages	Inexpensive; readily available The same product can be used for routine and special-event tasks, by changing the concentration	Readily available	Noncorrosive No rinsing or wiping required	Readily available Comes as a concentrate No rinsing required	Readily available Reduced exposure to chlorine as compared to bleach Read label for rinsing requirements	Readily available Reduced exposure to chlorine as compared to bleach No rinsing required	Readily available Noncorrosive in diluted form; some products are odorless No rinsing required except if direct skin or oral contact can occur (e.g., children's toys)	Readily available No rinsing required	No rinsing or wiping is required, except on direct food contact surfaces or toys which require a potable water rinse after treatment

Abbreviations: CDC, Centers for Disease Control and Prevention; HBV, hepatitis B virus; H1N1, a subtype of influenza virus A; HIV, human immunodeficiency virus; MRSA, methicillin-resistant *Staphylococcus aureus*; SDS, Safety Data Sheet; PPE, personal protective equipment; QAC, quaternary ammonium compounds; TB, tuberculosis. (Although tuberculosis is not a common microbe found in schools, products that are registered to kill tuberculosis will inactive most microbes.)

Notes:

CDC disinfection level – The CDC defines three levels of disinfection (i.e., 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):

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

Costs – When comparing costs, life-cycle costs must be considered. Although a product may be less expensive to buy, its negative impact on surface materials may require replacing hard surfaces more frequently, may increase worker's compensation claims, and may cause environmental damage.

Design for the Environment is a program of the **EPA's** Office of Pesticide Programs. EPA established the Design for the Environment (DfE) program for pesticide products to help consumers find products that have been reviewed by EPA and found to meet the DfE's Safer Choice standards. DfE allows qualifying antimicrobial products to carry a logo on their labels that indicates the product meets this criteria. DfE qualifying products:

- are in the least-hazardous classes (i.e., III and IV) of EPA's acute toxicity category hierarchy;
- are unlikely to have carcinogenic or endocrine disruptor properties;
- are unlikely to cause developmental, reproductive, mutagenic, or neurotoxicity issues;
- have all ingredients been reviewed, including inert ingredients;
- do not require the use of Agency-mandated personal protective equipment;
- have no unresolved or unreasonable adverse effects reported;
- have no unresolved efficacy failures (associated with the Antimicrobial Testing Program or otherwise);
- have no unresolved compliance or enforcement actions associated with it; and
- have the identical formulation as the one identified in the DfE application approved by EPA.

**Products must be submitted to DfE in order to be reviewed for approval. Some products such as those using Thymol as the active ingredient were not approved because of issues such as genotoxicity, developmental toxicity, and repeated dose toxicity endpoints.

*** Referring to products that have not been reviewed, Safer Choice notes that chemicals associated with health impacts are not allowed in products that would bear the DfE label.

Contact time – Contact time is product- and microbe-specific. All disinfectants are tested and labeled for the specific amount of time they must remain in contact with the surface to kill specific microbes. The times listed in the chart are approximate only.

Green Seal® is a non-profit environmental standard development and certification organization. Its flagship program is the certification of products, services, restaurants, and hotels. Certification is based on Green Seal standards, which contain performance, health, and sustainability criteria.

EPA toxicity categories require the following warnings:

Signal Word	Category	On the Basis of
DANGER, POISON (skull and crossbones)	I Highly toxic	Oral, dermal, or inhalation toxicity
WARNING	II Moderately toxic	Skin or eye irritation or dermal sensitization
CAUTION	III Slightly toxic	The results of all required acute toxicity studies
CAUTION	IV Relatively nontoxic	The results of all required acute toxicity studies

Information – Sources of information include the SDS; The Toxics Use Reduction Institute (TURI) - https://www.turi.org/; Green Seal - https://greenseal.org/certified-products-services?s=+force+of+nature; Design for the Environment - https://www.epa.gov/pesticide-labels/design-environment-logo-antimicrobial-pesticide-products and product information sheets.

pH – pH is a measure of how acidic or basic a product is. Look for products with a neutral pH of 7 or as close to this number as possible.

PPE – PPE may be required for the concentrated form of some products but not for the ready-to-use or pre-diluted form. Check the label and the SDS.

Blank Comparison Chart

Disinfectant Characteristics	Product and Active Ingredient	
Status of active ingredient under DfE review		
Product description		
CDC disinfection level		
EPA toxicity category		
Storage requirements		
Effectiveness		
Contact time		
Health effects		
Exposure controls		
Environmental issues pros and cons		
Additional disadvantages		
Additional advantages		

Resources

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Chapter 4.C. Using the Disinfectant Label Information to Make Informed Decisions

Introduction

Properly interpreting the information on a product label is the *key* to selecting the right products for each purpose and to using it effectively. Because manufacturers design and test their products to be effective under the conditions stated on the label, they cannot stand behind the product if the directions are not followed exactly. In addition, the product's efficacy cannot be assured. For products designed to be used in more than one capacity (e.g., cleaner, sanitizer, and disinfectant), the label lists the specific dilutions and contact times, which may vary for each function.

The ingredients and/or label content for a product may change frequently, so it is important to review the labels of products used on a regular basis. Companies also provide technical sheets that list the full set microbes the product is effective against. Since product labels often do not list them all, schools can consult technical sheets to determine whether existing products may be used for current disease outbreaks.

See List N for products effective against SARS-CoV-2 (https://www.epa.gov/pesticide-registration/list-n-disinfectants-coronavirus-covid-19) and the TURI website for safer products on List N (https://www.turi.org/Our_Work/Cleaning_Laboratory/COVID-19_Safely_Clean_Disinfect/Safer_Disinfecting_Products/List_of_Safer_Disinfecting_Products).

The following information and the more detailed companion document, *Appendix B.2. Interpreting the Disinfectant Label: Explanations and Examples*, provide a comprehensive overview of a label's information to assist in the selection, use, and management of disinfectants.

What is the role of a disinfectant label?

A label for a federally registered antimicrobial product (disinfectants and sanitizers) registered by the Environmental Protection Agency (EPA) (see https://iaspub.epa.gov/apex/pesticides/f?p=PPLS:1) is considered a legal document under the Federal Insecticide Fungicide and Rodenticide Act (FIFRA). The EPA uses the label to summarize scientific information about that formula and how it complies with FIFRA. The scientific information includes toxicology, environmental impacts, its effectiveness against specific microbes, and its chemical makeup.

This information represents the required research and registration procedures that a disinfectant undergoes before reaching the market. The information obtained in this process is referred to as the label or labeling, two similar words but with different meanings.

The *label* is the information printed on or attached to the disinfectant container. It has several interpretations:

- *To the buyer or user*, the label is the main source of information on how to use the product correctly, legally and safely.
- *To the manufacturer*, the label is the product's approval and clearance under FIFRA by EPA to sell the product.
- *To governmental agencies*, including the EPA, the label is a way to control the distribution, storage, sale, use and disposal of the product, and to ensure its proper use.

Labeling refers to all the information that might be received from a company or listed on its sales representatives' websites, and other information accompanying the product or referred to on the label.

When should labels be read?

- *Before purchasing* the disinfectant to ensure that it is the correct one for the intended use, and to understand and compare potential product hazards
- *Before developing protocols* to use the product
- *Before putting on personal protective equipment* to know what precautions to take
- *Before mixing* the disinfectant to ensure the proper disinfectant concentration
- *Before applying* the disinfectant to ensure proper use and contact time
- *Before storing* the chemical
- *Before disposing* of the empty container or product, particularly the concentrate, which is often disposed of as a hazardous waste. Always contact your local waste management authority as Massachusetts hazardous waste disposal laws supersede and are more stringent than the federal RCRA disposal requirements,

Sources

- Environmental Protection Agency, Pesticides: Regulating Pesticides, "Label Review Manual." Available at: https://www.epa.gov/pesticide-registration/label-review-manual.
- Information in this section was also derived and modified from the *PI-34 document*, one of a series of the Pesticide Information Office, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Published March 2005. EDIS Web site: https://edis.ifas.ufl.edu/pi071.

  The original fact sheet was written by Frederick M. Fishel, Associate Professor, Agronomy Department, and Director, Pesticide Information Office, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL.

Chapter 4.D. Interpreting Information from Hazardous Materials Rating Systems for Product Selection

Introduction

There are product hazard rating systems designed by different entities designed to alert people of product hazards "at a glance". The rating systems provided by the National Fire Protection Association (NFPA) system and the Hazardous Materials Information System (HMIS) were developed for different audiences and purposes but are often used interchangeably. The difference between the two systems are illustrated on the next page. For a detailed explanation of each of the systems, please see *Appendix B.3. Interpreting Information from Hazardous Materials Rating Systems: National Fire Protection Association and Hazardous Materials Information System.*

Use of NFPA/HMIS: The EPA does not clearly allow--or prohibit--the use of the NFPA and HMIS rating systems on pesticide labels. The information is provided here as a tool for product selection.

Both rating systems were developed at a time when there was no mandated labeling system for communicating hazards of workplace chemicals, except for workplace labels on secondary containers. In 2012, OSHA updated their Hazard Communication Standard by adopting a version of the international Global Harmonized System (GHS). The update included GHS labeling criteria (e.g., updated requirements for workplace labels) and a GHS rating system.

The NFPA and HMIS are allowed (but not required) to be used on product safety data sheets (SDS) under the OSHA Hazard Communication Standard in addition to, but not in place of, the required SDS information. Thus, some SDSs use one or both rating systems.

Difference between the GHS and NFPA/HMIS Rating Systems: the GHS rating numbers are the **reverse** of HMIS and NFPA. The GHS ratings are not typically posted on SDSs.

The NFPA hazard rating system refers to a safety standard developed by the NFPA. This standard, NFPA 704, outlines a hazard rating system for emergency personnel to use when encountering chemicals in emergency situations (e.g., fire, spill). Thus, the health hazard information that is rated is for acute health effects. It includes three color codes and five intensity levels to alert responders.

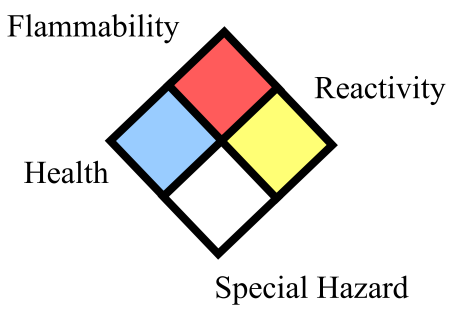
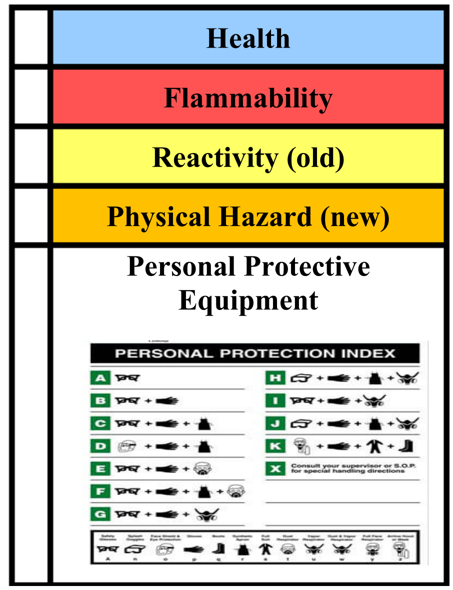
The HMIS rating system was developed by American Coatings Association as a compliance aid on labels for workers for the OSHA Hazard Communication Standard. It contains information on both acute and chronic health hazards.

The information in these rating systems can be used to quickly interpret product hazards and to compare product options to find the least-toxic one, as illustrated in the next section, *Chapter 4.E. Using Information from Hazardous Materials Rating Systems for Product Selection.*

How the NFPA and HMIS rating systems are similar and different, and how they are used

Both systems display similar color and numerical coding information in the blue, red, and yellow sections, but different information is listed in the white sections. In newest versions of the HMIS, the yellow color (Reactivity) has been replaced by orange (Physical Hazard).

Comparison of the NFPA and HMIS Rating Systems

	NFPA	HMIS
Symbol	 Oxidizer OX Acid ACID Alkali ALK Corrosive COR Use no water ~~W~~	
Primary Focus of Symbol	Provides information on the severity of product hazards to fire fighters and emergency responders.	Provides information on health, PPE, and product hazards to workers and medical responders.
How It Is Used	1) On *placards* used on large containers, doors, and walls to alert people as to hazards inside. 2) Allowed, but not required on workplace *labels* used on secondary containers where there is no manufacturer label. 3) As an optional rating system on SDSs.	1) Allowed, but not required on workplace *labels* used on secondary containers where there is no manufacturer label. 2) As an optional rating system on SDSs.
Use of Blue	Health	Health
Use of Red	Flammability	Flammability
Use of Yellow (old system)	Reactivity (still yellow for NFPA)	Reactivity (old - yellow color)
Use of Orange (new system)		Physical Hazard (new - orange color)
Use of White	Other Hazard – oxidizer, acid, alkaline, corrosive, water reactive	Personal Protective Equipment – gloves, safety glasses, goggles, mask, footwear, apron

Chapter 4.E Using Information from Hazardous Materials Rating Systems for Product Selection

Introduction

The information found in the NFPA and HMIS rating systems can be used to help compare the hazardous properties of products to find the least toxic one. The Workgroup recommends that schools establish a *Health and Safety Cap*[c] that determines acceptable hazard ratings for products before purchase, and the criteria for evaluating and accepting products that exceed that hazard rating cap.

Workgroup recommendations for selecting an acceptable rating for a product

0 to 1 Rating: Selection of products with a rating of 0 would be ideal; however, it may be necessary to use products with a rating of 1 in one or more of the other categories when no safer alternatives are available.

2 Rating: Although products with ratings in the 2 range can be considered, safer alternatives should be sought whenever possible.

3 to 4 Rating: Products with ratings of 3 or 4 in any category should be avoided, if possible. These products are dangerous, and often there are safer products available that can perform the same services with less risk to an employee or the environment.

Below are recommendations for PROHIBITING the purchase or use of products with the following hazard ratings. **Note that many chemicals will fall into more than one category**.

- *Chemicals with a Flammability or Reactivity rating of 4*
- *Chemicals with a Health rating of 4*

  These materials are generally fatal at very low exposure levels.
- *Chemicals with a Health rating of 3*

  Some corrosives in concentrate have a health rating of 3, but when diluted are reduced to a 2 or lower.
- *Chemicals that require use of a respirator*

  Respirator use requires a formal OSHA respiratory program, including medical evaluation and monitoring and fit testing. Most K-12 school districts in Massachusetts do not have a respiratory program.
- *Chemicals with special storage requirements*

  Consider the cost of the equipment (e.g., explosion-proof lighting), space requirements, and other storage issues.
- *Chemicals with special requirements for emergency response equipment*

  An example is flammable metals that require a class D fire extinguisher, which would not be needed for any other products.

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[c] Credits - The Health and Safety Cap concept was developed by Hilary Eustace of the Massachusetts Department of Labor Standards and modified by Lynn Rose for this project.

- *Chemicals with a regulatory designation of "extremely hazardous substance"*
  These materials can change a school's regulatory status to a more stringent one, that incurs additional regulatory requirements (e.g., from very small quantity generator to a small quantity generator of hazardous waste).

Chapter 4.F. Using Information from the Safety Data Sheet for Product Selection

Introduction

The following information is located on a product's Safety Data Sheet (SDS) and can serve as criteria to help determine how hazardous a product might be to employee and building-occupant health.

Product distributors and manufacturers are required to provide an SDS with a product when it is shipped. The company should be notified if the SDS is not included. SDSs are also available on a distributor's or manufacturer's web site. Under the federal OSHA Hazard Communication Standard, schools are required to provide the SDSs for all hazardous products used by employees, maintain an inventory list of hazardous products used, and to provide training to staff using these products on how to read the SDS and how products should be labeled.

Volatile Organic Compounds

The percentage of volatile organic compounds (VOCs) in a product is an important consideration due to the following health effects:

- VOCs are strong respiratory irritants. Prolonged chronic exposure to high levels of VOCs can lead to increased incidence of asthma and other respiratory ailments in employees and other building occupants.
- VOCs can affect the neurological system and cause symptoms of headache, nausea, and dizziness. High VOC products are usually solvent based and should always be avoided. They can usually be replaced with water-based products that have a lower VOC content.

% Volatile

Chemicals labeled with a high % volatile should also be avoided:

- This number is related to the likelihood that the product will evaporate into the breathing zone where it can be inhaled by employees and other building occupants. Alcohol is highly volatile and evaporates very quickly.

Corrosiveness – Acidity and Alkalinity

The degree of corrosivity is a safety consideration. Highly acidic and basic products are corrosive, and can cause burning and irritation to skin, respiratory system, and eyes.

- Products with a pH lower than 2 and higher than 12.5 are consider corrosive.
- Acids with a pH lower than 3.5 and bases with a pH higher than 10 can pose dermal, respiratory and eye hazards.
- Highly alkaline products in the corrosive pH range (greater than 12.5) can cause blindness. Quaternary ammonium compounds (QACs) found in low-level disinfecting products are highly alkaline. Even when their pH is not that high, products with QAC's are often listed as corrosive.

- Consider the reactivity between strong acids and bases, and how these products may react when mixed or stored together. They can cause a violent chemical reaction that would produce a lot of heat and gas.[d]
- Reactivity is also a key consideration in proper storage because these products can set off a reaction when coming in contact with other chemicals, thus should be stored separately. If a reactive product (such as bleach) comes in contact with a corrosive base (such as ammonia), whether intentionally or unintentionally, they create a violent reaction and release toxic gases.
- The pH of a concentrate will be affected slightly (may increase or decrease in pH levels one or two points) when it is diluted for use. Often a disinfectant in concentrate form has a “danger” signal word for corrosivity as it can cause chemical burns ad blindness. Once diluted for use, the same product may have only a “warning” signal word as it is only an irritant.
- See the pH chart below for common products and where they are located on the pH chart. This information will help to identify products that need to be kept separated. Schools can use this chart to add in their products.

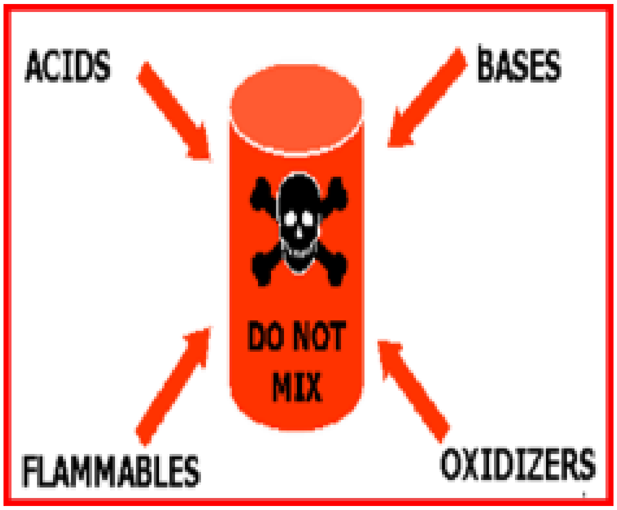
pH Chart

Hydrochloric acid		Bleach, hydrogen peroxide-based disinfectants	Vinegar				Pure water		Borax, baking soda	Hand soap	Ammonia, hospital-grade disinfectant	Bleach		Sodium hydroxide (lye)
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Corrosive												***Corrosive***		
ACIDS							**Neutral**	**BASES**						

[d] https://blog.storemasta.com.au/safe-practices-storing-acids-bases-workplace#:~:text=Segregate%20acids%20from%20bases&text=If%20acids%20and%20bases%20mix,lot%20of%20heat%20and%20gas.

- Schools can create a chart based-on the hazard characteristics (corrosives [acids and bases], reactives/oxidizers and flammables) listed in the SDS to determine storage requirements of the products they are considering.

  An example of a product that was under consideration for purchase that was rejected due to its storage requirements was an alcohol-based flammable disinfectant. It would have added to the large quantity of flammable hand sanitizer already stored in buildings during the pandemic. The additional requirements would have included a permit from the fire department and additional flammable storage equipment.



List of disinfectant ingredients sorted by hazard characteristics:

1. **Acids** – lactic acid, citric acid, hydrogen peroxide, peroxyacetic acid, some alcohol-based products
2. **Bases** – quaternary compounds, alcohol-based products that are slightly above corrosive
3. **Flammables** – alcohol (quantities may require a flammables cabinet)
4. **Oxidizers** – bleach, hydrogen peroxide, hypochlorous acid

Chapter 4.G. Selecting a Disinfectant Application System

Introduction

Several application options are available for disinfecting surfaces or objects. The following two charts provide comparisons of the hand and mop applied options and the criteria used to evaluate those options. Some criteria have to do with reducing exposure to the employee and building occupants; other criteria have to do with maintaining the efficacy of the disinfectant. Although some options are more preferable for reasons of health and efficacy, they are not always available. The charts are therefore designed help identify ways to meet the need for disinfection in a variety of settings.

It should be noted that research has found that microfiber has superior infection-control properties. Discussion continues on what impact the quality of microfiber has on the ability to retain this superiority as the cloths or mops are washed and reused.

Please also see *Appendix G: Disinfectant Application Equipment* for options and evaluations of equipment used to apply disinfectants.

Mop and Cloth Application Systems

	AVOID	PREFERRED	PREFERRED	AVOID IF POSSIBLE	AVOID IF POSSIBLE	USE WITH CAUTION
Criteria	**Conventional Mop and Bucket**	**Microfiber Mop Pads and Bucket**	**Reusable Microfiber Cloths**	**Reusable Cotton Cloths**	**Disposable Cotton or Paper Towels**	**Presaturated Wipes for Surfaces**
Effectiveness at Capturing and Removing Microbes	Minimal - Captured 30% of microbes in a hospital setting study[1]	Superior – captured 99% microbes in a hospital setting study[1] The type of microfiber may determine its effectiveness See *Chapter 6.C. Using Microfiber Cloths and Mops for Infection Control* for more information	Superior – Its small fibers enable it to penetrate cracks that cotton cloths or paper towels cannot Increased fiber surface area and static electric charge (when dry) enable it to attract, capture, and hold particulates better than other alternatives[2] The type of microfiber affects efficacy	Minimal - Significantly less than microfiber	Minimal - Significantly less than microfiber	Significantly less than microfiber
Efficacy (a measure of how well products killed or removed microbes)	30% in a hospital-setting study[1] Solution must be changed regularly to maintain efficacy	99% in a hospital-setting study[1]	Superior according to most research	Good	Less capable of capturing microbes than microfiber or cotton	Depends on saturation of wipe and ability to stay wet on the surface Solution remains stable in the presence of the wipe material
Ability to Maintain Adequate Contact/Dwell Time to Kill Microbes	Good	Superior – microfiber pads have such a high density and surface area that they can absorb up to 7 times their weight in water and retain that moisture	Superior – microfiber cloths have such a high density and surface area that they can absorb up to 7 times their weight in water and retain that moisture	Good	Cotton is better than paper but retains less moisture than microfiber	Can dry out on surface Although wipes are designed to provide a premeasured amount of solution, the possible uneven saturation level within the container may compromise this

	AVOID	PREFERRED	PREFERRED	AVOID IF POSSIBLE	AVOID IF POSSIBLE	USE WITH CAUTION
Criteria	**Conventional Mop and Bucket**	**Microfiber Mop Pads and Bucket**	**Reusable Microfiber Cloths**	**Reusable Cotton Cloths**	**Disposable Cotton or Paper Towels**	**Presaturated Wipes for Surfaces**
Cross-Contamination **Advantages and Disadvantages**	Solutions must be changed regularly Mop must be cleaned and dried or microbes will colonize on the fibers A bucket divided for clean and dirty water prevents cross-contamination when mops are dipped back into solution Disinfecting a mop is difficult; one practice that is hazardous is soaking overnight in bleach	Prevents cross-contamination if a color-coding system is used, and if changed when types of uses or rooms change Because the mop head is not dipped back into the solution, there is no cross-contamination of solution in bucket Increased fiber surface area and static electric charge (when dry) enable it to better hold captured microbes	Prevents cross-contamination if changed regularly and when uses or rooms change Increased fiber surface area and static electric charge (when dry) enable it to better hold captured microbes Although microfiber needs to be washed and dried, it dries faster than cotton, so there is less chance for microbes to be sustained and/or to proliferate	Can serve as a breeding ground for microbes and cause cross-contamination if not laundered and dried before reuse Does not hold captured microbes as well as microfiber so would need to be changed more frequently.	Cross-contamination may occur between towel dispenser handle and dispensers, especially if located in splash zone	Microbes can survive on the cloth and can cause cross-contamination Avoids cross-contamination that might occur from dipping cloths back into solution
Ergonomic Advantages or Disadvantages	Not ergonomically designed A typical cotton loop mop may weigh 60 lb. when saturated with water; a bucket of solution can weigh approximately 30 lb. and may need to be lifted several times a day to refill	The handles are ergonomically designed using light-weight metals The mop solution does not need to be changed because contaminated mop heads are not dipped in, thus reducing lifting of heavy mop buckets No wringing required	Because of their higher water retention capacity, microfiber cloths do not need to be wrung out repeatedly	None	None	None

	AVOID	PREFERRED	PREFERRED	AVOID IF POSSIBLE	AVOID IF POSSIBLE	USE WITH CAUTION
Criteria	**Conventional Mop and Bucket**	**Microfiber Mop Pads and Bucket**	**Reusable Microfiber Cloths**	**Reusable Cotton Cloths**	**Disposable Cotton or Paper Towels**	**Presaturated Wipes for Surfaces**
Cost Issues: Capital and Operating	Can use existing supplies Higher cost for replacement of solutions that become contaminated from mop dipping back in, unless a divided bucket system is used Mops can be rented	Initial capital expense can be captured in life-cycle costing Mops can be rented UC Davis Medical Center study found microfiber mopping system resulted in 60% lifetime cost savings for mops, 95% reduction in chemical costs associated with mopping tasks, and 20% labor savings per day[1]	Initial capital expense can be captured in the life-cycle costing Cloths can be rented	Cloths can be rented Cost is less than microfiber	Ongoing purchasing and disposing costs	Ongoing purchasing and disposing costs

	AVOID	**PREFERRED**	**PREFERRED**	**AVOID IF POSSIBLE**	**AVOID IF POSSIBLE**	**USE WITH CAUTION**
Criteria	**Conventional Mop and Bucket**	**Microfiber Mop Pads and Bucket**	**Reusable Microfiber Cloths**	**Reusable Cotton Cloths**	**Disposable Cotton or Paper Towels**	**Presaturated Wipes for Surfaces**
Lifespan, Waste, and Disposal Issues	Reusable Reduced lifespan compared to microfiber	Lasts 10 times longer than hook/loop mop[3] Can be washed and reused hundreds of times if done correctly As with all synthetic fibers, washing microfiber does release microplastics. These can be captured by washing machine filters.	Can be washed and reused hundreds of times if done correctly Microplastics can be released during the washing process. Washing machine filters or specially created microplastic filters can reduce the amount disbursed to the environment. [5]	Reusable Reduced lifespan compared to microfiber	Not reusable Generates waste	Must be used before expiration date Not reusable and generates waste A significant amount of residue (more than 1 inch observed) may be left in the bottom of the container after wipes are removed, which may need to be disposed of as hazardous waste*

[5] Lant NJ, Hayward AS, Peththawadu MMD, Sheridan KJ, Dean JR. Microfiber release from real soiled consumer laundry and the impact of fabric care products and washing conditions. PLoS One. 2020 Jun 5;15(6):e0233332. doi: 10.1371/journal.pone.0233332. PMID: 32502152; PMCID: PMC7274375. https://pubmed.ncbi.nlm.nih.gov/32502152/.

	AVOID	PREFERRED	PREFERRED	AVOID IF POSSIBLE	AVOID IF POSSIBLE	USE WITH CAUTION
Criteria	**Conventional Mop and Bucket**	**Microfiber Mop Pads and Bucket**	**Reusable Microfiber Cloths**	**Reusable Cotton Cloths**	**Disposable Cotton or Paper Towels**	**Presaturated Wipes for Surfaces**
Other Considerations					Useful in blood spill kits for cleaning up bloodborne pathogen spills where handling of contaminated materials should be minimized	Useful for incidents in which disinfectants are required but unavailable, such as on a school bus (if cleaned with detergent first) or on a field trip Often mistaken for hand wipes and used inappropriately Often found unsecured in classrooms and accessible to students
Guidelines for Use	Launder daily	Launder daily	Launder daily or rinse and hang to dry	Launder daily	None	Check to see that the wipes are adequately saturated

* Check state regulations. In Massachusetts, more than 1 inch of a hazardous product remaining in a container designates it as hazardous waste and must be disposed of in accordance with the hazardous waste regulations 30.106, "(2) Definition of Empty. (a) A container or an inner liner removed from a lined container that has held any hazardous material or hazardous waste, except a waste that is a compressed gas or that is listed or otherwise described in 310 CMR 30.136, is empty if: 1. all wastes have been removed that can be removed using the practices commonly employed to remove materials from that type of container, e.g., pouring, pumping, and aspirating; and 2. no more than 2.5 centimeters (one inch) of residue remain on the bottom of the container or inner liner."

**A recent study states that washing microfiber with a liquid detergent, in colder and quicker cycles, and transitioning to High-Efficiency washing machines can reduce the release of microfibers. "Garments showed the highest level of release in the first few washes and did not increase after a long multicycle wash history"

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Chapter 4.H. Choosing Between Concentrated Products and Ready-to-Use Products

Introduction

Using concentrated products saves money and conserves resources, and dispensing them with the correct equipment is safer than dispensing without the equipment. There are times, however, when using a ready-to-use (RTU) product is safer and more practical (e.g., when there is no access to facilities or no time to dilute a product, such as disinfecting a blood spill or dealing with an incident on a school bus or the playground). There are also situations where staff members do not have the required safety equipment to handle a concentrated product, so it would be safer to have a RTU product that is typically less hazardous in its diluted form. This chart provides criteria to help select the right concentration form for each type of situation.

Criteria to Evaluate	**Type of Product**		
	Concentrate to be diluted and dispensed from a wall-mounted station	**Concentrate to be diluted and dispensed from a handheld unit**	**Ready-to-use**
Design	Designed to dilute, mix and dispense product concentrates either in an area with plumbing and electricity for plumbed dilution stations, or non-plumbed manual premeasured dispensing stations	Designed to dilute a single product at point-of-use without plumbing and electricity Can be a pump system, or premeasured squeeze container, or a premeasured packet.	Designed in prepackaged concentrations of solutions that do not require any dilution on the part of the end user
Advantages	Less expensive to ship Less storage room required Uses fewer resources for packaging and shipping Less expensive than disinfectant wipes or RTU products Less waste due to exact measurements Less worker contact with concentrate	Can use immediately Already labeled The dispenser measures the amount, so the correct dilution for the job is achieved each time, unless the user has not selected the correct dilution level (e.g., higher concentration for bloodborne pathogens), or the dispenser is set at the wrong dilution The unit dilutes and mixes the product every time the unit is used, so there are fewer safety hazards (spills, inhalation of vapors, etc.) from dispensing from a gallon bottle on a daily basis Because there is no premixing before the product is used, there is no unused or expired product to dispose of on a daily basis Available for a range of products, including but not limited to bleach, QACs and accelerated hydrogen peroxide	Can store at point-of-use Can use immediately Less hazardous to handle Already labeled Some products only come in RTU formulations

Criteria to Evaluate	**Type of Product**		
	Concentrate to be diluted and dispensed from a wall-mounted station	**Concentrate to be diluted and dispensed from a handheld unit**	**Ready-to-use**
Disadvantages	More hazardous than RTU products, requiring more management and personal protection if not used as part of a dilution station Requires mixing for dispensing Eyewash, eye protection and chemical resistant gloves are required for products with a pH in the corrosive range (consult the SDS) and flammable	Product cartridges are more expensive than concentrates Eyewash, eye protection and chemical resistant gloves are required for products with a pH in the corrosive range (consult the SDS) and flammable	After being mixed, a diluted product has a limited shelf life Costs more to ship Requires more storage space Creates more solid waste

Criteria to Evaluate	**Type of Product**		
	Concentrate to be diluted and dispensed from a wall-mounted station	**Concentrate to be diluted and dispensed from a handheld unit**	**Ready-to-use**
Guidelines for Use and Management	Use a calibrated dispensing system Use the correct dilution for the task Wear the correct personal protective equipment (PPE) specified in the SDS Label the diluted product stored in a secondary container with the appropriate "workplace" label as specified by the OSHA Hazard Communication Standard Products must be stored in a secure place away from student access Store product in compatible groupings (check the SDS to see what types of products can be stored together safely) Some product use and storage requires the presence of an eyewash station in case of an incident involving the product Never mix chemicals together	Select the right concentration for the job. Some dispensers only provide a 10:1 dilution, which may not be required for all tasks One cartridge comes prefilled with concentrated bleach formula and the other cartridge must be filled with tap water Wear the correct PPE specified in the SDS Label the diluted product stored in a secondary container with the appropriate "workplace" label as specified by the OSHA Hazard Communication Standard (see *Chapter 3.E. Labeling Secondary Containers* for labeling guidelines) Products must be stored in a secure place away from student access Store products in compatible groupings (check the SDS to see what types of products can be stored together safely) Some product use and storage requires the presence of an eyewash station in case of an incident involving the product Never mix chemicals together	Small bottles of RTU disinfectant are recommended for: 1. Blood spill kits stored at the point-of-use to be available immediately 2. Disinfection tasks when trained staff members do not have access to the custodial dispensing system or the custodial staff cannot supply them with products dispensed from the dispensing station Apply product using manually pumped bottles (plastic or glass) Refill manually from a larger container of the same RTU product (sometimes) Wear the correct PPE specified in the SDS Store products in a secure place away from student access Store product in compatible groupings (check the SDS to see what types of products can be stored together safely) Some product use and storage requires the presence of an eyewash station in case there is an incident involving the product Never mix chemicals together

Chapter 4.I. Selecting and Installing Product-Dispensing Systems[f]

Introduction

Several types of wall-mounted product-dispensing systems are available. Most product vendors have a preferred system that they provide for their products. They can assist with the selection of systems and the type of installation. The following information provides useful material to discuss with a vendor and what should be considered when planning to install a dispenser.

- *Features of product-dispenser models*
  - There are numerous options, including flow rate options, supporting hardware, dilution ratios for specific concentrates, backflow prevention options, installation options, the number of products and containers (e.g., buckets, spray bottles), equipment (e.g., auto scrubbers) that can be filled by a system, etc.
  - A dispensing system could be gravity-fed, pneumatic, or electronically monitored (or similar). Consider requirements for water flow and pressure requirements since they can vary from building to building, and even from one area in a facility to another. Facilities without pressure regulation can run into the issue of inconsistent dilution rates. To manage high water pressure, look for a dispensing system with a component to regulate the pressure and eliminate dilution variance by controlling the amount of water allowed into the unit.
  - There are non-plumbed product dispensing systems that do not require hook-up to plumbing. These provide metered amounts of product, which then require a second step of filling the container with water to dilute the product.
  - Many vendors will supply and install a dispensing system at no cost when a specified amount of product is purchased from them. Be aware that proprietary dispensing systems may require proprietary containers. This becomes an issue when switching products as new dispensers need to be installed.
- *Recommendations for selecting product-dispensing systems*
  - Use only manufacturer-authorized products with the manufacturer's specific dispensing system.
  - Consider the system's security. Some have a lock and key mechanism or a tamper-resistant feature built into the system. If the dispensing system is not designed with this feature, a dispensing system enclosure is an alternative.

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[f] *This section on product dispensers was derived from:

1) The U.S. Navy Surface Ship, *Authorized Chemical Cleaning Products and Dispensing Systems Catalog*, Revision 1, 9/30/04.

2) Hydro, Ensuring Success with Dispensing Systems. https://hydrosystemsco.com/whitepaper-ensuring-success-dispensing-systems/.

  - A dispensing system should have a backflow prevention feature to prevent cross-contamination of the potable water system. Some plumbing codes and/or municipalities require this.
  - Look for a system that has extra space for maintenance and tubing purposes.
- *Installation criteria for product-dispensing systems*
  - Locate the dispensing systems in easily accessible areas that make sense for the facility and its employees. Consider the amount of square footage that needs to be serviced. If it would be inconvenient for employees to use one system, consider installing a centrally located flagship system and then one or several other satellite systems. For instance, it may make sense to have multiple systems if the facility has numerous floors or is especially large. It's also important to consider how often the system will be used.
  - Consider dispenser placement in relation to the chemical. Install the dispenser as close to the chemical as possible. If the chemical is higher than the dispenser, it's possible that chemical can be siphoned out, which would result in too much chemical being used, increasing costs and resulting in poor performance and decreased productivity.
    - The installation and maintenance of the product-dispensing system should be conducted by the manufacturer or authorized distributer in accordance with manufacturer's instructions and requirements.
    - The installation should follow all local and state plumbing codes. The ASSE 1055 is the plumbing standard that covers all chemical dispensing systems. Following this code helps prevent chemical backflow into the water supply.
    - The product-dispensing system should be physically and visually accessible from the front for operation and for normal maintenance with tools, test equipment, and replacement parts.
    - The product-dispensing system should be installed in an area that has adequate storage facilities for the product concentrates, available potable water source connections, and adequate ventilation.
    - A data nameplate or decal should be installed to provide the manufacturer's name, model, serial number, and any other information needed to identify the unit.
    - An instruction plate or poster should be installed to provide instructions for startup, operation, and shutdown.
- *Using the Dispenser*
  - The water flow should be on during use and off when the system is not in use.
  - Employees should report problems immediately.
- *Maintaining the Dispenser*
  - Regularly maintain the filter: Systems generally have a filter or strainer washer on the water inlet to ensure that particles in the water line don't get into the water valve.

Filters need to be regularly cleaned, with the frequency dependent on the water conditions at the site.

- o Replace metering tips: Metering tips regulate how much concentrate is mixed with the water, so it's crucial that these are functioning properly. Replace metering tips on a regular basis so that the dilution ratios are always accurate and don't impact cleaning results.
- o Replace tubing as needed: Over time, tubing can become brittle or yellow, depending on the types of chemicals being used. Replace this tubing as needed.

Chapter 5.A. Introduction

Safe work practices need to be developed for each product that is in use because each has specific hazards, precautions, and directions for maximum effectiveness. The information in this chapter is provided to ensure that all necessary factors are considered when developing cleaning protocols, with the goals of protecting employees and building occupants and using the products most effectively.

Although the use of bleach and other hazardous disinfection products is not recommended, the Handbook does provide guidelines on using them to **ensure the safety of workers and building occupants should these products be deemed necessary for specific situations**.

Consider that there is a corresponding relationship between the toxicity and hazard level of the products used and the number of health and safety measures required. The less toxic the product, the fewer the safety measures needed.

Chapter 5.B. Using Disinfectants

Introduction

This section provides guidelines on using disinfectants when developing a customized protocol. For specific information on how to perform the following work-practice recommendations, consult the label of each product being used. Educate school staff on the finalized disinfection protocols, and post these in accessible locations. Remember to change the protocols when products and processes (e.g., uses of application equipment) change.

Work-Practice Recommendations

- *Protect workers:* Spray or squirt the product on cloths and mops whenever possible versus spraying them into the air unless the label directions state otherwise. When the product is sprayed onto a hard surface, the mist can bounce back directly into the face and be inhaled. Always use disinfectants with the recommended PPE and adequate ventilation. Make sure the facility's heating, ventilating, and air conditioning system (HVAC) or other forms of ventilation are operating while disinfecting tasks are being performed.
- *Protect building occupants:* Consider how to minimize exposure (of product vapors or residue) to building occupants when selecting the application process and performing the disinfecting. Although some activities need to be conducted while school is in session, tasks that only need to be done once a day should be scheduled after the students, teachers, and other personnel leave.
- *Reduce quantity:* When applying the disinfectant, use the smallest possible amount of disinfectant as recommended by the manufacturer to obtain the desired level of microbe control. More is not necessarily better—it may be more hazardous and it creates more waste.
- *Allow enough time for disinfectants to react with the microbes to kill them:* Contact times vary from product to product. Follow label directions to determine the time required for the disinfectant to be wet on the surface and in contact with microbes.
- *Rinse:* Rinse all high-touch areas if the product label requires this step. Although product labels specify whether rinsing is required, there are general requirements for the following types of products and situations:
    - Food-contact sanitizers (sanitizing rinses) are considered a final rinse when used on surfaces that come in contact with food. No water rinse following application is allowed.
    - Some disinfectants with claims for use on food-contact surfaces must be rinsed when used in this capacity. Check the label to determine if rinsing is required.
- *Dry:* Wipe or dry surfaces only if the product label requires this step.

See *Appendix G: Disinfectant Application Equipment* for information on different disinfectant application methods.

Chapter 5.C. Using Bleach (Sodium Hypochlorite): Hazard Overview

Introduction

Bleach has been used for generations as a disinfectant. Recent research, however, has identified adverse health effects for users and the environment (see below). Because of this research, many purchasers are looking for a safer alternative with a better human health and environmental profile. Manufacturers are also developing safer disinfectants to augment their "green" cleaning lines of products. See *Chapter 4.B. Comparing Disinfectants: Comparison Chart for Hard-Surface Disinfectants Registered by the Environmental Protection Agency* for details on alternative products.

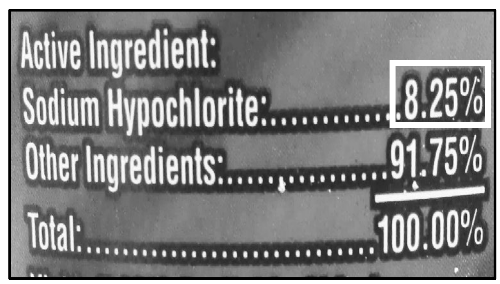
Bleach is used extensively in childcare centers and other settings due to a number of perceived conveniences such as low up-front cost, ease of purchase, and its ability to be used at different strengths for different purposes. Because many users are not implementing the required safety measures to address a number of the hazards associated with using bleach (as illustrated below), the perceived level of convenience and cost is inaccurate.

Are all bleach products disinfectants?

Bleach is known by several names, including chlorine bleach, household bleach, and sodium hypochlorite. In this document, *bleach* refers to products registered by the Environmental Protection Agency (EPA). Since not all bleach products are registered as a sanitizer or disinfectant for hard surfaces, and are instead registered as a laundry additive, users must read the label to determine if the product can be used as a hard surface disinfectant. Some products are used just for sanitizing laundry and other items/surfaces, and some just for disinfecting.

Are all disinfectant bleach products diluted the same?

These different types of products are registered at specific concentrations. Previously, disinfectant concentrations were 5.25% or 6.00% unless otherwise stated. Some disinfecting bleach concentrations are now 7.00% – 8.25%. Thus, you must read the label to determine the correct dilution rate based on the initial concentration rate.



What are the problems with using bleach as a disinfectant?

- ***Health problems for both children and workers***
  - Household chlorine bleach in a 5.25% to 6.00% concentration is considered an irritant to the skin, eyes, and respiratory tract. It is identified as corrosive in concentrations as low as 6.00%. The recently updated requirements of 7.00% – 8.25% pose more of a hazard.

    A corrosive product can chemically burn or irritate skin, mucous membranes and eyes. The Agency for Toxic Substances & Disease Registry (ATSDR) notes that "Inhalation of gases released from hypochlorite solutions may cause eye and nasal irritation, sore throat, and coughing at low concentrations. Inhalation of higher concentrations can lead to respiratory distress with airway constriction and accumulation of fluid in the lungs (pulmonary edema)."[1]

- ***Worker health and safety***
  - Since bleach in a concentrated form is corrosive and can cause irreversible eye damage and skin burns, it requires the use of an emergency eyewash station in a workplace to flush eyes for 15 to 20 minutes in the event of an exposure.
  - It can irritate mucous membranes and the respiratory system if inhaled and can trigger respiratory conditions such as chemical irritant-induced asthma if there is prolonged exposure.[2,3] According to the Association of Occupational and Environmental Clinic's Exposure Codes, bleach is considered an asthmagen, causing new onset asthma and exacerbating asthma episodes. Studies found that asthma symptoms in domestic cleaning women were associated with exposure to bleach.[4] Another study showed that bleach and organic chemicals (e.g., surfactants and fragrances) contained in several household cleaning products can react to form chlorinated volatile organic compounds (VOCs) when used during cleaning operations.[5] Some chlorinated VOCs are toxic and probable human carcinogens.
  - Due to these health risks, staff handling of bleach for daily preparation requires training, a ventilated dispensing area, tools that help measure the correct amount of bleach, (e.g., dispensing pumps, a funnel), and the proper use of personal protective equipment (e.g., nitrile or rubber gloves and chemical splash goggles). See *Chapter 5.D. Protocol for Safe Use of Bleach*.
  - Mixing bleach with ammonia, quaternary ammonium compounds, vinegar, or other acids can create toxic gases. **Never mix bleach with another cleaning solution.**
- ***Child health and safety***
  - The Agency for Toxic Substances & Disease Registry Medical Management Guidelines provides specific information on the effects of bleach on children: "Children exposed to the same levels of gases as adults may receive a larger dose because they have greater lung surface area to body weight ratios and higher minute volumes to weight ratios. Children may be more vulnerable to corrosive agents than adults because of the smaller diameter of their airways. In addition, they may be exposed to higher levels than adults in the same location because of their short stature and the higher levels of chlorine found nearer to the ground."
  - Children have accidentally ingested bleach. In 2020 there were 18,788 bleach-exposure cases reported to US Poison Control Centers from January through May 10, a year-over-year increase of 38%. From January through March 2020 the "increase in total calls was seen across all age groups; however, exposures among children aged ≤5 years consistently represented a large percentage of total calls…." Among all cleaner categories "bleaches accounted for the largest percentage of the increase."[6]
- ***In a school setting***
  - Bleach degrades metal and other incompatible surfaces.
  - It may damage fabrics and floor finishes.

- Bleach is unstable and degrades in storage, so it should be purchased monthly.
- A bleach solution must be mixed daily because the germicidal effectiveness of bleach in solution degrades after 24 hours.
- Bleach is an oxidizer and is categorized as reactive. See the specific storage requirements in the section below on *Storing Bleach and Bleach Solution.*

Summary Note: Chlorine bleach should be used only when proper precautions are followed and when safer alternatives are unavailable or regulations require its use.

References

1. Agency for Toxic Substances & Disease Registry, Managing Hazardous Materials Incidents, "Medical Management Guidelines for Calcium Hypochlorite/Sodium Hypochlorite." Available at: https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=192.
2. Bello A, Quinn MM, Perry MJ, Milton DK. Quantitative assessment of airborne exposures generated during common cleaning tasks: a pilot study. *Environ Health* 2010; 9:76.
3. Obadia M, Liss GM, Lou W, Purdham J, Tarlo SM. Relationships between asthma and work exposures among non-domestic cleaners in Ontario. *Am J Ind Med* 2009;52:716-23
4. M. Medina-Ramón, J.P. Zock, M. Kogevinas, et al, "Asthma, chronic bronchitis, and exposure to irritant agents in occupational domestic cleaning: a nested case-control study." *Occupational and Environmental Medicine* 62, no. 9 (2005): 598–606.
5. M. Odabasi, "Halogenated Volatile Organic Compounds from the Use of Chlorine-Bleach-Containing Household Products." *Environmental Science & Technology* 42, no. 5 (2008): 1445–51.
6. CDC Morbidity and Mortality Weekly Report. Cleaning and Disinfectant Chemical Exposures and Temporal Associations with COVID-19 — National Poison Data System, United States, January 1, 2020–March 31, 2020. https://www.cdc.gov/mmwr/volumes/69/wr/mm6916e1.htm.

Chapter 5.D. Protocol for Safe Use of Bleach

Introduction

Although the Toxics Use Reduction Institute (TURI) does not recommend the use of bleach for disinfecting and sanitizing due to its corrosiveness and health hazards, bleach continues to be used in some schools and childcare centers. The following guidelines are provided to help prevent overexposure and misuse for those who choose to use it.

Purchasing Bleach Products and Supplies

1. Obtain bleach that is fragrance-free and registered by the EPA for use as a disinfectant and/or sanitizer.
2. Select a product dispenser that provides portion control and helps to minimize the hazards from the daily mixing process. Some examples are illustrated below. Search on the Internet for a "metered dosing container."

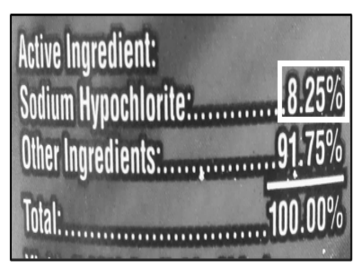


Preparing a Fresh Bleach Dilution Daily

Solutions lose their strength after 24 hours and should not be used. If the solution is not labeled with a date, it may be outdated. The lack of an odor also indicates an out-of-date product and that the solution should be discarded. Safe work practices include:

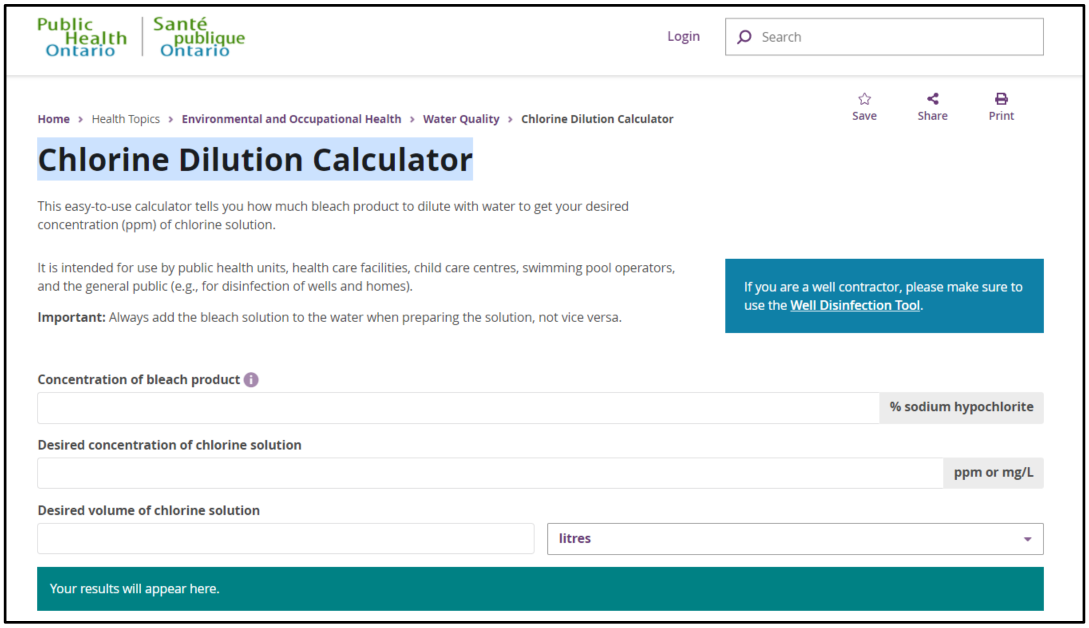
1. Put on PPE, including chemical splash goggles, and rubber or nitrile gloves as required on the label for pouring and mixing the bleach solution.
2. Determine the dilution rate. Proper dilution is extremely important to ensure adequate disinfection and to reduce health hazards. Identify the product's concentration rate to determine the proper dilution rate. Always check the product label for dilution rates and contact time for each specific product.

   It is very important to note that the required concentration in the bleach sold has **increased** from 5.25% and 6.00% to 7.00% and 8.25% to ensure efficacy for sanitizing and disinfecting. In order to ensure you have the correct dilution rate for the type of use (e.g., disinfecting, sanitizing, disinfecting for bloodborne pathogens), determine the starting concentration and the concentration needed for the task.



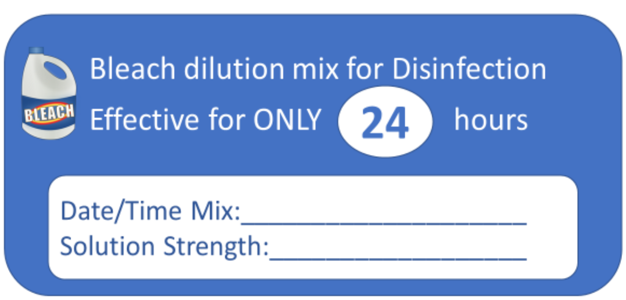
The following link provides a **Chlorine Dilution Calculator** from Public Health Ontario. This calculator will help you to determine the correct dilution needed based on the concentration of bleach you are starting with.

https://www.publichealthontario.ca/en/health-topics/environmental-occupational-health/water-quality/chlorine-dilution-calculator:



3. Prepare the solution over a sink (if possible).
    - Avoid contact with eyes, skin, and clothing.
    - First, fill the container with the measured amount of cool water.
    - Second, add the bleach to the water to reduce the release of vapors.
4. Label the diluted solution with a “Workplace Label” on the secondary container. See *Appendix H: Templates for Labeling Secondary Containers of Disinfectants and Sanitizers* for information that is required to be on this label. Be sure to update the date and concentration on a daily basis when you replace the product.

    The following label template can be used in addition to the “Workplace Label” on the secondary container with the diluted bleach. You can laminate the label and use a grease pencil to update the information.



Using the Prepared Bleach Solution

1. Protect yourself and building occupants.
    - Use when children are not present.
    - Wear PPE.
    - Ventilate the room well (using a fan to the outside if possible) while applying bleach.
2. Disinfect surface or item.
    - Clean the surface or item *first* with detergent and rinse.
    - Apply the bleach dilution *after* cleaning the surface.
    - Allow for a contact time as specified, or air dry. If the surface will be touched by skin, rinse after contact time is reached.
    - Allow the surfaces to completely dry before allowing children back into the area.

NOTE: *Never mix bleach with any product, especially ammonia or products containing ammonia, because it creates toxic gas.*

Cleaning Up

1. Wash measuring device (if used).
2. Remove goggles, and remove and dispose of gloves.
3. Wash hands after removing gloves.

Storing Bleach and Bleach Solution

1. Store the diluted product and the concentrated product in a secure area inaccessible to children, where it will not spill, and below eye level to prevent product from spilling into the eye when being moved.
2. Store away from incompatible products, including flammable products (such as solvent-based cleaning and degreasing products) and corrosives (which include *acids* such as an acid toilet bowl cleaner and *bases* such as ammonia-based or quaternary compound-based products).

Disposing of Bleach

1. Dispose of unused solution daily. Remember to update date and concentration (if changed) information label whenever changing out solution.
2. Diluted bleach solutions can be poured down the drain, but concentrated bleach must be disposed of as hazardous waste. Contact your school's facilities office or the town's Department of Public Works for hazardous waste guidance.

Sources

- Centers for Disease Control and Prevention, Special Pathogens Branch, "Infection Control for Viral Haemorrhagic Fevers in the African Health Care Setting, Section 5, Disinfect Reusable Supplies and Equipment."
- The Clorox Company, Safety Data Sheet, "Clorox Regular-Bleach." Available at: https://www.thecloroxcompany.com/wp-content/uploads/cloroxregular-bleach12015-06-12.pdf.
- U.S. Department of Labor, Occupational Safety and Health Administration, Occupational Safety and Health Standards, Toxic and Hazardous Substances, 1910.1200: Hazard Communication. Available at: https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=10099&p_table=STANDARDS.
- San Francisco Asthma Task Force, "Reducing Overuse of Bleach, Preventing Asthma with Safer Cleaning Practices in Child Care." PowerPoint Presentation, 7/09.

Chapter 6.A. Introduction

Institutional cleaning technology has undergone rapid change over the past few years. New advances in device technology are providing environmentally friendlier and safer ways to care for public buildings while protecting the health of the users and other occupants.

These technologies need to be combined with other infection-control strategies, such as ventilation, air treatment, and personal hygiene strategies (e.g., hand washing for microbes transmitted by contact with surfaces, or cough etiquette for microbes transmitted by an airborne and/or droplet route).

Cleaning industry manufacturers have introduced water-based devices for surface cleaning, sanitizing, and disinfecting in the past few years. Although the processes are different, they all use water as the basis for the technology. These innovations are possible because of advances in electrical engineering, software, and solid-state circuitry. Listed below are devices that have been proven effective as cleaners, sanitizers and/or disinfectants.

How These Technologies are Regulated

- Pesticide Product (Disinfectant, Sanitizer)

  Antimicrobial pesticides (disinfectants) are required to be registered with the Environmental Protection Agency (EPA) to document the product’s kill claims for specific microbes, and the product label must list this registration number.

  If a device incorporates a substance or mixture of substances to perform its intended purpose, or is packaged together for sale with a disinfectant, then it is considered a **pesticide** product, not a device, and must be EPA registered.

- Device

  A pesticidal device is an instrument or other machine that is used to destroy, repel, trap, or mitigate any pests, including viruses. A device must work solely by physical means (such as electricity, light, or mechanics). Examples of devices may include ozone generators, UV lights, etc.

  Unlike chemical pesticides, EPA does **not** register devices and, therefore, does not routinely review their safety or efficacy. Because EPA does not review or register pesticidal devices, EPA cannot confirm whether, or under what circumstances, such products might be effective against SARS-CoV-2.

  Thus, EPA advises companies to maintain records that confirm claims made on device labels/labeling are true and not misleading. Selling or distributing pesticidal devices with false or misleading claims about their safety or efficacy may subject the seller or distributor to penalties under FIFRA.

  There are other regulatory requirements that apply. For example, device labels must include adequate warning and caution statements and directions for use as well as the EPA *establishment number* (they will **not** have an EPA *registration number* because they are not subject to the same registration requirements as pesticides).

- Pesticide Application Equipment

  Product application equipment that is sold separately from the pesticide itself is **not** a device or a pesticide. For example, an electrostatic sprayer for a disinfectant that is sold separately from the disinfectant is considered to be application equipment, which EPA does not regulate.

  Information on disinfectant application equipment in the handbook is in *Appendix G: Disinfectant Application Equipment.*

Benefits of Using Disinfecting and Sanitizing Devices

- Reduced exposure to hazardous chemicals for custodians and building occupants
- Reduced cost of purchasing, storing, and disposing of chemicals
- Ease and effectiveness of use

Sources:

- EPA, Compliance Advisory, January 2021 (Replaces May 2020 Compliance Advisory) What You Need to Know Regarding Products Making Claims to Kill the Coronavirus Causing COVID-19 (UPDATE), https://www.epa.gov/sites/default/files/2020-05/documents/cornavirus-compliance-advisory.pdf

Chapter 6.B. Using Devices to Clean

Introduction

The following products are now widely available and have been evaluated for their disinfecting efficacy. Check with equipment manufacturers and vendors for details.

Equipment and Vendor	Technology	Cleaning, Sanitizing, and Disinfecting Claims and EPA Registration	Independent Research and Third-Party Certification	Comments
Force of Nature	This device uses a capsule containing salt and vinegar. The capsule is then mixed with water inside the device, and electrolyzed. This creates a hypochlorous acid solution.	The capsule used is an EPA registered disinfectant active against the virus causing COVID-19 when used according to the label instructions.	The chemical produced has been Green Seal® certified as meeting their health, safety, and performance standards.	The active ingredient produced by their device has not been evaluated by the DfE Safer Choice program. Research is showing that the hypochlorous based products can combine with other chemicals in the air to form hazardous fumes.
Kaivac Cleaning Systems™	Multipurpose, no-touch cleaning systems (also known as spray-and-vac or high-flow fluid-extraction units) are designed to work on most surfaces. They can be used with just water, a cleaning chemical or a disinfectant.	Kaivac's disinfecting products are EPA registered as active against the virus causing COVID-19.	Kaivac's cleaning solution, KaiO ™ has been Green Seal® certified as meeting their health and safety standards as a cleaner.	The active ingredient in **their disinfectants** will not pass the DfE's Safer Choice standards. The system can also be used with an EPA registered product that meets DfE's Safer Choice standards.

Equipment and Vendor	Technology	Cleaning, Sanitizing, and Disinfecting Claims and EPA Registration	Independent Research and Third-Party Certification	Comments
Liquefied ozone (e.g., Tersano products)	Liquid ozone is created by introducing an extra oxygen atom to an oxygen molecule and water molecules. The instability of the third oxygen atom creates a high-quality cleaning agent in which atoms of oxygen search for something to bond with. As it searches, the oxygen atoms break up dirt bonds and combine with hydrogen and oxygen to create more molecules of water and oxygen while cleaning the surface.	Meets EPA requirements as a disinfection device. Request test data on disinfectant efficacy from the device manufacturer. Aqueous ozone generators are approved by the US Food and Drug Administration (FDA) as sanitizers for food and non-food contact surfaces. Testing is in process for effectiveness against the virus causing COVID–19.	Green Seal® has certified the product as meeting their health, safety, and performance standards. USDA/National Organic Program approved.	The contact time to eliminate salmonella and *E. coli* is 30 seconds. There is no residue from the product so rinsing is not required.

Equipment and Vendor	Technology	Cleaning, Sanitizing, and Disinfecting Claims and EPA Registration	Independent Research and Third-Party Certification	Comments
Thermal Accelerated Nano Crystal Sanitation (TANCS®) Steam Vapor System Developed by Advanced Vapor Technologies, LLC Bauer Energy Design, Inc. holds the patent on this technology.	The TANCS Steam Vapor System technology (see Figure 2) works by facilitating the redistribution of charges between the water molecules and dissolved mineral components naturally found in tap water, which results, in part, in the development of nano crystals. This enhanced water is then transformed into super-heated, low-moisture steam. High-temperature, low-moisture steam vapor is applied at low pressure and low volume. It cleans by breaking the bond between the soils and the surface and destroys microorganisms by disrupting their cell membranes.	Meets EPA requirements as a disinfection device with claims (that the company must have but that EPA does not review) to effectively kill a broad range of microorganisms within 3 to 5 seconds, reducing surface-mediated infection risks. Although the TANCS System is not listed on the EPA List N, it is effective against viruses that are more difficult to kill than the virus causing COVID–19 and therefore expected to be effective against the virus causing COVID–19.	Nelson Laboratories, Inc. of Utah certified that a 7-second exposure to TANCS steam vapor produced a 5-to7-log reduction in microbes, which was consistently achieved on all microbes tested. The TANCS System has also been tested by independent researchers and found to be very effective against a variety of microbes.	The system only uses tap water and is designed to get into hard-to-reach areas. Although it has a dry (6%) moisture content, the manufacturer recommends that to reduce risk for mold after use, all surfaces must be dried and rooms must be ventilated and not closed up. Claims to eliminate biofilms and mold. It has a number of attachments for cleaning various surfaces, such as tile, carpet, and more.

Ultraviolet Light (UV)

Ultraviolet light (UV) has been used for decades to destroy airborne microbes (germs). Short-wave ultraviolet light (UV-C) has been used to destroy bacteria and viruses in hospital wards and operating theaters to control superbugs. This must be done overnight or when the areas are unoccupied because of the danger to human health.

UV-C can cause cancer, affects the corneas, and destroys DNA. It uses short-wavelength ultraviolet light (UV-C) to disrupt the viruses' DNA and inactivate essential acids. Although studies verify that it can destroy SARS and other corona viruses and is likely to be effective against the virus causing COVID-19, *it has not been verified at this time and should not be relied upon for destroying the virus causing COVID-19*.

The International Ultraviolet Association (IUVA) has a website, https://iuva.org/IUVA-Fact-Sheet-on-UV-Disinfection-for-COVID-19, dedicated to UV and COVID-19. It provides a fact sheet, FAQs, guidance on the selection and operation of equipment for the UV disinfection of air and surfaces.

Sources

- E-mail correspondence from Tom Morrison, Vice President of Marketing, Kaivac, Inc., 7/10.
- Force of Nature - https://www.forceofnatureclean.com/
- Kaivac, Inc - https://kaivac.com/
- Sylvane, Inc. - https://www.sylvane.com/tancs.html.
- Tersano - https://www.tersano.com/
- International Ultraviolet Association - https://www.iuva.org/IUVA-Fact-Sheet-on-UV-Disinfection-for-COVID-19
- Toxics Use Reduction Institute, Surface Solutions Laboratory - https://www.turi.org/Our_Work/Cleaning_Laboratory
- Burhan K. SaifAddin, Abdullah S. Almogbel, Christian J. Zollner, Feng Wu, Bastien Bonef, Michael Iza, Shuji Nakamura, Steven P. DenBaars, James S. Speck. AlGaN Deep-Ultraviolet Light-Emitting Diodes Grown on SiC Substrates. *ACS Photonics*, 2020; 7 (3): 554 DOI: 10.1021/acsphotonics.9b00600
- IUVA Fact Sheet on the COVID-19 virus - https://iuva.org/resources/IUVA_Fact_Sheet_on_COVID_19.pdf
- University of California - Santa Barbara. "Ultraviolet LEDs prove effective in eliminating coronavirus from surfaces and, potentially, air and water." ScienceDaily, 14 April 2020. https://www.sciencedaily.com/releases/2020/04/200414173251.htm

Chapter 6.C. Using Microfiber Cloths and Mops for Infection Control

Introduction

Microfiber cloths and mops are considered an essential tool in an infection-control program. They are superior at capturing microbes and other organic matter (dirt, food, liquid, etc.) while requiring less cleaning solution and water.

What is Microfiber?

Microfiber is a polyester and nylon (polyamide) fiber that is split many times smaller than a human hair and used to make cleaning cloths and mop heads. The small-size fiber is able to penetrate cracks and crevasses that cotton cloths or paper towels are not able to reach. The increased surface area of the fibers and their star shape enable them to absorb up to 7 to 8 times their weight in liquid. This capillary action is mechanically increased by the scrubbing movements during cleaning. These features also enable the microfiber to pick up grease and oil better than other alternatives.

The fibers have a static electric charge that attracts dust and holds it in a superior manner, rather than spreading it around or releasing it into the air when dry dusting.

The cloths and mops can be washed and reused hundreds of times; however, there is current research underway to determine the efficacy of microfiber after being washed numerous times.

Microfiber comes in different grades for a variety of uses. The term microfiber technically applies to fiber that is 1.0 denier or smaller, but some being sold under the microfiber name has not been split and has a larger denier measurement. The smaller the denier measurement, the finer and more effective the microfiber. Superior microfiber measures 0.13 denier.

When purchasing microfiber, make sure it is from a reputable manufacturer and that the fibers are split and are a smaller denier measurement.

Benefits of Using Microfiber

Infection-control benefits

1. *Ability to capture microbes and minimize microbial growth:* Microfiber is more effective at capturing microbes and dries (sheds water) more quickly than traditional cloths and mops, which helps to prevent the growth of microbes inside the fabric. Several studies have determined that microfiber is better at capturing bacteria than cotton.

   The University of California Davis Medical Center compared the amount of bacteria picked up by a cotton-loop mop and by a microfiber mop. The cotton-loop mop reduced bacteria on the floors by 30%, whereas the microfiber mop reduced bacteria by 99%.

2. *Prevention of cross-contamination:* This common problem in facilities can be reduced by using microfiber mops and cloths. Changing mop pads after each room avoids the opportunity for cross-contamination. Microfiber cloths and mops are available in different colors so that a color-coding system can be implemented for specific uses. For instance, in restrooms, pink cloths can be used for toilets and yellow cloths for sinks.

Green cloths can be used for classroom cleaning. See *Chapter 3.H. Preventing Cross-Contamination*.

Cost-saving benefits

1. The University of California Davis Medical Center study found that initiating a microfiber mopping system also resulted in the following cost benefits:
   - 60% lifetime cost savings for mops
   - 95% reduction in chemical and water usage associated with mopping tasks
   - 20% labor savings per day
2. The Sustainable Hospitals Project at the University of Massachusetts Lowell found similar cost savings:
   - a reduction in water and chemical usage
   - microfiber mop pads last 10 times longer than a cotton-loop mop
   - improved worker productivity

Ergonomic benefits of microfiber mop systems

Microfiber mopping systems consists of a handle and mop pads. Microfiber mop pads are easily detachable using Velcro® or snap-on fastening systems.

The University of Massachusetts Lowell study determined that because the microfiber mopping system uses less water and chemicals, it reduced strain associated with handling water and chemicals and eliminated the need to wring the heavy cotton mops, resulting in less potential for worker injury.

1. *Less weight to handle:* Microfiber mops reduce the amount of weight to be handled because:
   - The handles are ergonomically designed using lightweight metals.
   - A typical cotton-loop mop may weigh 60 pounds when saturated with water, whereas a microfiber mop weighs just over 2 pounds.
   - The mop solution does not need to be changed between rooms, because the dirty mop pad is not immersed in the clean solution. This reduces the need to lift an approximately 30-pound bucket of solution several times a day.
2. *No wringing heavy mops:* Mop heads are changed after cleaning each room, eliminating the need to wring out a conventional mop. Also, due to their higher water-retention capacity, microfiber mop heads do not need to be wrung out.

Advantages: Due to microfiber's numerous advantages, including its long-lasting profile, ability to remove microbes, ergonomic benefits, superior cleaning capability, and reduction in the amount of chemical and water needed, it is considered to be preferable to conventional cotton cloths or paper towels for cleaning tasks.

Washing Instructions

- *Washing:* Microfiber should be washed only with other microfiber materials because it can pull the lint out of cotton or other materials during the washing and drying process. Use a mild laundry detergent, and never use bleach, fabric softener, or dryer sheets because they can degrade the fabric.
- *Drying:* Microfiber can be line dried or dried using the low setting of an automatic dryer.
- *Caution:* Microfiber is flammable and burning microfiber can emit toxic fumes. Therefore, microfiber should be dried only using low heat. Follow the manufacturer's cleaning and management instructions.

Microfiber for Different Tasks

In general, look for microfiber from a reputable company. There are different weaves and weave densities for specific tasks. Ask the vendor about the grading system and which grade is best for specific cleaning tasks.

Hand tasks: dry and wet cleaning and dusting				

- *Glass:* Glass cleaning cloths have a much tighter weave than a dusting or wet cleaning cloth. Many schools have found that using a wet microfiber glass cloth for cleaning the surface and then a dry glass cloth for polishing is effective. In many cases, water is all that is needed. These cloths are also useful for cleaning and polishing stainless steel.
- *Dusting:* These soft fiber cloths require no polish or other chemical while removing up to 99% of dust, dirt, and other materials.
- *Wet cleaning:* Used for all wet cleaning tasks, these require a reduced amount of chemical for effective cleaning. Start by spraying the cloth with a minimal amount of all-purpose cleaner and add more product as needed or dip into a container of cleaning solution. Teachers can use these cloths instead of wipes.
- *High-dusting wands:* Wands reach places that are difficult to access and remove the dirt and dust that has accumulated.

Floor tasks: dry and wet mopping, dust mopping, and scrubbing			

- *Wet mopping:* Use wet mops for classrooms, restrooms, and tiled areas within carpeted spaces. Some microfiber mopping systems have an on-handle solution reservoir for accurate measurement.
- *Dust mopping:* Using microfiber mops can eliminate the need for petrochemical-based dust-mop treatment. Microfiber dust mops with a fringe around the edge are now available. These more closely resemble the conventional loop mops and pick up larger pieces of debris.
- *Floor finishing:* Use microfiber to apply floor finish with a specially designed flat mop that reduces fatigue and that does a better job at applying the product.
- *Scrubbing:* Microfiber floor pads available for auto scrubbers use less water and chemicals while cleaning and polishing more effectively.

For More Information

Green Cleaning for Dummies, by Stephen Ashkin and David Holly, is a comprehensive resource on Green Cleaning.

Resources

1. Environmental Protection Agency, *Using Microfiber Mops in Hospitals*, Environmental Best Practices for Health Care Facilities November 2002. Region 9 Pollution Prevention Program. https://archive.epa.gov/region9/waste/archive/web/pdf/mops.pdf
2. U Mass Lowell, 10 Reasons to Use Microfiber Mopping, https://www.uml.edu/docs/10%20Reasons%20for%20Microfiber%20Mops%20052215_tcm18-187539.pdf

Chapter 6.D. Using Ventilation Technologies to Help Reduce Disease Transmission

Introduction

Contracting an infectious disease is related in part to the number of microbes a person is exposed to. Thus, if the volume of infectious microbes in the air is reduced, so is the risk of contracting a related disease through inhalation. Airborne transmission of diseases can be reduced by proper ventilation and air treatment technologies.

Because microbes attach themselves to particulate matter, this section discusses the use of two ventilation technologies appropriate for use in school buildings to remove bioaerosols. Bioaerosols are biological particles (viruses, bacteria and fungi) about 0.5 to 20 microns in diameter which can stay suspended in the air for an extended period of time and are considered a potential cause of airborne disease.[1]

In their position paper on infectious aerosols, ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers)[a] states that various strategies have been found to be effective to some degree at controlling the transmission of bioaerosols. It is beyond the scope of this document to address those possibilities. Some of these strategies and related mechanicals incur significant capital costs for new HVAC systems, HVAC upgrades, redesign of distribution systems, etc. Due to the status and condition of HVAC and ventilation systems in many older school buildings, these options are not feasible in the short term. Many school buildings do not have any mechanical ventilation systems.

Therefore, this document has focused on possible options for reducing transmission using existing equipment that can possibly be enhanced through the addition of enhanced filtration or an increase in air exchange rates.

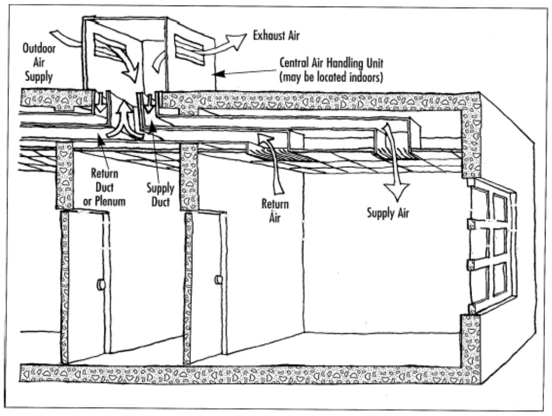
[a] ASHRAE is a global community that focuses on building systems, energy efficiency, indoor air quality, refrigeration, and sustainability within the industry. They set standards for HVAC systems and other forms of technology used to condition the indoor air and address indoor air contaminants.

Increasing Air Exchange to Reduce Transmission of Bioaerosols

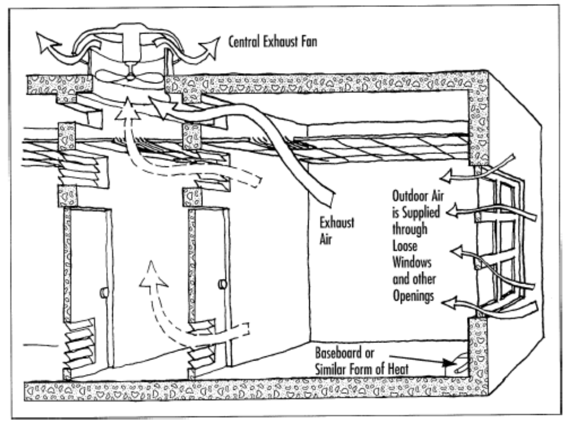
Ventilation Technology	How It Works	Comments
Provides fresh air supply and dilutes and removes a certain percentage of contaminated indoor air using a general mechanical ventilation system. There are passive ventilation systems in older buildings that circulate the air through intentional (e.g., windows) and unintentional openings (e.g., leaks) in the building envelope. Mechanical systems that condition and move the air through the building mechanically are called Heating, Ventilating and Cooling Systems (HVAC). School buildings often have a mix of systems to bring in and condition outdoor air. Although there are numerous configurations, two of the most common HVAC designs in schools are unit ventilators (UV) and central air-handling units (AHU). Both can perform the same HVAC functions, but a unit ventilator serves a single room while the central air-handling unit serves multiple rooms.	An HVAC system includes an outside air intake; filters; fans; ductwork; air exhaust; and vent diffusers/grilles for proper distribution of the air. Some also have humidity modification mechanisms and heating and cooling equipment. One of the HVAC's key roles is to exchange and dilute the indoor air by exhausting a certain percentage of it from the building, replenishing that amount with outside air supply, and recirculating it to all spaces served by that system. Please note that recirculation in an AHU can also circulate contaminants that were not completely removed through this process to all of the spaces served on that system. The amount of outside air exchange per hour can be increased to remove more of the contaminants for infection-control purposes. Any increase in the amount of air exhausted needs to be balanced with the air supply to prevent putting the building under negative pressure.	This option enables the existing HVAC system (while it is operating) to be used as is without modifications to the equipment. It can be modified to increase the air exchanges per hour on an "as needed" basis. Thus, this option only incurs operating costs for increased electricity to run the HVAC system and heat and/or cool an additional amount of air. Capital costs are not incurred. Please note that not all school buildings have mechanical systems, or have HVAC systems that are operational, or operate at an optimum level. Also, ASHRAE states: "However, it remains unclear by how much infectious particle loads must be reduced to achieve a measurable reduction in disease transmissions (infectious doses vary widely among different pathogens) and whether these reductions warrant the associated costs (Pantelic and Tham 2011; Pantelic and Tham 2012)."[2]

Illustrations of the Various Types of Systems and Configurations of Systems in School Buildings

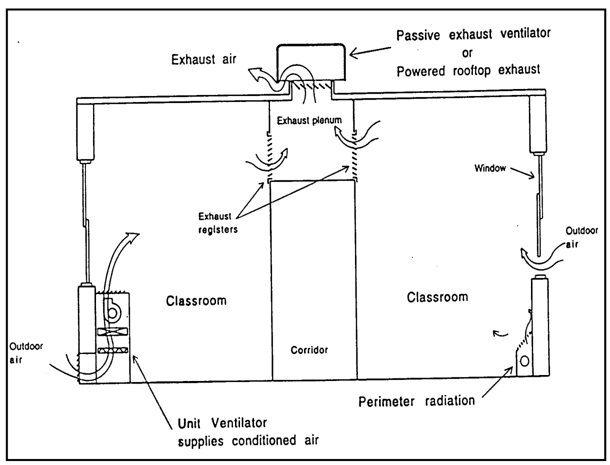
Central Air Handling System



Exhaust Only System



Typical School HVAC Design



Source for graphics: EPA Tools for Schools

Note: Buildings with Partial or No Mechanical Ventilation Systems

Buildings that are fully or partially naturally ventilated may use operable windows for providing or supplementing fresh air supply; therefore, their airflow and air exchange is affected by intentional and unintentional openings in the building envelope. The airflow and air distribution patterns in these buildings is variable and unpredictable. Thus, the ability to actively manage risk in such buildings using ventilation is much reduced.

These are circumstances where air treatment systems have been considered.

Increasing Filtration Levels to Reduce Transmission of Bioaerosols

Ventilation Technology	How It Works	Comments
Filtration, the physical removal of particulates from air, is the first step in achieving acceptable indoor air quality. It is the primary means of cleaning the air.[3] The level of filtration can be increased to filter out microbes, which are microscopic. Note that filters in HVAC systems were originally designed to protect the equipment.	Droplets from sneezing, coughing, and talking can dry out and stay suspended in the air. These droplets produce particles ranging in size from 1–5 µm (microns). Filtration is measured by MERV Rating (Minimum Efficiency Reporting Value) established by ASHRAE. The rating uses a scale of 1-16 to represent how effectively the filter traps particles. The higher a rating, the higher the number of particulates the filter traps.	The equipment must be designed to handle a higher-rated filter based on its fan power. Increased filtration increases the resistance to air flow through the filter, requiring the HVAC system to be able to generate a stronger air flow. Many older HVAC systems do not have the capacity to use an optimum level of filtration. If the system cannot handle the higher filtration, it can operate inefficiently and become overworked.

How to Select a MERV Rating for Filters

Due to discrepancies in manufacturers' claims for contaminants the various MERV rated filter can filter out, check the ANSI/ASHRAE Standard 52.2 "Understanding MERV" User Guide created by the National Air Filtration Association (NAFA). NAFA is an international group of air filter distributors, manufacturers and engineers. This Guide, and the application of a particle-based contaminant removal standard prescribed by ANSI/ASHRAE Standard 52.2-2017 "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size," are intended to assist end-users and specifiers in their selection of appropriate air filtration products and understanding of the MERV values in the 52.2 test reporting.
This information is available at https://www.nafahq.org/understanding-merv-nafa-users-guide-to-ansi-ashrae-52-2/.

Below is an example of a chart by a filter manufacturer to illustrate what the various levels of MERV rated filters can do. One note illustrated below is the statement that a MERV 13 rated filter can filter out virus carriers. Other manufacturers claim that you need a MERV rating of 16 to filter out viruses. Viruses range in sizes from 5 to 300 nanometers. ASHRAE states a MERV 13 rated filter is a good choice if the HVAC system can handle a filter this efficient.

source: https://unitedfilter.com/blogs/news/what-does-merv-rating-mean

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Position on Increased Filtration[2]

The use of highly efficient particle filtration in centralized HVAC systems reduces the airborne load of infectious particles.[4] This strategy reduces the transport of infectious agents from one area to another when these areas share the same central HVAC system through supply of recirculated air.

When appropriately selected and deployed, single-space high-efficiency filtration units (either ceiling mounted or portable) can be highly effective in reducing/lowering concentrations of infectious aerosols in a single space.

Filtration will not eliminate all risk of transmission of airborne particulates because many other factors besides infectious aerosol concentration contribute to disease transmission.

Research on Ventilation Rates and Reduction in Disease Transmission

A multidisciplinary expert panel reviewed 40 studies conducted between 1960 and 2005 and concluded that higher ventilation rates reduced the transmission and spread of infectious agents in buildings.[5] In their report, the authors of the report recommended that schools and similar high-density facilities increase their ventilation rates during peak influenza season. Although the authors found that there was strong and sufficient evidence to demonstrate the association between ventilation, air movement in buildings, and the transmission/spread of infectious diseases such as measles, tuberculosis, chickenpox, influenza, smallpox, and severe acute respiratory syndrome (SARS), they found that there was not enough research to specify the ventilation requirements in schools.[5]

In addition, a controlled study in office buildings found a link between short-term sick leave, often associated with respiratory illness, and low ventilation rates. Occupants of buildings with low ventilation rates and high occupant densities experienced far higher rates of respiratory illness than did occupants of similar buildings with higher ventilation rates.[6]

ASHRAE Recommendations

ASHRAE leadership has approved the following two statements regarding transmission of SARS-CoV-2 and the operation of HVAC systems during the COVID-19 pandemic.

1. Transmission of SARS-CoV-2 through the air is sufficiently likely that airborne exposure to the virus should be controlled. Changes to building operations, including the operation of heating, ventilating, and air-conditioning systems, can reduce airborne exposures.
2. Ventilation and filtration provided by HVACs can reduce the airborne concentration of SARS-CoV-2 and thus the risk of transmission through the air. Unconditioned spaces can cause thermal stress to people that may be directly life threatening and that may also lower resistance to infection. In general, disabling of heating, ventilating, and air-conditioning systems is not a recommended measure to reduce the transmission of the virus.

In the 4/14/20 Position Document on Infectious Aerosols, ASHRAE notes that "An HVAC system's impact will depend on source location, strength of the source, distribution of the released aerosol, droplet size, air distribution, temperature, relative humidity, and filtration."

Project Recommendations

1. Consult with an HVAC Engineer - to obtain an accurate assessment of the building's current HVAC system capacity and condition, and what the building needs to provide adequate ventilation during normal operating conditions and during pandemic conditions.

2. Consider the following options - to improve indoor air quality in consultation with the HVAC Engineer:

    1. Increase Air Changes Per Hour - To accomplish an increase in air changes per hour (ACH), check the number of air exchanges per hour the current system is programmed for, and determine whether the air exchanges per hour can be increased when needed.[7] You can view ASHRAE's most recent *Standard 62.1-2019 -- Ventilation for Acceptable Indoor Air Quality* for free on their website to find recommended ventilation rates for school spaces. Go to

https://www.ashrae.org/technical-resources/standards-and-guidelines to find this standard to review.

2. Increase Filtration Levels:

   - Identify the Minimum Efficiency Reporting Value (MERV) rating of the filters, and determine the highest MERV-rated filter that the system can accommodate. The higher the MERV rating, the more it will filter the air.[7]
   - Consult the *Recommended Filtration Practices for Schools*, by the National Air Filtration Association, which can be downloaded from https://www.nafahq.org/wp-content/uploads/Schools-Secured.pdf.
   - Consult the *Filtration for Higher Education Complexes* by the National Air Filtration Association, which can be downloaded from https://www.nafahq.org/wp-content/uploads/Higher-Education-Complexes-Secured.pdf. It provides information on more types of HVAC units that the document for schools.

3. Increase System Efficiency – Use the EPA's "Tools for Schools Ventilation Checklist and Log" for overall evaluation of the school's heating, ventilating, and air conditioning system, available at https://www.epa.gov/iaq-schools/ventilation-checklist-indoor-air-quality-tools-schools.

Ventilation Resources for School Districts to Mitigate Transmission of SARS-CoV-2

Overview

The following list of resources and information provides more in-depth information and tools to further help school districts to understand and prevent the transmission of SARS-CoV-2 by assessing and addressing ventilation and air treatments in their buildings.

Resources

- **COVID-19 Guidelines from ASHRAE**

  ASHRAE is considered the industry leader in North America producing the most current COVID-19 guidelines and best practices to prevent indoor transmission of airborne pathogens such as SARS-CoV-2. Latest COVID-19 Workplace Guidance from ASHRAE:

  - Schools and Universities

    https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-reopening-schools-and-universities-c19-guidance.pdf

  - Guidance for Building Operations During the COVID-19 Pandemic

    https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-reopening-schools-and-universities-c19-guidance.pdf

  - ASHRAE Resources Available to Address COVID-19 Concerns

    https://www.ashrae.org/about/news/2020/ashrae-resources-available-to-address-covid-19-concerns

- **"Reducing the Risk of COVID-19 Using Engineering Controls"**

  A seven-page guidance document explains the importance of engineering solutions, such as ventilation to reduce the risk of COVID-19. It provides details on air change rates and high efficiency filtration systems.

  American Industrial Hygiene Association (AIHA) Guidance Document, August 28,2020

  https://aiha-assets.sfo2.digitaloceanspaces.com/AIHA/resources/Guidance-Documents/Reducing-the-Risk-of-COVID-19-using-Engineering-Controls-Guidance-Document.pdf

- **"Indoor Ventilation and Reducing Transmission of COVID-19 (SARS-CoV-2)"**

  The fact sheet briefly explains airborne transmission of the virus and use of ventilation and air treatment systems to mitigate transmission of the virus.

  MFL Occupational Health Centre (OHC)

  https://ohcmb.ca/wp-content/uploads/2021/06/Indoor-Ventilation-COVID-Fact-Sheet.pdf

- **Ventilation Checklist (COVID-19)**

  This checklist that follows the NIOSH Hierarchy of Controls and can be used as a guide to assess the suitability of ventilation in the workspace/building that are to be occupied. This checklist references AHSRAE information in addition to other sources.

  Occupational Health Clinic for Ontario Workers.

  https://www.ohcow.on.ca/wp-content/uploads/2021/12/ventilation_checklist_generic_final_fillable.pdf

Articles

Overview

Below are links to peer-reviewed evidence-based research on the aerosol transmission of SARS-CoV-2 and indoor ventilation best-practices. Note that some of these articles were written during the time when airborne transmission of SARS-CoV-2 had not yet been verified. They provide excellent information on how the virus is transmitted.

- **It Is Time to Address Airborne Transmission of Coronavirus Disease 2019 (COVID-19).**

  Article was written at the time when the guidance from international and national bodies focused on hand washing, maintaining social distancing, and droplet precautions, and did not recognize airborne transmission except for aerosol-generating procedures performed in healthcare settings. The article appealed to the medical community and national and international bodies recognize the potential for airborne spread of COVID-19.

  Lidia Morawska, Donald K Milton, *Clinical Infectious Diseases*, Volume 71, Issue 9, 1 November 2020, Pages 2311–2313,

  https://academic.oup.com/cid/article/71/9/2311/5867798

- **Analysis - Two metres or one: what is the evidence for physical distancing in covid-19?**

  Discusses why rigid safe distancing rules are an oversimplification based on outdated science and experiences of past viruses.

  Nicholas R Jones, Zeshan U Qureshi, Robert J Temple, Jessica P J Larwood, Trisha Greenhalgh, Lydia Bourouiba, *BMJ* 2020;370:m3223

  https://www.bmj.com/content/bmj/370/bmj.m3223.full.pdf

- **Recognition of aerosol transmission of infectious agents: a commentary**.

  Discusses the concepts and definitions of aerosols and large droplet transmission.

  Tellier, R., Li, Y., Cowling, B.J. *et al.* *BMC Infect Dis* **19,** 101 (2019).

  https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-019-3707-y

- **Reducing transmission of SARS-CoV-2.**

  Discusses why control measures are important to address the transmission of aerosols.

  Kimberly A., Pratherchia C. Wang, and Robert T. Schooley, *SCIENCE,* 27 May 2020, Vol 368, Issue 6498, pp. 1422-1424

  DOI: 10.1126/science.abc6197

Videos

- **Airborne Transmission of SARS-CoV-2: A Virtual Workshop.** This Environmental Health Matters Initiative (EHMI) workshop delved into the science on the spread of the virus, as part of a larger body of COVID-19 related work at the National Academies available at https://www.nationalacademies.org/topics/covid-19-resources.

  Experts from the National Academies of Sciences Engineering Medicine in aerosol science, virology, infectious disease, and epidemiology discussed questions such as:

  - Whether the virus be transmitted through speech and exhaled breath?
  - How long do aerosols containing the virus linger in the air?
  - How far can these aerosols travel?

  https://www.nationalacademies.org/event/08-26-2020/airborne-transmission-of-sars-cov-2-a-virtual-workshop

- **Let's talk about transmission of respiratory infectious diseases**. This presentation used animation to clearly illustrate aerosol and droplet transmission of SARS-CoV-2, and what types of distances are required to minimize exposures.

  Video Text by Professor. Shelly Miller, University of Colorado Boulder, drawings and editing by Professor Marina Vance, University of Colorado.

  https://youtu.be/AGQYlrXzVJQ

- **How Can Airborne Transmission of COVID-19 Indoors be Minimized?** Discusses transmission and technologies to mitigate transmission.

  Video by Shelly L. Miller, Ph.D., Professor of Mechanical Engineering, and faculty in the Environmental Engineering Program at the University of Colorado Boulder.

  https://youtu.be/jK6Cef5A8FQ

- **How is COVID-19 Being Transmitted? How and Why Has This Changed Over the Course of This Pandemic?** Chronicles how the knowledge about transmission of the SARS CoV-2 virus has changed since its emergence, and the challenges of communicating the new information and protocols to the global community.

  Kim Prather, Director of The NSF Center for Aerosol Impacts on Chemistry of the Environment, is an Atmospheric Aerosols expert.

  https://youtu.be/d3ssV9JDE_k ,

References

1. A. Skinner, Microbes in Air and Bioaerosols presentation, University of North Carolina, School of Public Health, https://slideplayer.com/slide/9353409/

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Sources for some of the ventilation articles are from the MCL Occupational Health Centre, https://ohcmb.ca/ and Dorothy Wigmore, Occupational Hygienist.

Appendix A.1. Cleaning for Healthier Schools: Best Practices

Introduction

The Cleaning for Healthier Schools (CfHS) program was developed to assist facilities in their transition to less-toxic cleaning products and improved practices. It is a cleaning program designed to protect public health without adversely affecting the health of staff, building occupants, and the environment.

Best practices include a familiarity with the science of cleaning. Cleaning with detergent, microfiber, and friction removes organic matter (soil) and contaminants, including microbes. Frequent cleaning of high-risk or high-touch surfaces reduces the risk of building occupants coming into contact with these microbes.

Recognized experts in infection control recommend that cleaning surfaces with microfiber cloths and mops and a detergent such as an all-purpose cleaner can be very effective at removing microbes. One study found that microfiber mops (compared with cotton string mops) demonstrated superior microbe removal when used with a detergent cleaner and that the use of a disinfectant did not further improve microbial elimination when microfiber mops were used.[1]

Recommendations

1. Choose "green" (third-party certified) cleaning and maintenance products, including:
    - Cleaners certified by an independent third-party such as Green Seal, Safer Choice or UL ECOLOGO®
    - Disinfectants that carry the Environmental Protection Agency's (EPA) Design for the Environment (DfE) seal on the label
2. Practice state-of-the-art cleaning methods (best practices), such as:
    - Green Seal GS-42 Standard for Cleaning Services (https://www.greenseal.org/green-seal-standards/gs-42)
    - New York State Green Cleaning Program (https://greencleaning.ny.gov/Practices.asp)

Further Reading

Ashkin, S. and Holly, D. *Green Cleaning for Dummies ISSA Special Edition*. Indianapolis, Indiana: Wiley Publishing, Inc.; 2007.

Appendix A.2. Cleaning for Health: Program Components Checklist

Use this checklist to determine what components a facility has implemented and what still needs to be phased in.

___ Best practices

- ❐ NY State Best Practices for Schools https://greencleaning.ny.gov/bestPractice.aspx
- ❐ Vacuum entryway mats on a daily basis
- ❐ Review the Green S Commercial and Institutional Cleaning Services Standard 42 for other practices (https://greenseal.org/standards/gs-42-commercial-and-institutional-cleaning-services/)
- ❐ Monitor chemical usage

___ Cleaning chemicals for everyday use

- ❐ Third-party-certified cleaning chemicals
  - One concentrate that is diluted for the following tasks:
    - bathroom/restroom cleaner
    - all-purpose cleaner
    - carpet spotter/extraction cleaner
    - glass and window cleaner
    - neutral floor cleaner
  - One heavy-duty cleaning product

___ Hand soaps

- ❐ Third-party-certified hand soap (not antibacterial)

___ High-efficiency particulate air filter vacuum cleaners

- ❐ Air flow greater than 90 cubic feet of air per minute per square foot
- ❐ Capture 96% of particulates 0.3 microns in size

___ High-filtration floor care equipment (not gas fueled)

- ❐ Cord electric and battery floor buffers
- ❐ Cord electric and battery burnishers

___ Microfiber

- ❐ cloths
- ❐ high-dusting tools
- ❐ wet mops and dry mops
- ❐ determine how the microfiber will be laundered

___ Systems to prevent cross contamination:

- ❐ Mop buckets or systems that separate clean and dirty water
- ❐ Microfiber charging systems – a container with cleaning or disinfecting solution that is used to immerse cloths, trowel pads and mop heads to saturate them. The system involves loading the charging bucket with items, adding cleaning solution, closing the lid, and turning it over to evenly saturate mop heads. There are manual and mechanical systems to insert and dispense the items. They have been used to quickly clean cafeteria tables and other surfaces. Attributes of these systems are that they:

  - require no touch or wringing,
  - provide an even saturation of a large number of items in a short time,
  - use minimal chemical solution, and
  - enable fast attachment and removal of mop heads from mop frames.

___ Multilevel scraper walk-off mats with rubber backing

- ❐ Inside of entryways (and outside where possible)
- ❐ Span the entire entryway
- ❐ 15 to 20 feet long, where applicable
- ❐ Rotated on an appropriate schedule for weather conditions

___ Powered equipment

- ❐ Sound levels less than 70 decibels
- ❐ High-filtration vacuum attachments
- ❐ High efficiency/low emission motors
- ❐ Microfiber pads, where appropriate

___ Specialty cleaning products

- ❒ DfE certified environmentally preferable disinfectant
  - EPA List N Approved for COVID-19
  - rated 0–1 on the Hazardous Materials Identification System (HMIS) health rating scale
- ❒ Bioenzymatic cleaner for protein (e.g., urine)
- ❒ Urine neutralizer (instead of disinfectant)
- ❒ Third-party-certified floor care products
  - wax stripper
  - floor sealer and finish
  - baseboard stripper
- ❒ Third-party-certified graffiti remover
- ❒ Third-party-certified descaler (toilets, etc.)
- ❒ Third-party-certified whiteboard cleaner and markers
- ❒ Others

___ Training programs

- ❒ Best work practices training for cleaning and disinfecting
- ❒ Cleaning for health, safety, and appearance (including infection control)
- ❒ OSHA Personal Protective Equipment (PPE)
- ❒ OSHA Bloodborne Pathogen training
- ❒ OSHA Hazard Communication training (must provide for all products used)
- ❒ PPE for infection control
- ❒ Cleaning Equipment operator and maintenance training
- ❒ Multilingual training for non-English-speaking work staff
- ❒ Department, teacher, and other support staff training during a pandemic, as departments other than custodial and food service may become involved in the infection control program and require training (e.g., IT department using alcohol to decontaminate electronics)

TIP on PPE Training: This information can be provided as part of the Hazard Communication Training on PPE used for chemical safety.

Supplies recommended or required for preventing the spread of infectious diseases can be provided as part of Infection Control training.

___ Trash and recycling programs

- ❒ Trash management as part of infection control protocols
  - Standardized waste receptacle sizes
  - Proper-size liners for receptacles
  - Dedicated receptacles for recycled-product types
  - Lidded trash receptacles
  - Hands free lid

___ Washroom paper products

- ❒ Third-party-certified for boxed facial tissue, toilet paper, and dispenser roll or multifold towels
- ❒ Third-party certified /controlled-use dispensers
- ❒ Tissue and towels on large rolls

Appendix A.3. Program Planning Handout: Cleaning for Healthier Schools and Infection Control

Introduction

There are many challenges in maintaining a school in a safe, healthy, and effective manner and in conducting infection-control practices in the face of an infectious-disease outbreak. A CfHS program will help schools to prepare for and respond to an infectious disease/ pandemic episode. It is essential to have a disinfection plan in place as part of the CfHS program infection-control protocol. When a pandemic episode occurs in the school, the plan would outline the appropriate steps to take, avoiding the pressure to use inappropriate disinfecting methods.

Disinfectants are Environmental Protection Agency (EPA)-registered pesticides designed to kill or inactivate microbes (germs). The overuse or misuse of disinfectants can pose a health hazard because they contain toxic ingredients. Some common disinfectant ingredients have been identified as respiratory irritants; others are considered asthmagens.

Not all microbes are harmful (pathogenic). In fact, most are harmless (nonpathogenic) and many are even helpful because they perform such tasks as helping our digestive system to function effectively and stimulating the development of a healthy immune system. In addition, beneficial microbes are used in the fermentation process that creates bread, beer, cheese, and yogurt.

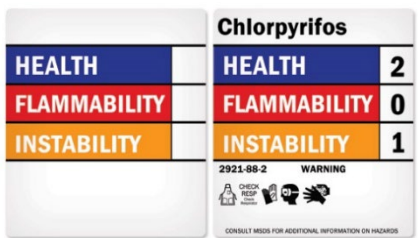
The CfHS program was developed to assist school facilities in enhancing their cleaning systems through the use of less-toxic cleaning products, state-of-the-art supplies and equipment, and improved cleaning practices. The program seeks to educate staff on the impacts that dirt, biological contaminants, cleaning products, cleaning equipment, and practices have on human health. It offers cost-effective, successful cleaning and disinfecting strategies to protect against infectious disease without adversely affecting the health of staff, building occupants, and the environment.

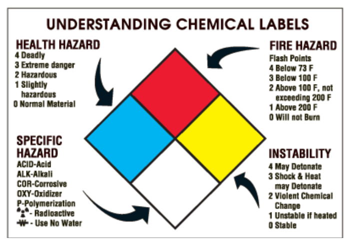
Types of Infectious Diseases Commonly Found in Schools

- Common cold – spread by cough, sneeze, and contact with objects on which microbes have landed
- Diarrhea illnesses – spread by fecal-oral contact, consuming food or drinks contaminated with feces, touching diarrhea or vomit, or breathing air from the same room in which someone has just vomited
- Mononucleosis – spread by mouth-to-mouth contact; sharing drinks, drinking cups, and other objects
- Strep throat – spread by cough, sneeze, and contact with objects on which microbes have landed
- Flu strains (including SARS-CoV-2) – spread by aerosols, cough, sneeze, and contact with objects on which microbes have landed

Program Recommendations

1. Form an Environmental Health and Safety Committee or use an existing committee (Wellness, Safety, etc.) made up of representatives from the school community (e.g., school nurse, facilities manager, athletic director, teacher, representatives from custodial and teachers' unions, administrator).
2. Implement a CfHS program and select cleaning products certified by an independent third party such as Green Seal, Safer Choice, or UL ECOLOGO®.
3. Select products certified by Design for the Environment or the least hazardous product in its class for disinfecting. Some companies state on their Safety Data Sheet or product label the Hazardous Materials Identification System (HMIS) or National Fire Protection Association (NFPA) graphic that rates their product on a spectrum from 0 to 4, with 0 being the least toxic. You can use this rating system to identify a low hazard rating of 0 to 1.





For cleaning products look for the following signal words on the Safety Data Sheet:

- ❒ Danger
- ❒ Warning

For disinfectants and sanitizers look for these signal words on labels:

Danger Level	Signal Word	Meaning
most dangerous ↓ safest	Poison	Highly toxic
	Danger	Extremely flammable, corrosive, or highly toxic
	Warning	Moderate hazard
	Caution	Mild/moderate hazard

4. Practice state-of-the-art cleaning strategies and methods (best practices), such as the Green Seal GS-42 Standard for Cleaning Services, a comprehensive program that can be customized by schools for their in-house staff.
5. Use advanced-technology equipment to reduce the need for chemicals and to improve indoor air quality.
   - Microfiber mops/cloths
   - High-filtration vacuums and vacuum attachments on floor care equipment
   - Floor care equipment with stripping pads to reduce the use of chemical floor strippers. Please note that vinyl asbestos flooring must be wet stripped.
   - Auto scrubbers

- Hands-free cleaning restroom equipment (e.g., units that spray and vacuum up water in a restroom)
- Chemical-free systems such as steam vapor devices or liquified ozone
- Walk-off mats to prevent dirt, pesticides, and other debris from being tracked into and throughout the facility

6. Develop a disinfection policy and related protocols so that all school stakeholders understand the issues and the approved practices.
   - **School staff should not be allowed to bring in disinfectant products from home.** *See Appendix D: Cleaning and Disinfecting by School Department Staff* that will provide guidance for staff to remove personal items safely if it is prohibited for them to bring them in.
   - Disinfection should be conducted by the custodial staff as part of their cleaning protocol, except in certain circumstances delineated in the policy. It is not recommended that staff other than custodians use and store disinfectants; however, if other staff are allowed to disinfect, the school should review *Appendix D: Cleaning and Disinfecting by School Department Staff* for detailed guidance on issues to be addressed in each department, the type of products relevant for that department and specific use guidance. At a minimum, the school should do the following:
     1. determine who will supply the product and how it will be refilled,
     2. supply an approved disinfectant product in a properly labeled container,
     3. train staff in its proper use and management, including when to use it,
     4. provide recommended personal protective equipment if required, and
     5. ensure that disinfectants are stored securely with compatible products.

     Improper storage of disinfectants is a major problem in classrooms, where toxic combinations of products are stored together and accessible to students. See *Chapter 3.I. Development of Protocols, Storing Disinfectant Products*.

Overview of Best Cleaning Practices

Cleaning with a detergent and a microfiber mop/cloth and using friction removes organic matter (soil) and contaminants, including microbes (germs). Frequent cleaning of high-risk and high-touch surfaces (see definitions below) reduces the risk of coming into contact with infectious microbes.

Recognized experts in infection control recommend that cleaning surfaces with microfiber cloths and mops and a detergent such as an all-purpose cleaner can be very effective at removing microbes. One study found that microfiber mops (compared with cotton string mops) demonstrated superior microbe removal when used with a detergent cleaner and that the use of a disinfectant did not further improve microbial elimination when microfiber mops were used.[1]

Overview of Best Disinfection Practices

Disinfectants are still needed on certain surfaces and under certain circumstances, but their use should be determined by a policy that specifies when and where disinfecting is appropriate.

Many facilities choose to use a combination disinfectant/cleaner to minimize the number of products and the number of steps required to clean and disinfect the building. Even though combination products (to clean and disinfect) have been developed, it is essential to **clean a surface first and then apply the disinfectant**.[2] Some disinfectants lose effectiveness in the presence of dirt, dust, and other organic matter. The disinfectant should be left on the surface for the recommended amount of contact or dwell time and then rinsed or wiped (if recommended). Because different products have different contact times, ranging from 30 seconds to 10 minutes, the label instructions must be checked.

Cleaning first and then applying the disinfectant for the recommended contact time ensures that the surface is truly being disinfected and that microbial resistance is not being created. When the disinfectant is not allowed the full contact time, the microbes that survive may develop resistance to the disinfectant and become superbugs that cannot be controlled by that disinfectant. **Always follow the manufacturer's instructions found on the product label.**

Disinfecting Policy and Protocols

When illness breaks out in a school, there may be pressure on the staff to try to eradicate the problem with disinfectants. Exposing occupants unnecessarily to toxic pesticides is a result of using disinfectants when they are not needed, in the wrong concentration or incorrectly.

Policy Criteria

- Identify school personnel (e.g., custodian, nurse) responsible for disinfecting.
- Develop cleaning, sanitizing, and disinfecting guidelines that promote cleaning; limit the use of disinfectants and sanitizers whenever possible to bloodborne pathogens cleanup, high-risk areas, diapering areas, and food preparation surfaces where disinfection or sanitization is required. Include special guidelines in case of a pandemic outbreak.
- Write a procedure for designated staff to follow (e.g., clean first, then disinfect, leaving the product on the surface for the specified contact time).
- Disseminate the cleaning and disinfection policy and related protocols so that all school stakeholders understand the issues and the approved practices.
- Allow only EPA-registered disinfectants that have been approved by the stakeholder committee for use in the facility. Prohibit the use of cleaning and disinfecting products that have been brought in by staff or parents without school review and approval.
- Avoid using products with a strong scent that may trigger asthma and allergy complaints. Scented products may also contain known hormone disruptors (substances that interfere with our endocrine system and can cause reproductive issues, early female development,

thyroid disorders, polycystic ovarian syndrome, genital deformities in newborn boys, etc.).

- Microfiber is recommended for use with disinfectants and can help prevent cross-contamination. Avoid using sponges in a school setting because they are difficult to disinfect. For more information, see *Chapter 6. Equipment for Infection Control, Using Microfiber Cloths and Mops for Infection Control*. Success of a microfiber program in large part is the implementation of a laundering program. Options include:
  - Launder cleaning cloths and mop heads/pads daily, separate from other laundry.
  - Establish a laundry program. This is essential to ensure that cloths are clean. Options for laundering microfiber include:
    - In school - wash by hand or in a washing machine; hang to dry or use a dryer. See *Chapter 6. Equipment for Infection Control, Using Microfiber Cloths and Mops for Infection Control* for information on how to launder the microfiber. There are special small potable non-plumbed units designed for microfiber cleaning if plumbed washers are not available.
    - Use a laundry service to wash and dry microfiber owned by the school or rent microfiber from the company. This is especially important when dealing with an infectious disease to minimize staff handling of items. Please see comparison of the options below when using a laundry service:

Considerations	Customer Owned Goods	Rent
Quality	The school decides when to replace it.	Company will make items last as possible. Unless in contract, you won't receive the same items back and have no way of knowing what they were used for.
Selection	The school has open ended options.	Choices may be more limited (e.g., color coded, denier quality, sizes)
Inventory Control	The school must track items sent and returned, and pays to replace lost items.	You must track amount sent and returned.
Cost	Purchasing in bulk wholesale might cost $0.60 each for replacement wipers. The school bears the cost of detergent, water, and electricity.	Provision and laundering might cost $0.15 per item per week. Cost included of detergent, water, and electricity

Considerations	Customer Owned Goods	Rent
Item Replacement Costs	Higher	Lower

- Schedule disinfecting when there are the fewest number of occupants whenever possible. For example, disinfect only after school hours except in the case of an incident involving vomit, feces, bloodborne pathogens clean-up, or as written in the protocol to control a pandemic outbreak (see *Appendix D: Cleaning and Disinfecting by School Department Staff*).

Disinfection Protocol

1. **Select** – Identify the least toxic product that will control the targeted microbes (e.g., H1N1, methicillin-resistant *Staphylococcus aureus,* SARS-CoV-2). Look for a Hazardous Materials Information System (HMIS) or National Fire Protection Association (NFPA) hazard rating of 0 to 1, found on the product's label and/or Safety Data Sheet (SDS).
2. **Clean** – Clean the surfaces to be disinfected with a third-party-certified all-purpose cleaner and a microfiber cloth. Rinse or wipe the surface as required.
3. **Ventilate** – Make sure there is ventilation in the work area (an open window or an operating heating, ventilating, and air conditioning system). For additional guidance related to COVID-19, see *Appendix H: Using Ventilation to Control Infectious Disease*.
4. **Wear protection** – Use personal protective equipment, such as chemically resistant gloves, if required by the label.
5. **Dilute the product –** Follow the label instructions for the proper dilution ratio if the product is a concentrate. Follow the manufacturer's instructions exactly. If using a concentrated product, do not add more concentrate hoping to create a more effective or stronger solution. Not only is this practice wasteful, but it can be less effective and may leave behind a harmful residue that could cause skin rashes and other harmful health effects for students and staff.
6. **Apply to the surface –** Use a pump spray bottle or squirt bottle to apply the product unless label directions state otherwise:
    a. Saturate the microfiber cloth with the disinfectant and wipe the surface, leaving a wet film. Make sure there is enough disinfectant on the cloth to cover the surface to be disinfected and to ensure that it will remain wet for the required contact time. This method of spraying into the cloth minimizes the dispersion of product into the air where it could be inhaled.
    b. Squirt the solution directly onto the surface and use a microfiber cloth to distribute evenly if this method is stated on the label.

7. **Let the contact time elapse** – Leave the disinfectant on the surface for the required amount of contact time (time needed for the disinfectant to kill the microbes) as listed on the product label.
8. **Remove residue** – Rinse or wipe the surface if the product label states that this procedure is required. Rinsing removes any toxic residue that may be left on the surface that could be transferred to skin. Not all disinfectants leave a residue.
9. **Allow to dry** – Allow the surface to dry before use.

Cleaning and Disinfection Protocols for Outbreaks of Infectious Disease/Pandemics

A **three-pronged strategy** made up of the following components is the best way to prevent the transmission of disease in the school setting while minimizing exposure to hazardous infection-control products:

1. Personal hygiene – building occupant responsibility – students and staff should be educated on the following:
    - Proper hand hygiene (see *Appendix A.5. Understanding Hand Hygiene*)
    - Cough etiquette and respiratory hygiene (see http://www.cdc.gov/flu/school/ and https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/about-face-coverings.html)
    - Distancing procedures – keep the distance recommended by the CDC from others who are sneezing or coughing depending on the microbe
    - Isolation and quarantine (see https://www.cdc.gov/quarantine/index.html)
2. Reducing Airborne transmission – ventilation is an essential part of infection control. See Chapter 6. *Equipment for Infection Control. D. Using Ventilation Technologies to Help Reduce Disease Transmission* for information.
3. A comprehensive Cleaning for Healthier Schools program with a disinfection strategy and protocols.

Expert Perspective on the SARS-CoV-2 (COVID-19) Virus

- Because SARS-CoV-2 was a new type of virus, we were learning about it as it developed. Check the Centers for Disease Control and Prevention (CDC) website at https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/index.html for the latest information.
- Schools should continue to clean and disinfect school buildings according to the regular schedule. **Additional disinfection beyond routine cleaning is not recommended unless specifically required by the CDC**. High-touch surfaces and items and high-risk areas should be cleaned with the products that are routinely used for these surfaces.[3]
- Viability of virus in the environment:
    - Although the SARS-CoV-2 virus might be viable on a surface for days depending on conditions (e.g., the type of surface, exposure to sunlight, temperature, humidity) it is not clear how well it transmits the virus. CDC in their *Science*

Brief: SARS-CoV-2 and Surface (Fomite) Transmission for Indoor Community Environment 4/5/21, found that studies suggest "that the risk of SARS-CoV-2 infection via the fomite transmission route is low, and generally less than 1 in 10,000, which means that each contact with a contaminated surface has less than a 1 in 10,000 chance of causing an infection."

- SARS-CoV-2 virus in aerosolized form can remain in the indoor air for up to 3 hours, depending on the conditions in the space (e.g., ventilation, relative humidity, etc.).[4]

- If there is an outbreak of the SARS-CoV-2 virus in your school, consult with the CDC and state health departments for guidance.

Recommendations for Surfaces to be Cleaned and Disinfected

- Use disinfectants (preferably when no students or other staff members are present) as required by law and in high-risk areas.
- Clean high-touch surfaces or touch-points more often during the day with a third-party-certified all-purpose cleaner and a microfiber cloth. For in depth guidance, designed to be provided to each type of classroom and department, see *Appendix E: Common High-Touch Points by Location*. At a minimum, here are general guidelines:

1. *Common **high-touch surfaces** in schools*

   These are surfaces that are frequently touched by a *variety* of hands. For example, a surface such as a desktop that is touched daily by only one student might be touched often but is not considered an area to be managed for infection control, because no one else would be exposed to those microbes. Areas that might be touched frequently by many different hands include but are not limited to:

   - A shared computer mouse and keyboard
   - Shared musical keyboards and instruments
   - Shared desks
   - Doorknobs, elevator buttons, light switches, door push bars, handrails
   - Faucet handles, toilet handles, toilet stall door locks, towel dispensers, hand dryers
   - School bus doors and railings
   - Coffee pots, microwave doors, refrigerator doors, cafeteria trays and tables

2. *Common **high-risk areas** in schools*

   Some areas of a school building are of greater concern for possible transmission of disease because there is an increased likelihood of skin-to-skin, object-to-mouth, or fecal-to-oral contact. High-risk areas also include any location where food is prepared, sick or preschool children are cared for, or special incidents (such as those involving blood, feces, and vomit) have occurred. High-risk areas include but are not limited to:

- Athletic departments – gym mats, exercise equipment, and shower and locker rooms
- Restrooms, kitchens, and lunchrooms
- Nurses' offices and COVID-19 isolation rooms
- Childcare and preschool centers
- School buses

Protocols

Cleaning desktops

- Wash desks with a third-party-certified all-purpose cleaner and a microfiber cloth.
- Rinse and/or wipe desks if required.
- Rinse cloth in clean water after each desk or use a new clean surface from a folded cloth.
- Reapply the cleaning solution for the next desk or surface.
- After the cleaning process is complete, rinse out microfiber cloths and hang to dry, or leave for pickup and laundering by the custodial staff.

Disinfecting touch points by custodians

1. First clean with a detergent and rinse (if required by the product) or wipe surfaces. (Some disinfectants lose effectiveness in the presence of soap residue.)
2. Uniformly apply the disinfectant to a microfiber cloth (with a pump spray bottle or squirt bottle) and wipe the surface with the saturated cloth, or apply the disinfectant directly to the surface (with a squirt bottle).
3. Ensure that the surface stays wet for the length of the contact time recommended on the label.
4. Rinse or wipe surfaces (if required) after contact time has elapsed.
5. Rinse the microfiber cloth in clean water between uses on each touch point, or if using the folding method, use a clean fold of the cloth for each touch point.
6. Launder microfiber cloths as recommended by the manufacturer. See *Appendix G: Disinfectant Application Equipment*.

Disinfecting in the classroom by teachers

If the school's disinfection policy includes the use of disinfectant products by teachers or other staff, please see *Appendix D: Cleaning and Disinfecting by School Department Staff* for detailed guidance. At a minimum, the following guidelines apply:

1. Do not ask students to use disinfectant products. Children under the age of 18 should not use disinfectants.

2. Children's developing bodies are more susceptible to the effects of chemicals than the bodies of most adults. Disinfectant sprays and wipes can contain ingredients that are recognized as asthmagens, and scented products can contain ingredients identified as endocrine disruptors. Use disinfectant products only after students have left the building. (In case of a pandemic this may not be possible.)
3. Train teachers on the proper use and storage of disinfectants and on the Hazard Communication Law, which will help them interpret the product management and health and safety information provided in the product's Safety Data Sheet (SDS). Provide copies of the SDS in case of an accident in the classroom.
4. Provide chemically resistant gloves as specified on the product's SDS or label.
5. Ensure that the products are stored properly in a secure area, away from students and with other compatible chemicals. Check the product's SDS to determine how to safely store the disinfectant.

Appendix A.4. Regulatory Categories and Definitions of Waste

Definition of Waste	**Agency/Regulation**
Regulated Waste – Biohazardous Waste: • Liquid or semiliquid blood or other potentially infectious materials • Contaminated items that would release blood or other potentially infectious materials in a liquid or semiliquid state if compressed • Items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling • Contaminated sharps • Pathological and microbiological wastes containing blood or other potentially infectious materials	Occupational Safety and Health Administration Bloodborne Pathogen Standard 1910.1030

Definition of Waste	**Agency/Regulation**
Medical or Biological Waste.[5] Waste that because of its characteristics may: • Cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness. • Pose a substantial potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. The following types of waste generally generated in schools are identified and defined as medical or biological waste: 1. Blood and Blood Products. Discarded bulk human blood and blood products in liquid state, body fluids contaminated with visible blood, and materials saturated/dripping with blood. 2. Pathological Waste. Human anatomical parts, organs, tissues, and body fluids removed and discarded during medical or diagnostic procedures; specimens of body fluids and their containers; and discarded material saturated with body fluids other than urine. 3. Cultures and Stocks of Infectious Agents and Associated Biologicals. All discarded cultures and stocks of infectious agents and associated biologicals, including culture dishes and devices used to transfer, inoculate, and mix cultures, as well as discarded live and attenuated vaccines intended for human use, that are 4. Sharps. Discarded medical articles that may cause puncture or cuts, including, but not limited to, all needles, syringes, lancets, pen needles, pasteur pipettes, broken medical glassware/plasticware, scalpel blades, suture needles, dental wires, and disposable razors used in connection with a medical procedure.	Massachusetts Department of Public Health 105 480.000

Definition of Waste	**Agency/Regulation**
MassDEP's Fact Sheet defines Infectious waste as physically dangerous medical or biological waste, such as:[6] • Sharps (e.g., lancets, needles, syringes, etc.), • Blood and blood products, • Pathological wastes, • Cultures and stocks of infectious agents and associated biologicals, and • Contaminated animal carcasses, body parts, and bedding. MassDEP does not regulate infectious waste as a regulated hazardous waste; it is classified as a special waste under the solid waste regulations. In 310 CMR 19.000, MassDEP defines Medical or Biological Waste as defined in 105 CMR 480.000: Minimum Requirements for the Management of Medical or Biological Waste (State Sanitary Code Chapter VIII). (this regulation refers to the Massachusetts Regulation listed above.)	Massachusetts Department of Environmental Protection 310 CMR 19.000
Hazardous Waste: There are two ways a waste may be identified as hazardous: it may be **listed** in the regulations (310 CMR 30.131-136) or it may be defined by its hazardous **characteristic** (310 CMR 30.120). Many common disinfectants have these characteristics. • *Ignitable* – easily catches fire, flash point 140°F • *Corrosive* – easily corrodes materials or human tissue, very acidic or alkaline, pH ≤ 2 or ≥ 12.5 • *Reactive* – explosive; produces toxic gases when mixed with water or acid) • *Toxic* – can leach toxic chemicals as determined by a special laboratory test; toxic to humans and wildlife	Massachusetts Department of Environmental Protection 310 CMR 30.000

Appendix A.5. Understanding Hand Hygiene

Introduction

Promoting proper hand hygiene in schools is an essential part of an infection-control program and is the best method for controlling the spread of colds and flu.

Best Practice

The Centers for Disease Control and Prevention recommends hand washing to effectively prevent transmission of infection.[7] Best practice is to vigorously wash hands with liquid soap and water for 20 seconds (or the time it takes to sing the ABC song). Any amount of hand washing is beneficial, but the longer time is optimum. During pandemics it is essential.

Selecting Hand Hygiene Products

Antibacterial products were originally developed for use by surgeons and other operating room personnel to prevent bacterial infections in hospitals and health care settings. These products were then marketed to the public with claims about preventing disease. Hand hygiene products come in several forms, including soaps, gels, and wipes.

1. *Antibacterial soaps and washes* – The U.S. Food and Drug Administration (FDA) states that "there isn't enough science to show that over-the-counter (OTC) antibacterial soaps are better at preventing illness than washing with plain soap and water. To date, the benefits of using antibacterial hand soap haven't been proven. In addition, the wide use of these products over a long time has raised the question of potential negative effects on your health."[8]
2. *Gels and wipes* – Other common hand hygiene products such as sanitizers and wipes advertised as antibacterial or antimicrobial contain alcohol or quaternary ammonium compounds (QACs) as the effective ingredient. These products have not been tested for daily use with children or other sensitive populations. Some QACs have been associated with asthma and with fertility problems in mice.[9] If a hand sanitizer is needed and hand washing is not an option, an unscented, alcohol-based product (greater than 60% alcohol) made from ethanol should be selected.

Frequently Asked Questions

What do "antimicrobial" and "antibacterial" mean?

Antimicrobial means the product contains a chemical that can kill or suppress the multiplication or growth of microorganisms such as bacteria, viruses, or fungi.

Antibacterial means the chemical in the product kills bacteria and some but not all viruses. Colds and flu are caused by viruses, not bacteria. This is why antibacterial soaps, gels, and wipes are a limited form of hand hygiene.

What role do bacteria play in human health?

The Alliance for Prudent Use of Antibiotics explains that bacteria are microorganisms that are found "on our skin, in our digestive tract, in the air, in soil, and on almost all the things we touch every day. Most are harmless (nonpathogenic). Many are helpful because they occupy ecological niches (both within our bodies and in the external environment) that could be occupied by harmful (pathogenic) bacteria. These helpful strains keep harmful microorganisms in check. They also help our digestion to function effectively and stimulate the development of a healthy immune system."[10]

Where should antibacterial or antimicrobial products be used and who should use them?

Antibacterial or antimicrobial products should be restricted for use in high-risk settings such as hospitals, clinics, nurse's offices and other health care settings, prisons, and by those with weakened immune systems. In case of a pandemic flu, antimicrobial products may be appropriate. They should not be used indiscriminately in homes, schools, and offices for routine hand hygiene.

What are the safety hazards of alcohol-based hand sanitizer products?

- Toxicity

  Alcohol-based products pose several safety hazards. One concern is that children in some schools have ingested these hand sanitizers. Reports to the National Poison Data System have identified serious consequences, including apnea, acidosis, and coma in young children who swallowed alcohol-based (alcohol) hand sanitizer.[11]

  During the COVID-19 Pandemic, the Federal Drug Administration (FDA) found the addition of contaminants added to the toxicity of hand sanitizer. Due to the that and the following issues of concern, the FDA issued a consumer warning on 7/2/20.[12]

  - Many hand sanitizers marketed as having ethanol (ethyl alcohol), which is an acceptable ingredient, found that they were contaminated with methanol. Methanol can be toxic when absorbed through the skin or ingested. It can be life threatening when ingested and has led to blindness, hospitalizations and death.
  - Some products were contaminated with 1-propanol, benzene, acetaldehyde, or acetal.
  - Some products had less than the correct amount of active ingredients.
  - Some products were contaminated with bacteria.

- Flammability - Another concern is the flammability of alcohol-based hand sanitizers:
    - Hazard - These products pose a fire and explosion hazard.[13] Due to the supply chain issues, schools stocked up on supplies that were available. Since it is a flammable liquid, there are special storage guidelines that may be hard for a school to meet which poses an even greater fire risk.
    - Regulatory Guidance - The State Fire Marshal guidance for schools on managing hand sanitizer provides this regulatory guidance on how much can be stored and allowable capacity and locations of the dispensers in a building. The guidance is available at https://www.mass.gov/doc/hand-sanitizer-fire-prevention/download.
- Expiration and Efficacy
    - Hazard - Hand sanitizer expires and loses its effectiveness.
        - Protocol - If possible, try to minimize purchases to minimize storage issues and monitor it for disposal.
    - Regulatory Guidance
        - Expiration Dates – the FDA normally requires manufacturers to list an expiration date, unless they have data showing that they are stable for more than 3 years.

          Early in the COVID 19 pandemic, hand sanitizer produced under FDA's temporary policies were not required to list an expiration date listed as they were expected to be used during the public health emergency. This temporary policy has been withdrawn.[14]

          This makes it much harder to know when it is no longer effective unless schools track the receipt of the hand sanitizer and track their inventory.
        - Hazardous Waste – Massachusetts Department of Environmental Protection requires it to be stored and disposed of as a hazardous waste once it has expired, it must be disposed of as hazardous waste.

Should antimicrobial hand sanitizers be used in schools when students do not have access to soap and water?

A hand sanitizer can kill the germs on hands if the hands are already clean. In the case of an infectious disease outbreak, an unscented, alcohol-based (greater than 60% alcohol) hand sanitizer made from ethanol should be used.

If the hands are dirty, the sanitizer will just move that dirt around. Because the sanitizer may not remove the dirt, it may not be effective against and kill all of the microbes. It can also build up if used continuously without washing hands and become less effective.

In cases of allergies to nuts, a study found that liquid and bar soaps and commercial wipes removed proteins (the allergenic component of peanuts) from hands equally well, whereas alcohol-based hand sanitizers and plain water were not as effective.[15]

Are there any preferable alternatives when students do not have access to sinks for handwashing purposes?

Yes, environmentally preferable products are available, such as those certified under UL ECOLOGO®'s Instant Hand Antiseptic Products standard and Green Seal's GS-44 Standard for Soaps, Cleansers, Hand Sanitizers and Shower Products.[16,17] If these are not readily available, look for products that do not contain added fragrances and that use bio-based ingredients.

The Federal Drug Administration (FDA) regulates hand sanitizer. FDA regulates them as "over the counter" drugs. Parents must approve their use in schools.

FDA does not approve any antiseptic product, including hand sanitizer, to prevent or treat COVID-19. FDA advises distributors not to sell hand sanitizers on the "Do Not Use List" available at: https://www.fda.gov/drugs/drug-safety-and-availability/fda-updates-hand-sanitizers-consumers-should-not-use. FDA includes some products on the list even if they were not recalled, due to the dangers of methanol, benzene, or 1-propanol contamination. FDA recommends continuously checking this list for updates.

FDA says for hand sanitizers to be legally marketed, products must have either alcohol (ethanol or isopropyl), or benzalkonium chloride (a quaternary compound as noted below, which the authors do not recommend).

How can antibacterial chemicals be avoided?

When shopping, read the labels and avoid purchasing antibacterial soaps, which contain quaternary ammonium compounds (QACs). To assist consumers in avoiding antibacterial chemicals, the following resource provides information, such as ingredients and safety ratings, on many products.

Environmental Working Group (EWG) Skin Deep – safer antibacterial soap:
https://www.ewg.org/skindeep/search/?utf8=%E2%9C%93&search=hand+antibacterial+soaps

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17. Green Seal GS-44 Standard. Available at: https://www.greenseal.org/green-seal-standards/gs-44

Resources

Note about the accuracy of the links: the CDC frequently updates their webpages and often renames them to reflect the updated information. If the content is outdated, CDC will often redirect users to the most recent content. The following links should take you to the links where relevant content is located.

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Appendix B.1. Introduction

Introduction

This Handbook provide numerous tools throughout both chapters and appendices to assist with selecting safer products. The content in this appendix covers use of the following tools:

- Safer disinfectant certification and labeling
- Label information
- NFPA and HMIS hazard rating systems
- EPA's toxicity categories
- A checklist to evaluate products

Although there are similar topics in the following sections of the handbook, the information is complementary, not duplicative:

Chapter 4. sections:

A. Comparing Disinfectants: Comparison Chart for Hard-Surface
B. Disinfectants Registered by the Environmental Protection Agency
C. Using the Disinfectant Label Information to Make Informed Decisions
D. Interpreting Information from Hazardous Materials Rating Systems for Product Selection
E. Using Information from Hazardous Materials Rating Systems for Product Selection
F. Using Information from Safety Data Sheets for Product Selection

Appendix J: Choosing Safer Disinfectants, Poster

Appendix B.2. Safer Disinfectant Certification and Labeling: Quick Reference

Introduction

The U.S. Environmental Protection Agency's (EPA) Design for the Environment Disinfectant Program screens and certifies disinfectants according to their health and safety standards.

Design for the Environment/Office of Pesticide Programs (OPP)

At the request of manufacturers, green cleaning advocates, and cleaning products distributors, the EPA Design for the Environment Program (DfE) and the OPP agreed to allow the identification and labeling of the least-toxic disinfection products currently on the market. All the products considered for certification were disinfectants already registered by the OPP.

Evaluation Process

Manufacturers submit their registered product(s) to the DfE Safer Product Labeling Program to go through the screening process. The DfE evaluates each ingredient on the basis of critical health and environmental end points as defined in their standards. These standards are available for review at https://www.epa.gov/saferchoice/standard.

Label Award

When a product is identified as having met the criteria for the Program, it will be allowed to display a DfE logo. Products will be listed on this site after they are approved (https://www.epa.gov/pesticide-labels/dfe-certified-disinfectants).

Ingredients Approved

The Program has identified the following active ingredients as being the least toxic in specific formulations:

- Chitosan
- Citric acid
- Ethanol
- Hydrogen peroxide
- Isopropanol
- L-Lactic acid
- Peroxyacetic acid
- Sodium Bisulfate

Design for the Environment U.S. EPA

Look for the DfE Logo

Ingredients Not Approved

Products containing the following ingredients will not be approved:

- Quaternary ammonium compounds
- Sodium hypochlorite (bleach)
- Ortho-phenylphenol (2-phenylphenol)
- Thymol

Appendix B.3. Interpreting the Disinfectant Label: Explanations and Examples

Introduction

This appendix provides a comprehensive overview of the information on a product's label to assist in the selection, use, and management of disinfectants. It is critical to follow the directions on a disinfectant's label to ensure its safe use and that the disinfectant will work as designed. Every product is tested under very specific circumstances, and the label describes exactly how the product should be used and managed (e.g., how it should be applied, how long it should be left on a surface, how it should be stored). Because label information can sometimes be daunting or intimidating to interpret, this appendix provides an explanation of the label information typically found on products used in school settings.

Label Format

Although the length of a disinfectant label varies widely, there is a general format that is used. The information contained on most disinfectant labels can be divided into the following four major categories:

I. Product Information

II. Use and Management Information

III. Safety Information

IV. Environmental Information

I. Product Information

Brand (trade) name

Although each manufacturer has a primary brand name for each of its registered products, the manufacturer may also use alternate brand names for the same product. In addition, manufacturers will use different brand names for products containing the *same* disinfectant active ingredient(s).

Ingredient statement

Active ingredient – The ingredient statement, which is normally on the front panel of the label, identifies the name and percentage by weight of each active ingredient. The active ingredients are the components of the product that have a pesticide effect on the target microbe(s).

Active ingredients are often identified by their chemical names, which may be complex. For example, the chemical name for one quaternary ammonium compound ("quat" or "QAC") may be listed on the label as "Alkyl (60% C_{14}, 30% C_{16}, 5% C_{12}, 5% C_{18}) dimethyl benzyl ammonium chloride."

Usually following the list of ingredients is the amount of each active ingredient. The amount is expressed as percentage by weight.

Inert ingredients – Inert ingredients are added for non-pesticide purposes, such as to improve a product's storage, mixing, or application properties. The EPA assesses inert ingredients, which can be toxic or nontoxic. Those present at less than 0.1% or those not considered highly toxic do not have to be named, but the label must show what percentage of the total contents they make up.

Net contents

The front panel of the label states how much *total* product is in the container.

EPA registration number

For federally registered pesticide products, this number identifies a specific manufacturer and product. It is the single most important piece of information for tracking pesticide products. This number has two sets of digits; for example, 12345-678 signifies that 12345 is the company number and 678 is the 678th product registered by that manufacturer.

For distributor products (where one company distributes another manufacturer's federally registered product), the registration number is in three parts, such as 12345-678-90000. The first two numbers represent the federally registered product (as above) and the third number represents the distributor company's number (in this case, 90000).

Name and address of manufacturer

The manufacturer name and address on the label specifies who produced the product. In many cases, the manufacturer will list a telephone number and/or Web address for those seeking technical advice.

Formulation

The front panel of some disinfectant labels sometimes describes the product formulation. This information provides insight into the type of application equipment needed and the product's handling properties.

Limited warranty and disclaimer

This statement conveys the manufacturer's assurance that the product conforms to the chemical description on the label and that it is fit for use according to label directions under normal conditions. The warranty does not extend to any use of the product contrary to label instructions, nor does it apply to use under abnormal conditions. Applicators who violate label instructions assume all liability associated with the product.

II. Use and Management Information

Antimicrobial claims

Efficacy claims - Often a label has a "claims" section that identifies the level of efficacy the product will achieve; for example, a product will usually be designated as a sanitizer, disinfectant, or sterilant.

Organism claims - The product label usually lists which microbes the product controls and under what conditions it will be effective against these microbes. Specific conditions may include contact time, surface type, use dilution, and the presence of dirt and/or hard water.

Example:

- Effective against / kills methicillin-resistant *Staphylococcus aureus* (MRSA) on hard, nonporous surfaces.

Directions for Use — READ AND FOLLOW CAREFULLY

This section usually makes up the bulk of the label and specifies all the steps that must be followed to apply the product safely and effectively. It typically contains the following:

- *Misuse statement* – The statement that always appears immediately under the *Directions for Use* heading is the misuse statement: "It is a violation of federal law to use this product in any manner inconsistent with its labeling." This statement means that all of the directions and precautions on the label must be followed; any other actions could be considered to be a violation of the Federal Insecticide, Fungicide, and Rodenticide Act.
- *Area(s) of use* – General locations where a disinfectant may be used, such as in or around:
    - Hospitals and nursing homes (special data requirements)
    - Schools other than preschools and daycare facilities
    - Museums and libraries, sports facilities, office buildings
- *Use sites and surfaces* – Specific places, items, or surfaces where the product may be applied.
    - Almost all disinfectants are registered for use only on hard, nonporous surfaces (e.g., floors, walls, countertops, stainless steel, sealed tile, plastic, etc.).
    - Carpet sanitizers are registered for spot treatment use on carpets, which are porous.
    - Food-contact sanitizers are only registered for use on hard, nonporous food-contact surfaces.
- *Water hardness* – Some disinfectants do not work as well in hard water, which contains magnesium and calcium.
    - Quaternary ammonium compounds may not be as effective in hard water.
    - Antimicrobial products may be tested for efficacy in the presence of hard water at 200 to 400 parts per million of hard water. If a product passes this test, the label will state the hardness level of the water in which the product was tested and was found effective.
- *Organic load* – Disinfectants can be deactivated by many organic materials, such as blood, protein, food, and body waste.
    - If the label includes the statement, "kills germs on precleaned environmental surfaces," then the surface must be cleaned and rinsed before being disinfected.
    - For a statement such as "effective against stated germs in the presence of 5% serum or 5% organic load or bioburden," then the product will work in the

presence of a small amount of organic matter, but the label will direct to the user to first remove the *visible* dirt. Best practices require cleaning surfaces first.

- *Use dilution* – This is the concentration at which the product has been tested and shown to be effective. More concentrated solutions may not always be better in a particular situation, and can be more toxic. A product may be diluted at different concentrations for different uses.

  Examples:

  - Ready to use.
  - Add X ounces of product to one gallon of water.

- *Application* – A description of how the product should be applied and the most effective application equipment. Select application methods that minimize exposure to the product.

  Example:

  - Apply with a wet sponge, cloth, mop, or sprayer.

- *Contact (e.g., dwell or kill) time*

  - Each product has a specific contact time for which the product must *stay* wet on the surface for the product to be in contact with and kill the microbes. Contact times are 10 minutes or less; longer times may be listed only when the treated item is to be immersed in the product.
  - The product is proven effective only at this exposure time.

- *Post application instructions*

  Examples:

  - Let air dry.
  - Rinse food-contact surfaces with potable water. (For disinfectant products with claims for food-contact surfaces.)
  - Do not rinse surfaces that contact food. (For food-contact sanitizer products.)

Storage

Most, if not all, disinfectant labels will contain a general statement in this section such as "Do not contaminate water, food, or feed by storage, disposal, or cleaning of equipment" and "Store in original containers only." Special conditions to be aware of include temperature and moisture:

- *Temperature* – Minimum and maximum temperature storage requirements may be specified.

  - Some disinfectants become ineffective or degrade if not stored under suitable temperatures. Light and heat can degrade some products.
  - The effectiveness of some disinfectants can increase or decrease with temperature levels.

- *Moisture* – The amount of moisture can be a concern with dry disinfectants, including granular materials and wettable powders, which have a strong affinity for water.

  Example:

  - Store in a dry place.

Disposal

Labels include information about the proper disposal of disinfectant containers and any excess quantities of diluted disinfectant mixtures. Proper disposal of concentrated products is very important because disinfectants and sanitizers are designed to kill microbes and have the potential to adversely affect biological activity in septic systems and wastewater treatment plants that rely on microbial activity to process the wastewater if disposed of down the sink. Instructions for disposal may include:

- Triple-rinse procedures for disinfectant containers of liquid
- Options for recycling or disposal of containers

Check with your local Department of Public Works, Solid Waste District, or the Massachusetts Department of Environmental Protection Bureau of Waste Prevention to obtain guidelines on the disposal of concentrated disinfectants, which may be considered hazardous waste.

III. Safety Information

Child hazard warning

The front panel of every disinfectant label must bear the statement, “KEEP OUT OF REACH OF CHILDREN.” Poisoning is a major cause of injuries to children.

Signal word

A signal word is displayed in large letters on the front of the label to indicate approximately how *acutely* toxic the disinfectant is to people. The signal word is based on acute toxicity data for oral, dermal, and inhalation routes, as well as skin and eye irritation and sometimes dermal sensitization. It is based on the entire contents of the product, including the active and the inert ingredients. It does not indicate the risk of delayed (*chronic* or long-term) or allergic effects.

Disinfectants that are very likely to cause acute illness or be corrosive to eyes or skin are classified as Category I and have DANGER as their signal word. In addition, if the product is Category I on the basis of its acute oral, acute dermal, or acute inhalation toxicity, it also has the word POISON printed in red with the skull and crossbones symbol.

Signal Word	Acute Toxicity Category
DANGER – POISON (plus skull and crossbones)	I
DANGER	I
WARNING	II
CAUTION	III
CAUTION or no signal word	IV

First aid statement

Labels for all highly toxic disinfectants (signal word DANGER – POISON) must provide information on the proper antidotes and treatment for all routes of exposure for which the product has the Category I oral, dermal, or inhalation toxicity.

These labels will also have an 800 telephone number that medical personal may call at any time for further treatment advice should an exposure occur. The product's label and safety data sheet (SDS), which provides first aid instructions, should be taken to the medical facility if an exposure occurs. Labels for less-toxic disinfectants sometimes provide first aid instructions.

Examples:

- *If swallowed:* Immediately induce vomiting by touching back of throat with finger. Drink 1 or 2 glasses of water and induce further vomiting. Call a physician or poison control center immediately.
- *If in eyes:* Hold eyelids open and flush with a steady, gentle stream of water for 15 minutes. Get medical attention.
- *If on skin:* Wash skin with soap and water. Get medical attention.

Hazards to humans and domestic animals

Acute effects – The label provides precautionary statements on specific hazards, routes of exposure (mouth, skin, eye, respiratory system), and precautions to be taken to avoid injury.

Examples:

- Causes eye and skin irritation. Harmful if swallowed, inhaled, or absorbed through skin.
- Do not get on skin or on clothing. Prolonged or repeated skin contact may cause allergic reactions in some individuals.
- Avoid breathing vapor or spray mist.
- Avoid contact with eyes.
- Wash thoroughly with soap and water after handling.

Chronic (delayed) effects – Label statements must warn the user of delayed effects from exposure to a product over a long period of time, such as cancer or reproductive damage.

Personal protective equipment and clothing

Most disinfectant labels contain specific instructions on the type of protective equipment and/or clothing that must be worn during the handling and mixing processes.

Examples:

- Chemical-resistant gloves.
- Protective eyewear.
- Long sleeves.
- Long pants.

Physical or chemical hazards

This section of the label warns users of any physical hazards (such as fire or explosion) or chemical hazards (such as corrosivity) that are associated with the product. For example, the label will alert you if the product is so flammable that you need to keep it away from an ignition source, or if it is so corrosive that it must be stored in a corrosion-resistant container.

This information is not always found in the same location on all labels. Some labels will identify these hazards in a designated box, whereas others may list them on the front panel beneath the signal word or under headings such as “Note” or “Important.”

Examples:

- Do not use or store near heat or open flame.
- Spray solutions of this product should be mixed, stored, and applied using only stainless steel, aluminum, fiberglass, plastic, or plastic-lined steel containers.

IV. Environmental Information

Environmental hazards

This section of the label explains the types of potential environmental hazards and the precautions needed to prevent injury or damage to the environment. Concentrated and dilute disinfectants can be toxic to the environment if disposed of improperly.

Further reading

- Check state-specific disinfectant guidelines and labeling.
- Locate labels for existing products using their registration numbers: https://iaspub.epa.gov/apex/pesticides/f?p=PPLS:1.
- EPA regulation of antimicrobial disinfectants: https://www.epa.gov/pesticide-registration/pesticide-registration-manual.
- Centers for Disease Control and Prevention (CDC) regulation of antimicrobial disinfectants: https://www.cdc.gov/infectioncontrol/guidelines/disinfection/disinfection-methods/regulatory-framework.html.

- National Pesticide Information Center provides posters and fact sheets interpretation of regulations and use and label information: http://npic.orst.edu/factsheets/antimicrobials.html.

Sources

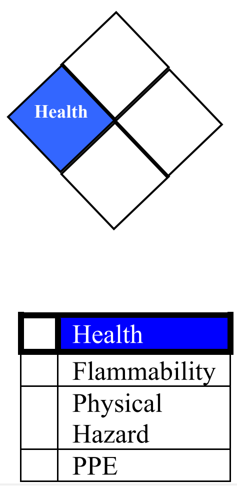
Appendix B.2. was derived from the PI-34 document, one of a series developed by the Pesticide Information Office, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences (IFAS), University of Florida. Published March 2005 through the Electronic Data Information Source Web site - https://edis.ifas.ufl.edu/pi071. The original fact sheet was written by Frederick M. Fishel, Associate Professor, Agronomy Department, and Director, Pesticide Information Office, Florida Cooperative Extension Service, IFAS, University of Florida, Gainesville, FL.

This appendix also utilized information from the EPA Label Review Manual.

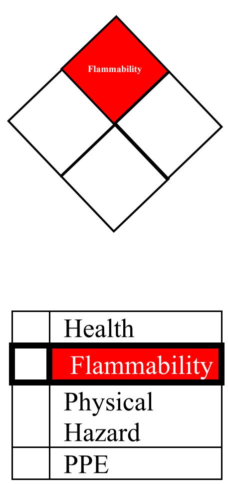
Appendix B.4. Interpreting Information from Hazardous Materials Rating Systems: National Fire Protection Association and Hazardous Materials Information System

Two hazard rating systems from the National Fire Protection Association (NFPA) and Hazardous Materials Information Systems (HMIS) are often used on SDSs to communicate product hazards "at-a-glance". Note that the EPA does not clearly allow--or prohibit--the use of these rating systems on labels. The information is provided here to assist with product selection. The following detailed explanation of these systems complements the information in *Chapter 4.E. Using Information from Hazardous Materials Rating Systems for Product Selection*.

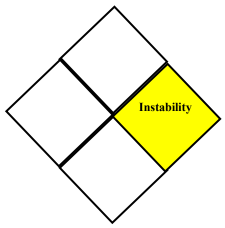
Interpretation of colored symbols – Each system rates health (blue box), flammability (red box), and instability or physical hazard (yellow or orange box) on a scale from 0 to 4, with 0 being the safest and 4 being the most hazardous.



Health Hazard	
4	Deadly – very short exposure could cause death or serious injury
3	Extreme Danger – short exposure could cause serious injury
2	Hazardous – intense or continued exposure could cause injury
1	Slightly Hazardous – exposure could cause irritation
0	Not Hazardous



Flammability	
4	Extremely flammable; will rapidly or completely vaporize at normal pressure and temperature
3	Ignites at normal temperatures
2	Ignites when heated
1	Ignites when moderately heated
0	Materials that will not burn



Instability – NFPA rating only (Reactivity – former rating)	
4	Can explode at normal temperatures and pressures
3	Can explode under shock and heat, or react explosively with water
2	Normally unstable; can undergo violent change or react violently with water
1	Normally stable but can become unstable when heated or under pressure
0	Normally stable

	Health
	Flammability
	Physical Hazard
	PPE

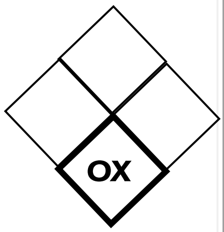
Seven physical hazard classes are recognized:

- Water reactives
- Organic peroxides
- Explosives
- Compressed gases
- Pyrophoric materials
- Oxidizers
- Unstable reactives

Physical Hazard – HMIS rating only	
4	Readily capable of explosive water reaction, detonation, explosive decomposition, polymerization, or self-reaction at normal temperature and pressure
3	May form explosive mixtures with water; capable of detonation or explosive reaction in the presence of a strong initiating source; may polymerize, decompose, self-react, or undergo other chemical change at normal temperature and pressure, with moderate risk of explosion
2	Unstable; may undergo violent chemical changes at normal temperature and pressure, with low risk for explosion; may react violently with water or form peroxides when exposed to air
1	Normally stable but can become unstable (self-react) at high temperatures and pressures; may react nonviolently with water or undergo hazardous polymerization in the absence of inhibitors
0	Normally stable, even under fire conditions; will NOT react with water, polymerize, decompose, condense, or self-react; nonexplosive

Interpretation of colored symbols – White Box - NFPA

The NFPA system uses the white box to alert the user to special hazards.



Special Hazards – NFPA rating only	
OX	Contains an oxidizer, which can greatly increase the rate of fire
~~W~~	Reacts to water and poses a hazard when using water to fight a fire
ACID	Contains acid, a corrosive with a pH of 2 or less
ALK	Contains alkali, a corrosive with a pH of 12.5 or above
COR	Corrosive; damages living tissue (a material is corrosive when it is at either end of the pH scale)

Interpretation of colored symbols – White Box - HMIS

The HMIS white box corresponds to the type of personal protective equipment (PPE) required, and uses a letter system to denote the appropriate PPE (see diagram below).

	Health
	Flammability
	Reactivity
	PPE

Letter	Required Equipment	Letter	Required Equipment
A	Safety Glasses	**B**	Safety Glasses, Gloves
C	Safety Glasses, Gloves, Protective Apron	**D**	Face Shield, Gloves, Protective Apron
E	Safety Glasses, Gloves, Dust Respirator	**F**	Safety Glasses, Gloves, Protective Apron, Dust Respirator
G	Safety Glasses, Gloves, Vapor Respirator	**H**	Splash Goggles, Gloves, Protective Apron, Vapor Respirator
I	Safety Glasses, Gloves, Dust Respirator, Vapor Respirator	**J**	Splash Goggles, Gloves, Protective Apron, Dust Respirator, Vapor Respirator
K	Air Line Mask or Hood, Gloves, Full Suit, Boots		

Appendix B.5. Environmental Protection Agency's Toxicity Categories for Precautionary Statements*

The following EPA Acute Toxicity Classification is a separate system from the HMIS and NFPA rating systems (which are not used by EPA to rank product hazards). The following EPA classification system is based on the results of six acute toxicity studies performed with the product formulation. The results serve as the basis for precautionary measures provided by the manufacturer on the pesticide label.

Table 1. Toxicity Categories

Study	Category I	Category II	Category III	Category IV
Acute Oral	Up to and including 50 mg/kg	>50 through 500 mg/kg	>500 through 5000 mg/kg	>5000 mg/kg
Acute Dermal	Up to and including 200 mg/kg	>200 through 2000 mg/kg	>2000 through 5000 mg/kg	>5000 mg/kg
Acute Inhalation (4-hour exposure)	Up to and including 0.05 mg/liter	>0.05 through 0.5 mg/liter	>0.5 through 2 mg/liter	>2 mg/liter
Primary Eye Irritation	Corrosive (irreversible destruction of ocular tissue) or corneal involvement or irritation persisting for more than 21 days	Corneal involvement or other eye irritation clearing in 8–21 days	Corneal involvement or other eye irritation clearing in 7 days or less	Minimal effects clearing in less than 24 hours
Primary Skin Irritation	Corrosive (tissue destruction into the dermis and/or scarring)	Severe irritation at 72 hours (severe erythema or edema)	Moderate irritation at 72 hours (moderate erythema)	Mild or slight irritation at 72 hours (no irritation or slight erythema)

* *From* U.S. Environmental Protection Agency, Label Review Manual, "Chapter 7: Precautionary Statements." Available at: https://www.epa.gov/sites/default/files/2018-04/documents/chap-07-mar-2018.pdf.

Table 2. Typical Statements for Acute Oral Toxicity		
Toxicity Category	**Signal Word**	**Statements**
I	DANGER – POISON Skull & Crossbones required	Fatal if swallowed. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet.
II	WARNING	May be fatal if swallowed. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet.
III	CAUTION	Harmful if swallowed. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet.
IV	CAUTION (optional)	No statements are required; however, the registrant may choose to use category III labeling.

Table 3. Typical Statements for Acute Dermal Toxicity		
Toxicity Category	**Signal Word**	**Statements**
I	DANGER – POISON Skull & Crossbones required	Fatal if absorbed through skin. Do not get in eyes, on skin, or on clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Wear [specify appropriate protective clothing]. Remove and wash contaminated clothing before reuse.
II	WARNING	May be fatal if absorbed through skin. Do not get in eyes, on skin, or on clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Wear [specify appropriate protective clothing]. Remove and wash contaminated clothing before reuse.
III	CAUTION	Harmful if absorbed through skin. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse. Wear [specify appropriate protective clothing].
IV	CAUTION (optional)	No statements are required; however, the registrant may choose to use category III labeling.

Table 4. Typical Statements for Acute Inhalation Toxicity		
Toxicity Category	**Signal Word**	**Statements**
I	DANGER – POISON Skull & Crossbones required	Fatal if inhaled. Do not breathe dust, vapor, or spray mist.[a] Wear [specify appropriate respiratory protection]. Remove and wash contaminated clothing before reuse.
II	WARNING	May be fatal if inhaled. Do not breathe dust, vapor, or spray mist.[a] Wear [specify appropriate respiratory protection]. Remove and wash contaminated clothing before reuse.
III	CAUTION	Harmful if inhaled. Avoid breathing dust, vapor, or spray mist.[a] Remove and wash contaminated clothing before reuse.
IV	CAUTION (optional)	No statements are required; however, the registrant may choose to use category III labeling.

[a] Choose the word that appropriately describes the product during use.

Table 5. Typical Statements for Primary Eye Irritation		
Toxicity Category	**Signal Word**	**Statements**
I	DANGER	Corrosive.[a] Causes irreversible eye damage. Do not get in eyes or on clothing. Wear [specify appropriate protective eyewear such as goggles, face shield, or safety glasses]. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse.
II	WARNING	Causes substantial but temporary eye injury. Do not get in eyes or on clothing. Wear [specify appropriate protective eyewear such as goggles, face shield, or safety glasses]. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse.
III	CAUTION	Causes moderate eye irritation. Avoid contact with eyes or clothing. Wear [specify appropriate protective eyewear]. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet.
IV	CAUTION (optional)	No statements are required; however, the registrant may choose to use category III labeling.

[a] The term *corrosive* is not required if corrosive effects were not observed during the study.

Table 6. Typical Statements for Primary Skin Irritation		
Toxicity Category	**Signal Word**	**Statements**
I	DANGER	Corrosive. Causes skin burns. Do not get in eyes, on skin, or on clothing. Wear [specify appropriate protective clothing and gloves]. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse.
II	WARNING	Causes skin irritation. Do not get on skin or on clothing. Wear [specify appropriate protective clothing and gloves]. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse.
III	CAUTION	Avoid contact with skin or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Wear [specify appropriate protective clothing and gloves].
IV	CAUTION (optional)	No statements are required; however, the registrant may choose to use category III labeling.

Appendix B.6. Selecting Disinfectants for Hard Surfaces: Checklist

Introduction **Page 1 of 2**

This checklist is designed to help compare disinfectant product labels when selecting the least hazardous product for the job.

Product Name: **Manufacturer:**

EPA Registration Categories	Registration for Targeted Microbes
❒ Limited disinfectant ❒ Broad-spectrum, general disinfectant ❒ Hospital/medical-use disinfectant ❒ Virucide ❒ Bactericide ❒ Fungicide ❒ Tuberculocide	❒ Methicillin-resistant *Staphylococcus aureus* (MRSA) ❒ HIV-1 virus* ❒ Vancomycin-resistant enterococci (VRE) ❒ Hepatitis B virus* ❒ Hepatitis C virus ❒ Norovirus ❒ SARS-CoV-2 ❒ *Mycobacterium tuberculosis** * If a product is registered with claims for *Mycobacterium tuberculosis*, HIV, or hepatitis B, the product can be used for bloodborne pathogen (BBP) spills.

Criteria	Product-Specific Information	Findings	Comments
Efficacy (Effectiveness)	❒ Is the product registered by the U.S. Environmental Protection Agency?	❒ yes ❒ no	
Environ-mental	❒ Is there active residual activity (if the information is available from the manufacturer)?	❒ yes ❒ no	
	❒ Is rinsing required?	❒ yes ❒ no	
	❒ Is the product noncorrosive and compatible with the surface or object?	❒ yes ❒ no	
Use and Management	❒ Is the product cost-effective?	❒ yes ❒ no	
	❒ Is it easy to use, with clear label instructions?	❒ yes ❒ no	
	❒ Is it non staining?	❒ yes ❒ no	
	❒ Can you safely transport and store it?	❒ yes ❒ no	
	❒ Is it available in a concentrate?	❒ yes ❒ no	
Dwell Time 10, 5–10, 2–5, or 2 minutes or less	❒ Is the disinfectant able to stay wet on a surface or item (in contact with microbes) for the amount of dwell time required on the label? ❒ Is the surface or item able to remain unused and inaccessible to occupants during the required dwell time?	❒ yes ❒ no	

Selecting Disinfectants for Hard Surfaces: Checklist **Page 2 of 2**

Product Name:

Criteria	Product-Specific Information				Findings
EPA Toxicity Categories Select the least hazardous product for the job	**Signal word**	**Category**	**On the Basis of**		
	DANGER – POISON (skull & crossbones)	I	Oral, dermal, or inhalation toxicity	❒ yes ❒ no	
	DANGER	I	Skin or eye irritation or dermal sensitization	❒ yes ❒ no	
	WARNING	II	The results of all required acute toxicity studies	❒ yes ❒ no	
	CAUTION	III		❒ yes ❒ no	
	CAUTION	IV		❒ yes ❒ no	
Health Hazards to Humans and Animals	❒ Does the label list any health hazards for people?			❒ yes ❒ no	
	❒ Does the label list health hazards for women who are pregnant or of childbearing age?			❒ yes ❒ no	
	Check any health hazards listed on the label: ❒ Respiratory system ❒ Eyes ❒ Skin, mucous membranes ❒ Nose, throat, lungs, breathing, inhalation ❒ Mouth, throat, esophagus, stomach, intestines, ingestion ❒ Nausea, vomiting, diarrhea ❒ Headache, dizziness			❒ yes ❒ no	
	❒ Will use of the product make certain health conditions (e.g., asthma) worse?			❒ yes ❒ no	
Personal Protective Equipment (PPE)	For each use of the product, check off the type(s) of PPE required on the label:  Glove type:				
	❒ Do staff members have access to PPE every time the product is used?			❒ yes ❒ no	
	❒ Is the PPE reusable or affordable?			❒ yes ❒ no	

Appendix C.1. Sample Policy and Work Practice: Classroom

Introduction

Unauthorized cleaning products may contain hazardous ingredients that can pose dangers to the user and other building occupants. Disinfectants are not cleaning products, they are antimicrobial pesticides designed to kill microbes. Health dangers of cleaning and disinfecting products include but are not limited to triggering an asthmatic or allergic reaction, chemically burning skin, and causing blindness. Safety hazards include fire, chemical reactions if stored with an incompatible product (e.g., bleach and ammonia form a toxic gas), and spills.

Classrooms do not have the proper storage for these products, and teachers do not have the proper training and personal protective equipment (PPE) to use these products safely. Thus, _____________ School District (School) has obtained products that are safe for the user, other building occupants, and the environment. Custodians are trained to use these products safely.

Cleaning Products for Staff Use in the Classroom

- ***Provision of cleaning product:*** The School will provide every school building with a third-party-certified, all-purpose cleaner for classroom use. Staff members are to use only this approved cleaning product and are prohibited from bringing in cleaning products, disinfectants, air fresheners, and pesticides from home.
- ***Recipients of cleaning product:*** All classrooms will receive a labeled spray bottle for use in the classroom, if requested.
- ***Uses of cleaning product:*** The cleaning product is for staff to use when cleaning surfaces and teaching aids in the classroom or office. This product can be used on any nonporous surface. For purposes of minimizing the dispersion of the cleaner, it is recommended that the product be sprayed onto a cloth, and the saturated cloth used to wipe the surface to be cleaned.
- ***What to do for addressing disinfection and other cleaning needs:*** If the classroom/office cleaner does not clean a particular item to staff satisfaction, or when staff members need a disinfectant or have a blood or body spill, the custodian (who is trained to select and use the appropriate product for the job) should be contacted. The cleanup may or may not take place after school hours.
- ***Refill of product:*** When a spray bottle is empty, staff members are to contact the building custodian to get it refilled. This bottle is not to be refilled with any other product or chemical, not even water.
- ***Storage of cleaner:*** The spray bottle should be kept out of the reach of children at all times, in a secure location.
- ***Cleaning desktops:***
    1. Wash desks with a third-party-certified, all-purpose cleaner and a microfiber cloth.
    2. Rinse and/or wipe desks if required.
    3. Rinse cloth in clean water after each desk.

4. Reapply the cleaning solution for the next desk.
5. After the cleaning process is complete, rinse out microfiber cloths and hang to dry, or leave for pick up by the custodial staff.

Disinfection in the Classroom

Guidelines for routine and special-event disinfection

- Staff members are prohibited from bringing in their own disinfectant products.
- Disinfection should be conducted by the custodial staff as part of their cleaning and disinfecting protocol, except in special circumstances approved by the principal.
- If there is a need for disinfection in a classroom, a teacher will contact a trained custodian to do the disinfection.

Protocols for staff use of disinfection

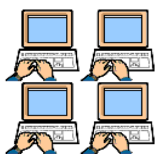
If the use of disinfectant products is allowed by teachers or other staff, the following guidelines apply:

1. The School will:
    a. Supply an approved disinfectant product in a properly labeled container.
    b. Train staff on the proper use and storage of disinfectants and on the Hazard Communication Standard Right to Understand Law. Hazard Communication training will provide information on how to manage the product, what the health and safety precautions are, and how to respond to an exposure or spill in the classroom.
    c. Provide recommended PPE as specified on the product's safety data sheet (SDS) or label, such as chemical-resistant gloves.
2. Teachers will:
    a. Use only products supplied and labeled by the School.
    b. Not allow students to use disinfectant products and will not use disinfectant products until students have left the building. The developing bodies of children are much more susceptible to the effects of chemicals than the bodies of most adults. Disinfectant sprays and wipes may contain ingredients that are recognized as asthmagens, and scented products may contain ingredients identified as hormone disruptors.
    c. Store disinfectants with compatible products in a secure area away from student access. The product's SDS directs how to safely store the disinfectant. Improper storage of disinfectants is a major problem in classrooms, where toxic combinations of products (e.g., bleach and ammonia) are typically stored together and accessible to students.[1]

[1] See xxx

Appendix C.2. Sample Poster for Cleaning Surfaces for Infection Control: School Custodians

Schools have several types of surfaces that require *cleaning*; only some surfaces need *disinfecting*, depending on specific circumstances. The Centers for Disease Control and Prevention recommends regular cleaning as a prevention strategy against H1N1 (Influenza A), SARS-CoV-2 and other flu types and germs. Best practice for some viruses is to clean high-touch points more frequently rather than disinfect them. Disinfectants are antimicrobial pesticides that can be toxic and pose a hazard to students and staff. Custodians receive an occupational exposure from daily use. However, in the case of SARS-CoV-2, disinfection may be required. For information on specific recommendations during an outbreak of gastrointestinal illnesses or viruses including SARS-CoV-2 see *Appendices: D and E.*

	**Desks, Work Tables, and Computer Keyboards – *Shared*** ***Products:*** An all-purpose cleaning product and a high-quality microfiber cloth. Keyboard covers are more easily cleaned than the keys. ***Recommended cleaning schedule:*** Routine: Clean daily.
	**Desks, Work Tables, and Computer Keyboards – *Not Shared*** ***Products:*** An all-purpose cleaning product and a microfiber cloth. ***Recommended cleaning schedule:*** Clean weekly or as needed.
	**Cafeteria Tables and Floors** ***Products:*** A cleaning detergent that removes dirt and allergenic protein matter, and high-quality microfiber cloths/mops (instead of a sponges, which are not recommended due to their potential to spread contamination). ***Recommended cleaning schedule:*** Clean after each use, before the next group arrives.
	**Other Surfaces Touched by a Variety of Hands (*phones, light fixtures, stair railings, door knobs and push bars, elevator buttons, water fountains, etc.)*** ***Products:*** An all-purpose cleaning product and a high-quality microfiber cloth. ***Recommended cleaning schedule:*** Routine: Clean daily. During outbreak of gastrointestinal illnesses or flu: Clean touch points in between classes or periodic events.
	**Bathrooms, Showers, and Locker Rooms** ***Products:*** A bathroom cleaner for all bathroom surfaces and facilities, and a disinfectant approved for broad-spectrum use with claims for fungi and methicillin-resistant *Staphylococcus aureus*. Use disinfectant *only* on surfaces touched by a variety of people (sink and toilet handles, door knobs, toilet seat, soap and towel dispenser) and high-risk surfaces (shower room floors). ***Recommended cleaning and DISINFECTING schedule:*** Clean and disinfect daily.
	**Floors in Classrooms and Hallways** ***Products:*** A neutral floor-cleaning product specific to flooring material that removes dirt year-round and salt in the wintertime, and a microfiber mop. ***Recommended cleaning schedule:*** Clean daily.

Appendix C.3. Sample Policy and Work Practice: School Nurse Disinfection and Sanitation Guidelines

Introduction

Hazardous materials are used throughout school buildings for cleaning, maintenance, curricular and office activities. These materials may present hazards to those using them and those exposed to them.

Disinfectants are not cleaning products, they are antimicrobial pesticides that are designed to *kill* microbes. Disinfectants do not clean, and cleaners do not disinfect. A surface must be cleaned and rinsed prior to being disinfected.

Disinfectants may be toxic, and exposure can occur through inhalation, skin contact, ingestion, or injection. The health dangers of disinfectant and sanitizing products include but are not limited to triggering an asthmatic or allergic reaction, chemically burning skin, and causing blindness. Safety hazards include fire, chemical reactions if stored with an incompatible product (e.g., bleach and ammonia form a toxic gas), and spills.

Often users of these products are not aware of the products' hazards and related precautions. Even with awareness, there is still a potential for accidents to happen, such as inhalation of vapors and contact with skin or eyes. This section provides information that will help nurses prevent and respond to an emergency involving a hazardous cleaning or disinfectant product.

Responsibilities of the Nurse

- Know the types, locations, and hazard level of hazardous products used in the building.
- Be aware of student and staff allergies and other potential health and safety hazards that can result from the use of hazardous cleaning and disinfectant products.
- Be aware of correct roles and procedures for use of disinfectants, including what surfaces can be disinfected, and when and how to disinfect.
- Understand how to interpret use, management, and emergency first aid procedures located on the product label and in the product's safety data sheet.
- Know the locations, specifications, and proper use of an emergency eye wash station and deluge shower for use in responding to a chemical exposure.
- Educate staff about the location and use of a first aid kit and other safety equipment, where applicable.
- Educate staff about the differences between cleaning, sanitation, and disinfection. Provide staff with information about approved cleaning procedures and products and the correct application of disinfectants (for bloodborne pathogen spills, methicillin-resistant *Staphylococcus aureus* risk, or vomit or feces incident). Only trained staff members who have proper personal protective equipment (PPE) and approved products are allowed to disinfect.

Important Considerations

- Unapproved cleaning products and disinfectants brought in from home, and institutional cleaning and disinfectant products used in the classroom may contain hazardous chemicals, which can cause severe health reactions. Staff should not bring in products from home for use in the school.
- Products used in curricular activities and for building maintenance may also be hazardous.
- Disinfectants should be used with adequate ventilation (the ventilation system needs to be on or a window needs to be opened).
- Disinfectants should be used only on nonporous surfaces after the object has been cleaned and rinsed.

Work Practice

- *Protect Yourself*
    - Use PPE as required by the label, such as chemical-resistant gloves and eye protection.
- *Protect Yourself and Building Occupants*
    - Schedule disinfection activities during periods of lowest occupancy, whenever possible.
    - Make sure that the heating, ventilating, and air conditioning system is running, or open a window during product use.
- *Prepare Surface*
    - Wash surface with a third-party-certified all-purpose cleaner.
    - Rinse surface.
- *Disinfect Surface*
    - Use the smallest possible amount of disinfectant as recommended by the manufacturer to obtain the desired level of microbe control. More is not necessarily better: it may be more hazardous and creates waste.
    - Spray or squirt product on cloth unless the label specifically requires spraying directly on the surface. Spraying on the cloth instead of the surface protects the user and building occupants from breathing in the fumes.
    - Allow time for disinfectants to react with the microbes to kill them (listed as dwell, contact, or kill time on the product label). Follow label directions for time required for the disinfectant to be wet on the surface and in contact with the microbes, which varies from product to product.
    - Rinse all high-touch areas if the product label requires this step.
    - Wipe or dry surfaces if the product label requires this step.

Appendix C.4. Sample Protocol Poster: Cleaning Up Blood and Body-Fluid Spills

Cleaning Up Blood and Body-Fluid Spills

Applicable to spills of blood, feces, and vomit on porous and nonporous surfaces

1. Secure Area and Notify Staff and Other Responders

- ❒ **Notify and remove others located in the area of the hazard.**
- ❒ **Notify nurse, principal, and other responders of the incident.**
- ❒ **Secure area using caution tape and any physical means available.**

2. Prepare to Clean Up

- ❒ **Bring spill kit and sharps container (from nurse, if needed for disposal of sharp objects such as glass) to spill site if there is blood.**
- ❒ **Review clean-up procedures in spill kit.**
- ❒ **Remove supplies from kit and double-line bucket with two 2-mil plastic trash bags.**
- ❒ **Use a disinfectant registered by the U.S. Environmental Protection Agency for disinfecting blood spills (see product label). Select a carpet sanitizer or cleaner for carpets; a disinfectant for hard surfaces.**
- ❒ **Put on personal protective equipment (PPE). *Always* wear gloves, and assess the level of other protection needed:**

If…	Then put on…
You could be splashed in the face…	A face mask or shield, or splash goggles
You could be splashed on the body…	An apron
You could step in it and track it round…	Booties

3. Remove Contaminated Objects from Spill

- ❒ **Use nonporous equipment such as a dustpan or tongs (not hands or vacuum) to pick up contaminated sharp items such as needles and broken glass.**
- ❒ **Place contaminated items in the double-lined bucket, and sharp objects in the sharps container.**

4. Remove Spill and Spill Waste

- ❒ **Cover all spills with absorbent powder and/or disposable paper or cloth towels.**
- ❒ **Remove contaminated absorbent powder or towels with the kit dustpan.**
- ❒ **Soak up any liquid absorbed into porous surfaces with disposable rags.**
- ❒ **Place contaminated spill materials and disposable equipment in the double-lined bucket.**

5. Wash and Rinse Area

- ❒ **Wash and rinse area with detergent and a disposable paper or cloth towel.**

6. Disinfect the Area

- ❒ ***Method of Application (leave disinfectant on the surface for the required contact or dwell time)***
  - **For horizontal surfaces, *pour* the disinfectant on.**
  - **For vertical surfaces, *spray* the disinfectant on cloth and wipe onto surface.**
- ❒ ***Remove the residual disinfectant with paper towels or cloth rags, unless label directions state otherwise.***
  - **For surfaces that do not come into contact with skin, rinse with water and air dry.**
  - **For surfaces that do come into contact with skin, rinse with water and dry with paper towels.**

7. Clean and Disinfect the Spill Equipment

- ❒ **Wash, rinse, and then disinfect nonporous equipment such as tongs for 10 minutes.**
- ❒ **Dispose of used paper towels and cloth rags in the double-lined bucket.**
- ❒ **Remove contaminated clothing, double-bag in 2-mil bags, label, wash separately in laundry in hot water, and dry on high setting.**

8. Remove PPE – *Assume Gloves Are Contaminated*

- ❒ **With gloves still on, remove and dispose of all PPE in the double-lined bucket, except for goggles.**
- ❒ **Clean goggles with soap and water, then disinfect for dwell time (e.g., 10 minutes), rinse, dry.**
- ❒ **Remove gloves and dispose of in the double-lined bucket.**

9. Dispose Spill Waste

- ❒ **If the outside of the double-layer trash bag becomes contaminated, close it, insert into two new 2-mil bags, and close and seal this so it does not leak.**
- ❒ ***If there is free-flowing blood in the waste*, (1) dispose of it in a red biohazard bag or put a biohazard label on the outside of the 2-mil bags, (2) bring to the _________ for storage until it can be disposed as biohazardous waste, and (3) call _________ for a pick up.**
- ❒ ***If the blood cannot be wrung out of the spill materials (not free-flowing)*, use the 2-mil bags and immediately dispose of it in the dumpster.**
- ❒ **Return the sharps container to the nurse's office.**

10. Follow-Up

- ❒ **Immediately after spill clean-up, wash hands and other areas of the body that may have come into contact with the disinfectant or contaminants.**
  - **Wash for 20 seconds with liquid soap under hot running water.**
  - **If soap and water are unavailable, use waterless hand sanitizer, and then wash hands as soon as possible. The hand sanitizer will not work effectively in the presence of blood.**
  - **If there has been an unprotected exposure, immediately contact ____________ at ____________.**
- ❒ **Allow reentry when**
  - **All materials are removed.**
  - **Area is clean and dry.**
- ❒ **Return spill kit to designated storage location.**
  - **Ensure that it is restocked.**
  - **If additional supplies or more information are needed, call _______________.**
- ❒ **Record incident in _________________, including**
  - **Date and location of incident, staff and/or students involved, and any exposures.**
  - **Type of incident and related waste (blood, feces, vomit, etc.).**
  - **Type and location of disposal.**

5. Sample Memo: Blood Spill Kit

Memorandum

****
TO: All Custodians, Nurses, Athletic Directors, Food Service Staff, Bus Drivers
FROM:
DATE:
RE: Blood and Body-Fluid Spill Clean-Up Kits
****

Instructions

This kit contains the personal protective equipment and supplies you need to safely clean up and dispose of spill materials from bodily substances (feces, vomit, body fluids, and blood).

1. When you use items from this kit, be sure to request replacement supplies from ___________.

2. _________________ should take an inventory of this kit monthly.

****

Inventory of Supplies

Personal Protective Equipment

Apron

Booties

Splash goggles and paper face mask, or goggles with face mask

Chemical-resistant gloves for the specific product used

Spill Supplies

Clean-up procedures

Bucket

Absorbent spill powder

Ready-to-use disinfectant for bloodborne pathogens

Disposable dustpan and scraper

Caution tape

Disposal bags – several 2-mil polyethylene trash bags & red bags with biohazard symbol

Tongs for picking up sharps

Paper towels and disposable cloth rags

Alcohol-based hand sanitizer (62%–70% ethanol) is to be used only in situations where hand-washing facilities are not immediately available. Remember to wear the gloves, and then wash hands immediately after the clean-up is complete or if you are exposed.

Appendix D: Cleaning and Disinfecting by School Department Staff

The authors developed the following document during the SARS-CoV 2 pandemic to address the need to safely expand school staff capacity to conduct infection control activities. During the pandemic, many school departments and staff became involved in these activities that had not done so previously. Some staff and department involvement were official, and some were voluntary. This brought up numerous issues that this document was designed to address:

1. The need for staff guidance on how to break the chain of transmission in their departments and spaces using a set of strategies, including cleaning and disinfecting; and how to safely use, store, and dispose of cleaning and disinfecting products.

   Each department has unique issues to address due to various educational activities using a variety of equipment and/or supplies (e.g., art supplies, musical instruments). Thus, this document provides an overview of the issues faced by all staff complemented with department specific guidance.

2. The need to distribute cleaning and disinfecting products to staff, including monitoring quantities and expiration dates. This challenge was compounded by staff bringing their own unauthorized products that were not accounted for, thus not able to be managed by the school. This document provides guidance for assisting schools to develop policies and provide assistance to either:
   1. allow and support staff to assist with the infection control activities, or
   2. prohibit the use of unauthorized products and assist staff removal of them.
3. The need to regulate the amount and types of products coming into the buildings because many schools were panic buying and stocking up on due to the supply chain issues and the availability of grant funding. This were several challenges that this presented:
   1. Classroom Storage - Staff not having secure locations designed for chemical storage away from student reach.
   2. School Storage - The lack of storage space in the school due to the removal and storage of classroom furniture to make room for social distancing resulted in chemicals being stored in unsafe locations.

In summary, the authors recommend that administrators:

1. review the issues identified in this document and the related recommendations for taking an official position on what practices are approved, and
2. provide support to staff on implementing whatever decisions are made.

This document summarizes some of the information in the information found through the other sections of the *Infection Control Handbook for Schools, Edition 2* because it is designed for sections to copied and distributed to relevant departments and staff.

Contents

Introduction

The recommendations by the Centers for Disease Control and Prevention (CDC) and the Commonwealth of Massachusetts to increase the frequency of cleaning and infection control tasks during the pandemic to prevent transmission of disease, most often exceeded the capacity of school Facility Departments' staffing levels. As a result, in addition to reprioritizing custodial tasks, some districts considered having additional (noncustodial) staff conduct certain infection control activities in their departments.

Although it is not required in most non-custodial school employee job descriptions, some school staff bring in their own products and clean and disinfect their spaces. Staff returning to school buildings as part of the re-entry process are bringing in their own products.

Some staff and union representatives have taken the position that cleaning and disinfecting tasks are not part of their job. It is up to each district to determine its employees' roles in their district's infection control program. There are issues to be addressed whether 1) the district permits staff participation, or 2) they prohibit staff participation. These issues and related options to solve them are outlined below:

- **If the district <u>does not</u> permit staff other than custodians to participate in the cleaning and disinfecting activities,** they may need to address the following issues:
    - Concerns about the level of infection control in rooms.
        - A procedure should be developed so that a staff person can request additional cleaning and disinfecting services.
        - A system should be established to document the cleaning and disinfecting that was completed in a space. Some districts use a checklist mounted on the entrance to the space. This may be particularly important if a person previously in that space tested positive for COVID-19.
    - Unauthorized products brought in by staff.
        - Staff education about the risks and liability related to the presence and use of unauthorized cleaning and disinfecting products should address:
            - Health - Household cleaners and disinfectants pose health risks (e.g., asthma) to vulnerable adults and students whose immune systems are less developed than adults. Also, children eat, breathe, and drink more relative to their body mass than adults do.[1] Therefore, children have greater exposures to toxic chemicals for their body weight than adults.[1] These differences result in children being disproportionately exposed to toxic chemicals in air, food, and water.[2]
            - Training - Under the OSHA Hazard Communications Standard, districts are required to provide training on hazardous products used in the workplace, maintain a product inventory and safety data sheet on each hazardous

product, assign roles and responsibilities, etc. It is impossible to comply with these requirements when staff bring in random types, amounts and hazard levels of products.

- Storage - Teachers do not have safe storage areas as evidenced by inspection findings, particularly in elementary school classrooms. Hazardous products are found stored unsecured under the classroom sink in incompatible groupings of chemicals which can cause a chemical reaction (e.g., mixing bleach and ammonia can cause toxic gases).[3] Also, these products are often accessible to children in the classroom.
- Products - Staff may not understand disease transmission and the correct products and processes to reduce transmission. Thus, they may have a false sense of security thinking that they have disinfected, when in actuality, they may have not, or may have actually caused cross contamination due to poor practices.

  It is also important for teachers to understand that students should not use disinfectants for any purpose. By law, you must keep disinfectants out of students' reach.

- Removal of staffs' personal cleaning and disinfecting products. The district has two options to address this issue:
  - Provide an amnesty collection of any prohibited products, or
  - Provide a timeframe and guidance for staff on safely packaging and transporting products home. Please see the *Memo Template - Staff Guidelines to Remove Unauthorized Cleaning Products* at the end of this appendix for guidance.

- **If the district <u>does involve</u> staff other than custodians in cleaning and disinfecting activities,** there are several regulatory and safety issues to address, in addition to the issues outlined in the previous section. This document provides criteria when considering potential procedural, supply and training provisions that may need to be put into place for each department. Please consult Chapter 3. Development of Protocols for complete guidance on developing these program components.

  The district's COVID-19 designated point person should meet with each department to go over the following to customize content for each department. The district may also want to:

  - **Consult with relevant stakeholders** - Consult the school unions, parents' groups, local health department, etc.

- **Consider district-wide purchasing** - The district would streamline efforts across the district though coordinated purchasing and provision of supplies through the district and department levels.

  Consider procuring supplies through the statewide contract (SWC) FAC85 at COMMBUYS – COMMBUYS is the State's online procurement platform, which links public purchasers of products and services with vendors. COMMBUYS is managed by the Massachusetts Operational Services Division (OSD). OSD has an Environmentally Preferable Products Program that has the technical expertise to screen products for hazard level to procure the safest products for many of the contracts. All contracted goods and services are evaluated for price and performance. The state can negotiate competitive prices and services through their enormous buying power. OSD has also negotiated with vendors for ancillary services (e.g., assistance with program set-up, training, delivery parameters, etc.).

  Due to the pandemic, many environmentally preferable products, supplies and equipment were hard to procure and were on backorder for months. Use of this SWC contract helped expedite the procurement process.

  One very important service provided is the technical assistance available from the FAC118 Contract Manager and Contract Team. Due to the limited availability of some products and equipment, schools relied on vendors to find needed products. This can be a problem as salespeople do not always have the expertise at providing the least toxic products and safest product application equipment.

  The following categories available in the contract for the majority of supplies and equipment include:

  Category 1: General Purpose Cleaners

  Category 3: Disinfectants and Sanitizers

  Category 6: General

  Cleaning Supplies,

  Equipment, and Service

  Category 7: Hand Soaps,

  Hand Sanitizers, and

  Personal Care Products

  Category 12: Microfiber

  Cleaning Service

Guidance on how to use this information to implement a program – please read this section before reading the department specific information.

- **Product References in the Matrix**
  - Cleaning Products - All references to cleaning products refer to third-party certified all-purpose cleaning products.
  - Disinfectants - All references to disinfectants are for a subset of the safest products listed on EPA's List N for Emerging Pathogens. This information is provided in *Appendix J: Choosing Safer Disinfectants Active Against the Covid-19 Virus, Poster.*
- **High-Touch Points**
  - Please provide each department with a list of high-touch points for their area. These are available in the companion document, *Appendix E: Common High-Touch Points by Location,* which is <u>in addition to</u> information provided in the second column (Items/Areas to be Disinfected) of the matrix below.
- **Criteria to Consider When Developing Procedures**
  - Each school department has specific issues to address depending on the population they serve, the activities conducted in that department, and types of items and surfaces touched. This section provides criteria to consider when developing a work practice or procedure in that department.
- **Training** – all departments should have training on the following topics:
  - **Work Practices** - How to store and use the product, including the use of personal protective equipment.
  - **Infection Control** – Topics should include disease transmission; preventing transmission through implementing personal hygiene and social distancing; cleaning for health; and targeted cleaning and disinfecting for common high-touch points.
  - **Hazard Communication** - If employees have had the basic Hazard Communication training, they will just need an overview of the SDS for any new products they will be using. Departments that typically receive the Hazard Communication training are CTE, custodial, food service, etc.
- **Supplies and Guidance** – districts need to provide all staff conducting cleaning and disinfecting activities with the following:
  - **Safety Data Sheets (SDS) and Written Work Practices** – under the OSHA Hazard Communication Standard, the school district is required to provide SDSs for all products used. In addition, the district should provide written work practices on how to use, store and dispose of products, and how to get supplies refilled.
  - **Product Spray Bottles and Labels** – work with your product supplier to

obtain spray bottles and premade labels for the spray bottles.

- **Microfiber** – Microfiber is an ideal cloth for cleaning and infection control. Its split fibers remove dirt and germs more efficiently than other cloths, and it harbors less germs due to its quick drying time.
    - Districts will need to organize a microfiber collection, laundering and distribution system. The lack of a collection and laundering system can seriously hinder efforts to use microfiber for infection control. Consider a microfiber laundering system or service. Note that SWC FAC85 described above has a listing under Category 12 for Microfiber Cleaning Services. Please also see the document in Chapter 6. Equipment for Infection Control, section *C. Using Microfiber Cloths and Mops for Infection Control* for more information on the benefits and considerations for using microfiber.
- **Disinfectant Wipes** – Either prohibit the use of, or, if use is authorized, provide the authorized brands of disinfectant wipes, and specify how, when and where they can be used. Please see *Appendix I: Using Disinfectant Wipes at School, Poster* to learn about their proper usage. There are many types of wipes, including disinfecting, sanitizing, cleaning, and hand wipes. It is important to use the correct product for the job to prevent exposures to disinfectants, which are antimicrobial pesticides, and to ensure that surfaces are adequately disinfected. There is extensive misuse of these products.
- **Disinfectants in Aerosol Containers** – Prohibit the use of disinfectant products in aerosol containers. They produce a fine mist that can stay suspended in the air for long periods of time, depending on the amount of air flow and air exchange in the space. As a result, they can pose more of a respiratory exposure than use of a spray bottle, which produces larger droplets that fall out of the air much faster. Note that disinfects in aerosol containers are often used incorrectly as an air freshener/deodorizer, where they can cause an unnecessary exposure.
- Personal **Protection Equipment (PPE)** - The Massachusetts Department of Elementary and Secondary Education (DESE) has developed a statewide purchasing system for PPE, called *K-12 Health Supply/PPE Acquisition Support.* DESE provides a spreadsheet with recommendations for the amount of PPE needed, as well as a way to calculate the needs across the district. For more information, contact LEAestimates@mass.gov.

Department	Items/Areas to be Disinfected	Product and Equipment Criteria	Criteria to Consider When Developing Procedures
Facilities These activities are an extension of normal custodial tasks.	Routine areas (e.g., bathrooms, locker rooms/showers). Add a list of high touch points throughout building.	Use microfiber (whenever possible) and consider using color coded microfiber to help prevent cross contamination.	Frequency of high touch point cleaning and disinfecting. Managing microfiber and custodial equipment and supplies to prevent cross contamination. Use of additional PPE if there has been a confirmed case of COVID-19, When to air out, clean and disinfect a space where there has been a confirmed case (if the district is doing this in house).
Food Service This department currently provides “breakfast in the classroom” in many districts. The addition of serving lunch may be based on the system used for breakfast.	Cafeteria - touch pad for student lunch accounting, counters where students select food items, tray return areas, etc. Transport to Classroom – totes and carts used to transport breakfast to classrooms, etc. Food Service staff breakroom.	Must be approved for food contact surfaces if these surfaces are included. Ideally has a short dwell time. Sanitizers are used for food contact surfaces, not disinfectants. Sanitizers are not approved to kill viruses. There are some products registered as both a sanitizer and a disinfectant (typically at different concentrations and dwell times).	Must determine where non-food service staff touch surfaces in cafeteria. Kitchen staff wear PPE for various tasks and the Food Service department should determine additional places they may need to wear them.

Department	Items/Areas to be Disinfected	Product and Equipment Criteria	Criteria to Consider When Developing Procedures
Transportation Many districts contract out this service. If so, they should review the state guidance on re-entry to determine if there are new guidelines the vendor should implement. If so, the vendor contract may need to be updated.	Bus interior and exterior high-touch points. Bus depot (where workers wait between routes), and buses are stored and/or maintained. This includes the eating areas and facilities, bathrooms and break rooms.	Product must reach inaccessible areas. Do not recommend use of mister/fogger in the enclosed space of a bus due to exposure risks. The electrostatic sprayer used with an approved product has been tested by TURI to be safe to use in buses and is able to reach inaccessible areas.	Increase frequency to in-between each trip (more than just at the end of the day). Do not disinfect while the bus is occupied, even if there is an accident during transport. Consider the time needed before the bus can be reoccupied. Buses carrying special education (SPED) students may require additional management due to occupants' potential limited control over body functions. Work practices should include disinfecting from the back of the bus to the front, to minimize exposure to products. Also, open windows while cleaning and disinfecting. This is particularly important if using any type of spray applicator equipment and hazardous products.
Athletics This department has had to deal with disinfecting for MRSA, a resistant bacterium transmitted from infected skin.	Foam mats and shared athletic equipment (weights and weight machines), and shared items (e.g. balls, frisbees).	Ideally disinfectant requires no rinse and has a short dwell time. Needs to have kill claims for MRSA as well. Consider an electrostatic sprayer to do mats and equipment touch points quickly.	No student use of cleaning and disinfecting products. Items and surfaces cleaned and disinfected between every use. All students clean their hands before and after equipment use and/or playing with a common item (e.g., ball, frisbee).

Department	Items/Areas to be Disinfected	Product and Equipment Criteria	Criteria to Consider When Developing Procedures
Nursing Nurses may use disinfectants for either a limited or a wide range of surfaces and items depending on the level of service.[4]	Treatment rooms – beds/cots, counters, drinking water fixtures, and handwashing facilities. Nurses may also have refrigerators and other types of appliances.	Must be suitable to use with vulnerable populations. Need to determine if the disinfectant currently being used is effective for COVID-19.	How to disinfect between patients in small nurses' offices where there may be limited space to segregate patients from the area being treated.
Academics Although it is not a teacher's job to clean and disinfect, these products can almost always be found under the sink in an elementary classroom.	Desks, counters, sinks, sink counters, water fountains, pencil sharpeners, and touch points.	Ideally disinfectant requires no rinse and has a short dwell time.	Students do not use chemicals. Safe, secured storage. How to get refills on cleaning and disinfecting products and supplies. How to get microfiber collected, cleaned and returned (if used).
Offices/Main Office/Copy Room/ Security Desk	Shared equipment – copier, fax, phone, laminating machine, etc. Counters where services are provided in main office, and binder and pens used for visitors and students to sign in.	Ideally disinfectant requires no rinse and has a short dwell time.	Clean hands before and after use of shared equipment. Consider having a pen jar for signing into binders in main office and security desk. These pens can then be cleaned and disinfected after use.

Department	Items/Areas to be Disinfected	Product and Equipment Criteria	Criteria to Consider When Developing Procedures
Vocational/CTE This department does not typically do disinfecting unless related to the Career and Technical Education programs in health and animal care.	There are required surfaces and items to be managed as part of the program that should already be accounted for. There are also shared equipment, tools and supplies in these hands-on practicums. They range from hand tools to stationary equipment to working on a shared project, such as a car.	Need to determine if what is currently being used in the health care and animal care programs is effective for COVID-19. Ideally no rinse, short dwell time.	Handwashing before and after use of each piece of shared equipment. Cleaning and disinfecting after use of each piece of shared equipment.

Department	Items/Areas to be Disinfected	Product and Equipment Criteria	Criteria to Consider When Developing Procedures
IT Laptop keyboards have been tested and found to have high levels of infectious disease.[5] In addition to disinfecting for viruses, the laptops used by students and staff in school buildings and off-site in homes may need to address issues of bedbugs and cockroaches inside laptops, rodent feces in keyboards, and other pathogens.	The keyboards and inside of laptops distributed to staff and students to be used on-site at school and at home. Other shared electronics on site, such as audiovisual equipment and remote controls, printers, scanners, etc.	Always check manufacturer's instructions as disinfectants can damage surfaces on electronics. Must be able to clean and disinfect electronics without getting them soaked, while also keeping the surface wet long enough for the required dwell time. Although CDC recommends 70% alcohol for some part of electronics, it evaporates very quickly and may need to be reapplied to keep the surface wet for the required dwell time of 5 minutes.[6] Ideally disinfectant requires no rinse and has a short dwell time. Use lint free, non-abrasive cloths for screens and covers. Consider use of microfiber, a brush and/or use of compressed air for keyboards. Consider using keyboard covers.	Prior to cleaning and disinfecting, unplug computer and remove battery. In addition to blowing particles from keyboards, you can also turn the unit upside down and shake it gently. If there are any signs of rodents, take precautions to do this outside or under a ventilation hood to prevent getting any dust and particles in the indoor air where they can be inhaled. Spray solutions on cloth, not electronics. All moisture you put on the computer must come off. Consider isolating returned equipment that has been returned when possible for a week in a sealed plastic bag. This will help with cockroaches, but not bedbugs[7] who can survive without feeding for 20 to 400 days, depending on temperature and humidity.[8]

Department	Items/Areas to be Disinfected	Product and Equipment Criteria	Criteria to Consider When Developing Procedures
Special Education This population has a higher risk factor for transmission of infectious disease due to physical and mental health conditions, which can result in less control over bodily functions, and result in higher transmission of infectious body fluids. This department may already be using disinfectants to address BBP spills and toileting tasks.	Food contact surfaces (e.g., sinks, counters, tables where students eat) and items (e.g., high chairs). Possibly the floor if activities are conducted on the floor. High-touch points (e.g., wheelchair handles).	Evaluate any products they may currently be using for bloodborne spills or toileting tasks to determine suitability for COVID-19 virus. Product should be food contact approved for at least some of the surfaces, and safe for vulnerable populations. Ideally disinfectant requires no rinse and has a short dwell time.	Due to possible communication challenges with students, implementing protocols for student personal hygiene, cough etiquette, etc., may have limited effectiveness. As a result, SPED surfaces and items may require a more frequent schedule of cleaning and disinfecting.

Department	Items/Areas to be Disinfected	Product and Equipment Criteria	Criteria to Consider When Developing Procedures
Preschool Please see a related publication, *Green Cleaning, Sanitizing, and Disinfecting: A Curriculum for Early Care and Education,* for more detail.[9] https://www.informedgreensolutions.org/toolkit	Follow DESE requirements on what and how to disinfectant and sanitizer use. DESE's 2014 guidance provides specifics: https://www.mass.gov/doc/cleaning-sanitizing- and-disinfecting/download. DESE updated these guidelines for COVID-19 in *MA Child and Youth Serving Programs Reopen Approach, Minimum Requirements for Health and Safety*, *Updated June 12, 2020*, https://eeclead.force.com/resource/1591036172000/Min_Req. It is worth reviewing both documents.	This department already uses sanitizers per DESE regulations for food contact surfaces and disinfectants for toileting and other areas. Should be food contact safe and safe for vulnerable populations. Short dwell time, no rinse.	This department has a vulnerable population. Consider how to disinfect when students are not in space.

Department	Items/Areas to be Disinfected	Product and Equipment Criteria	Criteria to Consider When Developing Procedures
Art Resources to address the COVID-19 virus are available at the National Endowment for the Arts. Many of the resources currently available are focused on teaching remotely. New guidance is constantly being generated as information is forthcoming and circumstances change.	Equipment in this department ranges from shared stationary equipment such as kilns and pottery wheels to handheld tools such as X-ACTO knives, paintbrushes, etc. Also, the handling of easels, rolls of paper and supplies, bags of items, etc., will require extra management.	This department has experience cleaning tools and supplies after projects. The level of infection control needed may require additional pre-class prep and post-class cleanup. Consider purchasing consumable supplies or assigning supplies to students for the year whenever possible.	Students should clean their hands before and after tool and equipment use. Tools and equipment should be cleaned and disinfected after every use. Some equipment may be sharp and require careful cleaning. Consider creating a “clean supplies” section or cart in the classroom, and a “used supplies” section to ensure supplies will not be used again until they can be disinfected. Students will then know what items are safe to use. Monitor any supplies or tools taken and returned to the classroom to ensure they are disinfected before use.

Department	Items/Areas to be Disinfected	Product and Equipment Criteria	Criteria to Consider When Developing Procedures
Music Department and Band Room	Contact transmission on shared instruments: • hand contact (e.g., drums, piano, strings), mouth contact (e.g., flutes, trumpets, tubas, clarinets), and near mouth contact (e.g., chin rest on violin and viola) • items, surfaces and touch points in the room itself Respiratory transmission from the following activities has been identified as a concern for transmission[10, 11]: • singing, acting, wind instruments	Products used to clean and disinfect musical equipment will require consideration of the materials the instrument is constructed from.	COVID-19 Instrument Cleaning Guidelines: https://www.nfhs.org/articles/covid-19-instrument-cleaning-guidelines/ Related downloadable resources: https://drive.google.com/drive/folders/1PZ8RF3EytzUWGwfJNpu4fsyXc4E_u2Yi Guidelines for cleaning classroom ukuleles and guitars: https://www.facebook.com/86441965717/posts/10156874767740718/

Department	Items/Areas to be Disinfected	Product and Equipment Criteria	Criteria to Consider When Developing Procedures
Performing Arts and Theater Includes areas where classes and events are held	Chairs – used as part of set, in auditorium, etc. Set pieces, props, rails, technical hardware, etc. Dressing rooms – hair dryers, makeup mirrors, lockers, costume racks, restrooms/showers/ sinks, etc. Fly system used to move set pieces, lights, mikes. Lobby – ticket counters, concessions, and coat check areas. Shop areas to build sets. Equipment in the control booth.	If the items such as props have not been handled for more than a week, they do not require disinfecting.	All students should wash hands before and after class, rehearsal and performances, as well as after handling equipment, props, surfaces, etc.

Sample Memo - Staff Guidelines to Remove Unauthorized Cleaning Products

****

TO: Teachers and Staff
FROM:
DATE:
RE: Staff Guidelines to Remove Cleaning Products from Home

****

Know:

Removing unauthorized products is one of the first steps to implement the ___'s "Green Housekeeping" Program. The program is designed to provide the safest products and building conditions as possible.

Understand - which products are included and how to transport them safely:

Although you can purchase cleaning and disinfectant products at the grocery store, they may contact hazardous ingredients, and can cause serious reactions if they spill or leak. Thus, it is important pack them correctly for transport home. It is also why they must be disposed of correctly **(<u>not</u> in the trash or down the drain).** If you are not sure how to handle or dispose of a product, call ______________________________.

Products include all cleaning or disinfecting products such as; disinfectant wipes, disinfectants, air fresheners, all-purpose cleaners, window cleaner, bleach, ammonia, degreasers, oven cleaners, etc.

Do - Help us REMOVE unauthorized cleaning products:

- Bring home any cleaning products you have brought into the school.
- Make a list of any cleaning products in your space that you are not removing, or that possibly pose a safety risk by __date. If you are concerned about a safety hazard, inform your principal immediately.

Guidelines for Packaging and Transporting Products Home:

- Remove ONLY those cleaning products that you have brought in, are sure of what the contents are, and have intact containers and sealable lids.
- If the products are not yours, or you have any questions about the identity or condition of a product, please leave the product exactly as is, and contact your _________________.
- Separate chemicals into the **four compatible categories** (acid, base, flammable, reactive) for packaging and transportation listed in the chart on page 2 of this memo. (*This is best practice for home storage as well to prevent contact between incompatible products.)*
- Seal lids, and pack products so that they will remain upright and secured during transport.
- Put the products into another container to keep them separated into compatible categories (so they do not react with each other). You can use large, sealable plastic bags, or small plastic tubs (e.g. dish tubs or plastic shoe boxes), or buckets.
- Products remaining in the school after ___(date) will be removed by the school district.

Sample Memo - Staff Guidelines to Remove Unauthorized Cleaning Products, Continued

Compatibility Chart for Cleaning Product Packaging and Transportation

Note: Since there are numerous products brought in from home, and it is impractical to list them all here, we have provided a list of the most common products typically found in school. Please note that product types listed below may fall into more than one category (e.g., disinfectants can be either alcohol based (flammable), or quaternary compound based (corrosive base) depending on the ingredients. Please check the label.

If you have products that are not on this list, you can check the labels to see if they list the hazard category, check the Safety Data Sheet (SDS) that you can find on-line for most products, and/or you can call the company for more information.

Hazard Category	Product	"Acute" Health Effects
Reactive "Oxidizer" They are very unstable and can reactive with other chemicals and water.	Bleach	Oxidizers are also corrosive, and can irritate and burn skin, eyes and the respiratory system. Can trigger asthma.
	Scouring Powder with bleach	
	Hydrogen peroxide-based products	
Base/Alkaline "Corrosive" The pH level is higher than 12.5. This information can be found on an SDS under the "Physical Data" category.	Disinfectants	Can irritate, burn, and damage the eyes and skin. Can trigger asthma.
	Ammonia, and ammonia-based window cleaner and all-purpose cleaners	
	Oven, drain cleaner and degreasers	
Acid "Corrosive" The pH level is lower than 2. This information can be found on an SDS under the "Physical Data" category.	Acid-based toilet bowl cleaner	Can irritate, burn, and damage the eyes and skin. Can trigger asthma.
	Vinegar based window cleaner	
	Mineral scale removers	
Flammable/Ignitable Can give off flammable vapors at room temperature.	Degreaser	Breathing in vapors can affect the nervous system and can irritate the respiratory system and trigger asthma.
	Alcohol based window cleaner	
	Alcohol based disinfectants	
	Metal polish	
	All-purpose cleaners	

References

[1] EPA, *Children are Not Just Little Adults,* https://www.epa.gov/children/children-are-not-little-adults

[2] Landrigan, Philip J. and Golman, Lynn R. Children's Vulnerability To Toxic Chemicals: A Challenge And Opportunity To Strengthen Health and Environmental Policy, Health Affairs, vol. 30, No. 5: Environmental Challenges for Health, May, 2011

[3]https://www.doh.wa.gov/YouandYourFamily/HealthyHome/Contaminants/BleachMixingDangers#:~:text=Mixing%20Bleach%20and%20Ammonia,Coughing.

[4] Normal school nurse functions require very limited use of disinfectants. Health Centers located in schools provide more extensive services and use more hazardous products. This document will not address health center product infection control practices.

[5] Which, Press office, *Gadgets Grubbier Than Toilet Seats*, September, 2013, https://press.which.co.uk/whichpressreleases/gadgets-grubbier-than-toilet-seats/

[6] Drexel University, Methods for Disinfecting COVID-19 from Surfaces, https://drexel.edu/~/media/Files/research/news/031420-methods-for-disinfecting-covid-19-from-surfaces-v1.ashx?la=en

[7] This issue is being explored by a national Integrated Pest Management Working Group of universities, state agencies and EPA. More information and guidance will become available in late summer 2020.

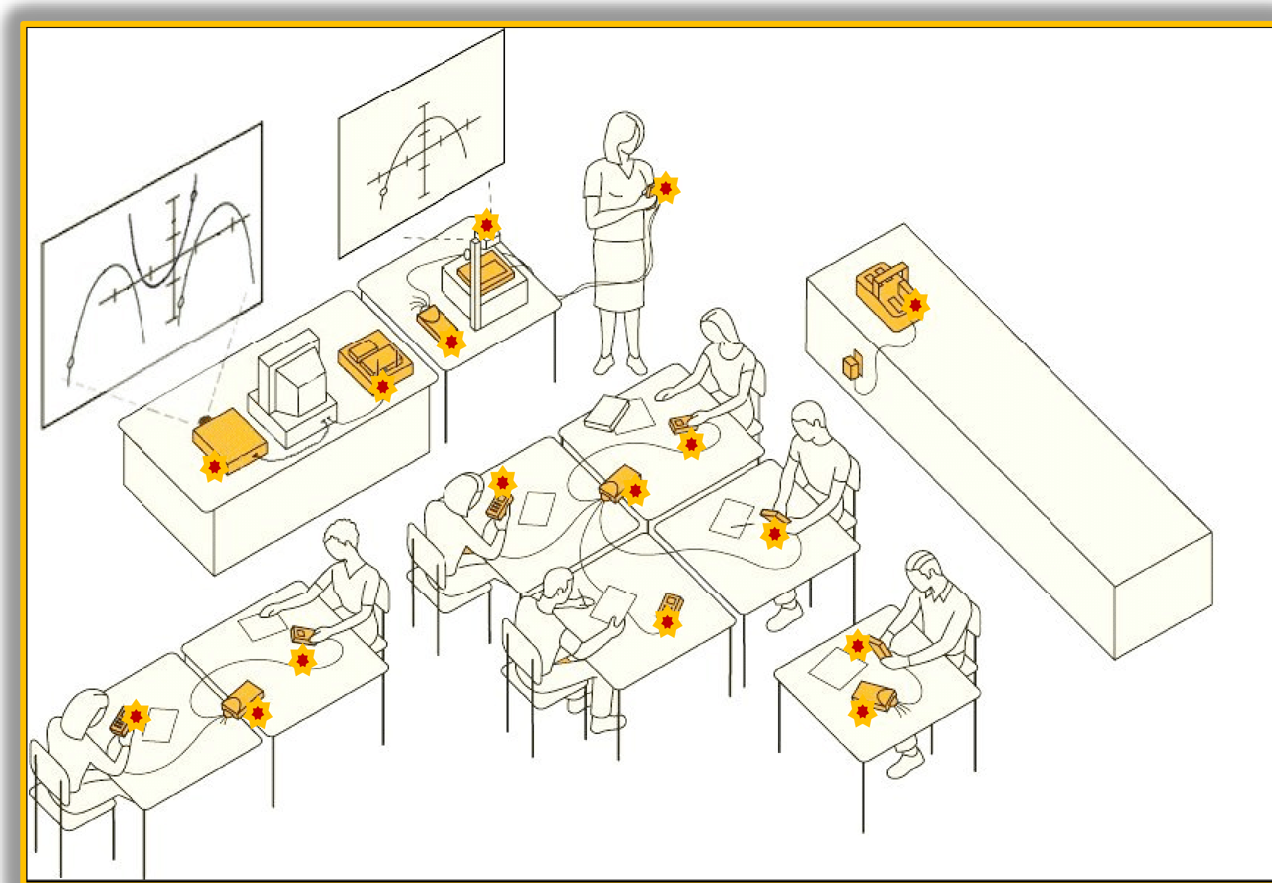
[8] University California, IPM, Agriculture and Natural Resources, *Pests of Homes, Structures, People, and Pets, Bed Bug Management Guidelines*--Bed Bug Management Guidelines--UC IPM

[9] The Caring for Our Children Appendix K is the standard most states base their regulations on. https://nrckids.org/files/appendix/AppendixK.pdf.

[10] CDC, MMWR*,* Lea Hamner, MPH; Polly Dubbel, MPH; Ian Capron; Andy Ross, MPH; Amber Jordan, MPH; Jaxon Lee, MPH; Joanne Lynn; Amelia Ball; Simranjit Narwal, MSc; Sam Russell; Dale Patrick; Howard Leibrand, MD, High SARS-CoV-2 Attack Rate Following Exposure at a Choir Practice — Skagit County, Washington, March 2020, *Weekly* / May 15, 2020 / 69(19);606–610, CDC, *May 12, 2020,* https://www.cdc.gov/mmwr/volumes/69/wr/mm6919e6.htm

[11] There is a new international coalition of performing arts organizations that commissioned a study on the effects of COVID-19 to understand risks in performing arts classrooms and venues. It will examine aerosol rates produced by wind instrumentalists, vocalists, and actors. The article, https://www.nfhs.org/articles/unprecedented-international-coalition-led-by-performing-arts-organizations-to-commission-covid-19-study/, 6/30/20, For more information, Mark Spede (CBDNA), mspede@clemson.edu, or James Weaver (NFHS), jweaver@nfhs.org

Cleaning and Disinfecting



Common High-Touch Points
by
Location in School Buildings

Customizable Templates

Developed by: Informed Green Solutions

Funded by: the Toxics Use Reduction Institute, University of Massachusetts Lowell

Contents

Introduction

Soiled surfaces provide conditions for pathogenic microbes (germs), including viruses, bacteria, and fungi, to survive outside of the body. They can serve as “reservoirs” for germs that can transmit them to people who touch them (indirect contact transmission). Heavily used surfaces touched frequently by many people are referred to as “high touch points.”

A key strategy to reduce disease transmission on high touch points is targeted cleaning and disinfecting at an increased frequency. To illustrate why this is an important strategy, consider that at home, we touch over 300 surfaces every 30 minutes.[1]

Only solid, non-porous surfaces can be disinfected using disinfectant chemicals. Soft, porous materials such as carpeting, upholstered furniture and fabric toys require a different process to kill germs. Porous surfaces will not be covered in this document.

How to Use this Document

This document provides lists of common high touch points organized by locations within a school building. The lists are designed to be customized based on the most relevant information for each area. Staff can use the checklists as a guide to focus efforts.

It can also be used as a checklist to document work completed, and/or posted to enable people to see the status of that space. Staff can date, sign, and post the sheets, if needed.

Managing these high touch points would be in addition to routine cleaning, sanitizing or disinfecting. This document does not discuss routine cleaning.

How to Clean and Disinfect High-Touch Points

Disinfecting high touch points involves putting on chemical resistant gloves, cleaning, and rinsing (if the product requires it), then using a disinfectant to kill the germs. The disinfectant must remain glistening wet on the surface for a certain length of “contact” time as listed on the label to be effective. This will vary for every product and for each type of germ, and typically does not exceed 10 minutes. Some products will also require a rinse after this step.

Note that disinfectants are different from sanitizers. Sanitizers only reduce to safe levels the bacteria they are tested to be effective against.

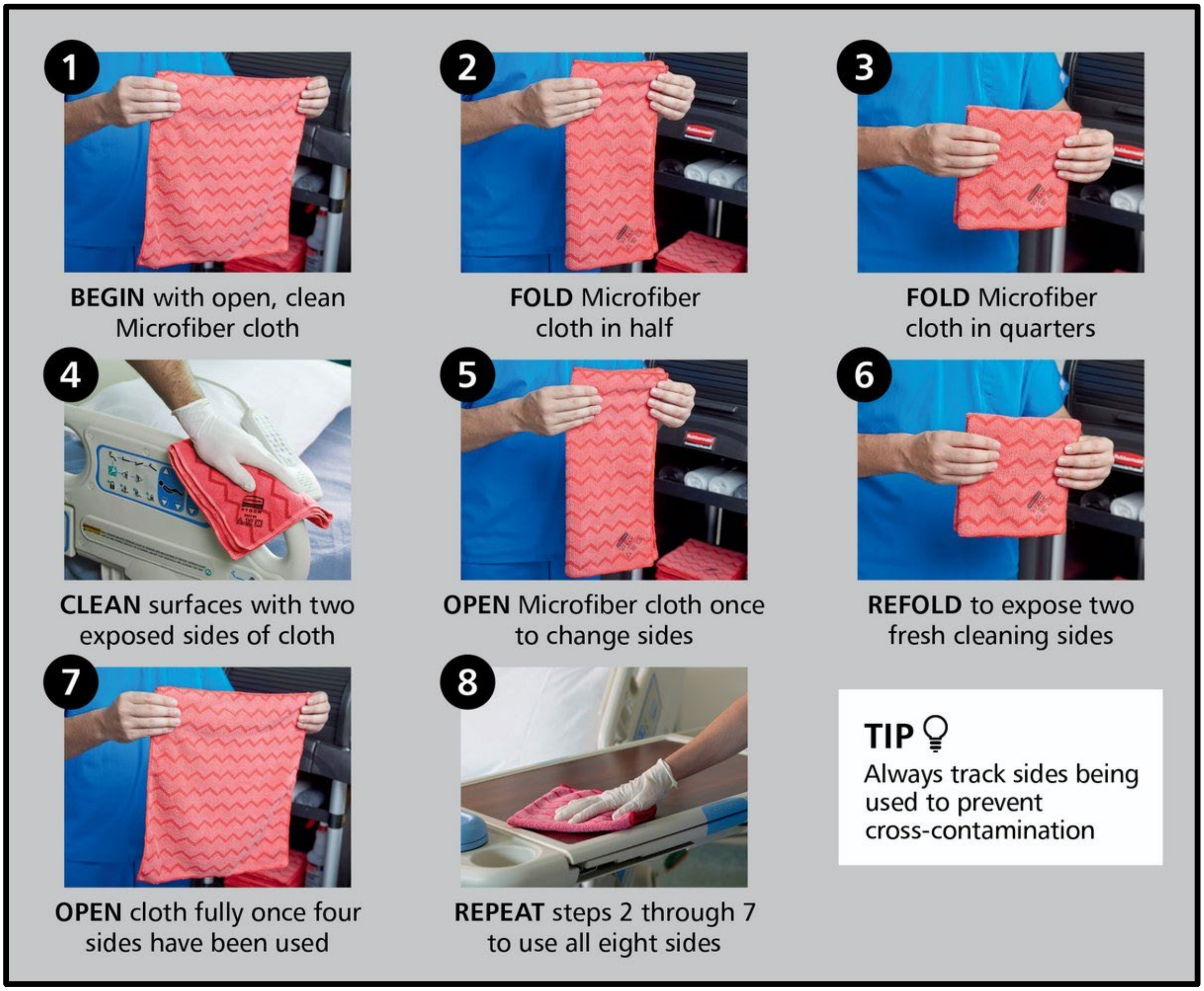
Thus, cleaning and disinfecting high touch points involves a two-step process that uses a third-party certified all-purpose cleaner first and then the application of a disinfectant. Please see *Appendix J: Choosing Safer Disinfectants*, *Poster* to help select a safer disinfectant.

The correct use of microfiber has the potential to remove dirt and germs more quickly and effectively than cotton, paper, or wipes. It also uses less product and dries the surface faster.

Since there are many different types and qualities of microfiber on the market with very different capabilities in removing germs from a surface, select a “split” microfiber, which is considered the most effective for infection control.[2]

The improper use of microfiber, cloth, paper, or wipes can leave germs behind as well as spread them to other surfaces (cross contamination).[3]

Please see the document in *Chapter 6. Equipment for Infection Control, C. Using Microfiber Cloths and Mops for Infection Control,* for more details on the advantages of using microfiber for infection control. Also, contact the company that supplies your microfiber for instructions on how to most effectively use and launder to prevent cross contamination. Below is an example of one company's use of the "Eight-Fold" method:

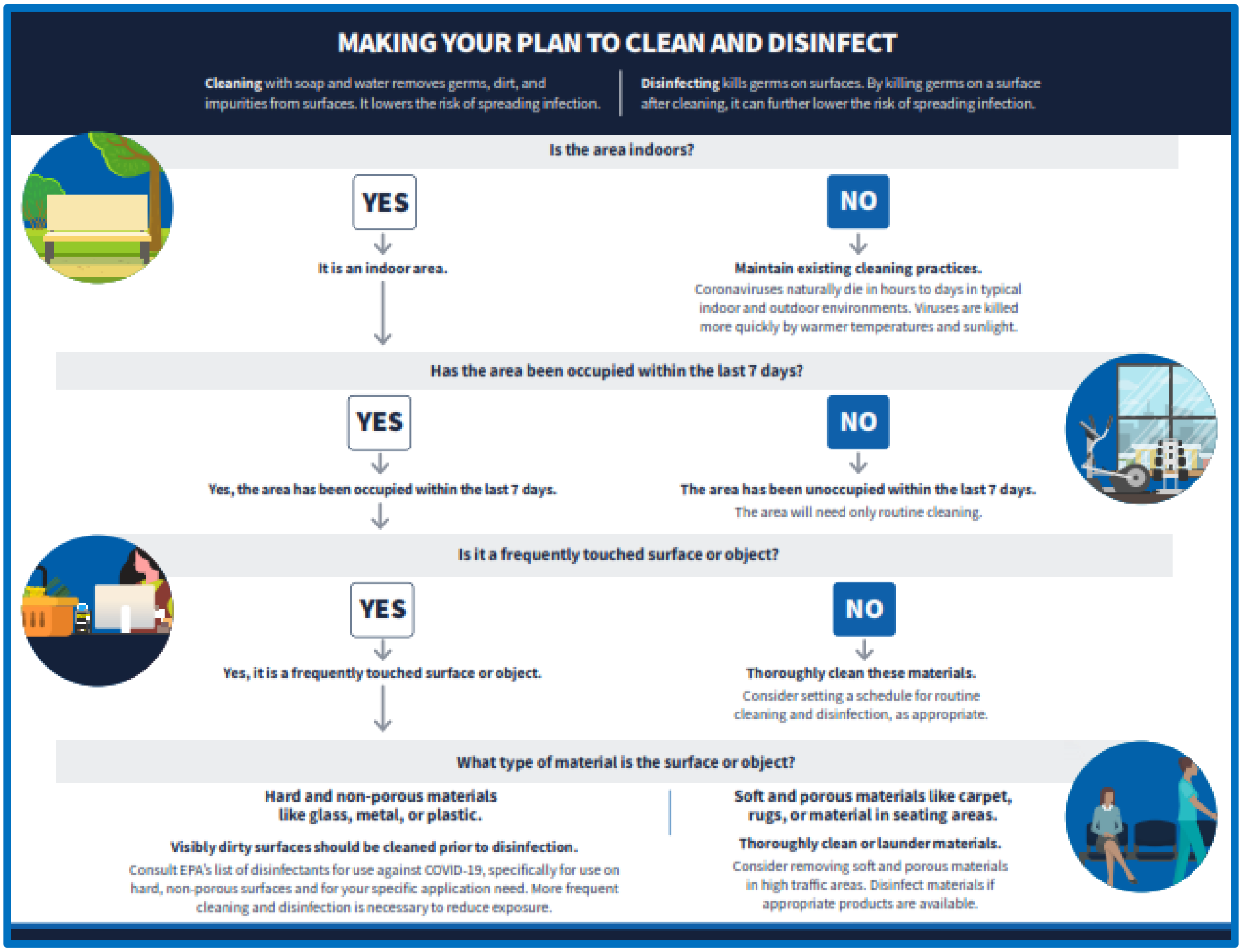


Source: Rubbermaid - https://www.rubbermaidcommercial.com/resource-center/0a1bf96b7165e962e90cb14648c9462d/Cross_Contamination_Prevention/

Schedule and Frequency of Touch Point Management

Frequency of managing high touch points is based on frequency of their use.

The decision-making flow chart developed by the Centers for Disease Control (CDC) at the onset of the pandemic is designed to assist Facilities determine when to clean and disinfect:



The CDC guidance was updated 11/15/2021[1]:

When to Clean and When to Disinfect

Cleaning with products containing soap or detergent reduces germs on surfaces by removing contaminants and decreases risk of infection from surfaces.

If no one with confirmed or suspected COVID-19 has been in a space cleaning once a day is usually enough to remove virus that may be on surfaces. This also helps maintain a healthy facility.

Disinfecting using EPA's List N disinfectants kills any remaining germs on surfaces, which further reduces any risk of spreading infection.

[1] CDC: https://www.cdc.gov/coronavirus/2019-ncov/community/disinfecting-building-facility.html

You may want to either clean more frequently or choose to disinfect in addition to cleaning in shared spaces if the space:

- Is a high traffic area, with a large number of people.
- Is poorly ventilated.
- Does not provide access to handwashing or hand sanitizer.
- Is occupied by people at increased risk for severe illness from COVID-19.

If a sick person or someone who tested positive for COVID-19 has been in your facility within the last 24 hours, you should clean **AND** disinfect the space.

- Schedule – some considerations:
    - Evaluate times where vulnerable populations (e.g., preschool students, SPED classrooms) may be present, as it would be best to schedule when occupants are not present. The best practice, whenever possible is to use disinfectants when occupants are not present.
    - Consider the contact time required for disinfectants to stay glistening wet on the surface/item. Try to obtain products with the shortest contact time for high touch points that may need to be immediately put back into use (e.g., bathroom fixtures, door handles in common).
    - Prepare to adjust the cleaning and disinfecting schedule from routine (daily) to a more frequent schedule based on the magnitude of an outbreak.
- Frequency – Consider how frequently the surface is touched and the amount of soil present:
    - Review schedules to determine heavy use of certain surfaces. Frequency should be scheduled based on use level versus a general number of times per day for all high touch points. One example is managing the High-Touch Points in the hallway after a students have passed to their next class.
    - Consider that schedules and level of use may change with the reduction in use or reopening of spaces. For example, schools may limit the use of common areas such as the teachers' lounge (where there are many high touch points), and direct staff to eat in their offices. If so, cleaning and disinfecting high touch points in the lounge may not need to be addressed as frequently.
    - Some items that involve repeated or extensive skin contact, such as gym equipment, should be managed after every use.
    - Consider whether the High-Touch Point is on an automatic sensor (e.g., light switch) as it may not need attention if not touched.
- Map High-Touch Points (if possible or needed):
    - Using a building layout, map out all known high touch points in the school building.
    - Distribute the map with the touch point checklists in the following pages to appropriate staff.

A Few Things to Note When Targeting High Touch Points

- Not all surfaces will be visibly dirty.
- Moist surfaces are key places for germ survival.
- Some high touch points may require special attention due to occupant(s) lack of control over body functions, communication, etc., due to age or medical conditions.
- Some surfaces may warrant a combination of strategies. A few examples:
  - Use of gym equipment should involve hand washing/sanitizing before and after use, as well as cleaning and disinfecting of the equipment after every use.
  - Use of shared computer keyboards and mice should involve hand washing/sanitizing before and after use, as well as cleaning and disinfecting the equipment periodically.
- There may be staff other than the custodial staff assisting with managing the high touch points, since it may not be feasible for custodians to do them all. Each sector has special considerations. Please see the document *Appendix D: Cleaning and Disinfecting by School Department Staff*, for criteria to be considered for departments.

CLASSROOM
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Common High-Touch Points in All Rooms

- ❒ Light switches
- ❒ Tables and countertops
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs

Classroom

- ❒ Pencil sharpeners
- ❒ Tape dispensers
- ❒ Shared tools (e.g., scissors)
- ❒ Shared toys (e.g., blocks, manipulatives)

Specialty Classrooms

- ❒ **Art**
  - o Kiln
  - o Potter's wheel
  - o Shared tools (e.g., scissors, X-ACTO knives, paint brushes)
  - o Computers for graphics work
- ❒ **Science**
  - o Experiment glassware
  - o Equipment (e.g., gas jets, trays)
  - o Sink faucets at lab tables
  - o Lab tables and counters
  - o Chemical storage equipment (should only be handled by teachers) (e.g., cabinets, refrigerators)
  - o Dishwasher for glassware

VOCATIONAL CLASSROOMS AND SHOPS
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

CTE Area of Study

- ❒ Auto Repair ❒ Auto Body ❒ Carpentry ❒ HVAC ❒ Cosmetology
- ❒ Electrical ❒ Plumbing ❒ Culinary Arts ❒ Horticulture ❒ IT
- ❒ Hospitality Management ❒ Early Education and Care ❒ Other:
- ❒ Animal Sciences ❒ Health Services (❒ Dental ❒ Health ❒ Medical)
- ❒ Graphics ❒ Manufacturing, Engineering and Technology

Vocational – Please note that the touch point initiative is in addition to any existing CTE program requirements for cleaning, sanitizing and disinfecting certain surfaces and items. These include, but are not limited to Cosmetology, Culinary Arts, Horticulture, Animal Sciences, Health Services, Early Education and Care, etc.

Review typical safety precautions to identify any special circumstances requiring additional management to avoid exposure to COVID-19. Some considerations:

- Shops need to develop a system to clean all equipment and/or tools used in a class to have them ready for the next student or next class.
- In a shop, equipment is used numerous times during a class period by either the same or a number of students, and may need to be cleaned in between uses within the same class session.
- Many CTE courses currently assign tasks to students to assist in cleanup at the end of class, and these students should be trained in all safety practices to ensure they are not exposed to contact transmission during cleanup.

Common High-Touch Points in All Rooms

- ❒ Light switches
- ❒ Tables and countertops
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Window handles

VOCATIONAL CLASSROOMS AND SHOPS
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

CTE Shop Focus – each shop should customize the list below to reflect the items and surfaces in their shop to be managed:

- ❐ Shared equipment (e.g., wood working, metal working, medical devices, computers, audio visual, manicure tables)
- ❐ Shared projects (e.g., working on a car for autobody or auto repair)
- ❐ Product dispensers (e.g., shampoo, degreasers)
- ❐ Workstations, including customer chairs, and hand, foot and head rests (e.g., cosmetology manicure stations, hair cutting stations)
- ❐ Reception area for customers using shop services (e.g., tables, chair arms and top of backs) – Consider removing magazines and coffee pots or refreshments.
- ❐ Linens in food service and cosmetology (e.g., towels, smocks, reusable capes, napkins, tablecloths) – These dirty linens and laundry are not high touch points but are likely to have had extensive skin contact. They should be:[4,5]
    - Handled by someone wearing gloves
    - Handled without shaking
    - Placed in a closed container (ideally with a liner that can be laundered or disposed of) and not used again until properly laundered
    - Cleaned by using a commercial laundering service or a laundering process which includes immersion in water of at least 160 degrees Fahrenheit for at least 25 minutes, and thoroughly dried
    - Stored in a clean, covered place

OFFICE
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Common High-Touch Points in All Rooms

- ❒ Light switches
- ❒ Tables and countertops
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Window handles

Office – whenever possible, try not to use other people's tools (e.g., staple remover, stapler). If needed, clean hands before and after use.

- ❒ Coffeepot
- ❒ Copy machine
- ❒ Laminator
- ❒ Printer
- ❒ Scanner
- ❒ Label maker
- ❒ Paper shredder
- ❒ Tools used by multiple people (e.g., stapler, staple remover, hole punch)

LIBRARY

CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Common High-Touch Points in All Rooms

- ❒ Light switches
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Window handles

Library Specific

- ❒ Card catalogues
- ❒ Water fountain and bottle filling station levers and bars
- ❒ Sink and faucet handles, sink counters, and paper towel and soap dispensers
- ❒ Headphones
- ❒ CD players
- ❒ Audiovisual cases (before re-shelving)
- ❒ Books with hard covers or plastic film coverings - before re-shelving.
- ❒ Paperback - paperback covers are porous surfaces and cannot be disinfected. An alternative is to quarantine the books for at least 24 hours, and then re-shelve them.
- ❒ Shelving carts for books, CDs, videos, etc.

CONFERENCE ROOMS
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Common High-Touch Points in All Rooms

- ❐ Light switches
- ❐ Handles on cupboards, drawers, file drawers, etc.
- ❐ Door locks, handles, push bars and plates
- ❐ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❐ Shared phones
- ❐ Audiovisual equipment and remote controls
- ❐ Tables and counters – work and snack tables
- ❐ Tops and arms of chairs
- ❐ Handles on windows

Conference Room Specific

- ❐ Conference phones
- ❐ Sink and faucet handles
- ❐ Sink counters
- ❐ Paper towel and soap dispensers

COPY ROOM

CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Common High-Touch Points in All Rooms

- ❒ Light switches
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Handles on windows

Copy Room Equipment (could be located anywhere, e.g., main office, teacher's lounge, etc.)

- ❒ Copier
- ❒ Laminator
- ❒ Fax machine
- ❒ Scanner
- ❒ Printer
- ❒ Small equipment (e.g., stapler, staple remover, hole punch, pencil sharpener)

SCHOOL OFFICE
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Common High-Touch Points in All Rooms

- ❒ Light switches
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Window handles

School Office Waiting Area

- ❒ Counter where visitors and students sign in
- ❒ Pen and clipboard or binder for visitors, students and district staff to sign in
- ❒ Staff mailboxes

SECURITY DESK
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Note: This desk is typically located at an entrance in a hallway, and not in a separate room. If it is located in a separate room, then also use the list *Common High-Touch Points in All Rooms.*

- ❒ Counter or table where visitors and students sign in
- ❒ Pen and clipboard or binder for visitors, students and district staff to sign

HALLWAYS AND STAIRWAYS
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

- ❒ Light Switches
- ❒ Elevator buttons – inside and outside of the elevator
- ❒ Drinking fountains and bottle filler handles and bars
- ❒ Door locks, handles, push bars and plates
- ❒ Handles on windows
- ❒ Stair railings and hall railings
- ❒ Vending machines

Notes: Locker handles are only touched by the student that uses them. Your school may want to clean and disinfect at an increased frequency, but they do not warrant as often as a surface touched frequently by many people.

PRESCHOOL

CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Common High-Touch Points in All Rooms

- ❒ Light switches
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Window handles

Preschool – Specific (Please be sure to follow all licensing regulations for your state! Continue to follow disinfecting and sanitizing protocols for toys, mouthed items, toileting high touch points, food and non-food surfaces, etc.)

- ❒ Handrails
- ❒ Handles on equipment (e.g., storage boxes)

Preschool Eating High-Touch Points

- ❒ Bubbler handles/bars
- ❒ Sink faucet handles and countertops
- ❒ Handles on soap and paper towel dispensers
- ❒ Handles on appliances (e.g., refrigerators, stoves, microwaves, toaster ovens, coffeepots, dishwashers, etc.)

Preschool Restrooms

- ❒ Sink faucet handles and countertops
- ❒ Toilet handles and seats (coronavirus is found in feces), and urinal handles
- ❒ Door locks, handles, push bars, and plates
- ❒ Handles/bars on soap, paper towel and toilet paper dispensers
- ❒ Hand dryer bars
- ❒ Sanitary napkin dispensers and disposal containers
- ❒ American Disabilities Act (ADA) assist bars in bathroom stalls
- ❒ Latches on the inside and outside of the bathroom stall doors

FOOD SERVICE
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Kitchen Office – Common High-Touch Points in All Rooms (if items are shared)

- ❒ Light switches
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Window handles

Kitchen - continue to clean, sanitize and disinfect as required by ServSafe and any other regulations. These high touch points may be in addition to those requirements.

- ❒ Light switches
- ❒ Handles on cupboards and drawers
- ❒ Door locks, handles, push bars and plates
- ❒ Window handles
- ❒ Tables and countertops
- ❒ Kitchen faucet handles, sink counters
- ❒ Handles/bars on paper towel and soap dispensers
- ❒ Dials and handles on equipment (e.g., refrigerator, stove, oven, steamer, mixer, ice machine)

Cafeteria (this will be affected if students are required to eat in their classrooms)

- ❒ Light switches
- ❒ Tables and counter tops
- ❒ Door locks, handles, push bars and plates
- ❒ Window handles
- ❒ Press buttons on vending machines
- ❒ Press buttons on machine tracking student meals
- ❒ Cash register buttons and drawer
- ❒ Drinking fountains and bottle filler handles and bars

TEACHER’S LOUNGE/STAFF BREAKROOM
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Notes:

- Consider reducing the use of this space by having staff eat in their work locations whenever possible, and bringing prepared meals to minimize the need to use kitchen equipment. If the school determines that they will continue to use these spaces, then consider developing a protocol for staff to wash their hands prior to using any equipment, and cleaning and disinfecting any items or High Touch Points that may have become contaminated during use.
- Consult the Facilities Department before staff consider bringing more appliances into their office or classroom spaces, such as coffeepots, small refrigerators, and microwave ovens. Although it could reduce use of common equipment, it can present other issues such as pest problems, increased energy use and electrical loads, etc.

Common High-Touch Points in All Rooms

- ❒ Light switches
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Window handles

Teacher’s Lounge/Breakroom Specific

- ❒ Handles and dials on all appliances (refrigerator, stove, microwave, toaster oven, toaster, coffeepot, etc.)
- ❒ Sink and faucet handles
- ❒ Sink counters
- ❒ Paper towel and soap dispensers
- ❒ Counter drawer handles
- ❒ Salt and pepper shakers
- ❒ Buttons on vending machines

NURSE’S SUITE
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Nurse’s Office (Common High-Touch Points)

- ❒ Light switches
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones, audiovisual equipment, and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Window handles
- ❒ Refrigerator and appliance handles

Treatment Room High-Touch Points

- ❒ Light switches
- ❒ Door locks, handles, push bars, and plates
- ❒ Chair backs and arm rests, cots, and treatment tables
- ❒ Tables, counters, cabinets
- ❒ Handles/bars on soap and paper towel dispensers,
- ❒ Handles on sink faucets and water fountains
- ❒ Window handles

Nurse Bathroom

- ❒ Light switches
- ❒ Sink faucet handles and counters
- ❒ Toilet handle and seat (coronavirus is found in feces)
- ❒ Urinal handles
- ❒ Door locks, handles, push bars, and plates
- ❒ Handles/bars on soap, paper towel and toilet paper dispensers
- ❒ Hand dryer bar
- ❒ Sanitary napkin dispensers and disposal containers
- ❒ American Disability Act (ADA) assist bars in bathroom stalls
- ❒ Latches on the inside and outside of the bathroom stall doors
- ❒ Window handles

ATHLETIC/FITNESS ROOMS
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Athletics Office – Common High-Touch Points (if equipment and items are shared)

- ❒ Light switches
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Window handles

Gym – students should clean their hands before and after using the gym facilities, and all items used should be cleaned and disinfected between users

- ❒ Light switches
- ❒ Window handles
- ❒ Door locks, handles, push bars, and plates
- ❒ Sink faucet handles
- ❒ Water fountain knobs and push bars
- ❒ Equipment (e.g., balls, nets, rackets)

LOCKER/SHOWER/REST ROOM
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Notes:

- The need to clean and disinfect these facilities will be determined by whether students are allowed to change and shower.
- Also, some of the touch points in the shower stall and in the bathroom will be cleaned and disinfected as part of cleaning and disinfecting the whole area. Shower stalls are high risk areas for some types of disease transmission.

Common High Touch Points

- ❐ Light switches
- ❐ Door locks, handles, push bars, and plates
- ❐ Sink and shower faucet handles
- ❐ ADA assist bars in bathroom and shower stalls
- ❐ Latches on the inside and outside of the bathroom stall doors
- ❐ Water fountain knobs and push bars
- ❐ Locker handles
- ❐ Hand and hair dryers push plates
- ❐ Handles/bars on soap, paper towel and toilet paper dispensers
- ❐ Knobs on sanitary napkin dispensers and lids on sanitary napkin receptacles
- ❐ Benches
- ❐ Tables and countertops
- ❐ Window handles

MUSIC ROOM/BAND ROOM
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Music Office/Classroom – Common High-Touch Points (if equipment and items are shared)

- ❒ Light switches
- ❒ Tables and countertops
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Window handles

Band Room

Have students clean their hands before and after using shared equipment.

Clean equipment after use for the next person.

Caution: Use of some types of cleaning and disinfectant products may damage some instruments. Contact the manufacturer of the equipment if you have any questions.

The following resource provides specific directions on COVID-19 Instrument Cleaning Guidelines - https://www.nfhs.org/articles/covid-19-instrument-cleaning-guidelines/.

- ❒ shared equipment – hand contact (e.g., drums, drumsticks, piano, strings)
- ❒ shared equipment – mouth contact (e.g., flutes, trumpets, tubas, clarinets)
- ❒ shared equipment – near mouth contact (e.g., chin rest on violin and viola)

PERFORMING ARTS
CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Theater Office/Classroom – Common High-Touch Points (if equipment and items are shared)

- ❒ Light switches
- ❒ Tables and countertops
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Window handles

Theater

- ❒ Theater props (base the frequency of management on how much the items are handled)
- ❒ Audiovisual equipment (e.g., control touch pads, remote controls, audio and lighting controls, microphone stands, speakers, projection equipment, screens)
- ❒ Tops and arms of chairs
- ❒ Door locks, handles, push bars and plates
- ❒ Light switches

COMPUTER LAB

CHECKLIST TEMPLATE: CLEANING/DISINFECTING

Common High-Touch Points in All Rooms

- ❒ Light switches
- ❒ Tables and countertops
- ❒ Handles on cupboards, drawers, file drawers, etc.
- ❒ Door locks, handles, push bars and plates
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Shared phones
- ❒ Audiovisual equipment and remote controls
- ❒ Tables and counters – work and snack tables
- ❒ Tops and arms of chairs
- ❒ Window handles

Classroom

- ❒ Pencil sharpeners
- ❒ Tape dispensers
- ❒ Shared tools (e.g., scissors)

Computer Lab Specific

- ❒ Audiovisual equipment and remote controls
- ❒ Computer mice and pads, wrist pads, keyboards, keyboard covers and touch screens
- ❒ Wi-Fi and router equipment
- ❒ Scanners
- ❒ Printers

References

[1] Mitchell, Erica**,** *Cleaning House, Part 4: Touch Points*, April 15, 2020.
[2] Hoyle, Mark, and Slekak, Bill, *Understanding Microfiber's Role in Infection Prevention*, November 7, 2008.
[3] Kahn, Michael, *Antibacterial wipes can spread superbugs: study*, https://www.reuters.com/article/us-infection-wipes/antibacterial-wipes-can-spread-superbugs-study-idUSL0383329520080603?sp=true
[4] Cal/OSHA, Industry Guidance: Hair Salons and Barbershops, June 5, 2020.
[5] CDC, https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cleaning-disinfection.html

Appendix F: EPA's Initiatives During the Pandemic Including How to Use List N

Contents

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Appendix F.1. The Status and Role of This Document

Status

This guidance has been updated several times, with the most recent, January 2022, from the first version developed by this project in the spring of 2020. It reflects the significant changes in the design and use of the search tools for List N, as well as the changes in initiatives by EPA to respond to the use of new technologies and product claims by manufacturers, as well as responses to questions that arose since the onset of the pandemic.

EPA Tools

EPA has also created the following helpful tools to assist the user search and use the List N. These new EPA tools are likely to be sufficient for use in determining if the product you are seeking is included on the list, or for seeking what is approved for use.

- Link to EPA's video on how to use List N: https://www.youtube.com/watch?v=mrp7xscZ4LA&feature=youtu.be
- Link to EPA's Infographic: Tips on using the List N Tool: https://www.epa.gov/pesticide-registration/infographic-tips-using-list-n-tool

Role of this Document

It provides a compilation and consolidation of the majority of related information located in a number of pages on the EPA website related to List N.

It provides an extensive level of detail beyond what is covered in EPA's infographic and the video on how to use List N. Some of these highlights include:

1. Some significant changes in disinfectant applications.
2. The use of EPA registered disinfectants in disinfectant application equipment.
3. Status of EPA's expedited review processes.
4. References and links to EPA's approval processes for new or expedited initiatives.

Appendix F.2. Overview of List N

Overview

EPA's Antimicrobial Division maintains lists of disinfectants selected for use on common pathogens (microbes that cause disease, also known as germs). Disinfectants are formulated and tested to be effective against specific germ(s). These lists help the end user select the right type of product for the germ they are concerned about. EPA's lists include:

Lists A-M:

These are specified for products that have been tested and registered to be effective against the Norovirus, Ebola, *C. difficile* spores, avian flu, etc.

List N:

The list provides products that meet EPA criteria for use against SARS-CoV-2, the virus that causes the COVID-19 disease. At the beginning of the pandemic, the virus was new and disinfectant products had not been tested to inactivate it. Since it can take more than a year for a company to obtain a viral "kill claim" for a disinfectant approved and registered by EPA, EPA has enacted a "hierarchy-based" policy. This means that if a disinfectant has been registered by EPA to be effective against harder-to-kill viruses, it is likely to inactivate a virus like COVID-19.[1]

Products claims are now being posted on disinfectant labels for the virus as manufacturers complete the EPA approval process.

What List N is Not:

- A static or exhaustive list of products. EPA continues to add products and update the list.
- An endorsement by EPA. Inclusion on the List N is not a platform for manufacturers to advertise their product's effectiveness against COVID-19 (unless they have met other EPA criteria). This is a list for end users who are seeking to use the products.
- A list of environmentally preferable products. Although part of EPA's decision to register a product is based on whether that product will perform the specific function for which it is being registered without causing unreasonable risk to human health or the environment, it does not mean it cannot cause health effects.[2] See the fact sheet in this handbook, *Appendix J: Choosing Safer Disinfectants,* for a subset of List N products that are environmentally preferable.
- A list of products that can be used on humans or animals. There are products registered for the animal coronavirus, but these are not included on the List N.

Appendix F.3. Status of List N Search Tools and Resources

- EPA created List N and the original Advanced Search Tool for the List N database in early March 2020. EPA updates the database as additional products are approved. The new date reflecting the updates is posted in the original Advanced Search Tool but is not located on the new version of the search tool. The date that each disinfectant is listed is posted with the product's information in the database.
- Although EPA created a new version of the original Advanced Search Tool, they have retained and continue to maintain both search tool formats on their website. The following pages provide an overview of the information contained in the search tools' data fields in both versions of the search tool. It also provides weblinks to each version of the search tool.
- The FAQs on EPA's webpages are updated on how to use the search tools, and often link to more extensive information on EPA's website. It is valuable to revisit the List N website periodically as it continues to evolve with the addition of new information, products, and search tools.

  In addition, EPA provides information on their product application processes and decisions, which are summarized on the EPA webpage called "Disinfectant Use and Coronavirus (COVID-19)" (https://www.epa.gov/coronavirus/disinfectant-use-and-coronavirus-covid-19). It includes information and links on some of the following important topics:

  - Expedited Review for Adding Electrostatic Spray Application Directions for Use to Antimicrobial Product Registrations (https://www.epa.gov/pesticide-registration/instructions-adding-electrostatic-spray-application-directions-use) – Electrostatic sprayers are being used more extensively as part of the pandemic response to disinfect larger areas in a shorter amount of time. At the onset of the pandemic, there were very few products approved by EPA to be used in the sprayers. EPA's expedited their review time to enable companies to fast track the review and approval process for disinfectant use in these devices. As a result, there are some additional products now on List N, and more under review.

    Please note that although some manufacturers may advertise and some vendors may promote the use of disinfectants in this equipment, it is important to verify these claims by checking the "Formulation Type" field in List N and/or the product's EPA Pesticide Registration information to verify whether the product has been approved by EPA to be used in this equipment.

> **Update on status of EPA's Expedited Review Processes:**
>
> Please note that as of April 2021, these references to topics under EPA's "expedited review" process are no longer under an expedited review timeframe and will follow normal review schedules.

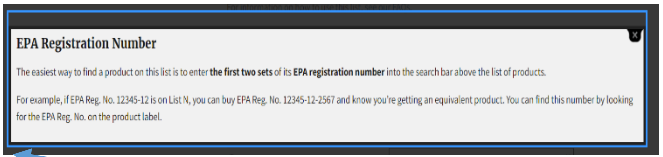
    Expedited Review for Products Adding Residual Efficacy Claims (https://www.epa.gov/pesticide-registration/interim-guidance-review-products-adding-residual-efficacy-claims) – These are manufacturer's claims that a product provides an ongoing antimicrobial effect beyond the initial time of application, ranging from days to weeks to months. Please see page 10 of this document, in the section *Claims of Residual Activity* for more information on the types of products under review.

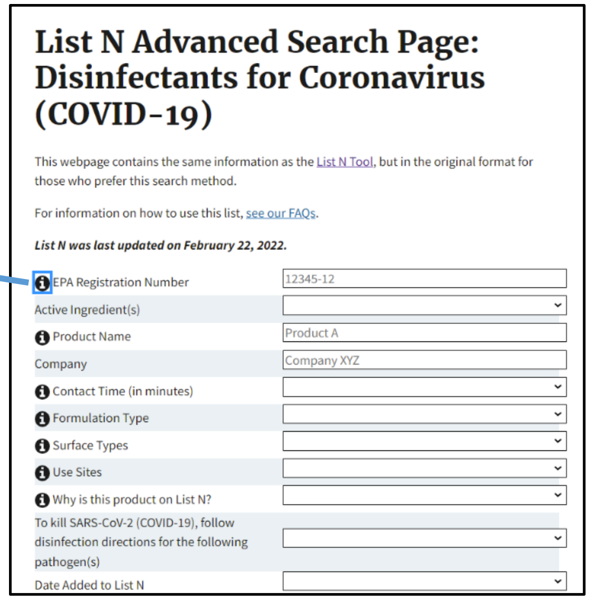
- Another change of note is what surfaces disinfectants can be used on. It is now possible to use a disinfectant for porous surfaces. Previously, disinfectants were only approved to be used on nonporous surfaces. Please see page 14 of this document for more information.
- There is no set schedule for any updates of the List N and the related search tools.

Appendix F.4. What the Search Fields Refer to in Both Versions of the Search Tool

Introduction to this section:

The information provided in this section is designed to complement the brief definitions of these fields on the EPA website: https://www.epa.gov/coronavirus/i-have-question-about-word-or-phrase-list-n-website-im-not-sure-how-something-list-n, and in the advanced search page:





Clinking on the icon opens a box that provides an explanation of that field.

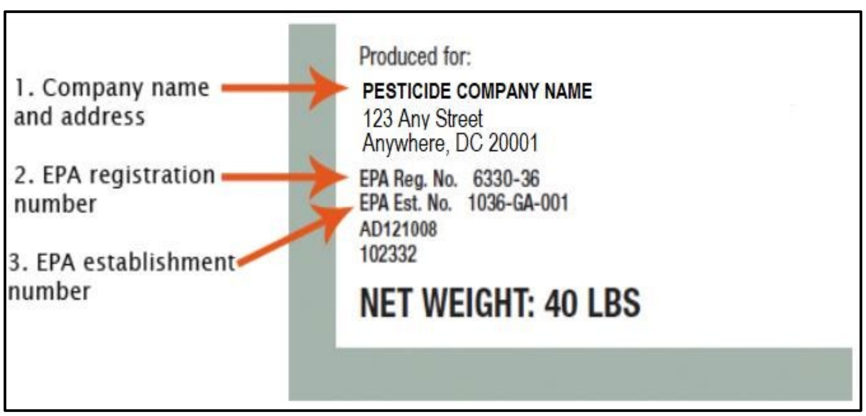
This document provides the information from each field in the database. Information provided ranges from brief explanations where the fields are self-explanatory to more extensive explanations with additional resources (e.g., graphics, links, status of regulatory and marketplace information, end user challenges, etc.)

EPA REGISTRATION NUMBER

What It Is

It is the number assigned by EPA to pesticide products that they have approved. The registration number must be preceded by either the phrase “EPA Registration No.” or “EPA Reg. No.” This phrase will be followed by a company number, then a hyphen (-), and then the product number.

If a product is labeled a “disinfectant,” it will always have an EPA Registration Number, which must be listed on the label. Although EPA does not require a specific location for the number to appear on the label, EPA prefers that it appear on the front panel near the registrant's name and address.



What is the difference between the EPA Registration Number and the EPA Establishment Number?

An EPA registration number signifies that the pesticide and its claims have been reviewed and approved by EPA. An establishment number identifies the EPA-registered location where the product was produced.

How can a disinfectant's EPA Registration Number be used to identify products effective against SARS-CoV-2?

EPA lists products on List N by their EPA Registration Number. Thus, the easiest and most reliable way to determine if a product is on the List N is to search by this number. It can also help with finding a formulation on List N marketed under other brand names, because one formulation may be marketed and sold under different brand and product names.

Sometimes a company will market the same exact formulation with the same registration number under two different product names. An example of this is the Clorox disinfectant "Anywhere" that advertised on their website but is posted on List N as "Galaxy", and all of the EPA registration information refers to Galaxy.

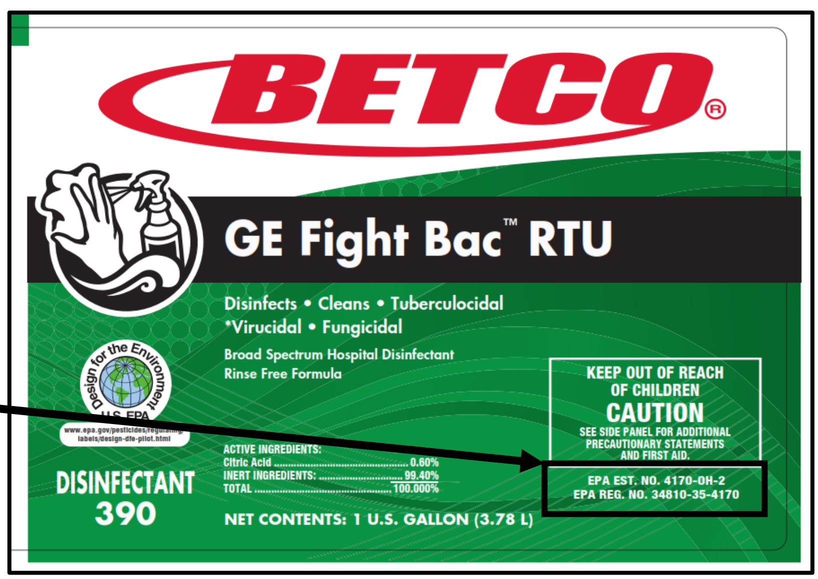
To determine whether a product is registered to inactivate SARS-CoV-2, determine whether its **primary registration number** is on List N. If the number is the same as one on the List N, then it is an equivalent product, and can be used for control of the COVID-19 virus. An example:

EPA Registration Number (12345-12) – consists of two sets of numbers separated by a hyphen. The first set of numbers refers to the registrant's company identification number, and the second set of numbers represents the primary product number.

EPA Registration Number (12345-12) - 2567 – if there is also a third set of numbers, it represents the identification number of the Distributor/Relabeler who repackaged the product for distribution. This product will have an identical formulation and efficacy to the primary product. The third set of numbers is irrelevant for determining if a product on the list is a match with a product you are evaluating.

There are several ways to find the EPA Registration Number. Some examples:

- Check with the manufacturer or distributer.
- Check the product label.



- Use the EPA Look-Up Search Page for Labels: Search by product name, company name, or active ingredients, etc. at https://iaspub.epa.gov/apex/pesticides/f?p=PPLS:1

  Note: The label search page also enables you to search by alternative names for the primary formulation! This can be extremely helpful when determining all the products available under that formulation.

- Search the Internet: Type in the product name and the words "EPA Registration Number" and the name of the product. Be sure that it is the correct product, and the date of the information found is the most current available.

  Note: EPA provides more detail about whether a product is on the list on their page located at: https://www.epa.gov/coronavirus/i-cant-tell-if-product-im-interested-list-or-not-can-you-help-me.

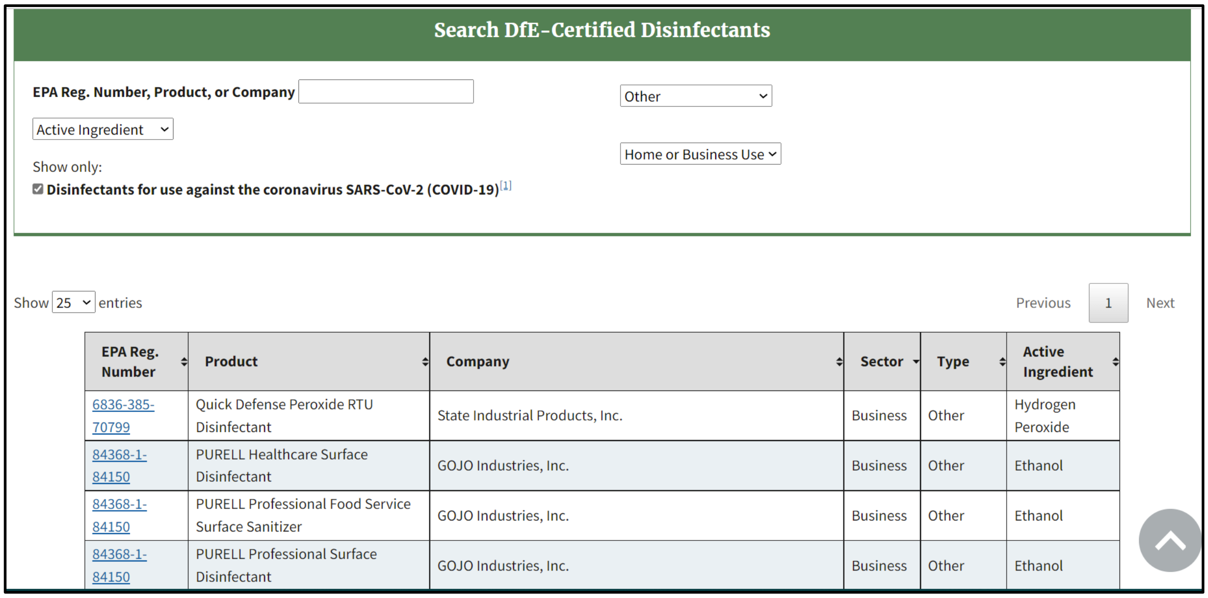
ACTIVE INGREDIENT(S)

List N includes all ingredients approved for use on SARS-CoV-2. Please note that EPA does not differentiate disinfectants on List N by their level of safety, it only verifies the efficacy of disinfectants for SARS-CoV-2. However, EPA does have a program, Design for the Environment (DfE), that provides a list of safer disinfectant active ingredients that the DfE program has evaluated and approved. This information is provided below to assist the identification of safer disinfectants.

EPA DfE resources for finding safer active ingredients to search List N - This list is available on the DfE webpage: https://www.epa.gov/pesticide-labels/design-environment-logo-antimicrobial-pesticide-products#approved. You can use this DfE list to search on List N for safer products.

Resources for finding DfE approved products on List N - In addition to using this "Ingredient Field" in List N to search, the DfE program also provides a search page for disinfectants formulated with safer active ingredients approved under the DfE program. The link to the DfE webpage is: https://www.epa.gov/pestici de-labels/dfe-certified-disinfectants.

The screenshot below illustrates how DfE approved products can be searched on this webpage by the EPA registration number, the active ingredient or by checking the box "*Disinfectants for use against the coronavirus SARS-CoV-2 (COVID-19)*" to only list products on List N.



Search DfE-Certified Disinfectants

EPA Reg. Number, Product, or Company

Other

Active Ingredient

Home or Business Use

Show only:

☑ Disinfectants for use against the coronavirus SARS-CoV-2 (COVID-19)[1]

Show 25 entries

Previous 1 Next

EPA Reg. Number	Product	Company	Sector	Type	Active Ingredient
6836-385-70799	Quick Defense Peroxide RTU Disinfectant	State Industrial Products, Inc.	Business	Other	Hydrogen Peroxide
84368-1-84150	PURELL Healthcare Surface Disinfectant	GOJO Industries, Inc.	Business	Other	Ethanol
84368-1-84150	PURELL Professional Food Service Surface Sanitizer	GOJO Industries, Inc.	Business	Other	Ethanol
84368-1-84150	PURELL Professional Surface Disinfectant	GOJO Industries, Inc.	Business	Other	Ethanol

Excerpt from the DfE-Certified Disinfectants search webpage.

Additional guidance on finding safer ingredients and products is in the handbook in the following appendices:

1. *Appendix B: Selecting Safer Disinfectants* for a list of ingredients evaluated for health and safety.
2. *Appendix J: Choosing Safer Disinfectants* for a subset of List N products that are environmentally preferable.

PRODUCT NAME

List N only includes the **primary product** name registered by EPA.

Disinfectant products may be marketed and sold under different brand and product names.

Please see the section above on the “EPA Registration Number” for more information on the role of the registration number versus the product name to identify a product’s chemical formulation and to determine if it is included on List N.

COMPANY

As noted above, there may be more than one company selling a product formulation, often under a different product name.

CONTACT TIME (IN MINUTES)

The contact time is the amount of time the treated surface should remain visibly wet for the full duration of the contact time to be effective against a specific germ (e.g., SARS-CoV-2).

Product Specific - Each product will have its own unique contact time that is required for the disinfectant to stay wet on the surface. Contact time can range from 15 seconds to 10 minutes.

Different products may have different contact time frames for inactivating a specific germ. For example, one product that is hydrogen peroxide based that inactivates a virus may take up to 10 minutes, while another product using citric acid as the active ingredient may only take 5 minutes to inactivate the same virus.

Microbe Specific - One product may have different contact times for different germs as some germs take longer to inactivate. The contact times will be listed on the label for various types of germs.

Manufacturers often test for more germs than listed on the label. Thus, if you are seeking to determine if a disinfectant is effective against a germ that is not listed on the label, review the product literature, or contact the manufacturer.

Type of Microbial Action – A product may be designed to be used as both a sanitizer and a disinfectant and will require either a longer contact time and/or a higher concentration of product to be used as a disinfectant.

FORMULATION TYPE

What is a formulation type?

This field provides information about approved methods and equipment for applying a disinfectant to a surface or an object. This information on approved disinfectant application methods is also included on EPA-registered disinfectant labels.

The information in this field is extremely important to consult because if a disinfectant has not been approved and registered through the FIFRA registration process to be used in a specific piece of equipment, its safety and effectiveness may change based on the type of equipment is it used in, and EPA cannot confirm its safety and effectiveness.

Due to the recent explosion of new disinfectant application equipment (e.g., mister/foggers, electrostatic sprayers, other pesticide application equipment) on the market being promoted by manufacturers and distributers for use during the pandemic, there have been numerous false claims that certain products are approved to be used in these types of equipment.

This field is the quickest and most informative field to determine if a product can be used in application equipment. The information below will guide you on how to find this information on List N.

What happens if a formulation type is not listed for a product I want to use?

The link, https://www.epa.gov/coronavirus/can-i-apply-product-using-method-not-specified-directions-use, takes you to a page on the EPA website that answers the question: *Can I apply a product using a method that is not specified in the directions for use?*

What are the options for searching for approved disinfectants by application methods in both of the EPA List N Search Tools?

1. List N Advanced Search Tool – the two options include:
    - Clicking on the "Formulation Type" field under the hanging menu and selecting an application process.
    - Searching for the product by EPA Registration number and reviewing results in the "Formulation Type" field.
2. Revised version of the List N Search Tool – the two options include:

- Typing in one of the application processes into the “Keyword Search” box.
- Downloading and searching the CSV list under column “G. Formulation Type.”

What are the formulation types included in List N and what do they mean?

Notes for this section:

- Due to the widespread incidents of false claims of products approved to be used in some of the application methods, the authors provided the number of disinfectants approved on List N (as of this publication date) for a specific application method as an example to provide a perspective on how few products are actually approved for use in that method.
- EPA has listed most of the application methods by general categories (e.g., electrostatic), and in some instances, they specify specific products and/or equipment (e.g., electrostatic, Clorox Total 360 System).

Formulation Types:

- **Dilutable:** A concentrated liquid that can be diluted with water at different concentrations for approved uses.
- **Electrostatic Spray:** Involves the use of an electrostatic sprayer to apply the disinfectant. The sprayers impart an electric charge to the disinfectant as it is discharged through the applicator nozzle to increase adhesion to an item or surface to better coat it.

  This application method **must** be approved for each disinfectant and listed on the disinfectant label. Please see the handbook document *Appendix G: Disinfectant Application Equipment, Appendix G.2. What is an electrostatic sprayer?* for an extensive discussion on the safety, efficacy, and regulatory requirements of using this technology.
- **Electrostatic Spray:** (This field is only on the List N Advanced Search Tool). **Clorox Total 360 System** – lists the three Clorox products that can be used with this system. Please note that EPA lists this "Electrostatic Spray” category for Clorox separate from the general category “Electrostatic Spray’.
- **Fog, Mist:** Involves the use of equipment to aerosolize a disinfectant as a fog or a mist.

  The EPA and the CDC use a common definition to define “a fogger also known as mister, as a device that uses a fan and a liquid solution to create a fog or aerosol with small droplets or mist”.[1] The liquid droplets are not positively charged (as they are for electrostatic sprayers).

  This technology can be deployed remotely, or by a person using handheld equipment. This is a different process than using a handheld spray bottle, which imparts a heavier spray that generates a droplet.

  Please see the handbook document *Appendix G.3. What is a Mister/Fogger?* for an extensive discussion on the safety, efficacy, and regulatory requirements of using this technology.

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[1] EPA U.S. EPA Research Webinar: COVID-19 Electrostatic Sprayers and Foggers for Disinfectant Application, https://youtu.be/-Qz2tnznUxI

This application method **must** be listed on the label.

- **Gas:** (This field is only on the List N Advanced Search Tool)**.** Involves the use of equipment to generate a gas. There is only one product on the list as of January 2022 that notes that it must be used with the company's equipment.
- **Generator:** (This field is only on the List N Advanced Search Tool). This category is a recent addition to List N. It refers to products that are "generated" by equipment to create the disinfectant.

What is a generator?

A generator would be covered by the following definition by EPA:

> "If the device incorporates a substance or mixture of substances to perform its intended pesticidal purpose, then it is considered a pesticide product, not a device."

A generator is **not** considered to be a device by the following definition by EPA:

> "In contrast to a chemical pesticide, a pesticidal device is an instrument or other machine that is used to destroy, repel, trap, or mitigate any pests, including viruses. A device must work solely by physical means (such as electricity, light, or mechanics)." Examples include ozone generators, UV lights, or air purifiers.
>
> Unlike chemical pesticides, EPA does not routinely review the safety or efficacy of pesticidal devices, and therefore cannot confirm whether, or under what circumstances, such products might be effective against SARS-CoV-2. Although pesticidal devices are not required to be registered with EPA, there are legal requirements that apply. For example, device labels must include adequate warning and caution statements and directions for use as well as the EPA establishment number (they will not have an EPA registration number because they are not subject to the same registration requirements as pesticides). Additionally, making false or misleading labeling claims about the safety or efficacy of a pesticidal device is prohibited and could result in the issuance of a Stop Sale, Use, or Removal Order and penalties under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). For more information on devices, see: https://www.epa.gov/safepestcontrol/pesticidedevices-guide-consumers.
>
> List N only includes surface disinfectants registered by EPA and does not include devices.

Is the equipment listed with the disinfectant for this method?

The three products listed under this category (as of January 2022), provided the following information in their EPA Registration Letters and EPA Registration Label Amendment Letters.

This information is provided here to illustrate how two disinfectants are listed independently from the equipment they are used in, while one disinfectant is listed with the equipment in the EPA Registration Label Amendment Letter and on the label:

1. Hydrogen Peroxide B-Cap™ 35 Antimicrobial Agent – manufacturer, PeroxyChem, LLC. This product is used for sterilization in the Bioquell Hydrogen Peroxide Vapor (HPV) generating equipment.

The EPA Label Amendment Letter that updates the product's EPA's registration letter does not mention the generating equipment. The label language in the letter states "B-Cap 35 Antimicrobial Agent is for use as a sterilant in conjunction with Bioquell Hydrogen Peroxide Vapor (HPV) generating equipment". It also states a few other applications unrelated to use in indoor air applications.

2. Vaprox Hydrogen Peroxide Sterilant - manufacturer, Steris Corporation.

   The EPA Label Amendment Letter does not mention the generating equipment. The label language in the letter states "Use only with STERIS VHP application equipment."

3. Salt Cartridge for Giselle – This product is designed to be used in the generator devices listed below.

   This equipment is listed in the product's EPA Registration Letter where they issued a single registration and label requirements for the following components:

   - a precursor material (sodium chloride),
   - two generator devices ("Giselle 1.0" and "Giselle 2.0"), and
   - three output solutions ("SOLEVA").

   The precursor, device, and output together comprise the registration and each component, including any container filled with one of the three output solutions, must have affixed to it the proper labeling for EPA Registration No. 91386-1:

   - a label for sodium chloride ("Salt Cartridge for Giselle"),
   - a label for the 0.6% Sodium hypochlorite solution ("SOLEVA"),
   - a label for the 0.1% Sodium hypochlorite solution ("SOLEVA"), or a label for the 0.05% Sodium hypochlorite solution ("SOLEVA").

     A technical manual that provides information on the two generator devices is associated by reference with this registration.

Are there other types of generating equipment referenced for disinfectants on List N that are not listed under generators?

There is another disinfectant, Force of Nature, on List N that is listed under the Formulation Type field as a "Ready to Use" formulation. It uses a small Electrolyzer Appliance, water, and an Activator Capsule to generate a hypochlorous acid solution but is **not** listed as a "generator".

The following printout of an excerpt from List N for this product.

EPA Registration Number i	Active Ingredient(s)	Product Name i	Company	Follow the disinfection directions and preparation for the following virus i	Contact Time (in minutes) i	Formulation Type i
93040-1	Sodium chloride	Force of Nature Activator Capsule	HCl Cleaning Products LLC	Feline calicivirus	10	Ready-to-use

Also, there are other, larger devices that also generate hypochlorous acid solutions that are not registered as disinfectants and are not included on List N.

- **Impregnated Materials:** The product has the disinfectant built into it (e.g., toilet wand).
- **Pressurized Liquid:** (This field is only on the List N Advanced Search Tool). This refers to disinfectants in aerosol cans.
- **Ready-To-Use (RTU):** The product is already diluted to the appropriate concentration and is RTU off the shelf.
- **Refer to the Curis User Manual –** (This field is only on the List N Advanced Search Tool). This product has a category of its own as well as also being listed under the Formulation Type fields "Fog" and "Mist".
- **Refer to the HaloFogger User manual –** (This field is only on the List N Advanced Search Tool). This product has a field of its own as well as also being listed under the Formulation Type field "Fog".
- **Residual:** Means that the product inactivates viral particles that come into contact with the surface after the product is applied.

  Has EPA previously allowed residual claims for antimicrobials?

  1. *Disinfectants* – Until recently, manufacturers of disinfectants were not allowed to make claims for residual effects for viruses, only for antibacterial products. Traditional liquid-based disinfectants treat the surface at the time of application, but do not provide efficacy beyond the time of application.
  2. *Antimicrobial Products* – There are antimicrobial products on the market approved by EPA to inactivate both viruses and bacteria. If these products also have an EPA approved claim for a residual effect, it has been only for the bacteria only. This type of product can be confusing to the purchaser because the claim is **only** for the bacteria.

  What is the status of research and approvals for products with residual claims[2]? - Products that qualified for EPA's expedited review process[4] to evaluate product claims for continuously active efficacy fall into two major categories:

  1. *Disinfectants that also provide residual efficacy* – these disinfectants would be included in List N if available for SARS-CoV-2. As of January 2022, there were no disinfectants with a residual claim listed. Details about these products if approved:
     - Claims for viruses can only be added if the product has also met the performance standard for bacteria.

[2] https://www.epa.gov/pesticide-registration/interim-guidance-review-products-adding-residual-efficacy-claims

- These product claims are allowed by EPA to state that efficacy begins within ten minutes of application, and that the disinfectant's efficacy time lasts up to 24 hours or less[3].
- This information is located under the "Formulation Type" field in the revised search tool, under "Residual." Please note that this field is not in the original Advanced Search Tool.

2. *Supplemental residual antimicrobial products* (e.g., coatings, paints, solid surfaces) – are products that do not meet EPA's standards for disinfectants but are intended to be used as a supplement to standard List N disinfectants.

   Information on this research is available on EPA's website: *Evaluating Residual Antimicrobial Coatings Test Results, Latest Test Results,* https://www.epa.gov/covid19-research/evaluating-residual-antimicrobial-coatings-test-results, and is summarized below.

   - These products are not disinfectants, which must meet a higher standard of efficacy.
   - These products are supplemental residual antimicrobial products. This means they can supplement, but do not replace, routine cleaning and disinfection.
   - Product claims for viruses can only be added if the product has also met the performance standard for bacteria.
   - The product works within two hours of a virus coming into contact with a surface and can remain effective for[4] the following length of time:
     - Coatings and Films - weeks (product efficacy determines duration).
     - Fixed (solid and paints) – years.
   - EPA had expedited the review of disinfectants submitted for approval in March 2020 and discontinued the expedited review in April 2021. Disinfectants will continue to be reviewed on the normal schedule.
   - EPA approved and registered products in this category are in *List N Appendix: Supplemental Residual Antimicrobial Products for Coronavirus (COVID-19) for Coatings* and can be found at this link: https://www.epa.gov/pesticide-registration/list-n-appendix-supplemental-residual-antimicrobial-products-coronavirus.

[3] https://www.epa.gov/pesticide-registration/interim-guidance-review-products-adding-residual-efficacy-claims

[4] https://www.epa.gov/pesticide-registration/interim-guidance-review-products-adding-residual-efficacy-claims

- Related link: *Interim Guidance for Registrants: Review for Products Adding Residual Efficacy Claims* - https://www.epa.gov/pesticide-registration/interim-guidance-review-products-adding-residual-efficacy-claims.
- This is supplemental list was recently developed and only listed two products as of January 2022. See the results from a search below.

EPA Registration Number	Product Name and Company	How long it takes to kill SARS-CoV-2	How long it remains effective	Product Type
56601-4	Copper Armor, PPG Industries, Inc.	2 hours	Will remain effective for as long as the product remains in place and is used as directed	Supplemental Residual Antimicrobial-Paint
82012-1	Antimicrobial Copper Alloys-Group 1, Copper Development Association	2 hours	Will remain effective for as long as the product remains in place and is used as directed	Supplemental Residual Antimicrobial-Solid Surface

- **Solid:** Dissolvable tablet. examples of this type of disinfectant are Brutabs, Effersan Tabs, Purtabs, Virotabs, etc.
- **Vapor:** Used in conjunction with a Vaporized Hydrogen Peroxide (VHP) generator. VHP generators deliver hydrogen peroxide as a dry vapor into spaces being treated. This is considered a sterilizing process. The room being sterilized is thoroughly sealed and enclosed to ensure that the application occurs via a closed system. The VHP generating unit may be placed within the enclosure/sealed room and remotely controlled or placed adjacent to the enclosure where the hydrogen peroxide is piped into the sealed enclosure.[3]

  SARS-CoV-2 does not require the sterilization process to deactivate it. This type of technology is typically used in a medical setting, not in a school setting.
- **Wipe:** Towelette pre-saturated with disinfectant.

SURFACE TYPES - This column tells you the types of surfaces on which the disinfectant can be used (e.g., nonporous surfaces like doorknobs or stainless-steel counters, or porous surfaces such as fabric).

- **Hard Nonporous (HN):** Use on hard nonporous surfaces like doorknobs, faucets, light switches, sealed wood, etc.
- **Porous (P):** Use on porous surfaces like fabric, cushions, and untreated wood.

  Until recently, EPA only approved disinfectants for use only on nonporous surfaces. The types of disinfectants currently approved on List N are designed for use as a laundry presoak, and in vaporized hydrogen peroxide (VHP) generators for sterilizing.

  Note that there are very few disinfectants on the list for porous surfaces.

- **Food Contact Surfaces, Post-Rinse Required (FCR):** Use on surfaces that food touches such as countertops, dishes, and cooking utensils. Not used on food. The surface must be rinsed after using this product.
- **Food Contact Surfaces, No Rinse (FCNR):** Use on surfaces that food touches such as countertops, dishes, and cooking utensils. Not used on food. Surfaces do not need to be rinsed after using this product.

  Note that until recently, most disinfectants required a rinse when used on food contact surfaces. Check the label as there are some new products on the market that do not require a rinse.

USE SITES - This column tells you where the disinfectant can be used:

- **Healthcare:** Hospital, dental or other healthcare facilities, including nursing homes and assisted living facilities
- **Institutional:** Schools, office buildings, and restaurants
- **Residential:** Homes

WHY IS THIS PRODUCT ON LIST N?

This column provides the basis for the product's inclusion on List N.

EPA starts their explanation with the phrase: "EPA expects all products on List N to be effective against SARS-CoV-2 (COVID-19) when used according to label directions."

List N: Disinfectants for Use Against SARS-CoV-2 (COVID-19)
Date Accessed: 11/11/2020

EPA Registration Number	Active Ingredient(s)	Product Name	Company	Contact Time (in minutes)	Formulation Type	Surface Types	Use Sites	Why is this product on List N?	To kill SARS-CoV-2 (COVID-19), follow disinfection directions for the following pathogen(s)	Date Added to List N
1677-259	Dodecylbenzenesulfonic acid; L-Lactic acid	CW32A-RTU	Ecolab Inc	0.25 (15 seconds)	Ready-to-use; Electrostatic spray	Hard Nonporous (HN); Food Contact No Rinse (FCNR)	Healthcare; Institutional; Residential	Tested against SARS-CoV-2 (COVID-19); Emerging viral pathogen claim	SARS-CoV-2	10/29/2020

- **Disinfectants qualify for List N if they:**
  - Demonstrate efficacy against the coronavirus SARS-CoV-2,
  - Demonstrate efficacy against a pathogen that is harder to inactivate than SARS-CoV-2, or
  - Demonstrate efficacy against a different human coronavirus similar to SARS-CoV-2.
- **Disinfectants qualify if they have an Emerging Viral Pathogen (EVP) Claim:**

  Some products are on List N because they have emerging viral pathogen (EVP) claims, which would be stated in this column. Some products have EVP claims because they are effective against harder-to-inactivate pathogens.

  The National Institute of Allergy and Infectious Diseases defines "emerging infectious diseases pathogens" (https://www.niaid.nih.gov/research/emerging-infectious-diseases-pathogens) as those "that have newly appeared in a population or have existed but are rapidly increasing in incidence or geographic range."

  Many of the emerging pathogens of greatest concern are pathogenic viruses. How long these viruses last on surfaces can play a role in the disease transmission. SARS-CoV-2, the coronavirus that causes COVID-19, is a pathogenic virus.

  Because the occurrence of emerging viral pathogens is less common and less predictable than established pathogens, few if any EPA-registered disinfectant product labels specify use against this category of infectious agents. To address this, EPA provides a voluntary, two-stage process (https://www.epa.gov/pesticides/coronavirus-cases-trigger-epa-rapid-response), to enable use of certain EPA-registered disinfectant products against emerging viral pathogens not identified on the product label.

EPA's EVP guidance was triggered for SARS-CoV-2 in January 2020. Products with human coronavirus claims, but not the EVP claim, cannot make the same marketing claims.

This claim asserts that the disinfect is going through or has gone through EPA's protocol for EVP Guidance for Antimicrobial Pesticides, **enabling use of an existing product for a more rapid response.** In addition, EVP claims affect the types of statements companies can make about their products' expected efficacy.

<< EMERGING VIRAL PATHOGENS CLAIMS – Hard, non-porous surface >>

This product qualifies for emerging viral pathogen claims per the EPA's 'Guidance to Registrants: Process for Making Claims Against Emerging Viral Pathogens not on EPA-Registered Disinfectant Labels' when used in accordance with the appropriate use directions indicated below.

This product meets the criteria to make claims against certain emerging viral pathogens from the following viral categories:
-Enveloped Viruses
-Large Non-Enveloped Viruses

For an emerging viral pathogen that is a/an…	…following the directions for use for the following organisms on the label:
Enveloped virus	Rotavirus WA Rhinovirus Type 39 Feline Calicivirus (Norovirus)
Large, non-enveloped virus	Rhinovirus Type 39 Feline Calicivirus (Norovirus)
Small, non-enveloped virus	Poliovirus Feline Calicivirus (Norovirus)

{Product name} has demonstrated effectiveness against viruses similar to [name of emerging virus] on hard, [porous and/or non-porous surfaces]. Therefore, {product name} can be used against [name of emerging virus] when used in accordance

An example of template for an EVC for a pathogen (note that it is for an "Enveloped Virus," which is also the type of virus that SARS-CoV-2 is):

TO INACTIVATE SARS-COV-2, FOLLOW THE DISINFECTION DIRECTIONS AND PREPARATION FOR THE FOLLOWING PATHOGENS:

This column shows the harder-to-kill virus pathogens than the human coronavirus. Products qualify for the emerging viral pathogen claim by showing that it works against the listed harder-to-kill virus pathogen.

Therefore, if the contact time for this harder-to-kill virus is followed, EPA expects the product to be effective against SARS-CoV-2 on surfaces. You can also find this information on the product label.

To inactivate SARS-CoV-2, follow the directions on the disinfectant package for the same pathogen referenced on List N. For example, if List N indicates that a product will inactivate SARS-CoV-2 if you follow the directions for Feline calicivirus, make sure the label contains directions for use against Feline calicivirus.

EPA Registration Number	Active Ingredient(s)	Product Name	Company	Contact Time (in minutes)	Formulation Type	Surface Types	Use Sites	Why is this product on List N?	To kill SARS-CoV-2 (COVID-19), follow disinfection directions for the following pathogen(s)	Date Added to List N
66570-2	Sodium dichloroisocyanurate	EfferSan™	Activon Inc	5	Solid	Hard Nonporous (HN); Food Contact Post-Rinse Required (FCR)	Healthcare; Institutional; Residential	Kills a harder-to-kill pathogen than SARS-CoV-2 (COVID-19); Emerging viral pathogen claim	Feline calicivirus	04/23/2020

Always check that the product's label includes directions for use on the pathogen listed. For example, if List N indicates that a product will inactivate SARS-CoV-2 by following the directions for **Feline Calicivirus**, make sure the disinfectant label contains directions for use against **Feline Calicivirus**.

Contact the company if the pathogen referenced in List N is not listed on the disinfectant label. Companies typically have a more extensive, complete list of pathogens that the product is registered to inactivate than what is listed on the label. They also have technical staff who can provide this information.

If this column includes:

- "*SARS-CoV-2*" the product has been tested against and demonstrated efficacy against SARS-COV-2. As of October 2020, products have been receiving approval for this claim as illustrated below.
- "*Human coronavirus*" - this product has demonstrated efficacy against a different human coronavirus that is similar to SARS-CoV-2.
- *Something "other than human coronavirus"* or *"SARS-CoV-2"* - means the product works against a **harder-to-kill pathogen** like norovirus. If you follow the directions on the package for this harder-to-kill pathogen, EPA expects the product to be effective against SARS-CoV-2.

List N: Disinfectants for Use Against SARS-CoV-2 (COVID-19)
Date Accessed: 11/11/2020

EPA Registration Number	Active Ingredient(s)	Product Name	Company	Contact Time (in minutes)	Formulation Type	Surface Types	Use Sites	Why is this product on List N?	To kill SARS-CoV-2 (COVID-19), follow disinfection directions for the following pathogen(s)	Date Added to List N
1677-259	Dodecylbenzenesulfonic acid; L-Lactic acid	CW32A-RTU	Ecolab Inc	0.25 (15 seconds)	Ready-to-use; Electrostatic spray	Hard Nonporous (HN); Food Contact No Rinse (FCNR)	Healthcare; Institutional Residential	Tested against SARS-CoV-2 (COVID-19); Emerging viral pathogen claim	SARS-CoV-2	0/29/2020

Appendix F.5. How to Search List N

<u>Original Search Tool Format - List N Advanced Search Page</u>:

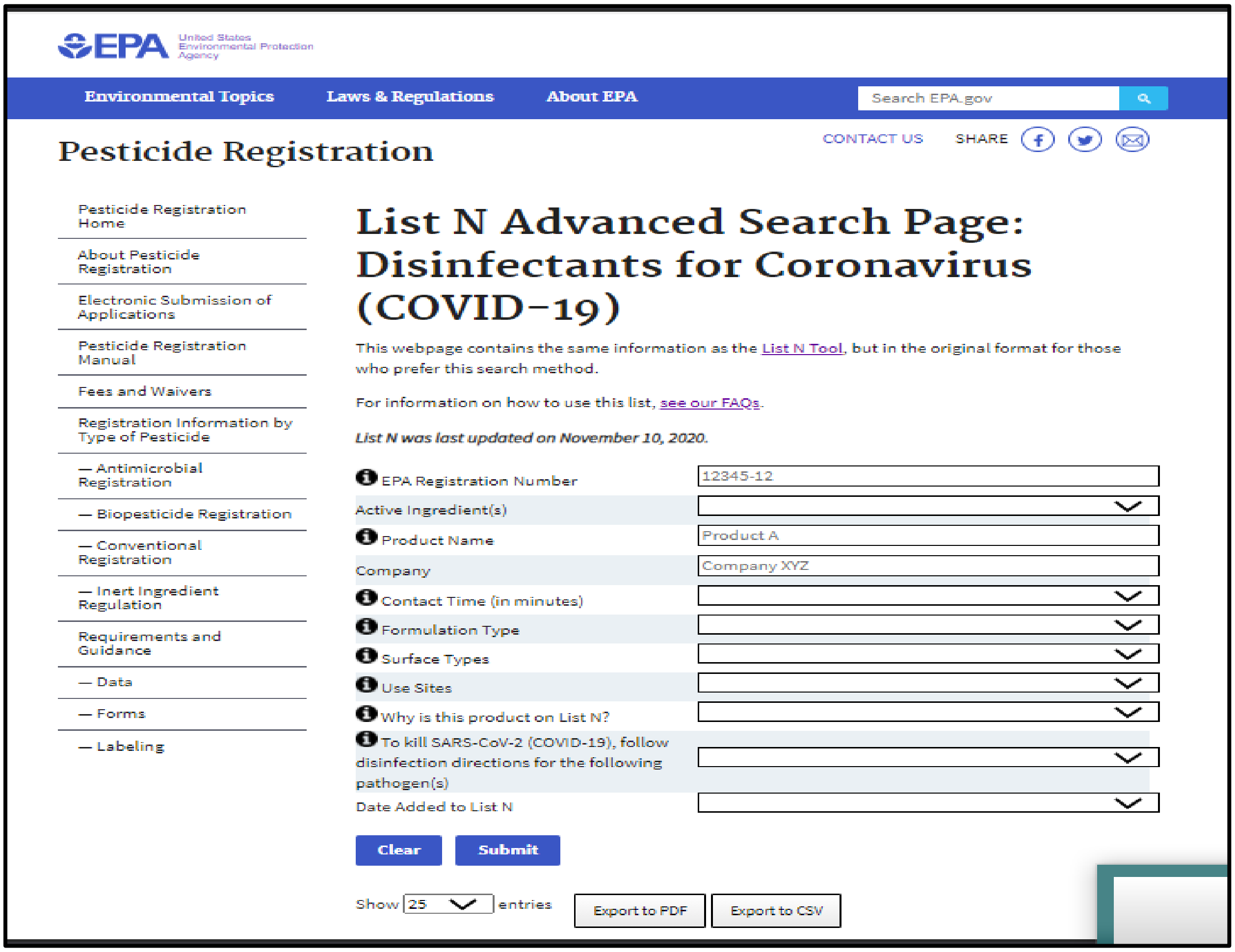
Disinfectants for Coronavirus (COVID-19)

This webpage, https://www.epa.gov/pesticide-registration/list-n-advanced-search-page-disinfectants-coronavirus-covid-19, contains the same information as the List N Tool, is in the original format for those who prefer this search method.

This format enables more efficient searching by providing more fields on the webpage to initially search by than the List N Tool. One important field that has more criteria to search by is the Formulation Field.

The Revised List N Tool is most effectively searched by downloading the csv file into an excel spreadsheet, which adds an additional few steps to the process.

Note that the other format, *"Revised List N Search Tool – November 2020,"* is on page 25 of this document and available at this link https://cfpub.epa.gov/wizards/disinfectants/.

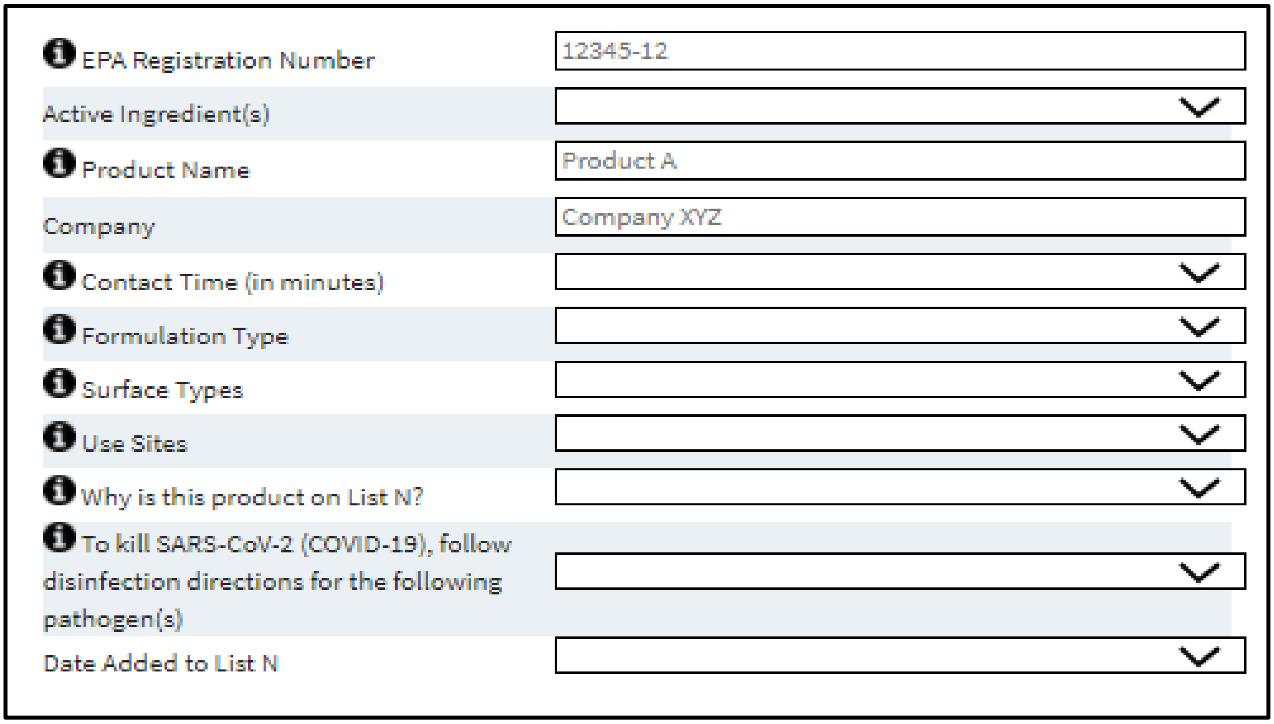


Format of the Original Search Tool: List N Advanced Search Page:

This version of the search tool generates a list of all the products on List N below this search box.

It is searchable in several fields, as illustrated in the following screen captures, and can be exported into a PDF or CSV format. Note that although not all fields are visible in all search formats, all the information on a disinfectant will be available in the PDF and CSV download.

Instructions on Unlocking Information Contained in the Search Box



EPA Registration Number	12345-12
Active Ingredient(s)	
Product Name	Product A
Company	Company XYZ
Contact Time (in minutes)	
Formulation Type	
Surface Types	
Use Sites	
Why is this product on List N?	
To kill SARS-CoV-2 (COVID-19), follow disinfection directions for the following pathogen(s)	
Date Added to List N	

1. Clicking the icon to the left of the field titles will provide an explanation of the information in that field.
2. Clicking on an arrow in the space to the right of a topic provides a drop-down menu of items for that field.

3. After searching for a disinfectant, and the list comes up, there is a green circle with a plus sign. Clicking on that icon turns the icon red and some information about the product drops down below.
4. If more information is needed, download the PDF or CSV, which will provide all the information available in the database.

EPA Registration Number	Active Ingredient(s)	Product Name	Company	Contact Time (in minutes)
1677-251	Hydrogen peroxide	Disinfectant And Glass Cleaner RTU	Ecolab Inc	seconds)
1677-256	Quaternary ammonium	FSC 35K	Ecolab Inc	2
1677-237	Hydrogen peroxide; Peroxyacetic acid (Peracetic acid)	Oxycide Daily Disinfectant Cleaner	Ecolab Inc	3
1677-259	Dodecylbenzenesulfonic acid; L-Lactic acid	CW32A-RTU	Ecolab Inc	0.25 (15 seconds)

Formulation Type Ready-to-use; Electrostatic spray

Surface Types Hard Nonporous (HN); Food Contact No Rinse (FCNR)

Use Sites Healthcare; Institutional; Residential

Why is this product on List N? Tested against SARS-CoV-2 (COVID-19); Emerging viral pathogen claim

To kill SARS-CoV-2 (COVID-19), follow disinfection directions for the following pathogen(s) SARS-CoV-2

Date Added to List N 10/29/2020

An example of a search result in a PDF download from the Original Format Search Tool for disinfectants approved for use in electrostatic sprayers:

Note that although the search results only displayed a few of the fields, the PDF download illustrated below provides information from all the fields:

List N: Disinfectants for Use Against SARS-CoV-2 (COVID-19)
Date Accessed: 11/11/2020

EPA Registration Number	Active Ingredient(s)	Product Name	Company	Contact Time (in minutes)	Formulation Type	Surface Types	Use Sites	Why is this product on List N?	To kill SARS-CoV-2 (COVID-19), follow disinfection directions for the following pathogen(s)	Date Added to List N
1677-259	Dodecylbenzenesulfonic acid; L-Lactic acid	CW32A-RTU	Ecolab Inc	0.25 (15 seconds)	Ready-to-use; Electrostatic spray	Hard Nonporous (HN); Food Contact No Rinse (FCNR)	Healthcare; Institutional; Residential	Tested against SARS-CoV-2 (COVID-19); Emerging viral pathogen claim	SARS-CoV-2	10/29/2020

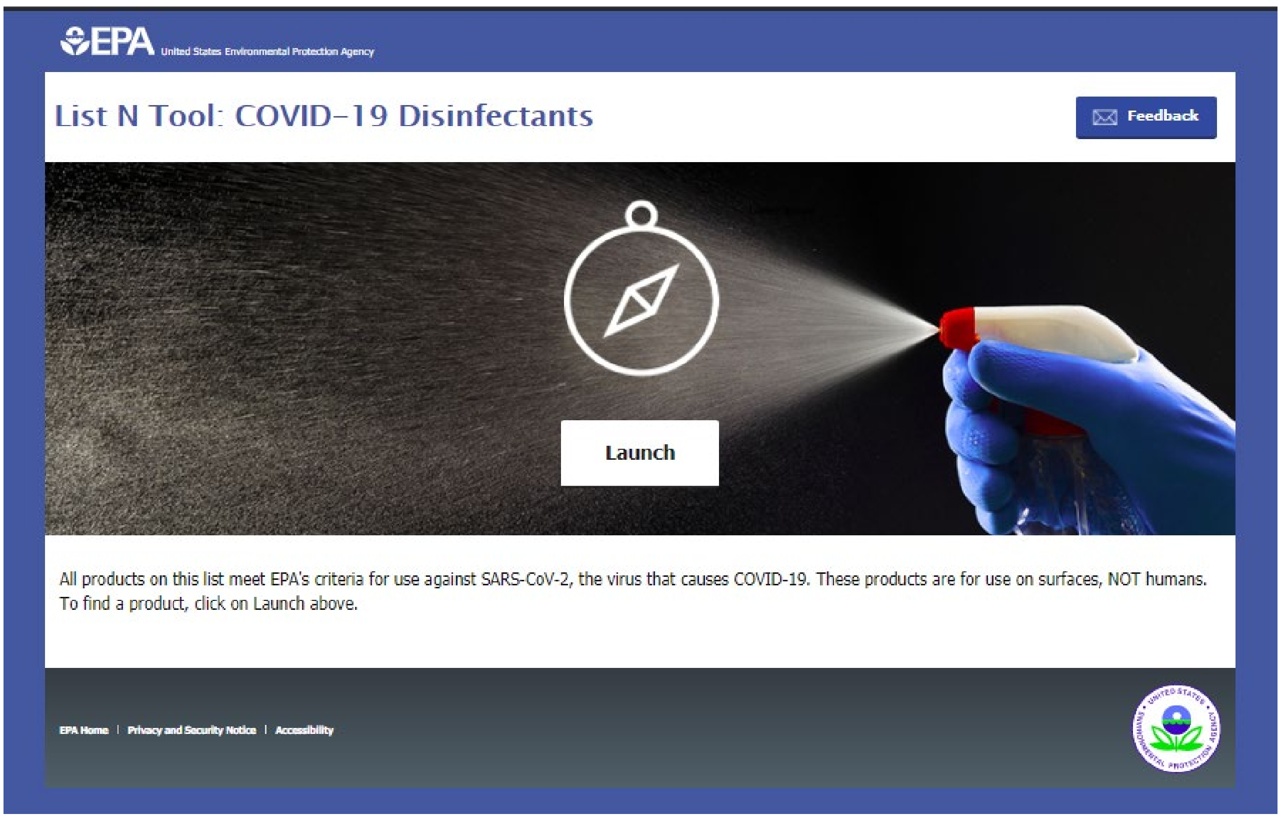
Revised List N Search Tool (November 2020)

List N Tool: COVID-19 Disinfectants

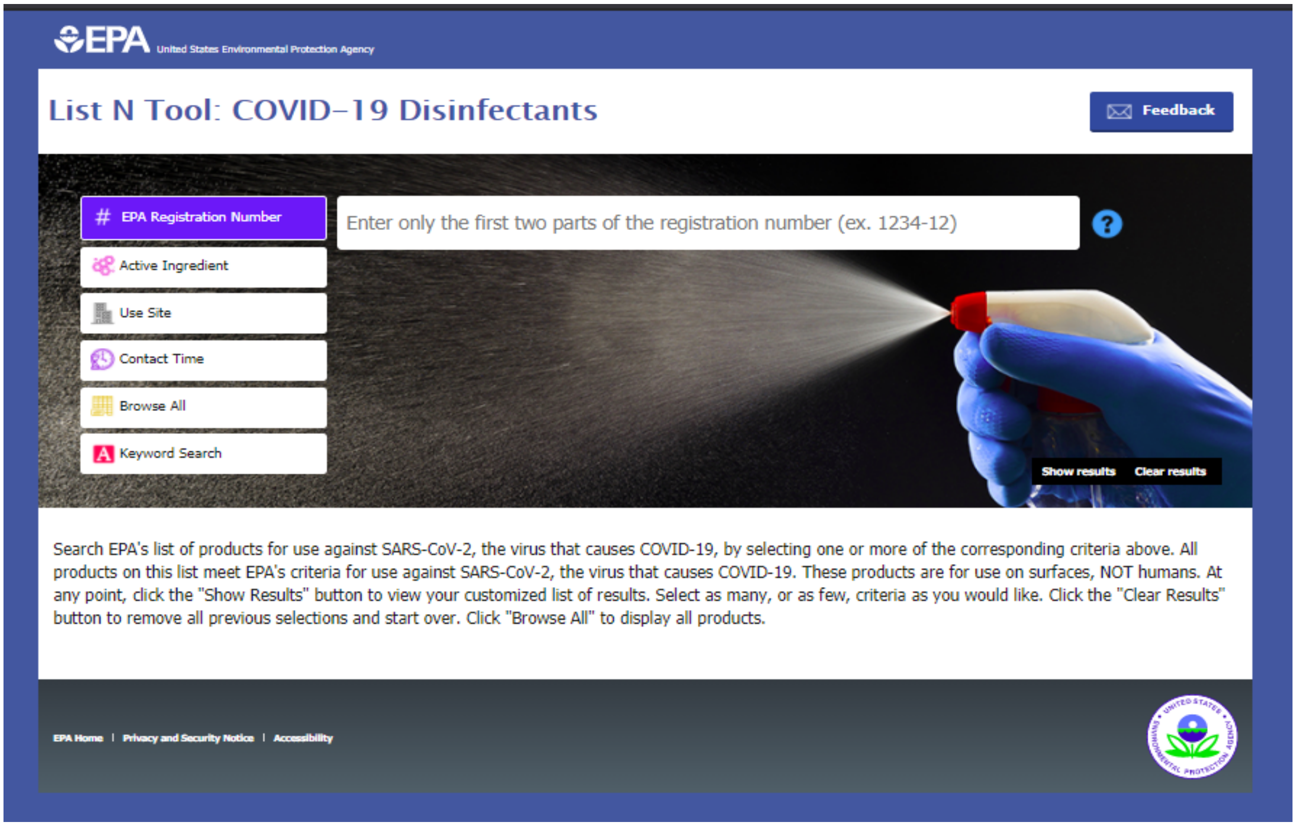
The revised, second web site is accessed here: https://cfpub.epa.gov/giwiz/disinfectants/index.cfm (see the image below). Tips for using this site are described below.

The disadvantage of using this version to search is that not all fields in the database are initially visible and accessible to search; it requires doing an initial search to get the database to open up to see all of the data fields.

It also requires more steps to narrow down a product with specific features.



Click Launch



Select one or more of the criteria from the menu on the left:

EPA Registration Number – only use the first 2 sets of numbers. Then click "show results" tab.

Active Ingredient – lists all ingredients. Click on ingredient and then "show results" tab.

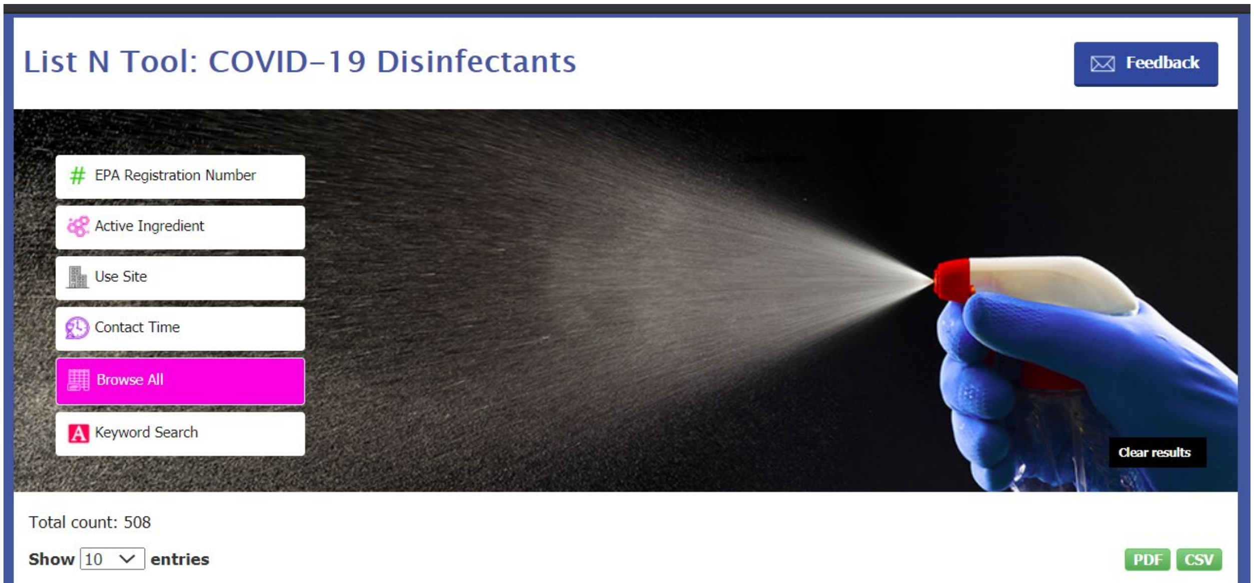
Use Site – all, healthcare, institutional, residential. Click on site, and then the "show results" tab.

Contact Time – provides a range of times. Click on desired time and then the "show results" tab.

Browse All – lists all disinfectants in the database (see next section for how to navigate this list).

Note: The search fields in this version are more limited than the Advanced Search Tool.

If searching for data in a field that is not available in the menu at the top, it requires either using the "Browse All" field to see the entire database on the website, or downloading the CSV version of the database to a computer in order to search by the additional fields.



EPA Registration Number	Active Ingredient(s)	Product Name	Company	Follow the disinfection directions and preparation for the following virus	Contact Time (in minutes)	Formulation Type	Surface Type	Use Site	Emerging Viral Pathogen Claim?
10190-14	Quaternary ammonium	Penetone XF-7117	Penetone Corp	Porcine circovirus	10	Dilutable	Hard Nonporous (HN)	Institutional	Yes
10324-105	Quaternary ammonium	Maquat 128-PD	Mason Chemical Company	Human coronavirus	10	Dilutable	Hard Nonporous (HN)	Healthcare; Institutional; Residential	No
10324-108	Quaternary ammonium	Maquat 256-MN	Mason Chemical Company	Human coronavirus	10	Dilutable	Hard Nonporous (HN); Food Contact Post-Rinse Required (FCR)	Healthcare; Institutional; Residential	No

Browse All

This menu will provide all of the fields in the database for all of the disinfectants listed. Click on the fields at the top header to sort the list by a specific field.

Clicking on the blue up and down arrows to the right of each field will start the list at the beginning and at the end of the database.

EPA Registration Number	Active Ingredient(s)	Product Name	Company	Follow the disinfection directions and preparation for the following virus	Contact Time (in minutes)	Formulation Type	Surface Type	Use Site	Emerging Viral Pathogen Claim?

The search function can be helpful in many ways. For example, it is possible to search products with short contact times, by a certain ingredient, formulation types (e.g., electrostatic application equipment), EPA Registration Number, etc.

One example to search by is the "Formulation Type" to determine if a product can be used in electrostatic or fogger/mister sprayer equipment. Sorting by the EPA registration number, and then by formulation, will provide the formulation type for that registration number.

Show 10 entries PDF CSV

EPA Registration Number	Active Ingredient(s)	Product Name	Company	Follow the disinfection directions and preparation for the following virus	Contact Time (in minutes)	Formulation Type	Surface Type	Use Site	Why is this product on List N?
70627-56	Hydrogen peroxide	Oxivir™ Tb	Diversey Inc	Norovirus; Rhinovirus; Poliovirus Type 1	1	Ready-to-use; Electrostatic spray	Hard Nonporous (HN); Food Contact Post-Rinse Required (FCR)	Healthcare; Institutional	Kills a harder-to-kill pathogen than SARS-CoV-2 (COVID-19); Emerging viral pathogen claim
67619-42	Hypochlorous acid	Galaxy	Clorox Professional Products Company	Canine parvovirus; Rhinovirus	5	Ready-to-use; Electrostatic spray (Clorox® Total 360® system)	Hard Nonporous (HN)	Healthcare; Institutional; Residential	Kills a harder-to-kill pathogen than SARS-CoV-2 (COVID-19); Emerging viral pathogen claim
67619-38	Quaternary ammonium	CloroxPro™ Clorox Total 360® Disinfecting Cleaner1	Clorox Professional Products Company	SARS-CoV-2	2	Ready-to-use; Electrostatic spray (Clorox® Total 360® system)	Hard Nonporous (HN); Food Contact Post-Rinse Required (FCR)	Healthcare; Institutional; Residential	Tested against SARS-CoV-2 (COVID-19); Emerging viral pathogen claim

Showing 451 to 460 of 535 entries   Previous 1 … 45 46 47 … 54 Next

Appendix F.6. What are the reasons a product is not on List N?

- *It is not a disinfectant (it may be a sanitizer or cleaner only) because it may not have:*

  Virus-killing claims – sanitizers are only registered to inactivate bacteria.

  An EPA Registration Number – all disinfectants are required by law to have a number as disinfectants are antimicrobial pesticides and manufacturers must verify that the kill claims are valid. If a product does not have an EPA registration number, then EPA has not reviewed or approved any data on whether the product will inactivate public health pathogens such as viruses, and whether the product can be used safely.

- *It is a qualifying disinfectant, but has not been added yet to the List N:*

  Kill Claims - Look for "human coronavirus" kill claims on the label.

- *It is a disinfectant, but does not list "human coronavirus":*

  Kill Claims – There is not enough information to know if it controls SARS-CoV-2. Thus, you should not use it.

  It is a disinfectant with "animal coronavirus" claims but doesn't list "human coronavirus."

Appendix F.7. What has EPA done to address fraudulent disinfectant claims?

EPA created a Compliance Advisory, January 2021, which replaces May 2020 Compliance Advisory) for consumers on *What You Need to Know Regarding Products Making Claims to Kill the Coronavirus Causing COVID-19*.

It is available at: https://www.epa.gov/sites/default/files/2020-05/documents/cornavirus-compliance-advisory.pdf.

In addition to providing an overview of List N, EPA registration number and establishment number, device claims, and health and compliance concerns, the advisory provides the following resources;

- Frequently Asked Questions and up-to-date press releases: https://www.epa.gov/coronavirus
- EPA's enforcement actions: https://www.epa.gov/enforcement/covid-19-enforcement-and-compliance-resources
- Tips and complaints related to products making coronavirus claims: https://echo.epa.gov/report-environmental-violations

References

[1] chemicalsafetyfacts.org - https://www.chemicalsafetyfacts.org/antimicrobials/

[2] https://www.chemicalsafetyfacts.org/antimicrobials/

[3] EPA, Revised Occupational/Bystander Inhalation Exposure and Risk Assessments of New Uses of Vaporox Hydrogen Peroxide Sterilant, 2006

[4] EPA halted all expedited reviews related to products for SARS-CoV-2 in late April 2021 once the CDC determined that SARS-CoV 2 is predominately transmitted through exposure to respiratory droplets, and that although infection through contact with contaminated surfaces or objects is possible, the risk is generally considered to be low. These reviews continue under normal review schedules. https://www.cdc.gov/coronavirus/2019-ncov/more/science-and-research/surface-transmission.html.

For the residual claims process, typical decision review timeframes under PRIA for these types of registration actions range from four months for amendments and new registrations for products similar to existing products, to 24 months for new active ingredient submissions.

Sources

Much of the document information about the content of each field in the List N database is consolidated from numerous EPA webpages related to List N, with the addition of some explanation and referral to the project's resources.

This document provides some screenshots from the EPA website for List N and additional examples to illustrate how the List N Search Tools work, and how to use the information generated from searching the List N database.

- EPA – registers antimicrobial pesticides and maintains List N:
  1. https://www.epa.gov/pesticide-registration/selected-epa-registered-disinfectants
  2. https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2
- National Pesticide Information Center (NPIC), Speaker Amy Cross, at amy.cross@oregon.edu, Webinar, *Using Disinfectants Against COVID-19.*

  NPIC provides information on pesticide health and safety, use, precautions, and toxicology. They also help people navigate information available from the CDC and EPA. Their website address for information on antimicrobial pesticides is: http://npic.orst.edu/ingred/ptype/amicrob/index.html
- www.chemicalsafetyfacts
- Waxy Editorial Staff, Waxy Sanitary Supply, EPA Emerging Viral Pathogens & Hard Surface Disinfectants, What Disinfectant Cleaners Can Be Used Against COVID-19 & Other Viruses, April 16, 2020

Appendix G: Disinfection Application Equipment

Contents

Appendix G.1. Introduction

Overview

This appendix provides information on specific types of equipment currently on the market for applying antimicrobial products. Although there are several emerging technologies, this document will discuss three of the most common types currently in use, electrostatic, mister and fogger applicators. The summary of the document's conclusions starts on page 20 of this document.

It is important to note that some of the equipment sold for this purpose was designed for disinfectant use and some was not. Due to supply chain availability related to a backlog of equipment during the pandemic, some vendors started selling equipment that was not designed for this purpose, such as paint and insecticide sprayers. Equipment not designed for applying disinfectants could pose health and safety risks to the user as well as pose efficacy issues.

Prior to the use of specialized equipment, disinfectants were hand applied using spray bottles, cloths and mops dipped in disinfectant solutions, and/or with mops pre-saturated with disinfectants in charging buckets, and then applied, etc.

In addition to new technologies and repurposing of old technologies to apply disinfectants, there are also small modifications to existing applicators, such as adding batteries to trigger sprayers to apply product faster. Modified equipment can have limitations, such as when using a trigger sprayer to apply product, as it may reduce the user's ability to control droplet size.

The expanded use of battery operated and corded electrical equipment to apply antimicrobial products in response to the pandemic, has raised several new issues. Although some of these issues are addressed to some degree in this document, some issues are still in the process of being addressed through federal regulation, academic research, and manufacturer testing. Links provided in this document to the regulatory agency positions will enable the reader to follow-up for the latest information.

The purpose of this document is to specifically address issues related to the use of electrostatic applicators, misters, and foggers with disinfectants. It provides an overview and comparison of these technologies, and will address the following summary of **perceived** advantages and emerging concerns:

- Advantages - This equipment is being promoted as having the following major advantages:
  - Higher productivity as larger areas can be treated in a shorter amount of time.
  - Ease of application.
  - Reduced use of product, ability to control droplet size and reduced overspray (for electrostatic) if equipment is used correctly.
  - Minimized cross contamination as there is no cloth or mop head to dip into a solution.

- Concerns – regulatory agencies and health advocacy groups have several concerns:
    - Efficacy
    - Safety and Health
    - Regulatory compliance with disinfectant label requirements

Basic disinfecting procedures still apply when using disinfectant application equipment!

- The surface/items must be cleaned prior to disinfecting.
- The disinfectant must remain wet on the surface for the length of the required contact time. This is particularly a concern for mister/foggers, which on certain equipment settings can create a fog that might not adequately wet the surface.
- Proper ventilation should be ensured through an operating Heating, Ventilating and Air Conditioning (HVAC) system. Alternately, windows or doors can be opened.
- Common high-touch points should be targeted, taking care to NOT broadcast the product widely into the air or onto items and surfaces.
- Do not use application equipment to disinfect electronics and porous (e.g., paper, upholstery, carpet) materials. A study[1] found that product from fogging equipment can get drawn into equipment that is powered on, where it can damage internal electronic components.

  Although there are a few products on List N approved for use on porous materials, they are designed for use as a laundry presoak and for use in other types of specialized equipment.

Important Regulatory Information Regarding the Use of Disinfectants in Application Equipment

- **Disinfectants are antimicrobial <u>pesticides</u>** that are regulated by the EPA under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

  For a company to register a disinfectant under FIFRA guidelines, a manufacturer must submit test data documenting the product's efficacy on specific microbes (germs). This data provides the basis for the label information that the company provides on how the product must be applied for each specified microbe, including:
    - type of application equipment the product can be used in,
    - the proper dilution rate for each type~~s~~ of use (e.g., disinfecting, sanitizing), and
    - the contact time the disinfectant must remain wet on the surface, and
    - use and safety precautions, such as personal protective equipment.

[1] Sams, Jim, Forensics Firm Says Disinfectant Foggers Can Damage Electronics, May 26, 2020, https://www.claimsjournal.com/news/national/2020/05/26/297233.htm

- **Pesticide Labels** - are considered the "law," and directions must be followed exactly to ensure efficacy and safe use.

  The EPA requires disinfectant manufacturers to list the types of approved application equipment (e.g., electrostatic sprayer, pesticide sprayer, mister, fogger) that the product can be used in, on the label.

  If the application type is not listed on the label, it is not an approved application method. Since it is not an approved use, the company is not required to submit guidance on respiratory protections on it.

General Guidance for all types of disinfectant application equipment (additional detail will be provided for each type of technology)**:**

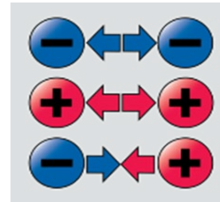
- Ensure that antimicrobial products to be applied with an electrostatic sprayer or mister/fogger are compatible with the device per manufacturer specifications to ensure safety and efficacy. One example is a fire safety hazard posed when a flammable product is used in an electrostatic applicator as the electrostatic charge could ignite the flammable product.
- Consult the product primary label to determine if respiratory protection is required to be used with specific types of application equipment. If the label does not list either the electrostatic sprayer or mister/fogger, it will not provide corresponding respiratory protection information for that application.
- It is important to determine how long to wait to safely reenter a space that has been treated. This document will discuss droplet size as it is one of the factors that can affect how long the product remains in the air and breathing zone, and how long it takes to dry on a surface.

Important considerations for selection of disinfectant applicators related to maintenance and repair of the equipment:

- Determine where the closest service centers are located.
- Determine if the equipment can easily be serviced in-house.
- Assess the cost of maintenance and repair, which can be significant.
- Review directions to identify protocols required to comply with the warranty and prevent damaging the equipment. Some key operating criteria to consider is whether:
  - the product needs to be diluted before putting in the tank,
  - the equipment needs to be emptied and rinsed at the end of each day, and
  - if the nozzles need to be cleaned.
- Warranty
  - Determine how long the warranties are for and what they cover.
  - Some manufacturers only allow certain proprietary products to be used, otherwise use of other products will void the warranty.

Appendix G.2. What is an electrostatic sprayer?

What is an electrostatic sprayer?



An electrostatic sprayer uses electricity to positively charges a liquid as it passes through the sprayer nozzle. Manufacturers claim that this process generates positively charged droplets that are attracted to and adhere to neutral (uncharged) or negatively charged surfaces and objects in a uniform coating to fully cover them and prevent dripping. The droplets are applied wet and left to dry.

An analogy would be magnets where positively and negatively charged metals are attracted to and pull towards each other. Since opposite electrical charges attract and like charges repel, this process can help reduce over-application of a product because the charged particles will seek out an exposed surface area instead of adhering to each other (and forming larger droplets).

Electrostatic sprayers are available as battery operated or corded, and as a handheld unit, backpack unit or as a unit on a cart. In 2021, EPA conducted limited experiments[2] using disinfectants in electrostatic and mister/fogger applicators. EPA's experiments[3] found that the corded units had the highest charge. They also found that the two corded units carried a positive charge, and the four battery-operated carried a negative charge. This may affect how the charged disinfectant coats and adheres to the surface adhere to the surface.

Manufacturers also claim that the electrostatically charged droplets wrap around objects for complete coverage and helps prevent pooling of product. Thus, another aspect of EPA's experiments was to determine whether the electrostatic sprayers and mister/fogger applicator created this "wrap around" effect, and to what extent. To visualize this affect, they used a fluorescent dye in the disinfectant and a blacklight to highlight the disposition of the disinfectant, and found that:

1. the wrap around effect was not as pronounced as expected when spraying with an electrostatic sprayer an eight-inch diameter object,
2. smaller objects tested had better coverage from wrapping, and
3. the results of disposition of disinfectant on the surface for electrostatic and mister/foggers tested were similar.

EPA also found that the size of the droplet and the amount of disinfectant deposited on the surface affected the disposition of spray on a surface or item and how well they are wetted. Smaller droplets dry faster, and larger droplets stay wet longer. This can affect whether the surface can remain wet for the required contact time.

[2] EPA Research Webinar: COVID-19 Electrostatic Sprayers and Foggers for Disinfectant Application, https://youtu.be/-Qz2tnznUxI

[3] EPA Research Webinar: COVID-19 Electrostatic Sprayers and Foggers for Disinfectant Application, https://youtu.be/-Qz2tnznUxI

Some nozzles are adjustable to disperse different droplet sizes (e.g., microns ranging from 40 to 80 microns).

EPA tested a few devices with a VMD of > 40 microns and found that adjusting the nozzle did not significantly change the droplet size.

EPA Requirements for Droplet Size: Although some equipment nozzles are adjustable for different size droplets, EPA (as of April 2021) requires manufacturers to state requirements for droplet size on the label of a product approved for use in electrostatic sprayers: "Spray droplet particle size should be limited to a volume median diameter (VMD) ≥40 µm."

[4],[5] See Footnote #4 and # 5 for text box information

What was the outcome of EPA's experiments[6]:

EPA found that there are several parameters that may impact the disinfectant's ability to inactivate the virus on surfaces (in addition to the effectiveness of the disinfectant used), including:

- The amount of disinfectant applied to a surface to ensure that it remains wet for the required contact time.
- The electrostatic charge imparted to the spray, potentially affecting its ability to deposit onto surfaces, including surfaces not in the direct path of the spray (e.g., the ability to wrap around and adhere to complex surfaces).
- The amount of the disinfectant's active ingredient lost to the air before reaching the surface, which will diminish the concentration of the active ingredient on the surface, thus potentially reducing disinfection efficacy.

[4] EPA Instructions for Adding Electrostatic Spray Application Directions for Use to Antimicrobial Product Registrations, https://www.epa.gov/pesticide-registration/instructions-adding-electrostatic-spray-application-directions-use

[5] EPA Research Webinar: COVID-19 Electrostatic Sprayers and Foggers for Disinfectant Application, https://youtu.be/-Qz2tnznUxI

[6] EPA, https://www.epa.gov/covid19-research/evaluating-electrostatic-sprayers-disinfectant-application

How has EPA addressed the expanded use of electrostatic sprayers for disinfection and manufacturers' claims during the pandemic?

- **EPA's temporarily expedited the review process of antimicrobial products for use with electrostatic sprayers.**

  Due to the COVID-19 pandemic, there had been increased promotion and related demand for use of electrostatic sprayers to apply disinfectants because they could cover larger areas in a shorter amount of time than traditional methods of disinfecting.

  At the inset of the pandemic, there were no EPA approved products available on List N for use in this equipment. All manufacturers seeking to make claims under the Pesticide Registration Improvement Act (PRIA) about the use of their product in any type of equipment are required to participate in an EPA review process to receive approval. This process involves submitting test data for their formulation to document that the use of their product in this equipment maintains its efficacy. The test results also determine what respiratory protection would be required and provides the basis for the related health and safety precautions on product labels.

  EPA's requirements under PRIA are based on their position that "A disinfectant product's safety and effectiveness may change based on how you use it. If a pesticide product's label does not include disinfection directions for use with fogging, fumigation, wide-area, or electrostatic spraying, EPA has not reviewed any data on whether the product is safe and effective when used by those methods.[7]"

  Under PRIA, typical decision review timeframes range from four months to nine months. To respond to the surge in use of disinfectants in this equipment, EPA expedited their "review process" for antimicrobial products submitted by manufacturers to speed up the review process. The text from EPA's website regarding the use of this process for electrostatic sprayers is available at: *EPA'S Expedited Review for Adding Electrostatic Spray Application Directions for Use to Antimicrobial Product Registrations* *https://www.epa.gov/pesticide-registration/expedited-review-adding-electrostatic-spray-application-directions-use.*

  Please note that EPA announced the ending of this expedited process in April 2021 due to the CDC's revised position that the surface transmission of SARS-CoV-2 was not the primary route of transmission.[8] Thus, products under review at the time will take longer to obtain approval.

[7] EPA, Can I use fogging, fumigation, or electrostatic spraying or drones to help control COVID-19? https://www.epa.gov/coronavirus/can-i-use-fogging-fumigation-or-electrostatic-spraying-or-drones-help-control-covid-19

[8] The CDC changed its guidance on April 5, 2021, that that the risk of being infected with COVID-19 by touching contaminated surfaces is considered low. They discuss reduced need for disinfection and provide updated recommended procedures on their website at https://www.cdc.gov/coronavirus/2019-ncov/community/disinfecting-building-facility.html.

EPA also supported this position and sent a press release with a link on April 28, 2021 with more details about surface transmission: Recent information from the Centers for Disease Control and Prevention (CDC).

- **EPA approved some disinfectants on List N for use in electrostatic sprayers:**

  Although there were a few products listed in EPA's List N: Disinfectants for Coronavirus (COVID-19) as early as March 2020, new products for use in electrostatic sprayers began being posted on List N in the late summer and fall of 2020.

  Below are two examples of products approved for use in electrostatic sprayers on List N.

EPA Registration Number	Active Ingredient(s)	Product Name	Company	Contact Time (in minutes)	Formulation Type	Surface Types	Use Sites	Why is this product on List N?	To kill SARS-CoV-2 (COVID-19), follow disinfection directions for the following pathogen(s)	Date Added to List N
70627-56	Hydrogen peroxide	Oxivir™ Tb	Diversey Inc	1	Ready-to-use; Electrostatic spray	Hard Nonporous (HN); Food Contact Post-Rinse Required (FCR)	Healthcare; Institutional	Tested against SARS-CoV-2 (COVID-19); Emerging viral pathogen claim	SARS-CoV-2	04/13/2021
67619-42	Hypochlorous acid	Galaxy	Clorox Professional Products Company	5	Ready-to-use; Electrostatic spray (Clorox® Total 360® system)	Hard Nonporous (HN)	Healthcare; Institutional; Residential	Kills a harder-to-kill pathogen than SARS-CoV-2 (COVID-19); Emerging viral pathogen claim	Canine parvovirus; Rhinovirus	05/07/2020

An excerpt of a search on List N under the "Formulation" for Electrostatic Sprayers

  See *Appendix G.5: Examples of Products Approved for Use with Electrostatic Sprayers* for additional examples with additional product information.

  See *Appendix F: EPA's Initiatives During the Pandemic, Including How to Use List N* to learn how to search under the "Formulation Type" field for an updated list of disinfectants that can be used in electrostatic sprayers.

What research has been conducted to verify the safety and efficacy of disinfectants for use in application equipment?

- EPA[9] - EPA's experiments referenced earlier in this chapter also explored inhalation exposure concerns to the operator of the electrostatic sprayer or those occupying the space following disinfection. The evaluation addressed the following health and safety concerns:
  - "The droplet size distribution of the spray and chemical composition of the droplets. Smaller droplets are more readily inhaled and deposited deeper in the respiratory tract.
  - The loss of the active ingredient of the disinfectant to the vapor phase during the spray process. Some disinfectant active ingredient chemicals, such as chlorine and hydrogen peroxide, may volatilize and become hazardous if in sufficiently high

[9] https://www.epa.gov/covid19-research/evaluating-electrostatic-sprayers-disinfectant-application

vapor concentrations. This is a concern for the ESS operator, as well as for occupants of the space following disinfection (if not properly aerated).” Occupant exposure is also affected by when they return to the space if it is treated while unoccupied.

- Testing for Occupational Exposures Using Disinfectant Tabs (that create a hypochlorous solution):

  Please note that the conditions in the following research examples do not necessarily reflect all the conditions a disinfectant applicator might be used in.

> **Take Away:** The availability of manufacturer research on a specific disinfectant does not ensure that it has been approved for use by EPA under FIFRA as illustrated below. You must verify these claims by checking the product’s disinfectant label and/or searching the product’s EPA registration number on List N under the Formulation Type field.

  - Manufacturer’s Research:

    One manufacturer of electrostatic sprayers and hypochlorous tabs posted information on their website about the independent third-party testing (personal air sampling) they conducted during applicator use to determine if there were any exposure exceedances for established OSHA standards. They stated that these tests were performed by an industrial hygienist using OSHA and NIOSH sampling techniques, and that the results verified that spraying the diluted product with the electrostatic sprayer fell below OSHA’s Permissible Exposure Limits (PELS). Their results found no OSHA or NIOSH exposure concerns for workers.

    Please note that this company promotes the use of the tabs with their electrostatic sprayer on their website, but the product label does not list electrostatic as an approved application method, and the EPA registration number for the disinfectant on List N does not list electrostatic sprayers as an approved application method.

    Note: There are several other companies selling products with an electrostatic applicator on the internet that make similar claims, but they also lack required documentation and EPA approval.

  - Toxics Use Reduction Institute (TURI) Testing

    A Massachusetts school transportation department worked with the TURI laboratory in a pilot project in 2017 – 2018 to do exposure testing using personal air sampling devices with the use of the electrostatic sprayer and hypochlorous tabs in an enclosed school bus. The test results found no exceedances of OSHA’s PELS.

    TURI has been conducting additional testing with a variety of disinfectant application equipment and products. Contact the TURI Lab website at https://www.turi.org/Our_Work/Cleaning_Laboratory/COVID-19_Safely_Clean_Disinfect for the results of this research.

What are other sources of information on respiratory exposures and precautions for use of disinfectants in electrostatic sprayers?

- The Disinfectant Label[10] – Pesticide product labels provide critical information about how to handle and use pesticide products safely and legally. Pesticide labels are legally enforceable, and all of them carry the statement: “It is a violation of Federal law to use this product in a manner inconsistent with its labeling.” In other words, the label is the law.

  A key function of the pesticide product label is to manage the potential risks from pesticides. EPA requires extensive scientific data on the potential health and environmental effects of a pesticide before granting an EPA registration. EPA evaluates the data and ensures that the label translates the results of those evaluations into a set of conditions, directions, and precautions that provide information on use.

  Thus, information on respiratory exposures and precautions for use of disinfectants in electrostatic sprayers will be included on the label if the product has been approved to be used in an electrostatic sprayer.

- Information Required on the Disinfectant Label for products approved by EPA to be used in an electrostatic sprayer - EPA requires manufacturers to specify respiratory requirements as part of their amendments to the product label under a product’s PRIA review[11]:

  The following personal protective equipment (for respiratory protection) should be specified on the product label as part of the electrostatic spray directions for use:

  - *For chemicals that have low vapor pressures (less than 1. X 10-4 mm Hg), use N95 filtering facepiece respirators or half face respirators with N95 filters.*
  - *For high vapor pressure chemicals (greater than 1. X 10-4 mm Hg), such as hydrogen peroxide, use half face respirators with chemical specific cartridges and N95 filters.*

> **Why is Vapor Pressure Important?**
> When assessing health hazards of a substance, it is important to know its vapor pressure because the higher the vapor pressure, the faster a liquid evaporates and gets into the air.

  The vapor pressure of a product should be located on the product’s safety data sheet (SDS) in Section 9. Physical and Chemical Properties. If the vapor pressure is not listed in the SDS, contact the manufacturer.

  These requirements provide insight into the type of respiratory protection that is likely to be required for disinfectants undergoing EPA PRIA review. An exception to these is

[10] EPA, https://www.epa.gov/pesticide-labels/introduction-pesticide-labels#:~:text=Unlike%20most%20other%20types%20of,the%20label%20is%20the%20law.&text=pesticide%20users%20read%20and%20follow%20the%20label%20directions.

[11] EPA, Instructions for Adding Electrostatic Spray Application Directions for Use to Antimicrobial Product Registrations, https://www.epa.gov/pesticide-registration/instructions-adding-electrostatic-spray-application-directions-use

EPA's approval of a product by Clorox called Anywhere Daily Disinfectant and Sanitizer, that can be used **without** respirator protection in an electrostatic sprayer.

- Safety Data Sheet (SDS) and PRIA Label Amendment Letters (EPA provides these letters to amend the original PRIA registration when manufacturers disinfectants undergo PRIA Review to add electrostatic sprayers as an approved use on their labels):

  Information on respiratory protection requirements on an SDS for a disinfectant approved for use in electrostatic sprayers can be unreliable. The following SDS excerpts are provided as examples to illustrate inconsistencies in accurate information for three disinfectants approved by EPA to be used in electrostatic applicators:

  - Oxivir TB Disinfectant - There are two things to note:
    1. Although Oxivir TB is considered one of the safer disinfectants available with a zero rating for health, flammability, and instability on the NFPA Hazard Rating System, it does require the use of a respirator due to having the active ingredient hydrogen peroxide, which has a high vapor pressure.
    2. The SDS was revised after it was approved for use in electrostatic sprayers, and it **does** specify respiratory protection for use in an electrostatic sprayer.

Personal Protective Equipment

It is the responsibility of the employer to determine the potential risk of exposure to hazardous chemicals for employees in the workplace in order to determine the necessity, selection, and use of personal protective equipment.

Eye protection:	No personal protective equipment required under normal use conditions.
Hand protection:	No personal protective equipment required under normal use conditions.
Skin and body protection:	No personal protective equipment required under normal use conditions.
Respiratory protection:	No personal protective equipment required under normal use conditions. Wear a half face respirator with chemical specific cartridges and N95 filters when an electrostatic sprayer is used.
Hygiene measures:	Handle in accordance with good industrial hygiene and safety practice.

Excerpt of SDS for Oxivir TB Disinfectant 3/8/21

  - Envirocleanse A Disinfectant - There are several things to note:
    1. This product in a "ready to use" diluted form and contains hypochlorous acid.
    2. Although it is considered one of the safer disinfectants available with a zero rating for health, flammability, and instability on the NFPA Hazard Rating System, it **does** require the use of a respirator when used in an electrostatic sprayer.
    3. The EPA PRIA Label Amendment Letter states that a respirator is required when using the electrostatic sprayer as illustrated below.

Electrostatic Sprayers

Spray droplet particle size (regardless of the ability to change nozzles that impact particle size) should be limited to volume median diameter (VMD) ≥40 µm. Place the electrostatic spray function in the ON position for electrostatic spray models that have the functionality to toggle ON/OFF. Bystanders and pets must not be in the room during application. Minimum spray distance is 6 inches, maximum spray distance is 8 inches, from application equipment spray nozzle tip to the treated surface. The product must remain visibly wet on treated surfaces for 10 minutes and the product should be reapplied if the surface dries before the contact time is achieved. When applying, use an N95 filtering facepiece respirator or half face respirator with N95 filters.

Excerpt of the 9/9/21 EPA Letter, PRIA Label Amendment,
Addition of Electrostatic Sprayer Application Method, for Envirocleanse A

4. The SDS was updated after the use of the electrostatic sprayer was approved, and it does **not** mention the electrostatic sprayer or the requirement to use a respirator as illustrated in the excerpt below. The information in this section refers to Section 11 of the SDS, but there is only guidance on response to an exposure.

Individual protection measures, such as personal protective equipment	
Eye/face protection	No special protective equipment required.
Skin and body protection	No special protective equipment required.
Respiratory protection	No special protective equipment required. Refer to section 11
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

Excerpt of SDS for Envirocleanse A Disinfectant 3/8/21

- CloroxPro™ Clorox® Anywhere® Daily Disinfectant and Sanitizer - There are several things to note:

1. It contains the active ingredient, hypochlorous acid. It does **not** require a respirator to use.
2. This SDS was generated in the spring of 2021 after the product received EPA approval to be used in an electrostatic sprayer. The reference in the SDS to "a mechanically powered sprayer" does not specify the use of electrostatic specifically.
3. The authors were unable to locate the PRIA Label Amendment Letter that specifically addressed the approval for use in an electrostatic sprayer.
4. The documentation that is available is that it is listed on list N as approved for use in electrostatic sprayers.

Individual protection measures, such as personal protective equipment	
Eye/Face Protection	No protective equipment required. Recommended use of eyewear protection when using through a mechanically powered sprayer.
Skin and Body Protection	No special protective equipment required.
Respiratory Protection	No protective equipment is needed under normal use conditions. If irritation is experienced, ventilation and evacuation may be required.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

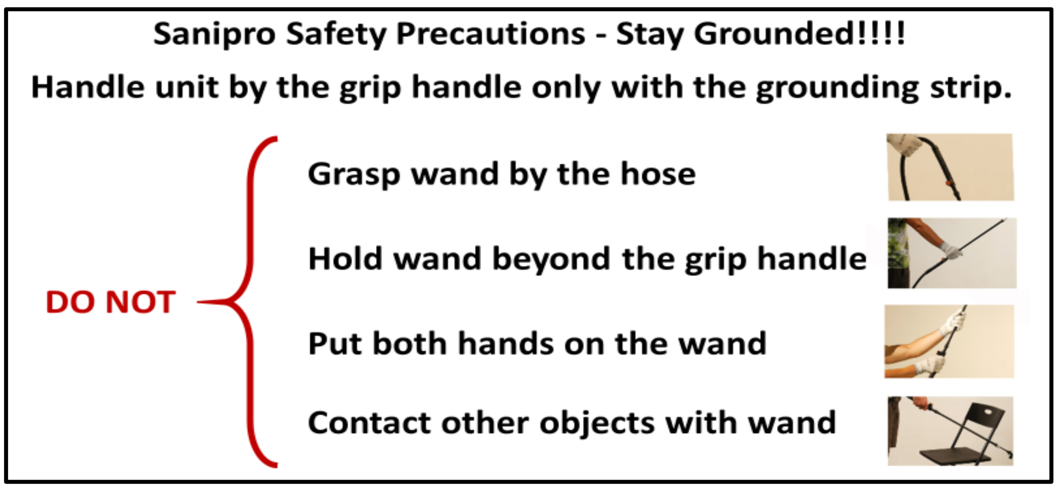
11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure	
Product Information	.
Inhalation	Exposure to vapor or mist may cause minor irritation to respiratory tract.

Two Excerpts of SDS for Clorox Anywhere Disinfectant 3/9/21

What other safety precautions should I take when using electrostatic applicators?

- Fire Hazards
  - Flammable products (e.g., alcohol-based disinfectants) and oil-based products cannot be used in electrostatic applicators due to the electrostatic charge applied at the nozzle to the liquid being discharged, which could ignite the product.[12]
  - Electrostatic applicators cannot be used around flammable liquids and combustible dust due to the fire risk posed by the equipment's electrostatic static charge.
- Shock Hazards
  - The user must be grounded when using electrostatic applicators. Examples of grounding practices include the use of grounding strips in equipment handles and protective gloves, only using when standing on a dry floor, etc. Check the equipment manufacturer's instructions.



This slide was developed by the authors using Sanipro's instructions and photos to train users on safe use of the electrostatic applicators to prevent shock.

- Safety Risks for Use of Medical Devices[13]
  - Pacemaker - A person cannot use electrostatic equipment or be located within 10 ft of one if they have a pacemaker. It is possible to shut off the electrostatic function and use the equipment, but it may affect the way the applicator applies the disinfectant.
  - Defibrillator – Electrostatic equipment could interfere with us of a defibrillator within 10 feet.

[12] Earthsafe Chemical Alternatives, PX200ES Safety Instructions

[13] Earthsafe Chemical Alternatives, PX200ES Safety Instructions

Do I need a Pesticide Applicator License to use an electrostatic sprayer?

- Some states (Maine) require a pesticide license and training to use this technology with disinfectants. Massachusetts does not.

What work practices help to minimize the amount of disinfectant in the air?

- After cleaning surfaces, start working from high to low, from the farthest corner of a space and work your way out of the room. This will enable the user to minimize contact with any product in the air.
- Set the pressure and flow to a minimum of 40 microns (as required by EPA[14]) to create a larger size droplet. Please note that EPA's experiments[15] did not find a significant difference in droplet size when they adjusted nozzles.

What surfaces and items should not be sprayed?

- Electronics - Check equipment and product directions for use around office electronic equipment (e.g., computers, keyboards, and monitors):
    - The EvaClean website notes that the Protexus sprayer use with hypochlorous tabs can be used around, but not directly applied to any sensitive electronics.
    - Some disinfectant products can damage the various materials in electronic equipment as well as cause damage from the liquid.
- Paper – do not use on paper.
- Soft, porous, surfaces (carpet, fabric) - do not use on these surfaces.

[14] EPA Instructions for Adding Electrostatic Spray Application Directions for Use to Antimicrobial Product Registrations, https://www.epa.gov/pesticide-registration/instructions-adding-electrostatic-spray-application-directions-use

[15] EPA Research Webinar: COVID-19 Electrostatic Sprayers and Foggers for Disinfectant Application, https://youtu.be/-Qz2tnznUxI

Appendix G.3. What is a Mister/Fogger?

What is a mister/fogger?

The EPA and the CDC have agreed on a common definition to define "a fogger also known as mister, as a device that uses a fan and a liquid solution to create a fog or aerosol with small droplets or mist".[16] The liquid droplets are not positively charged (as they are for electrostatic applicators).

As illustrated by the EPA's and CDC's definition above, the terms mister and fogger are often used interchangeably. Author efforts to clarify the differences in these definitions used by various entities on the internet found that there is no consistent definition, and the terms are most often used interchangeably.

The main differences and considerations between the two technologies and how they are used are:

- The size of the droplet, which is measured in microns.
- Whether the size droplet creates a mist or a fog (which is further defined below), which determines how long is stays in the air and how well it coats the surface.

This technology comes in:

- battery operated and corded options, and
- handheld and backpack options.

Some units deliver both a mist and a fog. Since most references to mister/foggers focus on fogging systems or on a unit that can deliver both a mist and a fog, this document will focus on providing information on fogging systems.

The information in this appendix is provided to help to clarify these terms to the extent possible and the uses of the mister and fogger application systems.

[16] EPA Research Webinar: COVID-19 Electrostatic Sprayers and Foggers for Disinfectant Application, https://youtu.be/-Qz2tnznUxI

Which definition of fogging and misting should I use as a reference?

- EPA's List N – Disinfectants Approved for COVID-19;

  EPA does not provide a definition of the micron size of droplets generated from misters and foggers (other than for the total release foggers) on List N. The products list under the "Mist" category of the Formulation Type menu on List N includes the following two products that illustrates the companies interchangeable use of the terms mist and fog:

  1. Steramist – a Binary Ionization Technology (BIT) is a patented process that activates and ionizes an EPA registered solution of 7.8% Hydrogen Peroxide solution into a fine **mist and fog** called ionized Hydrogen Peroxide.
  2. Curoxide Innovative Pulse™ technology – generates a Hybrid Hydrogen Peroxide™ **fog**, a powerful combination of aerosol and vapor hydrogen peroxide.

  There are three products on List N under the "Fog" category, two of which are the same products as listed under the "Mist" category above.

> **Take Away:** none of the products included on List N for use in fogging and misting applicators are appropriate for use in schools for surface disinfection.
>
> EPA and the CDC and state agencies (e.g., New Jersey Department of Environmental Protection and Vermont Department of Health) do not recommend the use of this technology for surface disinfection. The reasons for this are detailed throughout the rest of this document.

- Definitions from Weather, Pesticide Applications and Propagation Equipment:

  Author research found a range of droplet micron sizes referred to for mist and fog. References were identified from a wide range of entities such as nozzle companies, pesticide applicators, weather references to mist and fog, etc.

- Author combined definitions for purposes of discussion:

  Thus, this document will use a combination of the following definitions from the TURI references for moisture levels in the atmosphere, the UMass Extension references from discharge of water from equipment to a mist or fog for propagation purposes, and the American Society of Agricultural and Biological Engineers (ASABE) for applying pesticides.

  Information for droplet size for spraying pesticides is somewhat more specific because the pesticide label may require a certain size, which then requires the applicator to set equipment nozzle for that size. Although the pesticide information is geared to prevent drift of a pesticide in the outdoor air, it has some implications for how different size microns might behave in the indoor air as explained below.

What does micron size have to do with whether it is a mister or fogger, and why should I be concerned?[17]

A droplet from a mist is larger than a fog droplet. the disposition on **surfaces** is based on the direction of the spray and the effect of gravity. Thus, the operator has more control over accurately directing a mist to treat **surfaces** as opposed to trying to direct a fog, which tends to be a technique used to treat a **volume of air** in a space.

A micron is 1/1000 millimeter, or about 1/25,000 of an inch.

See the chart below for a perspective in size compared to common objects.

Take Away: Droplet size is important when the goal is to keep the disinfectant out of the air and breathing zone, and as one of the factors in depositing the disinfectant onto an intended surface.

Heavier droplets fall more quickly and will decrease inhalation risk, increase efficacy of the disinfectant by delivering the product to the surface versus the air, and reduces product waste.

Degree of Atomization	Droplet Size (Microns)	Relative Size Related to Common Objects
Fog	Up to 25	Point of a Needle (25 Microns)
Fine Mist	20-100	Human Hair (100 Microns)
Fine Drizzle	100-250	Sewing Thread (150 Microns)
Heavy Drizzle	250-500	Toothbrush Bristle (300 Microns)
Light Rain	500-800	Staple (550 Microns)
Heavy Rain	800-1000	Paper Clip (850 Microns)
Thunderstorm Rain	10004-1000	#2 Pencil Lead (2000 Microns)

Source: https://cdn2.hubspot.net/hub/95784/file-32015844-pdf/docs/asabe_s572.1_droplet_size_classification.pdf

[17] Pesticide Environmental Stewardship, Understanding Droplet Size, https://pesticidestewardship.org/pesticide-drift/understanding-droplet-size/

Spray droplets smaller than 150 microns fall more slowly than large droplets. They do not have enough weight to overcome air resistance and are likely to float.

Even small changes in droplet diameter make big differences in droplet weight, for example:

- An increase in droplet diameter from 150 microns to about 190 microns doubles the droplet weight.
- An increase in droplet diameter from 150 microns to about 240 microns increases the weight 4 times.
- Doubling the diameter to 300 microns increases its weight, and its volume, by 8 times!

The size of the droplet also matters because when the size of spray droplets is reduced, their numbers increase, and the potential for air current to effect it also increases. For example, reducing droplet diameter in half multiplies the number of droplets by eight.

What are the Droplet Size Categories?

Although the following reference is used in the agricultural industry, you may find references to it when selecting equipment or reviewing the specifications for application equipment because distributors began promoting use of pesticide application equipment during the pandemic.

The American Society of Agricultural and Biological Engineers (ASABE) has a droplet size classification system (ASABE S-572.1) that ranges from extremely fine to ultra-coarse. This standard is based upon the average size droplet (VMD), measured in microns, that is produced at a particular operating pressure.[18] The higher the pressure, the smaller the droplets.[19]

If provided on the equipment, refer to the ASABE S-572.1 droplet category and not the "micron" size when selecting nozzles. Droplets in the medium to extremely coarse range 226 to >650 range will have a heavier droplet.

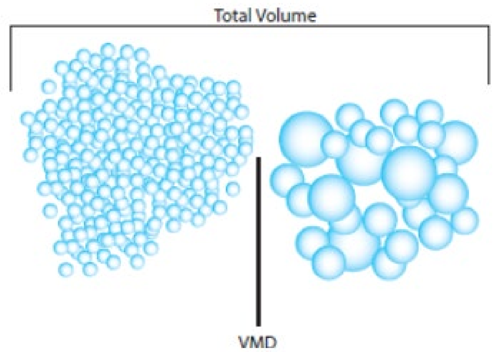
Because of differences in the equipment and methods used to measure droplet sizes, different nozzle manufacturers may report different micron values for ASABE S-572.1 droplet size categories.

Category	Symbol	Approximate VMD* Range (Microns)
Extremely Fine	EF	<60
Very Fine	VF	60 – 145
Fine	F	145 – 225
Medium	M	226-145
Coarse	C	325-400
Very Coarse	VC	401-500
Extremely Coarse	EC	501-650
Ultra Coarse	UC	>650

[18] Wilson, JCoarseim; Nowatzki, John; and Hofman, Vern, "Selecting Drift-reducing Nozzles" (2008). Fact Sheets. Paper 98.http://openprairie.sdstate.edu/extension_fact/98

[19]https://www.bete.com/applications/misting#:~:text=Misting%20nozzles%20produce%20the%20smallest,range%20of%2020%2D500%20microns.

* VMD (Volume Median Diameter) - This means the midpoint droplet size (median), where half of the volume of spray is in droplets smaller, and half of the volume is in droplets larger than the median.



VMD is the droplet size at which 50% of the spray volume is in droplets larger than the VMD and 50% of the volume is in droplets smaller than the VMD (adapted from Matthews 1992).

Other than the effects of the specific material being sprayed, the four major factors effecting droplet size are: tip style, capacity, spraying pressure and spray pattern type.

Lower spraying pressures provide larger droplet sizes, while higher spraying pressures yield smaller droplet sizes.

Comparison of Fog and Mist Definitions

	Fogger	Mister
Duration in the air	Floats in the air – when the fog particles are propelled into the air, tiny water droplets remain suspended until they evaporate. The smallest droplets vaporize almost instantaneously. The larger ones are carried by on any air currents, gradually becoming smaller until they are vaporized. The smaller the droplet, the more they can be affected by airflow from room ventilation and outside air from open windows.	Falls out of the air – the mist particles propelled into the air are heavier and take much longer to evaporate than fog size droplets. These particles are more likely to fall out of the air.
Micron Size - measured in µm	From insecticide labels (which also can vary): 1. Dry fog (5-15 microns VMD) 2. Wet fog (20-30 microns VMD) 3. Mist (30-60 microns VMD) 4. Fine Spray (> 60 microns VMD)	
	TURI Reference - 10 microns	TURI Reference - 200 microns
	UMass Extension Reference - Fog generated from foggers as 50 microns or less in size, with 10 microns the size of a particle that is generated from high pressure fogging systems.[20]	
Environment created	Fog like cloud	Rainy
Comments	The smaller the droplets, the longer they stay suspended in the air and the more readily inhaled, which pose more of a respiratory exposure hazard. Fog can stay suspended in the air and in the breathing zone until it dries. The amount of time this takes depends on room ventilation, temperature and relative humidity. Wet foggers are not designed to treat the virus in the air.	Misters are not designed to treat the virus in the air.

[20] UMass Extension, Greenhouse Crops and Floriculture Program, Mist and Fog Equipment for Propagation, https://ag.umass.edu/greenhouse-floriculture/fact-sheets/mist-fog-equipment-for-propagation

What types of foggers are used to dispense disinfectants?

Foggers comes in both battery operated and corded options, and as standalone, handheld, and backpack units. There are several types of foggers designed for a range of uses:

- Wet Foggers (cold fogging, also known as micro-condensation):
    - Foggers – work by dispensing a fine spray of liquid particles (not a gas or a vapor). These particles are measured in microns.

      Note: This document **will focus** on this technology.
    - Ultra-Low Volume (ULV) Foggers[21] – (cold fogging) work by using large volumes of air to compress and dispense pesticides or disinfectants at low pressure through a specially designed nozzle. They produce smaller particles than standard wet foggers or misters. The smaller droplets stay suspended in the air longer.

      ULV fogging machines can apply both oil and water-based solutions. This technology has been used extensively in the pesticide industry and has been used to apply disinfectants and are being sold in small unit for use in homes and businesses.

      Note: This document **will not** provide any additional details on this technology as it is not appropriate to spray the air for addressing surface disinfection in schools.
- Dry Foggers (thermal fogging):
    - Work by generating ultra-fine droplets in a range of 1-50 µm using thermo-pneumatic energy. Liquid substances are vaporized at the end of fogging barrel (resonator) and form ultra-fine aerosols by condensing on contact with cool ambient air to create dense visible fog-clouds.
    - Used to apply pesticides or disinfectants. This technology can be used with a water and oil-based product.

      Note: This document **will not** provide any additional details on this technology.

Methods for producing wet and dry fog vary and are based on the product used and equipment design. Vaporized disinfectants are smaller, remain airborne for a longer period compared to wet fog and provide both air and surface disinfection.

The effectiveness of each of these technologies depends on the type and volume of product used, the type of pathogen targeted, the type of surface, the size of indoor space, the location of the fogging equipment, pre-cleaning practices, organic load, air movement, relative humidity, and contact time[22].

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[21] Vector Fog, https://www.vectorfog.com/what-is-ulv/

[22] National Collaborating Centre for Environmental Health, COVID-19 in indoor environments — Air and surface disinfection measures, https://ncceh.ca/documents/guide/covid-19-indoor-environments-air-and-surface-disinfection-measures

Questions regarding the safety and efficacy of mister/foggers:

The key concerns are efficacy of the product and health and safety of the product applicator. These issues are addressed in EPA's documents and CDC referenced below.

- **EPA:**
  - **EPA concerns dating back to 2013 -** EPA has had the following concerns stated in their letter from 2013, which is still posted on their website:

    Fogger/Mister Final Signed Letter (PDF)(4 pp, 727 K) - We (EPA) sent this letter to companies holding a registration for one or more antimicrobial pesticide products that make claims to provide control of public health microorganisms when applied by fogging and/or misting methods. We seek to make sure that fogger/mister products are effective as claimed and are labeled in a manner that will prevent unreasonable adverse effects from occurring with regard to human health and the environment.

    As explained in the letter, we are concerned that fogging/misting products may not be as effective as claimed, and we want to ensure that these fogging/misting products are accurately labeled. By this letter, we are asking companies either to provide existing efficacy data, or to commit to provide new data, that address the public health claims for the fogger/mister products. Alternatively, the registrant may elect to revise the labeling of the affected products and registrations to delete the public health claims for the fogger/mister products.

    The reasons that the EPA believes that fogging/misting methods of application may not be adequately effective include the following:

    - Application by fogging/misting results in much smaller particle sizes, different surface coverage characteristics, and potentially reduced efficacy when compared to sanitization or disinfection product applications by spraying, sponging, wiping, or mopping.
    - The absence of pre-cleaning in the presence of soil contamination, potential reaction with or absorption of the active ingredient for different surfaces, and humidity/temperature fluctuations can also impact distribution and efficacy of the product.
    - A surface treated by fogging/misting does not receive the same amount of active ingredient per unit area as the standard methods of application and, as a result, the level of efficacy achieved may not be the same level claimed on the label.

- **EPA Expedited Review 2020-2021:** in a press release on 05/12/2020, From EPA's Chemical Safety and Pollution Prevention (OCSPP), *EPA Makes it Easier for Consumers to Find Safe, Effective Disinfectant Products to Use Against the Novel Coronavirus:* there is a section that references the reevaluation of disinfectants in mister/foggers:

  EPA's Expedited Review of Pesticide Registration Improvement Act (PRIA) Submissions for Products Eligible for Inclusion on List N: Submission Information for Registrants:

  "EPA may also consider expedited review of new active ingredients or new uses for currently registered active ingredients (including higher application rates, new application methods such as fogging and electrostatic sprayers, or use sites such as porous surfaces)."

Important Update: As of April 28, 2021, EPA will no longer expedite new product registrations, emerging viral pathogen claims, SARS-CoV-2 claims, and electrostatic spraying directions for products intended to kill SARS-CoV-2 on surfaces.

Although the press release did not specifically reference misters and foggers, the authors believe that the expedited review of the misters and foggers is likely to be dropped for the same reasons.

- **Centers for Disease Control and Prevention (CDC):**
  - **CDC Environmental Fogging (with disinfectants) [December 2009]**[23]

    Clarification Statement: CDC and HICPAC have recommendations in both *2003 Guidelines for Environmental Infection Control in Health-Care Facilities* and the *2008 Guideline for Disinfection and Sterilization in Healthcare Facilities* that state that the CDC does not support disinfectant fogging. Specifically, the 2003 and 2008 Guidelines state:

    - 2003: "Do not perform disinfectant fogging for routine purposes in patient-care areas. Category IB"
    - 2008: "Do not perform disinfectant fogging in patient-care areas. Category II"

    These recommendations refer to the spraying or fogging of chemicals (e.g., formaldehyde, phenol-based agents, or quaternary ammonium compounds) to decontaminate environmental surfaces or disinfect the air in patient rooms. The recommendation against fogging was based on studies in the 1970's that reported a lack of microbicidal efficacy (e.g., use of quaternary ammonium compounds in mist applications) but also adverse effects on healthcare workers and others in facilities where these methods were utilized. Furthermore, some of these chemicals are not EPA-registered for use in fogging-type applications.

[23] CDC, Updates. Guideline for Disinfection and Sterilization in Healthcare Facilities (2008), https://www.cdc.gov/infectioncontrol/guidelines/disinfection/updates.html

These recommendations do not apply to newer technologies involving fogging for room decontamination (e.g., ozone mists, vaporized hydrogen peroxide) that have become available since the 2003 and 2008 recommendations were made. These newer technologies were assessed by CDC and HICPAC in the 2011 Guidelines for the Prevention and Control of Norovirus Gastroenteritis Outbreaks in Healthcare Settings, which makes the recommendation:

"More research is required to clarify the effectiveness and reliability of fogging, UV irradiation, and ozone mists to reduce norovirus environmental contamination. (No recommendation/unresolved issue)"

The 2003 and 2008 recommendations still apply; however, CDC does not yet make a recommendation regarding these newer technologies. This issue will be revisited as additional evidence becomes available. Please see below for the 2021 recommendations.

- **CDC Important Update, April 5, 2021 - Alternative Disinfection Methods[24] – excerpt:**

  In most cases, fogging, fumigation, and wide-area or electrostatic spraying is not recommended as a primary method of surface disinfection and has several safety risks to consider.

F

State and Other Efforts to Restrict Use of Foggers - Some states have begun to ban or recommend against the use of disinfectant application in mister/foggers:

- Green Seal[25] – an independent third-party certification agency, does not recommend the use of mister/foggers in their publication Guidelines for COVID-19 Cleaning and Disinfection for schools and colleges.

Should You Use These to Disinfect?

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EPA List N Products	YES	Follow label directions for approved application methods and required contact times.
Electrostatic Spraying	MORE INFO NEEDED	EPA and CDC are reviewing safety and effectiveness.
Ultraviolet, Ozone or Steam	MORE INFO NEEDED	EPA and CDC are reviewing effectiveness.
Fogging	NO	Increases hazardous chemical exposure and provides no added benefit.
Ultrasonic Waves or LED blue light	NO	There is no data to suggest these are effective against COVID-19.

- State of Vermont, Department of Public Health – has recommended against the use of this equipment for disinfecting.
- State of New Jersey[26] – issued a compliance advisory: "To avoid any potential misuse of disinfection/sanitizer products by direct application to humans and clothing thorough the use of fogging/misting systems. Unless specifically approved by DEP or USEPA and set forth in the product's label, use of disinfection/sanitizer products in this manner poses a potential threat to human health via direct exposure and is contrary to law."

DEPARTMENT OF ENVIRONMENTAL PROTECTION NEW JERSEY

Compliance Advisory

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
Compliance & Enforcement #2020-15 Issued: 10/5/2020

Fogging/Misting Systems Using Disinfectants/Sanitizers as a COVID-19 Treatment - Not permissible for Human Exposure

WHO IS AFFECTED BY THIS ADVISORY?

Anyone using Disinfection/Sanitizer Products (Pesticides) to treat or control COVID-19.

WHY IS DEP ISSUING THIS ADVISORY?

To avoid any potential misuse of disinfection/sanitizer products by direct application to humans and clothing thorough the use of fogging/misting systems. Unless specifically approved by DEP or USEPA and set forth in the product's label, use of disinfection/sanitizer products in this manner poses a potential threat to human health via direct exposure and is contrary to law. Some disinfectant/sanitizer products are regulated as pesticides under the Pesticide Control Program (PCP) regulations, N.J.A.C. 7:30-1 et. seq.

[25] Green Seal, https://www.healthygreenschools.org/wp-content/uploads/HGSC_DisinfectingGuidelines.pdf

[26] New Jersey, Department of Environmental Protection, https://www.nj.gov/dep/enforcement/advisories/2020-15.pdf?utm_medium=email&utm_source=govdelivery

Other Use Considerations

- Product Coverage – remember that the even and complete coverage of the disinfectant on a surface or an object relies on[27]:
    - gravity and airflow in the immediate area,
    - the equipment operator to set the spray for a sufficient micron size to sufficiently target and wet the surfaces without oversaturating, and
    - on the applicator’s application technique, including direction of spray, distance from the application surface, etc.
- User Safety
    - As stated earlier in the document, one of the key concerns for use of misters and foggers is the aerosolization of the product in the air in the breathing zone where it can stay suspended until it evaporates. The amount of exposure to the applicator and others in the vicinity depends on the size droplet, and room conditions such as ventilation, temperature, relative humidity, etc.
    - As of May 2021, there are only three products listed on EPA’s List N for use in fogging equipment. Two of those **same** products are listed on EPA’s List N for use in misters. None of these technologies and related products are suitable for use in schools for surface disinfection. Also, the use of these technologies without using a remote activation system would require the use of respirators.
    - If your school district has equipment that is defined as a mister or fogger or as a mister/fogger, your district could consider working with an industrial hygienist to conduct an exposure assessment. This would determine what type of respiratory protection would be required.
    - In addition to respiratory protection, implement practices to minimize the amount of product in the air by:
        - Setting the equipment to the largest droplet possible.
        - Achieving the best ventilation possible for that space.
        - Starting at the farthest corner of a room and working your way out of the space.

Potential harmful effects of fogging near electronic equipment:

- A recent study found that electronic equipment that is powered on can draw in fogged product from the air.[28] Some of the disinfectants were found to corrode the electronics. The authors of the study recommend powering off and covering electronics before fogging.

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[27] National Collaborating Centre for Environmental Health, COVID-19 in indoor environments — Air and surface disinfection measures, https://ncceh.ca/documents/guide/covid-19-indoor-environments-air-and-surface-disinfection-measures

[28] Sams, Jim, Forensics Firm Says Disinfectant Foggers Can Damage Electronics, May 26, 2020, https://www.claimsjournal.com/news/national/2020/05/26/297233.htm

Appendix G.4: Comparison of Mister/Foggers and Electrostatic Sprayers

	Avoid	Use With Caution with Required Respiratory Protection
Criteria	**Mister/Fogger**	**Electrostatic Sprayer**
Health Issues	Respiratory exposures to the equipment applicator and occupants in the space. Adverse health impacts from respiratory exposure to disinfectants can be categorized into acute adverse reactions and chronic health impacts. For example, some types of common ingredients in school disinfectants such as quaternary compounds, can trigger (acute) and/or cause asthma (chronic), and cause other reproductive effects (chronic). The level of risk and the possible health effects are based on the frequency and duration of the exposure, the amount and concentration of the product in the air, the level of respiratory protection, and the health conditions of the people exposed.	A possible respiratory exposure to the disinfectant is posed if proper respiratory protection is not used when required. EPA requires manufacturers to state on the label of the product approved for use in electrostatic sprayers information on product exposure risks and related respiratory protection requirements if the product was approved for use in this type of applicator.

	Avoid	**Use With Caution with Required Respiratory Protection**
Criteria	**Mister/Fogger**	**Electrostatic Sprayer**
Safety Issues		One safety risk for this equipment is based on the hazard posed by application of an electrical charge to the liquid as the liquid passes through the nozzle: • The user must be grounded while using the unit. These precautions include making and maintaining contact with any grounding strips or straps on the equipment, using in a dry environment and with dry hands, and using rubber gloves if directed by the manufacturer. • If the user touches the nozzle of the applicator without appropriate gloves, they can receive an electric shock from static electricity. The level of shock has been described as an experience similar to what you experience when sliding along a rug and touching something. • This technology cannot be used: o around a defibrillator, o within 10 feet of someone with a pacemaker, o with a flammable product, or o in a flammable environment (e.g., combustible dust, flammable vapors, etc.)

	Avoid	**Use With Caution with Required Respiratory Protection**
Criteria	**Mister/Fogger**	**Electrostatic Sprayer**
Reentry time	May take longer than an application from an electrostatic applicator due to possible presence of liquid particulates suspended in the air that take time to evaporate. Product dispersion in the air and evaporation time will depend on amount dispensed, relative humidity in the room, air changes per hour, etc.	Although product instructions may state that re-occupancy can happen immediately after application as air concentrations are below acceptable exposure levels (this would require testing), or when the surfaces are dry, Public Health Ontario's research in summer of 2020 could not find any data to support this claim.[29] Droplets maybe larger and drop out of the air sooner than a fog. Thus, reentry times maybe shorter. Occupants could reenter when the surfaces are dry.
How Droplet Size Affects Coverage **Measured in microns**	Droplet size in addition to relative humidity, temperature, and ventilation and air flow, affects how quickly the surface is covered and how fast the particles drop out of the air or evaporate.	EPA requires manufacturers to state on the label of the product approved for use in electrostatic sprayers[30]: "Spray droplet particle size should be limited to a volume median diameter (VMD) ≥40 µm." The droplet size may not be the only factor in how fast the droplets drop out of the air. Manufacturers claim that the electrostatic charge (when working correctly) applied to the droplets attracts the liquid to a surface (due to the negative and positive charges) and pulls it out of the air.

[29] Public Health Ontario, FAQ COVID-19: Electrostatic Spray Disinfection Systems 07/28/2020 Questions and Answers

[30] EPA Instructions for Adding Electrostatic Spray Application Directions for Use to Antimicrobial Product Registrations, https://www.epa.gov/pesticide-registration/instructions-adding-electrostatic-spray-application-directions-use

	Avoid	Use With Caution with Required Respiratory Protection
Criteria	**Mister/Fogger**	**Electrostatic Sprayer**
Application Coverage	Equipment passively dispenses liquid product based on: • direction of spray, and • the effect of gravity. This may result in uneven and inadequate coverage due to droplet size (a fog may also stay suspended in the air until it dries).	Manufacturers claim that electrostatically charged liquid draws it to the magnetic field on all planes of an object, enabling it to wrap around and under items. Limited experiments by EPA[31] to test this theory found that: 1. the wrap around effect was not as pronounced as expected when spraying an eight-inch diameter object, 2. smaller objects had better coverage from wrapping, and 3. the results of disposition of disinfectant on the surface for electrostatic and mister/foggers tested were similar. Manufacturers also claim that charged disinfectant droplets repel each other and seek the opposite magnetic field, enabling the disinfectant to evenly coat a surface versus sticking to each other. EPA's research (discussed on page 5) on a limited number of electrostatic applicators found that the type of charge imparted on the liquid discharged from the electrostatic applicator was based on whether it was corded or not. The results found that two of the corded units carried a positive charge, and the four battery-operated carried a negative charge.

[31] EPA Research Webinar: COVID-19 Electrostatic Sprayers and Foggers for Disinfectant Application, https://youtu.be/-Qz2tnznUxI

	Avoid	**Use With Caution with Required Respiratory Protection**
Criteria	**Mister/Fogger**	**Electrostatic Sprayer**
Efficacy Related to the Ability to Maintain Contact Time	EPA has concerns about how well this technology coats the surface because the liquid particulates are so small and are aerosolized, versus coating the surface sufficiently to stay wet during the required contact time.	Certain environmental conditions (i.e., air flow, size of the object, other sources of static electricity, etc.) may affect how well the product coats surfaces and objects. EPA found that size of an object affected how well the electrostatically charged disinfectant wrapped around it. This could affect efficacy level on all planes of an object unless those planes are targeted. They found small objects (e.g., the size of a small lampshade) received better wrap around coverage.
Maintenance and Repair	Disinfectants should be diluted prior to putting in solution tank. Units may need to be drained and rinsed after use. Nozzle can easily clog in some units if they are not cleaned properly.	Disinfectants should be diluted prior to putting in solution tank. Units may need to be drained and rinsed after use. Nozzle can easily clog in some units if they are not cleaned properly.
Surface and Item Concerns	Electronics that are powered on can draw in the fogged product, which can damage the electronics.[32]	

[32] Sams, Jim, Forensics Firm Says Disinfectant Foggers Can Damage Electronics, May 26, 2020, https://www.claimsjournal.com/news/national/2020/05/26/297233.htm

Appendix G.5: Examples of Products Approved for Use with Electrostatic Sprayers

Examples of some products approved for use with electrostatic sprayers on the EPA's List N: Disinfectants for Coronavirus (COVID-19)

EPA Registration Number	Active Ingredient(s)	Product Name	Company	Contact Time (in minutes)	Formulation Type	Surface Types	Use Sites	Respiratory Protection Required
1677-259	Dodecylbenzenesulfonic acid; L-Lactic acid	CW32A-RTU	Ecolab Inc	0.25 (15 seconds)	Ready-to-use; Electrostatic spray	Hard Nonporous (HN); Food Contact No Rinse (FCNR)	Healthcare; Institutional; Residential	As used no personal respiratory protective equipment normally required.
1677-238	Hydrogen peroxide	Peroxide Multi Surface Cleaner and Disinfectant	Ecolab Inc	0.5 (30 seconds)	Dilutable; Electrostatic spray	Hard Nonporous (HN)	Healthcare; Institutional	As used no personal respiratory protective equipment normally required.
70627-56	Hydrogen peroxide	Oxivir™ Tb	Diversey Inc	30 seconds	Ready-to-use; Electrostatic spray	Hard Nonporous (HN); Food Contact Post-Rinse Required (FCR)	Healthcare; Institutional	As used no personal respiratory protective equipment normally required.

Appendix H:
Templates for Labeling Secondary Containers of Disinfectants and Sanitizers

Blank Label Templates for:
Use on Secondary (Workplace) Containers with Antimicrobial Products

The following two versions of label templates can be copied and pasted onto label paper for use. Laminated labels can be reused by marking dates and solution concentrations with a grease marker. Each label template is provided in color and in black and white for printing purposes.

1. **FIFRA -** Includes only information required by FIFRA, and a space to note the solution's concentration and date diluted to help track disposal requirements.

Product Name:	EPA Registration #:	Date Diluted:
	% of active ingredient:	❒ Disinfectant, ❒ Sanitizer

Concentration of Solution - note units of measure:

❒ PPM______, ❒ ratio______ to______, ❒ volume (___TSP, ___TBSP, ___Cup) to (___Cup, ___Quart, ___Gallon)

Signal Word from the Pesticide Label – Check only one:			
❒ DANGER ❒ WARNING ❒ CAUTION	❒ Splash Goggles	❒ Protective Apron	❒ Gloves

Follow the directions for use on the pesticide label when applying this product.
The product in this container is diluted as directed on the pesticide product label.

Hazard Statements – Check all that apply	Precautionary Statements – If unsure, get medical attention
❑ Explosive - ❑ Pressurized, ❑ In Absence Of Air, ❑ Projection	❑ If Swallowed - ❑ Do Not Vomit, ❑ Induce Vomiting, ❑ Rinse Mouth, ❑ Poison Control, ❑ Medical Attention
❑ Fire - ❑ Extremely or ❑ Highly Flam, ❑ Aerosol, ❑ Spontaneous Ignition, ❑ In Contact with Water, ❑ Flammable Solid, ❑ Flammable Vapor	❑ If in Eyes - ❑ Remove or ❑ Do Not Remove Contacts, ❑ Rinse for Several Minutes, or ❑ 15 -20 Minutes
❑ Toxic, ❑ Fatal, ❑ Harmful – if ❑ Swallowed, ❑ Inhaled, ❑ Skin	
❑ Irritant, ❑ Damage ❑ Allergic/Asthma - ❒ Skin, ❑ Respiratory, ❑ Eye	❑ If Inhaled, or ❑ Respiratory Symptoms - ❑ Call Poison Control, ❑ Get Medical Attention, ❑ Remove - Fresh Air
❑ Corrosive - ❑ Metals, ❑ Skin (burns), ❑ Eyes (burns)	
❑ May Cause, or ❑ Causes - ❑ Cancer, ❑ Genetic Defects, ❑ Infertility	❑ If on Skin or Clothes - ❑ Remove Clothes,

Product Name:	EPA Registration #:	Date Diluted:
	% of active ingredient:	❒ Disinfectant, ❒ Sanitizer

Concentration of Solution - note units of measure:

❒ PPM______, ❒ ratio______ to______, ❒ volume (___TSP, ___TBSP, ___Cup) to (___Cup, ___Quart, ___Gallon)

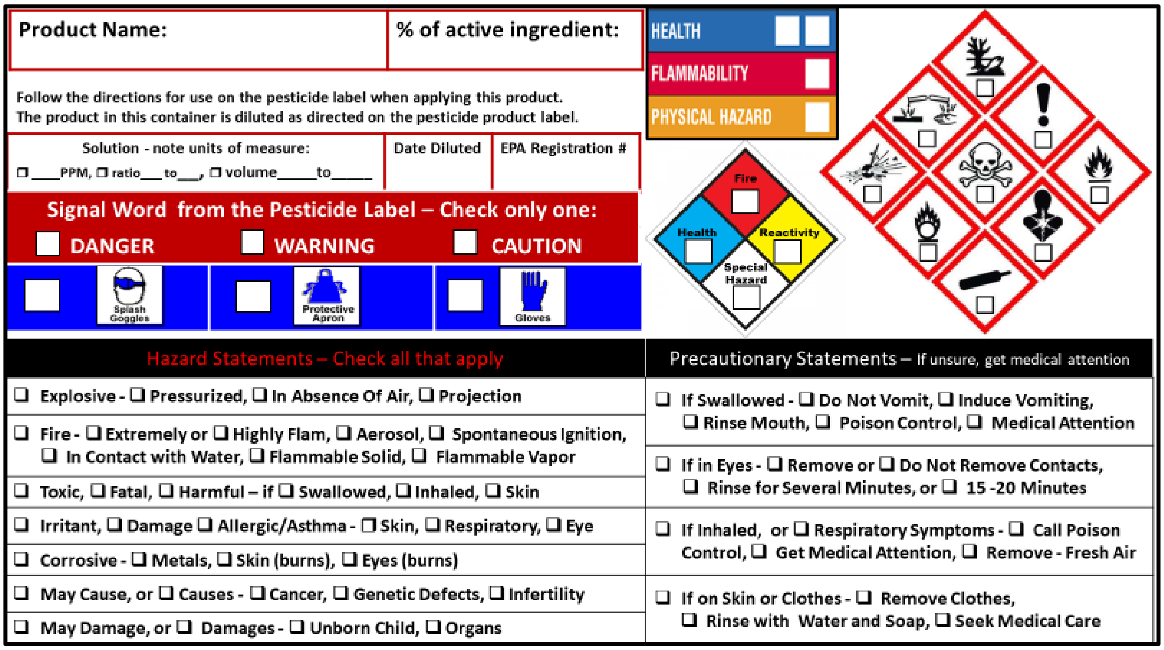
Follow the directions for use on the pesticide label when applying this product.
The product in this container is diluted as directed on the pesticide product label.

❒ Chemical Splash Goggles	❒ Nitrile Gloves	❒ Chemical Resistant Apron	Signal Word from the Pesticide Label – Check only one: ❒ DANGER ❒ WARNING ❒ CAUTION

Hazard Statements – Check off all that apply	Precautionary Statements – If unsure, get medical attention
❑ Explosive - ❑ Pressurized, ❑ In Absence Of Air, ❑ Projection	❑ If Swallowed - ❑ Do Not Vomit, ❑ Induce Vomiting, ❑ Rinse Mouth, ❑ Poison Control, ❑ Medical Attention
❑ Fire - ❑ Extremely or ❑ Highly Flam, ❑ Aerosol, ❑ Spontaneous Ignition, ❑ In Contact with Water, ❑ Flammable Solid, ❑ Flammable Vapor	❑ If in Eyes - ❑ Remove or ❑ Do Not Remove Contacts , ❑ Rinse for Several Minutes, or ❑ 15 -20 Minutes
❑ Toxic or ❑ Fatal or ❑ Harmful - ❑ Swallowed, ❑ Inhaled, ❑ Skin	
❑ Irritant or ❑ Damage or ❑ Allergic/Asthma - ❑ Skin, ❑ Respiratory, ❑ Eye	❑ If Inhaled or ❑ Respiratory Symptoms - ❑ Call Poison Control, ❑ Get Medical Attention, ❑ Remove to Fresh Air
❑ Corrosive - ❑ Metals, ❑ Skin (burns), ❑ Eyes (burns)	
❑ May Cause or ❑ Causes - ❑ Cancer, ❑ Genetic Defects, ❑ Infertility	❑ If on Skin or Clothes - ❑ Remove Clothes, ❑ Rinse with: ❑ Water and ❑ Soap, ❑ Seek Medical Care
❑ May Damage or ❑ Damages - ❑ Unborn Child, ❑ Organs	
❑ May Cause - ❑ Drowsiness, ❑ Dizziness, ❑ Nausea	❑ Keep away: ❑ Heat, ❑ Water, ❑ Air, ❑ Ignition, ❑ Flame

2. **FIFRA, Hazard Communication and NFPA/HMIS -** Includes the required FIFRA Pesticide Label information and "At a Glance" hazard information that is not required to be on the label, including GHS Pictograms from the OSHA Hazard Communication Standard (allowed by FIFRA), and the NFPA and HMIS Rating Systems.

   FIFRA's guidelines are unclear about whether HMIS ratings are allowed on labels, but if the information does not conflict with FIFRA's, it can be useful to include it.



Product Name: | % of active ingredient:

Follow the directions for use on the pesticide label when applying this product.
The product in this container is diluted as directed on the pesticide product label.

Solution - note units of measure: ❐ ___PPM, ❐ ratio___to___, ❐ volume____to____ | Date Diluted | EPA Registration #

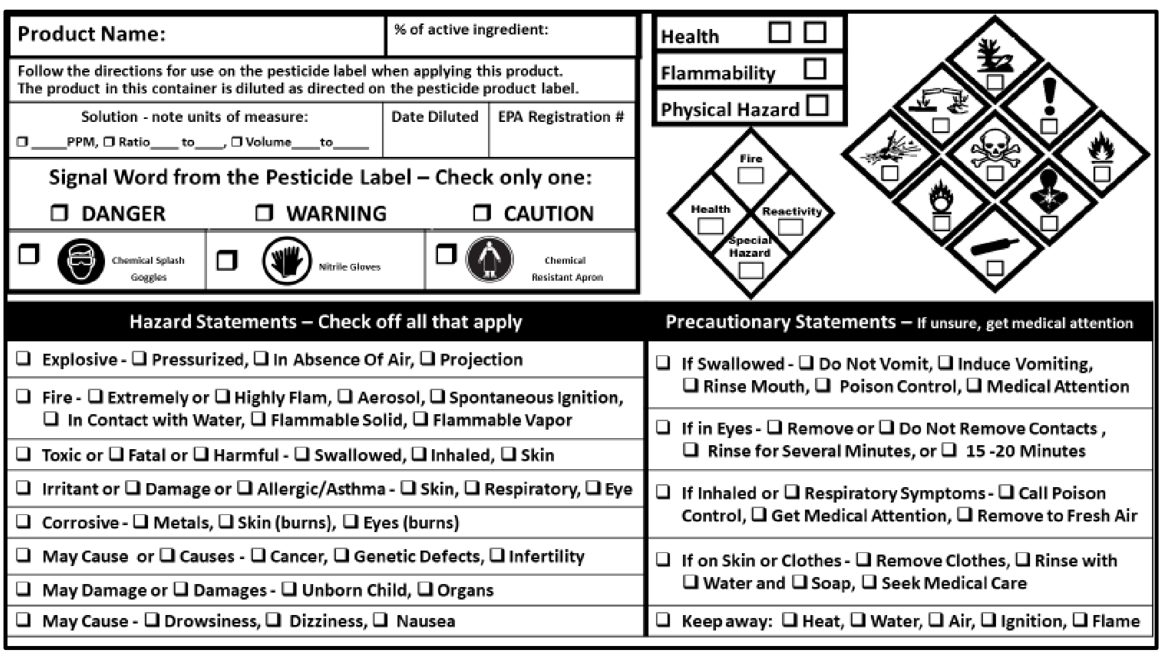
Signal Word from the Pesticide Label – Check only one:
❐ DANGER ❐ WARNING ❐ CAUTION

❐ Splash Goggles ❐ Protective Apron ❐ Gloves

HEALTH ❐❐
FLAMMABILITY ❐
PHYSICAL HAZARD ❐

Fire ❐ Health ❐ Reactivity ❐ Special Hazard ❐

Hazard Statements – Check all that apply	Precautionary Statements – If unsure, get medical attention
❑ Explosive - ❑ Pressurized, ❑ In Absence Of Air, ❑ Projection	❑ If Swallowed - ❑ Do Not Vomit, ❑ Induce Vomiting, ❑ Rinse Mouth, ❑ Poison Control, ❑ Medical Attention
❑ Fire - ❑ Extremely or ❑ Highly Flam, ❑ Aerosol, ❑ Spontaneous Ignition, ❑ In Contact with Water, ❑ Flammable Solid, ❑ Flammable Vapor	❑ If in Eyes - ❑ Remove or ❑ Do Not Remove Contacts, ❑ Rinse for Several Minutes, or ❑ 15 -20 Minutes
❑ Toxic, ❑ Fatal, ❑ Harmful – if ❑ Swallowed, ❑ Inhaled, ❑ Skin	❑ If Inhaled, or ❑ Respiratory Symptoms - ❑ Call Poison Control, ❑ Get Medical Attention, ❑ Remove - Fresh Air
❑ Irritant, ❑ Damage ❑ Allergic/Asthma - ❑ Skin, ❑ Respiratory, ❑ Eye	
❑ Corrosive - ❑ Metals, ❑ Skin (burns), ❑ Eyes (burns)	❑ If on Skin or Clothes - ❑ Remove Clothes, ❑ Rinse with Water and Soap, ❑ Seek Medical Care
❑ May Cause, or ❑ Causes - ❑ Cancer, ❑ Genetic Defects, ❑ Infertility	
❑ May Damage, or ❑ Damages - ❑ Unborn Child, ❑ Organs	



Product Name: | % of active ingredient:

Follow the directions for use on the pesticide label when applying this product.
The product in this container is diluted as directed on the pesticide product label.

Solution - note units of measure: ❐ ____PPM, ❐ Ratio____to____, ❐ Volume____to____ | Date Diluted | EPA Registration #

Signal Word from the Pesticide Label – Check only one:
❐ DANGER ❐ WARNING ❐ CAUTION

❐ Chemical Splash Goggles ❐ Nitrile Gloves ❐ Chemical Resistant Apron

Health ❐❐
Flammability ❐
Physical Hazard ❐

Fire ❐ Health ❐ Reactivity ❐ Special Hazard ❐

Hazard Statements – Check off all that apply	Precautionary Statements – If unsure, get medical attention
❑ Explosive - ❑ Pressurized, ❑ In Absence Of Air, ❑ Projection	❑ If Swallowed - ❑ Do Not Vomit, ❑ Induce Vomiting, ❑ Rinse Mouth, ❑ Poison Control, ❑ Medical Attention
❑ Fire - ❑ Extremely or ❑ Highly Flam, ❑ Aerosol, ❑ Spontaneous Ignition, ❑ In Contact with Water, ❑ Flammable Solid, ❑ Flammable Vapor	❑ If in Eyes - ❑ Remove or ❑ Do Not Remove Contacts , ❑ Rinse for Several Minutes, or ❑ 15 -20 Minutes
❑ Toxic or ❑ Fatal or ❑ Harmful - ❑ Swallowed, ❑ Inhaled, ❑ Skin	❑ If Inhaled or ❑ Respiratory Symptoms - ❑ Call Poison Control, ❑ Get Medical Attention, ❑ Remove to Fresh Air
❑ Irritant or ❑ Damage or ❑ Allergic/Asthma - ❑ Skin, ❑ Respiratory, ❑ Eye	
❑ Corrosive - ❑ Metals, ❑ Skin (burns), ❑ Eyes (burns)	❑ If on Skin or Clothes - ❑ Remove Clothes, ❑ Rinse with ❑ Water and ❑ Soap, ❑ Seek Medical Care
❑ May Cause or ❑ Causes - ❑ Cancer, ❑ Genetic Defects, ❑ Infertility	
❑ May Damage or ❑ Damages - ❑ Unborn Child, ❑ Organs	
❑ May Cause - ❑ Drowsiness, ❑ Dizziness, ❑ Nausea	❑ Keep away: ❑ Heat, ❑ Water, ❑ Air, ❑ Ignition, ❑ Flame

Using Disinfecting Wipes at School

What disinfectants can be used on hard surfaces to kill the virus that causes COVID-19?

Antimicrobial Pesticides

- Disinfectants – approved by EPA to be effective against specific viruses.
- EPA List N for Emerging Pathogens – lists disinfectants for use for COVID-19 on surfaces.

See fact sheet "Choosing Safer Disinfectants" from the EPA List N.

What are disinfectant wipes?

☑ Disposable material soaked in disinfectant.

While wipes are convenient, if used incorrectly, they can spread germs, give a false sense of security that surfaces are disinfected, and cause unnecessary exposures.

What should wipes not be used for?

☒ They are NOT handwipes or baby wipes, and should NOT be used on skin.

☒ They should NOT be used on produce, or have contact with food.

How can I safely and effectively use wipes?

1. Protect hands - put on chemical resistant gloves, even if label doesn't mention it.
2. Wash and rinse surface to enable disinfectant to be in direct contact with germs.
3. Shake wipe container with lid securely on to wet wipes with any liquid that settled.
4. Disinfectants only work when wet! Use enough wipes to keep surface wet for the "contact time' listed on label, which can vary by product and type of germ.

   Use wipe(s) *only once on one surface* to prevent spreading germs around.
5. Rinse surface if it will be in contact with skin or food, and label directs you to do so.

Who can use wipes in school?

☑ Only adults should use disinfecting wipes.

☒ Children under 18 should NOT use wipes.

Where can I get more information?

informed GREEN SOLUTIONS

www.informedgreensolutions.org

Poster funded by: Toxics Use Reduction Institute, UMass, Lowell

TURI TOXICS USE REDUCTION INSTITUTE UMASS LOWELL

Sources: NPIC, 1.800.858.7378, npic@ace.orst.edu
Health News, 6/3/08 Study Antibacterial wipes can spread superbugs, Michael Kahn

npic NATIONAL PESTICIDE INFORMATION CENTER

CHOOSING SAFER DISINFECTANTS ACTIVE AGAINST THE COVID-19 VIRUS

Research over the past ten years has identified significant health and environmental issues related to some of the active ingredients used in disinfecting products. These include associations with asthma, cancer, endocrine disruption, and skin and respiratory system irritation.

The Environmental Protection Agency (EPA), Office of Pesticide Programs, registers sanitizers and disinfectants, but does not review all the health effects associated with the products. They have allowed their Design for the Environment (DfE) program to evaluate safer ingredients for use in sanitizers and disinfectants. DfE has identified safer active ingredients and some safer products – https://www.epa.gov/pesticide-labels/design-environment-logo-antimicrobial-pesticide-products.

DfE Approved Active Ingredients

- Hydrogen Peroxide
- Ethanol
- Citric Acid
- L-lactic Acid

TIP - Disinfectants must be left visibly wet on a surface for the "contact time" listed on the product label. Follow label directions.

TIP - Disinfectants don't work well on dirty surfaces. Always clean first and then disinfect, even if the product is labeled as a cleaner/disinfectant.

Examples of Safer Disinfectants Active Against The COVID-19 Virus

Product	Contact Time
Diversey's Oxivir Wipes	1 minute
Diversey's Oxivir TB Ready-to-Use Liquid	1 minute
Clorox Commercial Solutions Hydrogen Peroxide Disinfecting Cleaner	1 minute
Clorox Healthcare Hydrogen Peroxide Cleaner Disinfectant	1 minute

Examples of Safer Disinfectants Active Against The COVID-19 Virus

Product	Contact Time
Clorox Commercial Solutions® Hydrogen Peroxide Cleaner Disinfectant Wipes and Clorox Healthcare Hydrogen Peroxide Cleaner Disinfectant Wipes	2 minutes
PURELL Professional Surface Disinfecting Wipes (60 seconds against COVID-19)	5 minutes
Diversey's SureTouch Disinfectant	5 minutes
PURELL Professional Surface Disinfectant (registered under the name URTHPro) (60 seconds against the virus causing COVID-19)	5 minutes
Diversey's Oxivir Five 16 Concentrate (registered under the name Oxy-Team Disinfectant Cleaner)	5 minutes
Betco GE Fight Bac RTU Disinfectant (registered under the name CleanCide)	5 minutes

TIP - Soap, water, microfiber and friction can remove microbes (germs) from surfaces.

Examples of Safer Disinfectants Active Against The COVID-19 Virus

Product	Contact Time
Diversey's Alpha HP Multi-Surface Disinfectant Cleaner (registered under the name Phato 1:64 Disinfectant Cleaner)	5 minutes
Force of Nature Activator Capsule (This device is included because of the difficulty in procuring other approved products. The active ingredient has not been DfE approved but is Green Seal® Certified)	10 minutes

TIP - Look for products that are approved by:

GREEN SEAL

RPN Responsible Purchasing Network

Design for the Environment U.S. EPA

The above products were selected from EPA's comprehensive List N of disinfectants active against the COVID-19 virus.

These products were determined safer by Green Seal - https://greenseal.org/coronavirus, Responsible Purchasing Network - http://www.responsiblepurchasing.org/, and EPA Design for the Environment.- https://www.epa.gov/pesticide-labels/design-environment-logo-antimicrobial-pesticide-products

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Appendix K: Comparing Information on Pesticide Labels and Safety Data Sheets

Introduction

Antimicrobial products are categorized as both a pesticide and a hazardous product and are regulated under two different laws by two different federal agencies. Both of the following agencies govern the requirements for the content of a pesticide's product health and safety information:

1. The Occupational Safety and Health Administration (OSHA) specifies content requirements for product hazards, precautions and safety and health information in the Safety Data Sheets (SDS) format under the Global Harmonized System (GHS) portion of the Hazard Communication Standard (HCS) (29 CFR 1910.1200).
2. The United States Environmental Protection Agency (EPA) specifies content requirements for antimicrobial pesticide labels under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).

   EPA requires a pesticide label to be the user's guide to applying pesticides to minimize risk and maximize efficacy. The label provides information about how to handle and use pesticide products safely. Pesticide labels are legally enforceable, and all of them carry the statement: "It is a violation of federal law to use this product in a manner inconsistent with its labeling. "[1]

What are the challenges to interpreting health and safety information for an antimicrobial product?

The product's health and safety information on an antimicrobial pesticide product's label and a Safety Data Sheet (SDS) can be inconsistent, and at times can appear to or actually conflict. The inconsistencies in this information can cause confusion under the following circumstances:

1. It can be confusing to the end user if they are trying to use the information to select a safer product.
2. The labels used on secondary containers (e.g., spray bottles) of diluted product may actually refer to the concentrate, not the hazards, of the diluted product. Please see the section in this document called *Labels on Secondary Containers of Antimicrobial Products* for more information.

[1] Note that EPA does not recommend that other elements of the FIFRA label, such as directions for use, should be included.

What are some of the differences between health information on the SDS and the pesticide information referenced on the same SDS?

Some differences are illustrated below for Purtabs,
a disinfectant tab, that is made into a solution:

Information in the SDS for the concentrate in tab form:	**Pesticide Label Information in the SDS for the concentrate in tab form:**
Section 2: Hazards Identification Section 9: Physical/Chemical Properties Section 11: Toxicological Information Section 16: Other Information	Section 16: Other information
Signal Word: WARNING	**Signal Word:** DANGER
pH 5.5 - 6.5 (not corrosive) • Causes serious eye irritation. • Harmful in contact with skin. • Harmful if swallowed. • Prolonged inhalation may be harmful. May cause irritation to the respiratory system.	CORROSIVE • Causes irreversible eye damage and skin burns. • Harmful if swallowed, inhaled or absorbed through the skin.
Pictogram	**N/A**
Exclamation Mark  ▪ Irritant (skin and eye) ▪ Skin Sensitizer ▪ Acute Toxicity ▪ Narcotic Effects ▪ Respiratory Tract Irritant	
Hazardous Materials Information Systems (HMIS) Hazard Ratings Health: 1 (note a corrosive is typically a 3 rating) Flammability: 0 Physical Hazard: 0	**N/A**
National Fire Protection Association (NFPA) Hazard Ratings Health: 1 Flammability: 0 Instability: 0	**N/A**

Why the Confusion?

The confusion is due to the fact that EPA has not adopted OSHA's HCS GHS criteria; there are differences between EPA's requirements and OSHA's requirements related to: classification criteria, hazard statements, pictograms, and signal words.

How did EPA seek to reconcile these potential problems?

To avoid potential inconsistencies between EPA-approved labels for pesticides regulated under FIFRA, and the SDSs that OSHA requires under the HCS, EPA had issued a clarification of its policy[2]. EPA's recommended guidance is designed to prevent this problem as noted below[3]:

> "Generally, every pesticide sold or distributed in the United States must be registered by EPA (FIFRA § 12(a)(1)(A)). In granting a registration, EPA must determine that the pesticide's "labeling" complies with the requirements of FIFRA (FIFRA § 3(c)(5)(B)). In Section 2(p)(2)(A), FIFRA defines "labeling" to include all written, printed, or graphic matter accompanying the pesticide at any time. One of FIFRA's requirements for labeling is that it not be false or misleading in any particular."
>
> EPA's policy allows SDSs to accompany pesticides so long as they do not obscure or conflict with the labeling approved by EPA.

To provide an adequate explanation in the SDS so the pesticide labeling is not misleading, EPA recommends manufacturers include the following information in the product's SDS:

- FIFRA label information in the SDS Section 15, "Regulatory Information."

  The recommended information would provide a brief explanation for any differences between the pesticide label information and the SDS information, as well as FIFRA hazard statements (e.g., "fatal if swallowed"), signal word, and symbol (if required).

- EPA also recommends that the following general statement be included in the SDS Section 15:

  "This chemical is a pesticide product registered by the United States Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals. The hazard information required on the pesticide label is reproduced below. The pesticide label also includes other important information, including directions for use. [EPA directs the manufacturer to insert their FIFRA label hazard information]"

  Author's note: Although EPA recommends that any information from the FIFRA label on hazards included in the SDS be in the SDS Section 15, or, for ecological hazards, in SDS Section 12 as noted above, the author's review of numerous SDSs found that the location and content of this information varies from SDS to SDS and is not always located in the sections recommended by EPA.

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[2] EPA, Pesticide Registration (PR) Notice 2012-1, April 20, 2012

[3] FIFRA 2(p)(2)(A) EPA, Label Review Manual (for Pesticides), Revised July 2011

What are other important points of note?

- All other aspects of the OSHA Hazard Communication Standard apply to chemical management in the workplace.[4]
- OSHA does not require manufactures to complete SDS sections 12 (Ecological Information), 13 (Disposal Considerations), 14 (Transport Information), and 15 (Regulatory Information) of the SDS format specified by the HCS GHS.
- EPA does not recommend that other elements of the FIFRA label should be included, such as directions for use.
- FIFRA labels approved by EPA pre-empt OSHA's label requirements.
- EPA only uses one symbol, the skull and crossbones, for severe acute toxicity and products containing methanol at concentrations above 4%. The GHS uses symbols for all hazard classes (but not all categories).[5]
- EPA's signal words on labels are different from OSHA's signal words on labels:

  Signal words indicate a product's potential for making you sick. Regardless of how many hazards a chemical may have, there will only be one signal word on the label. The signal word for the highest hazard will appear on the label.

  EPA prohibits the use of signal words for environmental or physical hazards;[6] the GHS mandates their use for some categories (e.g., extremely flammable liquids). Other differences are illustrated below:

EPA's Signal Words	OSHA's Signal Words[7]
"Caution" appears on products that are the least harmful to you.	
"Warning" means a product is more harmful than one with a "Caution" label.	"Warning" is used for the less severe hazards
"Danger" means a product is poisonous or corrosive and should be used with extreme care. GHS uses the "danger" signal word and skull and cross bones symbol for chemicals in Categories 1-3 (e.g., oral LD50 of up to 300 mg/kg) and introduces the exclamation point symbol for Category 4.	"Danger" is used for the more severe hazards. EPA uses the "danger" signal word and skull and crossbones symbol for chemicals in Categories I and II (e.g., oral LD50 of up to 50 mg/kg).

[4] Massachusetts Department of Labor Standards, Workplace Safety and Health Program

[5] EPA, Chemical Hazard Classification and Labeling: Comparison of OPP Requirements and the GHS

[6] EPA, Chemical Hazard Classification and Labeling: Comparison of OPP Requirements and the GHS

[7] OSHA Brief: Hazard Communication Standard: Labels and Pictograms

Conclusion

Although EPA has sought to minimize inconsistencies between the two sets of requirements for health information, it is obvious from the sample provided above that either there are significant inconsistencies between the information provided for many of the antimicrobial products that are considered to be safer, or the information is too technical for the layperson to interpret. If there are questions based on what appear to be inconsistencies or conflicting or confusing information, contact the manufacturer directly to clarify any concerns. Also, you can consult the EPA publication, *Chemical Hazard Classification and Labeling: Comparison of OPP Requirements and the GHS,* https://www.epa.gov/sites/default/files/2015-09/documents/ghscriteria-summary.pdf, for a detailed comparison**.**

Sample Pesticide Label with GHS Modifications for Illustration Purposes Only

See the sample labels provided in EPA document available at https://www.epa.gov/sites/default/files/2015-08/documents/sample-labels.pdf on the following two pages. They use these sample labels to illustrate what a pesticide label would look like if it was aligned with the GHS. Although EPA developed the label comparison below, a statement on their webpage notes that; “EPA has not adopted GHS for pesticide product classification and labeling. In most cases, GHS hazard statements and pictograms should not appear on pesticide product labels sold and distributed in the United States.”

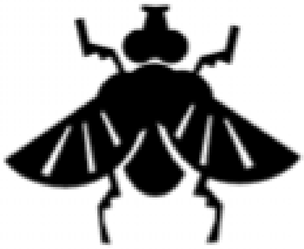
The following sample labels are for an insecticide pesticide, not an antimicrobial pesticide.

EPA states that:

“Aligning the appropriate hazard communication elements to pesticide products requires knowledge of the product’s toxicity categories. The assumption for toxicity categories of the sample product are as follows:

Under Current Office of Pesticide Programs (OPP) Requirements	Under GHS
• Acute Inhalation Toxicity: Category III	• Acute Inhalation Toxicity: Category 4
• Acute Dermal Toxicity: Category IV	• Acute Dermal Toxicity: Unclassified
• Acute Oral Toxicity: Category IV	• Acute Oral Toxicity: Unclassified
• Skin Corrosion/Irritation: Category 111	• Skin Corrosion/Irritation: Category 3
• Eye Damage/Irritation: Category III	• Eye Damage/Irritation: Category 2 B
• Acute Hazard to the Aquatic Environment: N/A	• Acute Hazard to the Aquatic Environment: Category 3

Pesticide Label



Home and Garden
DUST

Contains XXX Biological Insecticide
Active ingredient:
XXX..0.5%
INERT INGREDIENTS....................99.5%
TOTAL.......................................100.0%

KEEP OUT OF REACH OF CHILDREN

CAUTION

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Harmful if inhaled. Avoid breathing dust. Causes moderate eye irritation. Avoid contact with skin, eyes, or clothing. Harmful if swallowed. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove and wash contaminated clothing before reuse.

ENVIRONMENTAL HAZARDS

Do not apply directly to water. Do not contaminate water when disposing of equipment washwaters or rinsate.

FIRST AID

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice. Have product container or label with you when calling a poison control center or doctor or going for treatment.
IF INHALED: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice.

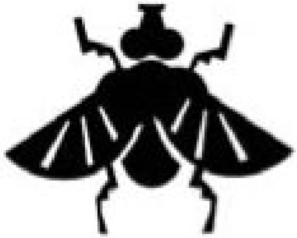
For information on this pesticide product (including health concerns, medical emergencies, or pesticide incidents), call the National Pesticide Information Center at 1-800-858-7378

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.
PESTICIDE STORAGE: Pesticide should be stored in the original container in a locked storage area.
PESTICIDE DISPOSAL: If empty: Do not reuse this container. Place in trash or offer for recycling if available.
If partly filled: Call your local solid waste agency for disposal instructions. Never place unused product down any indoor or outdoor drain.

Arlington Agricultural Insecticides, Inc.
Arlington, VA 22202
EPA REG. No. XXX-XXX   EPA EST. No. XXX-VA-1   Net Weight 2 lbs (.905 kg)

Pesticide Label with GHS Elements



Home and Garden

DUST

Contains XXX Biological Insecticide

Active ingredient:
XXX..0.5%
INERT INGREDIENTS.....................99.5%
TOTAL..100.0%

KEEP OUT OF REACH OF CHILDREN

WARNING

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Harmful if inhaled. Avoid breathing dust. Causes eye irritation. Causes mild skin irritation. Avoid contact with skin, eyes, or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove and wash contaminated clothing before reuse.

ENVIRONMENTAL HAZARDS

Harmful to aquatic life. Do not apply directly to water. Do not contaminate water when disposing of equipment washwaters or rinsate.

FIRST AID

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice. Have product container or label with you when calling a poison control center or doctor or going for treatment.
IF INHALED: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice.

For information on this pesticide product (including health concerns, medical emergencies, or pesticide incidents), call the National Pesticide Information Center at 1-800-858-7378

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.
PESTICIDE STORAGE: Pesticide should be stored in the original container in a locked storage area.
PESTICIDE DISPOSAL: If empty: Do not reuse this container. Place in trash or offer for recycling if available. If partly filled: Call your local solid waste agency for disposal instructions. Never place unused product down any indoor or outdoor drain.

Arlington Agricultural Insecticides, Inc.
Arlington, VA 22202

EPA REG. No. XXX-XXX EPA EST. No. XXX-VA-1 Net Weight 2 lbs (.905 kg)

See a very well done illustration and explanation at the Center for Food Security website located at Iowa State University:
https://www.cfsph.iastate.edu/Disinfection/Assets/disinfectant_product_label.pdf

Disinfectant Product Label

Understanding the information on a disinfectant product label is essential for effective microorganism inactivation and removal, as well as ensuring safety when using the product.

This handout overviews key areas of a sample disinfectant label. Always read the product label before use.

Only products with EPA registration numbers should be used. This number indicates the product has been reviewed by the EPA and poses minimal risk to animals, people and the environment when used in accordance with the label.

Products must be used according to label directions. Disinfectants (i.e., antimicrobial pesticides) are regulated under the Federal Insecticide, Fungicide, and Rodenticide (FIFRA) Act.

EPA Reg. No.
1658-XX

COMPANY Y

EPA Est. No.
16XX–MO–1

Product-X

Disinfect-Cleaner-Sanitizer-Fungicide-Mildewstat-Virucide* – Deodorizer for Hospitals, Institutional and Industrial Use
Effective in hard water up to 400 ppm hardness (calculated as $CaCO_3$) in the presence of 5% serum contamination

ACTIVE INGREDIENTS:

Octyl decyl dimethyl ammonium chloride	1.650%
Dioctyl dimethyl ammonium chloride	0.825%
Didecyl dimethyl ammonium chloride	0.825%
Alkyl dimethyl benzyl ammonium chloride	2.200%
INERT INGREDIENTS	94.500%
TOTAL:	100.000%

KEEP OUT OF REACH OF CHILDREN

DANGER

HAZARD TO HUMANS AND DOMESTIC ANIMALS

PRECAUTIONARY STATEMENTS

CORROSIVE: Causes severe eye and skin damage. Do not get into eyes, on skin, or clothing. Wear goggles or face shield and rubber gloves when handling Product X. Harmful or fatal if swallowed. Wash thoroughly with soap and water after handling.

ENVIRONMENTAL HAZARDS: This product is toxic to fish. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. For guidance contact your State Water Board or Regional Office of the EPA.

PHYSICAL AND CHEMICAL HAZARDS: Do not use or store near heat or open flame.

STATEMENT OF PRACTICAL TREATMENT: In case of contact, immediately flush eyes or skin with plenty of water for at least 20 minutes. For eyes, call a physician. Remove and wash contaminated clothing before reuse.
If ingested call a physician immediately.

NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage.

Manufactured by Y Chemical Company, Sometown, Somestate 60345

This section will describe the hazards related to humans and animals when using this product. It recommends personal protective gear that should be worn, what effects it will have on the environment and treatment information should it be splashed into the eyes or ingested.

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.

DIRECTIONS FOR USE

Product X is a germicide, soapless cleaner and deodorant which is effective in water up to 400 ppm hardness in the presence of organic soil (5% serum). When used as directed, will not harm tile, terrazzo, resilient flooring, concrete, painted or varnished wood, glass or metals.

FOR USE IN VETERINARY CLINICS, ANIMAL CARE FACILITIES, LIVESTOCK FACILITIES AND ANIMAL QUARANTINE AREAS

Apply Product X to walls, floors and other hard (inanimate) non-porous surfaces with a cloth, mop or mechanical spray device so as to thoroughly wet surfaces. Prepare a fresh solution daily or when use solution becomes visibly dirty.

DISINFECTION - To disinfect hard surfaces, use 1 fluid ounce of Product X per gallon of water. Apply by immersion, flushing solution over treated surfaces with a mop, sponge or cloth to thoroughly wet surfaces. Allow treated surfaces to remain moist for at least 15 minutes before wiping or rinsing. Product X will disinfect hard, non-porous surfaces in veterinary clinics, animal care facilities, livestock facilities and animal quarantine areas.

For heavily soiled areas, a preliminary cleaning is required.

Some products may have multiple uses (i.e., cleaning versus disinfection) and require different dilutions and contact times for such actions.

2 oz. gallon use-level. The activity of Product X has been evaluated in the presence of 5% serum and 400 ppm hard water by the AOAC use dilution test and found to be effective against a broad spectrum of gram negative and gram positive organisms as represented by:

Pseudomonas aeruginosa	*Enterobacter aerogenes*
Staphylococcus aureus	*Streptococcus faecalis*
Salmonella choleraesuis	*Shigella dysenteriae*
Escherichia coli	*Brevibacterium ammoniagenes*
Streptococcus pyogenes	*Salmonella typhi*
Klebsiella pneumoniae	*Serratia marcescens*

This section describes what disease organism the product works against and under what conditions it was tested.

Boot bath: Use 1.5 fluid ounces per gallon in boot baths. Change solution daily and anytime it becomes visibly soiled. Use a bristle brush to clean soil from boots before disinfecting with Product X.

Disinfecting trucks and farm vehicles: Clean and rinse vehicles and disinfect with 1 fluid ounce per gallon of Product X. If desired, rinse after 12 minutes contact or leave unrinsed. Do not use Product X on vaccination equipment, needles, or diluent bottles as the residual germicide may render the vaccines ineffective.

Sanitizing non-food contact surfaces (such as floors, walls, tables, etc): A 1 ounce per 2 oz. gallon use-level, Product X is an effective sanitizer against *Staphylococcus aureus* and *Klebsiella pneumoniae* on hard porous and non-porous environmental surfaces. Treated surfaces must remain wet for 60 seconds.

This section describes what dilutions should be used for different applications. Specialty applications (e.g., boot baths) will also be listed.

http://www.cfsph.iastate.edu/Disinfection/

the Center for Food Security & Public Health
Iowa State University®

Overview - Labels on Secondary Containers of Antimicrobial Products

The following information is provided to help explain another related but separate issue that is potentially misleading. This issue is also a consequence of the label being governed by two different agencies.

A primary container is the original container a product comes in with the manufacturer's label. A secondary container is any container holding a product which is not the original container supplied by the manufacturer. It is most often used in schools for diluting and applying a product.

EPA does not require labels on secondary containers. OSHA does have requirements that apply to "workplace" labels under the HCS GHS. Please see the OSHA sample workplace label with requirements highlighted at the end of this document.

EPA

- **What are EPA's recommendations for information to be included in OSHA workplace labels on secondary containers? [8]**

  EPA recommends that the applicator identify the material in the secondary container in the event of a spill to ensure that adequate information can be obtained in case of medical or environmental emergency. EPA recommends that such labels include the following information:

  - The name, address and telephone number of the applicator/pest control firm (if applicable).
  - Product name.
  - EPA registration number.
  - Name and percentage of active ingredient.
  - If the product in the container is diluted, it should be followed by the phrase: "*The product in this container is diluted as directed on the pesticide product label.*"
  - **Signal word and precautionary statements (including First Aid statements) from the registered label <u>unless the registrant has acute toxicity data supporting lesser precautionary statements for the diluted product</u> and alternate directions for the diluted product are indicated on the product label. The secondary container may have reduced precautionary language (if supported by dilution-specific acute toxicity data) but <u>not</u> a reduced signal word.**
  - The statement:
    "Follow the directions for use on the pesticide label when applying this product."
    Note: Information provided in a pesticide label is considered a regulatory requirement governing use of an antimicrobial product. If the product user does not follow these directions, it is considered a violation of the law. Thus, EPA's recommendation to include this statement on the label reinforces this requirement.

[8] EPA, https://www.epa.gov/pesticide-labels/secondary-containers-and-service-containers-pesticides

- **What is EPA's position on manufacturers providing ready-made labels on secondary containers?**
  - EPA also allows manufacturers to provide labels to users for secondary containers that are used to apply or temporarily store end-use pesticides, as long as the labels are not inconsistent (i.e., have no other statements that conflict) with the EPA approved pesticide label.
- **What is EPA's position on ingredient information on the workplace label?**
  - The percentage of active ingredient listed on the secondary container may reflect the concentrated product, or if known, the percentage of active ingredient in the end-use dilution. Listing the percentage of active ingredient as reflected on the product label and indicating the product has been diluted as directed relieves the user from having to calculate the percentage of active ingredient in the dilute formulation.
  - Such a calculation can be difficult for the average user when the directions for use call for a ratio of product to diluent, (e.g., 1 part product to 64 parts diluent or 5 ounces of product to 128 ounces of diluent), and the directions do not list the percentage of active ingredient in the finished dilution.
- **Why is the ingredient information a concern?**
  - Some diluted products in secondary containers have manufacturer's labels with information from the concentrate. Thus, it is important to cross check with the concentrate's label with the label on the "ready to use" product because the manufacturer may have provided the same label for both the concentration and the dilute. This is important information to distribute with the product for end users to understand the hazard level and precautions for the product.

OSHA Requirements

What are OSHS Workplace Label Requirements on "Primary" Containers?

OSHA® QUICK CARD™

Hazard Communication Standard Labels

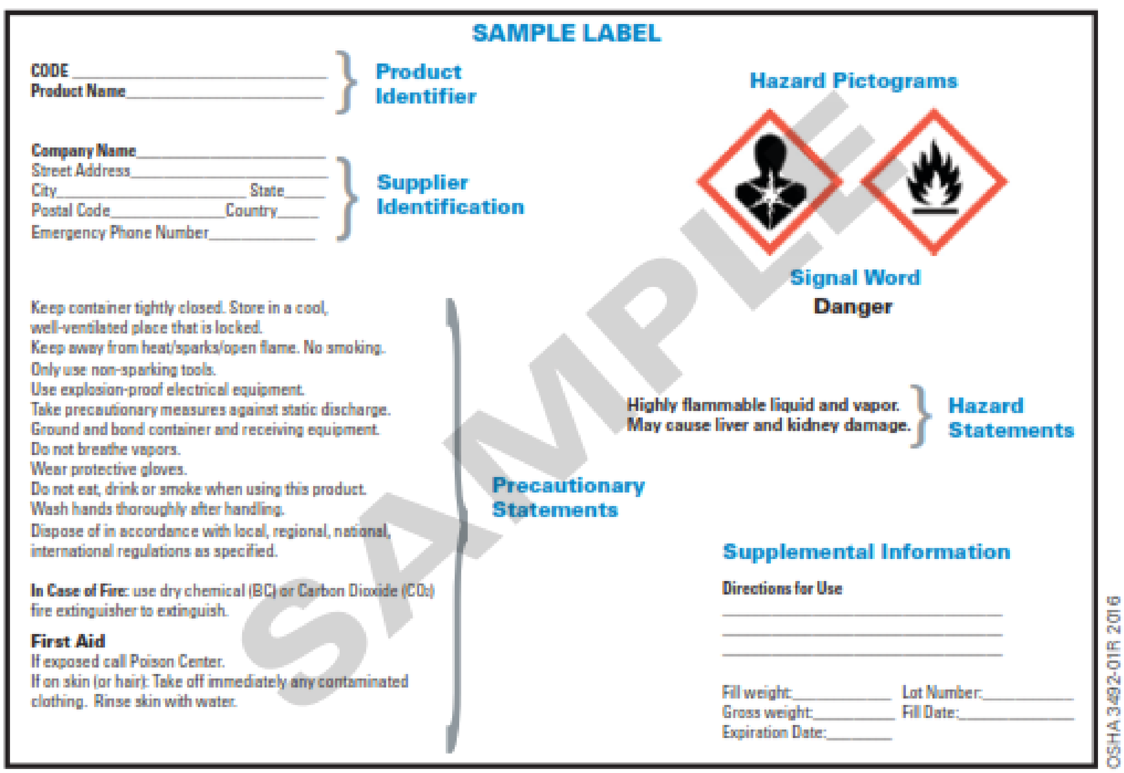
OSHA has updated the requirements for labeling of hazardous chemicals under its Hazard Communication Standard (HCS). All labels are required to have pictograms, a signal word, hazard and precautionary statements, the product identifier, and supplier identification. A sample revised HCS label, identifying the required label elements, is shown on the right. Supplemental information can also be provided on the label as needed.

For more information:

U.S. Department of Labor

OSHA® Occupational Safety and Health Administration

www.osha.gov (800) 321-OSHA (6742)



Appendix L. Resources

Organization /Agency	Contact Information	Mission	Activities	Resources
Childcare				
California Childcare Health Program	1950 Addison St., Suite 107 Berkeley, CA 94704 Tel: (510) 204-0930 https://cchp.ucsf.edu/	Improve the quality of childcare by initiating and strengthening linkages between the health, safety, and childcare communities and the families they serve	Research Public policy	Fact sheets Survival tips poster Training curricula (Prevention of Infectious Disease and Asthma Information) Newsletter Health and safety checklists
Eco-Healthy Child Care	Children's Environmental Health Network 110 Maryland Avenue NE Suite 404 Washington, D.C. 20002 Phone: (202) 543-4033 Email: cehn@cehn.org https://cehn.org/our-work/eco-healthy-child-care/	Creating safer and healthier child care settings--free of harmful environmental hazards--is key to protecting the safety and well-being of our nation's children. Young children are the most vulnerable to toxic exposures.	Endorse child care facilities List endorsed providers Showcase facilities	Fact sheets Reports Other publications
Green Cleaning/				
Design for the Environment Disinfectant Program	Environmental Protection Agency 1200 Pennsylvania Avenue, N.W. Washington, DC 20460 https://www.epa.gov/aboutepa/mailing-addresses-and-phone-numbers#HQ	Help consumers and purchasers find antimicrobial products, like disinfectants and sanitizers, that have been reviewed by EPA and found to meet both the pesticide registration requirements and the standard for DfE-certified products. These products contain ingredients that have been reviewed for both human health and environmental fate.	Develop standards Certify products Assist manufacturers Research chemicals	Publications Lists of products

Organization /Agency	**Contact Information**	**Mission**	**Activities**	**Resources**
Green Seal	1001 Connecticut Avenue, NW, Suite 827 Washington, DC 20036-5525 Tel: 202-872-6400 https://greenseal.org	Global nonprofit organization that pioneered the ecolabeling movement with a mission to transform the economy for a healthier, greener world. For 30 years, Green Seal's rigorous standards for health, sustainability and product performance have driven permanent shifts in the marketplace, empowering better purchasing decisions and rewarding industry innovators.	Develop Standards Certify products, services and spaces	Standards Publications Guides Certifications
Healthy Green Schools and Colleges	2545 W. Diversey Ave., Suite 214 Chicago, IL 60647 Tel: 312-419-1810 https://www.healthygreenschools.org/wp-content/uploads/GS_HGSC_DisinfectingGuidelinesReport_07.pdf	Provides facility managers and staff with verifiable standards, education, tools and resources to accelerate the uptake of practices that promote healthier and more sustainable school environments.	Promotes green cleaning in schools, bringing together the cleaning industry, educational leaders, parents, and advocates in a Green Team	"The Quick & Easy Guide to Green Cleaning in Schools" comprehensive guide to green cleaning with extensive tools Training and resources to improve indoor air quality in schools Webinars Blogs Publications
Informed Green Solutions, Inc.	https://www.informedgreensolutions.org/ info@informedgreensolutions.org	Educate the general public on the benefits of environmentally preferable purchasing and the impacts that our purchasing decisions have on human health and the environment	Assists schools and childcare centers in the development and implementation of Cleaning for Health and Integrated Pest Management (IPM) Programs	"Cleaning for Health" fact sheets IPM fact sheets Train-the-Trainer Program Workshops Conference presentations "Cleaning for Healthier Schools – Infection Control Handbook"

Organization /Agency	Contact Information	Mission	Activities	Resources
National Collaborative Workgroup on Green Cleaning and Chemical Policy Reform in Schools	153 Regent St. Ste. 1050 Saratoga Springs, NY 12866 http://healthyschools.org/Cleaning-For-Healthy-Schools/	Advance policy and practices that help health, reduce use of toxic chemicals, cost-effectively improve cleaning, and improve school indoor air quality	Free, online "Cleaning for Healthy Schools Toolkit" can be tailored for agencies, schools, workers and parents	Sample presentations with audio: "What is Cleaning for Healthy Schools?" "Chemicals: Your Health and Right to Know" "Getting Started: The School Building Walk-Through" "What schools need to know for developing a cleaning program"
New York's Green Cleaning Program Executive Order 134	Environmental Services Unit, New York State Office of General Services Tel: (518) 408-1782 https://greencleaning.ny.gov/Policies.asp	Promote the use of environmentally preferable products (EPPs) by all state agencies and the use of environmentally sensitive cleaning and maintenance products by all school districts in NYS to help protect human health and the environment without sacrificing product effectiveness	Implements legislation by providing tools to state agencies and schools	Online training Customizable documents and templates Best practices Product selection criteria and recommended products Polices, plans, and reports
Safer Choice (DFE)	Safer Choice Program Office of Pollution Prevention & Toxics US EPA 1200 Pennsylvania Avenue, NW Mail Code 7406-M Washington, DC 20460 https://www.epa.gov/saferchoice	Helps consumers, businesses, and purchasers find products that perform and contain ingredients that are safer for human health and the environment.	Develop Standards for: Safer Chemicals Safer Products Certify Products Issue Reports Administer Safer Choice Label Identify safer disinfectants	Fact Sheets Videos Webinars

Organization /Agency	Contact Information	Mission	Activities	Resources
UL ECOLOGO®	UL Headquarters 333 Pfingsten Road Northbrook, IL 60062 Telephone: +1.847.272.8800 Customer Service: +1.877.854.3577	To promote safe, secure and sustainable living and working environments for people by the application of science, hazard-based safety engineering and data acumen To support the production and use of products which are physically and environmentally safe and to apply our efforts to prevent or reduce loss of life and property	Develop Standards Test Products Certify Products	Reports List of Products
US Green Building Council (USGBC)	U.S. Green Building Council 2101 L St NW, Suite 500 Washington, DC 20037 https://www.usgbc.org/articles/maintaining-green-cleaning-practices-during-covid-19-pandemic	Committed to transforming how our buildings are designed, constructed and operated through LEED, because we believe that every person deserves a better, more sustainable life.	Administer the Leadership in Energy and Environmental Design (LEED) Green building rating system.	Standards Training Publications Advocacy
Laboratories				
Surface Solutions Laboratory, Toxics Use Reduction Institute (TURI)	TURI/University of Massachusetts Lowell 126 John Street, Suite 14 Lowell, MA 01852 Tel: (978) 934-3275 https://www.turi.org/Our_Work/Cleaning_Laboratory	Research industry and the university to identify and promote innovations in toxics use reduction and pollution prevention	Researches, tests, and promotes alternatives to toxic chemicals used Provides training, resources, and tools Funds toxics use reduction efforts	Laboratory services to test performance of safer cleaning solvents

Organization /Agency	**Contact Information**	**Mission**	**Activities**	**Resources**
Toxics Use Reduction Institute (TURI)	TURI/University of Massachusetts Lowell 126 John Street, Suite 14 Lowell, MA 01852 Tel: (978) 934-3275 https://www.turi.org/	Identify and promote innovations in toxics use reduction and pollution prevention	Researches, tests, and promotes alternatives to toxic chemicals used Provides training, resources, and tools Funds toxics use reduction efforts	Training for toxics use reduction professionals, community groups, and trade associations Technical support from the TURI library and staff Laboratory services to test performance of safer cleaning solvents Grants to industry, small businesses, community groups, and researchers in academia
Purchasing				
Center for New American Dream **The Responsible Purchasing Network (RPN)**	6930 Carroll Ave., Ste 900 Takoma Park, MD 20912 Tel: (301) 891-3683 (877) 68-DREAM http://www.responsiblepurchasing.org/purchasing_guides/cleaners/index.php	Help Americans to consume responsibly to protect the environment, enhance quality of life, and promote social justice	Works with individuals, institutions, communities, and businesses to conserve natural resources, counter the commercialization of our culture, and promote changes in the way goods are produced and consumed	Member-based network of over 125 purchasing stakeholders working together to identify, buy, maintain, and dispose of or repurpose socially and environmentally responsible goods and services
CleanGredients®	600 East Water Street Charlottesville, VA 22902 Tel: 434.817.1424 https://cleangredients.org/	Align environmental and human health goals with the cleaning product industry's business objectives and supports formulation of products with human and environmental health benefits A partnership between GreenBlue®, the U.S. Environmental Protection Agency, and industry Developed by GreenBlue, a nonprofit institute	Helps formulators identify ingredients that have potential environmental and human health and safety benefits Provides manufacturers a showcase for their ingredients with environmental health and safety benefits	Online database of institutional and industrial cleaning ingredients List of surfactants and solvents (modules for additional ingredient classes, including fragrances and chelating agents, are in development) Data for aquatic toxicity, biodegradability, and ingredient formulations reviewed by a third party (NSF International) using the Design for the Environment Screen for Surfactants

Organization /Agency	**Contact Information**	**Mission**	**Activities**	**Resources**
Massachusetts Operational Services Division (OSD) Environment-ally Preferable Products (EPPs) Program	Operational Services Division 1 Ashburton Place, Room 1017 Boston, MA 02108-1552 Tel: (617) 720-3356 https://www.mass.gov/environmentally-preferable-products-epp-procurement-programs	Promote the use of EPPs in state and municipal agencies, with the primary goal to use the Commonwealth's purchasing power to reduce the environmental and public health impact of state government and foster markets for EPPs	OSD has issued over three dozen statewide contracts containing EPPs Contracts mangers oversee vendor adherence to contracts and are available to troubleshoot any problems	FAC58 criteria for disinfectants, sanitizers, and mold/mildew remediation for several products that do not have third-party certification but are necessary to purchase "Recycled and EPPs Services Guide for State Contracts" "Massachusetts Statewide Contracts for Healthier Schools: How to Use MA Contracts for Pollution Prevention in Schools" EPP newsletter Training on use of the contracts Training from vendors when purchasing products Benefits of EPPs EPP contracts Resources, guides, reports, tools, case studies, and EPP events
National Association of State Procurement Officials	110 West Vine Street, Suite 600 Lexington, Kentucky 40507 Tel: (859) 514-9159 https://www.naspo.org/	Dedicated to advancing public procurement through leadership, excellence, and integrity. It is made up of the directors of the central purchasing offices in each of the 50 states, the District of Columbia and the territories of the United States.	Through conferences, research, informative publications, and various member benefit programs, NASPO is dedicated to providing educational and information-sharing opportunities to the state government procurement community Publishes various research briefs and reference publication	Conferences Publications Research Cooperative purchasing program
Other				

Organization /Agency	**Contact Information**	**Mission**	**Activities**	**Resources**
Mass Facilities Administrators Association (MFAA)	P.O. Box 1027 Dedham, MA 02027 **exec@massfacilities.com**	Formed in 1973 to provide members access to education and information. With 180+ members, the association is dedicated to improving their professional knowledge through an on-going exchange of information and ideas. MFAA is working with state agencies to provide information to members on the least toxic product options.	Webinars Conferences Trainings	Jobs listings Procurement information
Northeastern University School Health Institute	School Health Institute, Northeastern University College of Professional Studies School of Nursing 102 Robinson 360 Huntington Avenue Boston, MA 02115-9959 https://neusha.org/	Collaborate with the Massachusetts Department of Public Health School Health Unit to coordinate and provide quality, professional education programs to enhance school nursing practice throughout the Commonwealth of Massachusetts These offerings provide information that allows school nurses and other school health professionals to manage the increasingly complex health, medical, behavioral, and psychosocial issues facing our multicultural school-aged population	Offers 30 to 40 programs per year on a variety of topics, including a 3-day Summer Institute / Leadership Academy Offers online programming to meet the continuing educational needs of the school health professional in a convenient and timely manner	Web site visitors can link to several sites and resources

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