Cleaning for Healthier Schools – Infection Control Handbook

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Chapter 1.A. Introduction

Goal and Purpose of the Cleaning for Healthier Schools – Infection Control Handbook

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 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 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 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 dwell 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:

- Disinfectants: used on hard, inanimate surfaces and objects to destroy or irreversibly inactivate infectious fungi and bacteria, but not necessarily their spores.
- Sanitizers: used to reduce, but not necessarily eliminate, microorganisms from the inanimate environment to levels considered safe, as determined by public health codes or regulations.

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, soil samples from these fields have been found to contain high levels of bacteria with antibiotic-resistant genes. 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 Healthier Schools 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 the on 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 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. **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. 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, EcoLogo) 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. Research from the Centers for Disease Control and Prevention 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 your a cleaning program enhances this process, because studies show that microfiber is superior at capturing microbes.[9]

3. **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 or incidents 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.

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), 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.

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) – chemicals that have a similar chemical structure and are known for their disinfectant and 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 unreasonable 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.

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

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.

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 Cleaning for Healthier Schools – Infection Control Handbook when discussing bacteria, viruses, and fungi.

Microbes that are capable of causing disease and/or infection are *pathogens*. Pathogenic microbes may be bacteria, viruses, fungi, or parasites. A sufficient number of 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 effectively 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 apart from 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 spread through the air, by contact with contaminated surfaces, and by exchange of body fluids.

What illnesses do they cause? Viruses are responsible for the common cold (rhinoviruses), intestinal and respiratory flu (noroviruses), human immunodeficiency virus (HIV), hepatitis B, hepatitis C, and influenza A subtype H1N1 (swine flu). 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 everywhere in dust, in biofilm, and on surfaces throughout the school.

1. 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

- A shared computer mouse and keyboard
- Shared musical keyboards and instruments
- Doorknobs, elevator buttons, light switches, door push bars, handrails
- Faucet handles, toilet handles, towel dispensers, hand driers
- School bus doors and railings
- Handles on coffee pots, microwave doors, refrigerator doors
- Vending machines
- Buses

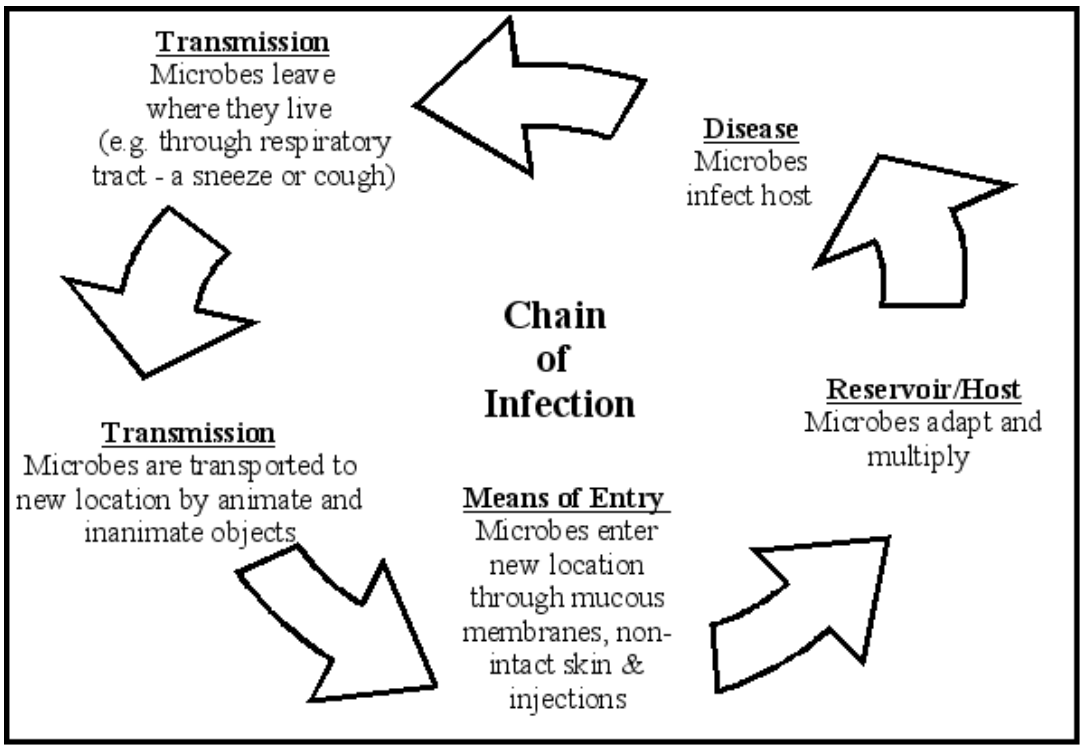
2. Common "high-risk" areas in schools

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 the areas in which 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 and lunch rooms
- Nurses' offices
- 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.



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 must be used to break down the shell. Microfiber cloths or mops, brushes, or steam vapor 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 or inanimate. 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 survive and remain on surfaces when the conditions are optimal.

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

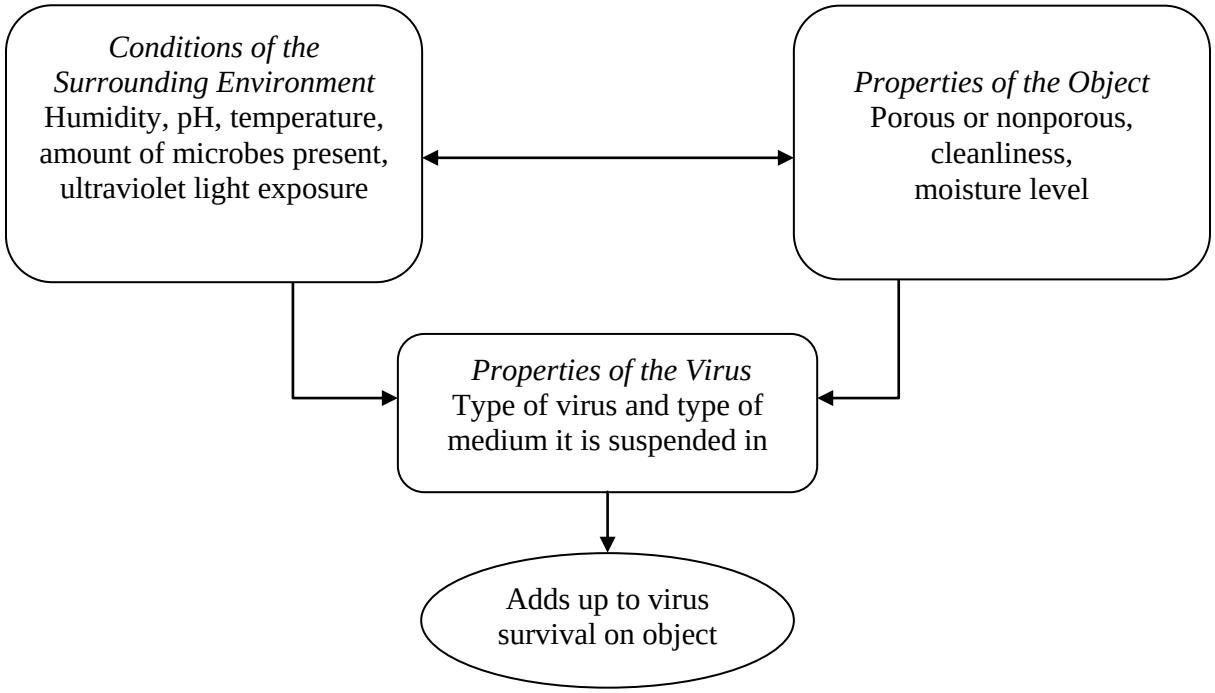
1. **Contact transmission** can happen in one of two ways:
   - Direct – involves surface-to-body contact and the physical transfer of microbes from an infected person to a susceptible host (person).
   - Indirect – involves contact of a susceptible host (person) with a contaminated object (usually inanimate).
2. **Droplet transmission** occurs when large particle droplets (>10 microns) containing microbes from an infected person are propelled short distances 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 vermin 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]

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 recommends the following steps for infection control:
    1. Cover the nose/mouth with tissue when coughing or sneezing. Coughing into the elbow is an alternative when tissues are not available.
    2. Use tissues when possible to capture droplets and dispose of them in a waste receptacle after use.
    3. Encourage coughing or sneezing students/staff to leave a 3-foot buffer between themselves and others.[14]
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 microorganisms from surfaces to levels considered safe as determined by public health codes or regulations. Thus, it can reduce the transmission of some diseases 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 it has been tested to kill or inactivate. Disinfectants are registered by the Environmental Protection Agency as pesticides and 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.

    Different ingredients or combinations of ingredients kill different microbes. 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.

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

Disinfectants are *not recommended* for daily use *other than* on high-risk surfaces and where required by regulation. The surface will remain disinfected only until the next person or microbe touches that surface.

6. ***Will ventilation reduce transmission?*** *Yes.* Adequate ventilation and filter changes on ventilation systems can help break the chain of infection by providing fresh air, by diluting the amount of infectious airborne microbes, and by filtering some of them out. Using the highest minimum efficiency reporting value (MERV)-rated filter (i.e., with a rating of 8 and above) for the ventilation system will filter out some airborne microbes. Check the existing equipment for MERV compatibility. See *Chapter 6.D. Using Ventilation to Help Reduce Disease Transmission* for more information.

7. ***Will ultraviolet radiation reduce transmission?*** *Yes.* If designed properly, the installation of ultraviolet (UV) radiation bulbs in a ventilation system or in the upper areas of a room can reduce the overall microbe load in the space. The benefits can be compared to an increase in ventilation in terms of room air changes per hour.

   UV radiation of specific wavelengths has been known to be an effective germicide for decades. 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. Although some companies advocate the use of this technology in schools, the level of infection control required in a school setting does not warrant its use.

   Although in theory, the reduction of microbes using this technology would infer reduced infection rates in the building occupants this relationship has yet to be proved. In addition, the costs of installation and operation of UV radiation bulbs have not been fully demonstrated to outweigh the use of an effective ventilation system. Lastly, 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:

4. ***Personal hygiene strategies for microbe control*** – Hand and respiratory hygiene and cough and sneeze etiquette are key components of personal hygiene that help to reduce the spread of some types of infectious diseases.

5. ***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* the majority of the microbes and the conditions they need to survive and thrive.

6. ***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 or incidents in which there is a specific biological hazard.

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 in developing a school's own set of protocols.

A written procedure should provide guidelines to the following questions:

1. Why disinfect?
2. What surfaces and objects need disinfection?
3. What is the schedule for disinfection?
4. What are the least toxic and most effective products, processes, and equipment that can be used?
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 should workers and building occupants be protected during the disinfection process?
8. What is the proper way to manage disinfectants and equipment?
9. How should 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*.

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 principal is to *remove* microbes if possible[1] rather than kill them (with a sanitizer or disinfectant). In addition, thoroughly cleaning a surface can reduce the need to disinfect because without the nutrients and moisture needed to survive and multiply, most microbes cannot live 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

   a. 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.

   b. 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.

1. Know whether a surface is porous or nonporous. Manufacturers design their antimicrobial products—and the Environmental Protection Agency (EPA) registers them—on the basis of surface and use criteria. Different types of surfaces require different types of products and methodology for microbe management.
2. 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?
3. Consider whether the surface is a type that would allow for the removal of most of the microbes with high-quality microfiber mops and cloths and an all-purpose cleaning product (third-party certified*) to the level of 99% deemed acceptable for the protection of public health, or whether a disinfectant (to kill virtually everything) 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*.

*Refers to cleaning products that have been certified by Green Seal™ or EcoLogo™, nonprofit organizations that provide independent third-party certification of products for environmental and human health criteria.

Evaluate the Need for Disinfection

There are typically two 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 high chairs 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 and outbreaks* (see also *Appendix A.3. Program Planning Handout: Cleaning for Healthier Schools and Infection Control*)

- Identify and prepare for these types of events. Work with the school nurse, custodian, and classroom and athletic teachers to develop a protocol. These events may include
  - Outbreaks of contagious disease, such as 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, and so forth.

- 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
  - Nurse's office
  - Other

Types of Surfaces

There are two types of surfaces—porous and nonporous—that must be taken into consideration when selecting infection-control strategies and products. Porous surfaces are further categorized as carpet, laundry, or other such surfaces. Nonporous surfaces are categorized as food-contact or non-food-contact surfaces.

Please note that disinfectants are registered by the EPA to be used only on nonporous surfaces, and that sanitizers are registered to be used on porous and nonporous 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 can act as both a sanitizer and a disinfectant,* depending on the concentration specified on the label. Disinfectants that have claims for use on food-contact surfaces must be rinsed with potable water.

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

- *Nonporous surfaces* are smooth, nonpenetrable 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 recontaminated 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, especially during an infectious disease outbreak.
    - Staff Kitchen Areas/Break Rooms/Cafeterias
        - Handles on cabinets, microwave doors, refrigerators, coffee pots, and vending machines
        - Vending machines
        - Tables and countertops
        - Sink faucets
    - Office Work Areas and Equipment
        - Shared desks, chair arms, work tables, and public reception counters and logs
        - Handles on cabinet and file drawers
        - Shared computer keyboards and mice
        - Shared telephones
        - Shared staplers, staple removers, and scissors
        - Controls on audiovisual and other equipment
        - Copier/scanner machines, printer/fax machines, and laminating machines
        - Light switches
    - Classrooms
        - Shared desks and worktables
        - Shared computers, headphones, scissors, and toys
        - Shared telephones
        - Light fixtures
        - Handles on doors, cabinets, and file drawers
    - Hallways and Stairwells
        - Stairwell handrails, doorknobs, and handles
        - Elevator buttons
        - Handles on water fountains
        - Light switches
    - Specialty Rooms – Consider that the items in these rooms could be damaged by the use of disinfectants, and that a hand-washing strategy before and after the use of the following items might achieve the goal of infection control while minimizing the use of disinfectants.
        - Music room keyboards, instruments, and other equipment
        - Computer lab keyboards, printers, scanners, and other equipment
    - Bathroom, Shower, and Locker Rooms

- Fixtures – toilet handle, sink faucet, shower faucet
- Dispensers – towel, sanitary napkin
- Handles – bathroom stall, shower door, entrance door, locker door
- Switches – light, fan, hand dryer, hair dryer
- Disposal containers – trash, sanitary napkin
- Surfaces in locker rooms – locker, bench, shower floor

- Preschool and Childcare
  - Water fountains are common sources of rotavirus contamination within the childcare environment.[3]
  - Water-play tables are common sources of rotavirus contamination within the childcare environment.[3]
  - High chairs with trays are considered to be a food-contact surface. A food-contact sanitizer must be used, which is considered a final rinse. No water rinse following application is allowed.
  - Toys (each state provides regulations on disinfectant requirements).
    - The use of a sanitizer on toys is considered non-food-contact use. The EPA evaluates the use of antimicrobial products on toys, taking into account the mouthing contact and exposure. If the available data indicate that an additional margin of safety for infants and children is needed (susceptibility and sensitivity issues), then the EPA will apply it.
    - The use of a sanitizer on teething toys is considered food-contact use and requires a specific concentration of a sanitizer.

- *Porous Surfaces* are surfaces that contain pores and allow fluids and gases to move through them. These surfaces can harbor microbes but cannot be disinfected because disinfectants are not designed and registered to be used on porous surfaces. Although the EPA registers sanitizer products for use on some porous surfaces, sanitizers do not claim to kill viruses or fungi.
  - **Carpet** is a porous material that can provide an ideal environment for the growth of microbes.[4] The moisture and nutrient material that can accumulate in carpet combines to form optimal conditions for microbes to thrive. Areas of contamination can be sanitized but must be dried within 24 to 48 hours to prevent the growth of mold.
    - Management of bloodborne pathogens (BBP): Because disinfectants are not registered by the EPA to be used on porous surfaces, carpet cannot be disinfected. Carpet should not be used in areas where there is a high risk of blood-related incidents; alternatively, modular carpet tiles may be used that can be pulled up and replaced. In cases in which a carpet or other plush surface has been contaminated, the

Occupational and Safety Administration (OSHA) requires employees to make a reasonable effort to clean the surface with regular carpet detergent/cleaner products.[5]

- Products: An EPA-registered non-food-contact surface sanitizer may be used. Check the label to determine whether it is effective on wool carpet. Products are designed and labeled to be one of the following:
    - Sanitizers for precleaned carpeting
    - One-step cleaner/sanitizers (the label will specify the amount of organic matter for which it is effective; because carpets tend to be reservoirs for dirt, best practices would require cleaning first)
- Alternatives to sanitizer products:
    - Carpet detergent that is rinsed thoroughly and dried within 24 hours to prevent the growth of microbes.
    - Steam cleaning/vapor technologies that sanitize carpets without added chemicals.

- **Laundry** items contaminated with blood that *can* be washed should be washed separately using an EPA-registered non-food-contact surface sanitizer as an additive in laundry detergent.[6] The following EPA requirements apply to antimicrobial products that have label claims for sanitizing activity for fabrics and/or laundry water.
    - The directions for use of laundry additives will specify the
        - Machine cycle in which to add product, the water level, the temperature range, and the treatment time
        - Products compatibility with other common laundry additives such as soaps, detergents, bleach, starch, bluing, sours, and fabric softeners
    - Label claims must distinguish between products for soaking treatments prior to laundering and product additives in laundry operations:
        - Presoaking treatment products are used for soaking soiled fabrics prior to routine laundering. Product directions will specify rinsing of the items to remove dirt prior to soaking, followed by immersion in an adequate volume of soaking solution at the recommended-use dilution (at least 5:1 weight per weight [w/w] solution-to-fabric ratio; e.g., half a wash load in a 3-gallon pail) for a specified contact time prior to the laundering operation.
        - Product directions for laundry operation additives will distinguish between products designed for household and coin-operated laundering and those designed for commercial/industrial/institutional laundering:

- Home or coin-operated machines:
  - Water-to-fabric ratio is about 10:1 (w/w).
  - Dosage instructions will be different for front-loading automatics (e.g., 8- to 10-gallon water capacity) and for top-loading automatics and wringer-type washers (e.g., 12- to 15-gallon water capacity).
- Industrial laundering operations:
  - Water-to-fabric ratio is about 5:1 (w/w).
  - Dosage instructions for industrial laundering may be based on pounds of dry fabric.

- **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] Options to address this issue include the use of
  - Microwave oven heat for decontamination. Microwave heat has been reported to be an efficient method for decontaminating cellulose sponges and cotton dishcloths and for preventing cross-contamination of other food-contact surfaces. Research found that exposures of 60 seconds in a common household microwave oven on the highest settings were sufficient to kill bacteria.[8] Caution is advised, however, because the sponge or dishcloth will be extremely hot after microwaving.
  - Microfiber cloths as an alternative to sponges. Microfiber cloths are an ideal substitute for 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*.

Consider the Surface Before, During, and After Disinfecting

1. *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 on a metal surface.
2. *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.
3. *Final treatment of the surface: rinsed, wiped off, or air dried* – Always read labels for instructions. Several issues to consider when determining whether to rinse off the disinfectant or sanitizer:

a. Regulatory requirements: Disinfectant and sanitizer products have rinse and no-rinse requirements depending on their end use.

b. Residual activity: This process happens when the disinfectant is not rinsed off and continues to work. Although some consider it an asset to have the product continue to work, residual activity may not be desirable because it has been linked to the creation of mutated microbes that can then lead to antibiotic resistance.

c. 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. Rinsing of all touchable surfaces is recommended 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 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 bleach that must be disposed of within 24 hours if not used.

Dispensing Products

- *Without a dispensing station (this practice is not recommended—consider a ready-to-use product)*
  - Use a measuring device and funnel, nozzle, or spigot for dispensing fluids from bulk containers to reduce the chance of spills and overflows.
  - Thoroughly wash and rinse dispensing equipment after use.
  - Dilute and mix the product in a well-ventilated space.
- *With a 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 transferred from the original container or dispensing station for use throughout the building. Typically, custodial staff members fill spray bottles of each product from a dispensing station and put them on their cleaning cart. Some vendors provide labels for spray bottles with all of the required product information.

When labels are not supplied, these spray bottles are often haphazardly labeled with marker or tape, or not labeled at all. They can often be found inadequately labeled on the cleaning cart or in rooms throughout the building if they were left behind by the custodian or were 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."

Requirements

The Massachusetts Right to Know Law and the OSHA Hazard Communication Standard require that secondary containers be labeled with the name of the product and the appropriate hazard warning as specified below. Copies of the product's label, or spray bottles that have the manufacturer's or distributor's information printed on them may be obtained.

- *Required label information for secondary containers:*
  - The brand name of the hazardous chemical (if the container is original) or the name as listed on the material safety data sheet (MSDS; if the container is secondary).
  - Hazard warnings, listing **health hazards** such as effects on target organs and systems (heart, liver, kidneys, nervous system, etc.) and **physical hazards** such as whether the chemical is flammable, corrosive, or reactive.
- *Optional label information for secondary containers:*
  - The name, date, and initials of who diluted the solution to track its expiration date. Expiration dates can be found on the manufacturer's label.
  - Hazardous Materials Identification System labels. These labels provide a good "at-a-glance" warning to alert workers of the degree of hazard, particularly for those who do not speak English.

Old Version

	Health
	Flammability
	Reactivity
	PPE

Revised Version – 2001

	Health
	Flammability
	Physical Hazard
	PPE (personal protective equipment)

- Signal words. These provide a quick method of identifying the degree of hazard.

 **Danger:** *Highest degree of hazard (red text). Description of imminent hazard and injures that will result in death or serious injury if not avoided.*

 **Warning:** *Intermediate degree of hazard (orange text). Description of hazard that could result in death or serious injury if not avoided.*

 **Caution:** *Lowest degree of hazard (yellow text). Description of hazard that could result in minor or moderate injury if not avoided.*

For example, the following warning is found on the MSDS for Clorox® bleach:

 DANGER: CORROSIVE. May cause severe irritation or damage to eyes and skin. Vapor or mist may irritate. Harmful if swallowed. Keep out of reach of children.

Some clinical reports suggest a low potential for sensitization upon exaggerated exposure to sodium hypochlorite if skin damage (e.g., irritation) occurs during exposure. Under normal consumer use conditions the likelihood of any adverse health effects are low.

Medical conditions that may be aggravated by exposure to high concentrations of vapor or mist: heart conditions or chronic respiratory problems such as asthma, emphysema, chronic bronchitis or obstructive lung disease.

Chapter 3.F. Precleaning Surfaces and a Discussion on Using Cleaner/Disinfectants

Introduction

The cleaning step prior to disinfecting and sanitizing is often skipped for a number of 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 Compromise Disinfectant Efficacy* provide the reasons why cleaning can make a difference in efficacy.

There are several types of disinfectant products on the market, some of which claim to clean and disinfect. These dual-use products are appealing due to their potential time- and labor-saving advantages. 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, debris, and organic matter 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 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?*
  - 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 *heavily* soiled surfaces need to be cleaned first using a separate cleaning agent. 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% may be difficult.

- **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*.)

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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:

1. *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. In addition, the EPA's Web site, http://www.epa.gov/oppad001/chemregindex.htm, sorts disinfectants by the microbe(s) they are registered to kill.

2. *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 chemical 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]).

3. *Cross-contamination issues.* Solutions of disinfectant should be changed for each room where disinfectants are used, and in some cases for different types of surfaces, such as the toilet and the sink. See *Chapter 3.H. Preventing Cross-Contamination* for details on the potential for and prevention of cross-contamination.

4. *Concentration and quantity of product.* It is important to choose the proper concentration and quantity of chemical 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.

5. *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. The Workgroup has found this issue to be one of the biggest mistakes

most staff members make when using disinfectants.

6. *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. During the use of most disinfectant types, the higher the water temperature, the faster and more effective the disinfectant activity.[2–4] Too great an increase in temperature during storage and use, however, may cause the disinfectant to degrade and lose effectiveness.

7. *Compatibility of the product and the surfaces it is used on (e.g., fabric and metal surfaces).* 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 sensitive to the disinfectant pH. Chemical damage is irreversible and can be costly to repair. In most cases, floors do not need to be disinfected.

8. *The length of time the disinfectant sits in the bucket and the amount that is used.* When a solution of disinfectant is used on several rooms over a period of time, efficacy is reduced. As the solution temperature cools, it may lose its effectiveness. As the solution continues to be used, it can cross-contaminate other areas with the microbes that it does not kill and with those that proliferate in the bucket. In addition, microbes that do not die can develop resistance to disinfectants.

9. *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]

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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 (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 help 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.
- *Cleaning and disinfecting equipment:*
  - ☑ Mop systems – use systems that require a new mop head or pad for each room.
  - ☑ Buckets – use dual-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.
  - ☑ Other equipment – use no-touch cleaning equipment. 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] Because these systems use a smaller amount of chemicals, savings are realized on the product and on labor.
- *Color-coded equipment (cloths and mops):*
  - ☑ The color-coded system prevents accidentally reusing a cloth or mop that has been used to clean areas such as bathrooms.
  - ☑ 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

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, for instance, 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.

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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 classroom will reveal hazardous cleaning and disinfectant products stored haphazardly, unsecured, and in dangerous combinations. These extremely common scenarios are accidents waiting to happen.

Disinfectants are pesticides and are not appropriate to store in a classroom where there is no proper 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.
- Store disinfectants in original containers whenever possible.
- Ensure that all containers are labeled with the contents and percentage concentration information.
- Minimize the transfer of disinfectants from container to container.

Storage Locations and Conditions

- **Store disinfectants in a secure location out of the reach of students**. Examples are custodial closets and designated product storage areas, *not* classrooms.
- Store disinfectants on shelves located below eye level. Some disinfectants are corrosive and can cause severe eye damage and blindness if spilled into the eye.
- Store containers in well-ventilated storage areas.
- Store products in compatible hazard categories, and maintain a distance between those that are not compatible to prevent a hazardous reaction. Check the disinfectants' MSDSs 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)

3. Corrosive bases (e.g., QACs)
4. Corrosive acids (e.g., citric acid– or lactic acid–based disinfectants)

- Ensure that flammable and combustible liquids like alcohol-based hand sanitizers are stored properly, such as in flammable storage cabinets. The Massachusetts Fire Prevention Codes require that flammable liquids and oxidizers (e.g., bleach) be stored in separate rooms. In case of a fire, the oxidizer will feed the fire and make it worse.
- Some disinfectants (e.g., bleach) lose stability quickly after 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 label for the shelf life of a product concentrate.

Spill Control and Inspection

- Prepare for an incident by stocking spill clean-up supplies, including absorbents, tools, receptacles, personal protective equipment, and so forth.
- Clean up spills immediately. See the MSDS 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.

Shelving

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

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Chapter 3.J. Disposal of Disinfectant and Biological Wastes

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

It is important to understand and follow the disposal instructions on the 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.

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 pick up.
  - The transport of infectious waste is regulated by local Boards of Health, the Massachusetts Department of Telecommunications and Energy, or other local and 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 and dispose of it immediately in the dumpster.

- *Sharps and sharps disposal containers*
  - Store sharps in a rigid, puncture-proof sharps container facing down.
  - 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 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 for some reason may be considered hazardous waste. The local WWTP, DPW, the Massachusetts Department of Environmental Protection, or other appropriate agencies will have instructions for disposal. Concentrates poured down the drain may kill populations of microbes in septic tanks and in WWTPs that are designed to break down waste, thus interfering with these biological processes.

- Hazardous waste must be stored separately from hazardous products, in a secured labeled area, and in compatible categories. A fact sheet on the requirements for storing hazardous waste is available at www.mass.gov/dep/recycle/laws/vsqgfcts.doc.
- A container 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 where the best way to manage it could be determined. One exception is if the product is designated an *acutely hazardous waste,* which must then be disposed of hazardous waste.

Sources

Massachusetts Department of Public Health, *105 CMR 480.000 Minimum requirements for the Management of Medical or BiologicalWaste.* Available at: http://www.lawlib.state.ma.us/source/mass/cmr/cmrtext/105CMR480.pdf.

Massachusetts Department of Environmental Protection, *310 CMR 19.000 Solid Waste Management.* Available at: http://www.mass.gov/dep/service/regulations/310cmr19.pdf.

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

Introduction to Selecting Personal Protective Equipment

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).

The Massachusetts Right to Know Law and the OSHA Hazard Communication Standard require that employers provide training to their employees on the use of required PPE. These requirements are listed on the product label and on the product's MSDS.

An example of using PPE is 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 protect hands from the chemicals used to disinfect the surface after the spill is removed. 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?

Some disinfectants have an extremely high pH and are corrosive to skin and eyes and can cause blindness. Others are poisonous and can be absorbed through the skin.

What types of PPE are available?

Type	Specifications	Comments
 Protective Apron	Chemically resistant depending on the type of chemical being used.	
 Vapor Respirator	The type of mask needed is determined by the chemical being used. Dust, particulate, and surgical masks do not prevent vapors from penetrating the mask.	The mask should fit well, without any leaks.
 Splash Goggles	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 glasses.

Type	Specifications	Comments
 Gloves	Criteria to select chemical-resistant gloves: Type of chemicals being handled Nature of contact (total immersion, splash, etc.) Duration of contact Area requiring protection (hand only, forearm, arm) 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.
 Boots	Chemically resistant depending on the type of chemical being used.	Some chemicals can penetrate footwear.

When should PPE be worn?

If an employee could…	then…
have contact with infectious materials	gloves are required
be splashed in the face	a mask is required
be splashed on the body	an apron is required
step in it and track it around	foot protection is required

What type of training 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, take off, and wear 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 after use.
- Store PPE in a clean place.
- Avoid contaminating the skin when taking off PPE.
- Try not to spread chemical residue around.
- Inform a supervisor of the need to repair or replace PPE.

Worksheet template to track requirements for PPE and emergency wash stations

Check the label and MSDS to complete the following chart for the disinfectants that are being considered or that are currently being used.

Product Type (Ingredients)	**Hazard Characteristics** (corrosivity, toxicity, flammability, reactivity, etc.)	**Eye Protection, Gloves, other PPE**	**Emergency Wash Station Required**

Sources

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

Introduction

If the disinfectant and sanitizer products are corrosive in a concentrated form (e.g. QACs, bleach) or are flammable (e.g., alcohol, alcohol-based hand sanitizers), OSHA standards and Massachusetts Fire Prevention Regulations require the provision of an emergency eyewash facility.

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 that are required,

1. Use products that do not require their use, such as water-based (nonflammable) and neutral PH (noncorrosive) products.
2. 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.
3. Centralize facilities for storing and dispensing flammable and corrosive products.

If an eyewash station is not available in the area where the disinfectant is dispensed and used, a diluted, 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: MA Fire Prevention Regulations General Provisions 527 CMR 10
- *General requirements for emergency wash stations*
    - The station should be located within approximately 50 feet or a 10-second walk of the hazard and be easily accessible.[1]
    - Water temperature should be kept between 70°F and 90°F.[1]
    - All eyewashes and showers should be approved by the American National Standards Institute.
    - Signage (at least 70 square inches and in contrasting colors such as red and white or green and white) should be posted, indicating the location of each type of equipment: "Emergency Shower" or "Emergency Eyewash."[1]
    - When possible, the emergency wash system should trigger an alarm when activated to alert other people that there is an emergency.
    - The system should have a mechanism that enables it to stay on, allowing the hands to be kept free for cleaning off chemicals.

  - Equipment should be put in place and made operational before storing products and prior to staff and student use of hazardous materials.[1]

- *Deluge shower additional requirements*
  - Water flow should be 30 gallons per minute.[1]
  - Equipment should be available at all times, 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): attachments can be obtained for converting existing faucets to an eyewash.
    2. Gravity-fed (portable): nonplumbed unit with a 15-minute flush. May require water to be changed due to the potential for the water to become contaminated. Some units are sealed and have a longer shelf life.
    3. Handheld (portable): nonplumbed 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 while accessing a plumbed eyewash station. In addition, the water in portable eyewashes can become contaminated and must be replaced.[2]

References

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2. Executive Office of Labor and Workforce Development, Massachusetts Division of Occupational Safety, Massachusetts Workplace Safety and Health Program, *Hazard Information Bulletin 403: School Laboratory Safety for Teachers and Laboratory Supervisors.* (Published 9/2001, Updated 10/2009). Available at: http://www.mass.gov/?pageID=elwdterminal&L=5&L0=Home&L1=Businesses&L2=Occupational+Safety+and+Health+Programs&L3=Massachusetts+Workplace+Safety+and+Health+Program&L4=Hazard+Information+Bulletins&sid=Elwd&b=terminalcontent&f=dos_mwshp_hib403&csid=Elwd.

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

Introduction

When the school has determined what the protocols should be, the person(s) responsible for each aspect of the infection-control program must be selected. Staff members should receive training for their own responsibilities but should also 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 reminders such as posters and memos to reinforce policies and procedures.

This document 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 will have its own system. 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 program is in place	Approve purchasing policy and criteria		Review reports
Facility Manager	Assign custodial roles and responsibilities	Organize training for custodians and possibly athletics department	Participate in developing purchasing criteria, vendor selection, and product ordering	Oversee custodial adherence to protocols	Disposal of spill waste Follow-up to BBP exposure
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

Department/ Staff	Policy	Training	Purchasing*	Use	Incident Response
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 Director	Oversee nurse roles and responsibilities Coordinate policy with an Exposure Control Plan	Organize nurse training —as part of BBP, infection control, or orientation training	Participate in developing purchasing criteria, vendor selection, and product ordering	Oversee nurse use and information dissemination to school staff	Provide medical assistance Follow-up to BBP exposure
Nurses	Implement policy	Attend training Train classroom and office staff	Inventory supplies (PPE, disinfectants, spill kits)	Use products routinely and for incidents	
Food Service Director	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	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 Director	Assign and oversee staff roles and responsibilities	Combine with other training	Order and distribute spill kits	Use disinfectant for incidents only	Director – follow-up BBP exposure Driver – secure site, clean up, and submit report

* 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 product for all departments who can use the same formulation.

Determine who is responsible for which 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, and so forth • Athletics department – use antimicrobials on wrestling mats to prevent transmission of MRSA
Once a day	• Custodians – disinfect toilet seats and handles, shower floors and handles, and so forth
Special events	Disinfectants are generally used for special events. • 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

Develop a training or orientation program on the following topics, or incorporate the information into an existing training program. It is particularly important to train custodians, who are typically designated as responsible for routine and special-event disinfection. Whenever possible, this information should be added to existing training sessions such as annual BBP training, and/or disseminated at weekly staff meetings.

Personnel	Annual Bloodborne Pathogen Training	Train the Trainer	Awareness of Policy/Procedures
Administrators			Yes
Teachers	May be required depending on the activities involved	Train students on personal hygiene practices	Yes
Custodians	Yes		Yes

Personnel	Annual Bloodborne Pathogen Training	Train the Trainer	Awareness of Policy/Procedures
Students			Yes
Facility Manager	Yes	Train custodians	Yes
Athletics Director/Staff	Yes	Director can train staff	Yes
Nurses	Yes	Nurse can train staff on BBP, first aid, hand washing, and life-threatening allergies	Yes
Food Service	Yes	Director can train staff	Yes (in addition to health department and food handler requirements)
Bus Drivers	Yes	Director can train staff	
After-School Programs (follow same guidelines as day programs)	May be required depending on the activities involved		Yes
Preschool		Director can train staff	Yes (in addition to state requirements)

Additional Sources for Chapter 3

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McDonnell, G., Russell, A.D. "Antiseptics and Disinfectants: Activity, Action, and Resistance." *Clinical Microbiology Reviews* 12, no. 1 (1999):147–79.

Minnesota Technical Assistance Program, "Fact Sheet: Disinfection Best Management Practices, Writing a Procedure." Available at: http://www.mntap.umn.edu/health/73-DisinfectionBMP.htm.

Chapter 4.A. Introduction

One of the key strategies in reducing the use of toxic products is to prevent their purchase. After an infection-control program is developed, purchasing the right products enables implementation.

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

How to Begin

Work with custodial staff to identify products that concern them due to performance, air quality, toxicity, hazards, storage requirements, and so forth. Also, involve them in choosing and trying out new 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 products that have previously worked well for them.

The process of identifying and switching to less hazardous alternative products and equipment may involve one or more of the following processes:

1. A phased-in approach: Replace products as they are finished, or replace equipment when the old equipment is no longer useful.
2. End-of-year switch: Start working with the school's existing vendor to evaluate the current program and set up a pilot, or start with new products from a new vendor when old contracts expire and new ones 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 seeking Leadership in Energy and Environmental Design (a green-building certification system) credits for a Green Housekeeping Plan are using this approach.

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.

Possible Phases of the Switch

The switch often starts with obtaining one third-party-certified concentrate that can be diluted for cleaning the following areas:

- bathroom/ restroom
- all-purpose
- carpet spotter/extraction
- glass and window
- neutral floor

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

- heavy-duty cleaner
- wax stripper
- floor sealer and finish
- hand soaps
- graffiti removers
- metal cleaners
- whiteboard cleaners

Although disinfectants are not currently allowed by the Environmental Protection Agency to be labeled by a third-party certification organization, some product formulations have been identified as environmentally preferable. 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.

See *Appendix A.2. Cleaning for Health: Program Components Checklist* for a complete list of environmentally preferable items.

Microfiber

Purchasing microfiber equipment requires having a laundering system in place or using a rental company that offers microfiber. Microfiber needs laundering after each use. It must be washed separately from other laundry using only mild detergent. Bleach, dryer sheets, or fabric softener should not be used.

Small, conventional washing machines or small, affordable machines designed just for microfiber that fit into custodial closets can be purchased for this purpose. Washing microfiber by hand and hanging to dry is also an option.

Resources

Consider using the Massachusetts Operational Services Division (OSD) Environmentally Preferable Products (EPP) program and contracts when exploring options. Four other states, including New Hampshire, Vermont, New York, and Connecticut, have joined Massachusetts in adopting these contracts. The OSD has contracted with vendors for many EPPs. The OSD screens these products and equipment 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 EPP contract manager is an excellent resource regarding these contracts and can provide information on how to use them. See *Appendix D.1. Organizations* for information on how to contact the EPP program and view the resources available to help with purchasing.

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 development that will help in the selection of the least-toxic disinfectant in the near future is the Environmental Protection Agency (EPA) Design for the Environment (DfE) Antimicrobial Pesticide Pilot Project. This project is set up as a 36-month pilot that will screen disinfectants against the DfE Standard and allow the companies that meet the criteria to label their products with a DfE logo. Approved products will be posted at the EPA Web site: www.epa.gov/pesticides/dfepilot.

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

	Active Ingredient in Institutional Disinfectant Products					
Disinfectant Characteristics	**Bleach (sodium hypochlorite, 5.25% concentration)**	**Phenols**	**Quaternary ammonium compounds**	**Botanicals (e.g., thymol in Benefect®)**	**Silver dihydrogen citrate (e.g., in PureGreen24®)**	**Accelerated hydrogen peroxide (hydrogen peroxide/anionic surfactants)**
Status of DfE review*	Will not pass DfE screen (see below)	Will not pass DfE screen (see below)	Will not pass DfE screen (see below)	Will not pass DfE screen (see below)	Currently under review by DfE	Has passed the DfE screen
Product description	EPA-registered chlorine bleach at a 5.25% dilution (use only EPA-registered products for disinfecting)	Ready-to-use product Usually an aerosol Warning – not intended for use as an air freshener	Many products use QACs as the active ingredient	Plant-based products with natural disinfecting characteristics	Combination of citric acid and a minute amount of silver ions	Hydrogen peroxide in synergy with a blend of commonly used ingredients
CDC disinfection level*	Intermediate-level disinfectant	Can be low level or intermediate; noted on label	Low-level disinfectant	Intermediate-level disinfectant	Low-level disinfectant	Product-specific low- or intermediate-level disinfectant

Disinfectant Characteristics	Active Ingredient in Institutional Disinfectant Products					
	Bleach (sodium hypochlorite, 5.25% concentration)	**Phenols**	**Quaternary ammonium compounds**	**Botanicals (e.g., thymol in Benefect®)**	**Silver dihydrogen citrate (e.g., in PureGreen24®)**	**Accelerated hydrogen peroxide (hydrogen peroxide/anionic surfactants)**
EPA toxicity category*	Category I	Category I or II	Category III	Category IV	Category IV	Category III or IV, product specific
Precleaning needed	Surfaces must be precleaned.[1] Best practices advise precleaning all surfaces before disinfecting	Surfaces must be pre-cleaned; see specific product information sheet Best practices advise precleaning all surfaces before disinfecting	Product specific Some products registered as one-step disinfectant cleaners Best practices advise precleaning all surfaces before disinfecting	Surfaces must be precleaned according to label instructions Best practices advise precleaning all surfaces before disinfecting	Surfaces must be precleaned according to label instructions Best practices advise precleaning all surfaces before disinfecting	Registered as one-step disinfectant cleaners Best practices advise precleaning all surfaces before disinfecting
Storage	If used for disinfecting purposes, bleach should not be stored longer than 3 months When mixed with water, the solution is effective as a disinfectant only for 24 hours[2]	Stable in storage Flammable if in aerosol form.[3]	Stable in storage	Stable in storage 2-year shelf life	Stable in storage No expiration date required	Stable in storage 2-year shelf life
Effectiveness	Effective against most bacteria and some viruses Registered as effective against HIV, HBV, H1N1, MRSA, and TB*,[4]	Read product label for effectiveness against specific microbes	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	Effective against a broad spectrum of microbes including H1N1, TB, and MRSA Read product label	Effective against a broad spectrum of microbes, including MRSA, norovirus, and H1N1 Read product label	Effective against a broad spectrum of microbes, including H1N1, norovirus, and MRSA Read product label for specific claims, including effectiveness against TB

Disinfectant Characteristics	Active Ingredient in Institutional Disinfectant Products					
	Bleach (sodium hypochlorite, 5.25% concentration)	**Phenols**	**Quaternary ammonium compounds**	**Botanicals (e.g., thymol in Benefect®)**	**Silver dihydrogen citrate (e.g., in PureGreen24®)**	**Accelerated hydrogen peroxide (hydrogen peroxide/anionic surfactants)**
Dwell time*	5–10 minute dwell time Read the label for specific recommended dwell times	Generally 10-minute dwell time Read the label for specific recommended dwell times	Generally 10-minute dwell time Read the label for specific recommended dwell times	10-minute dwell time Read the label for specific recommended dwell times	30-second to 10-minute dwell time Read the label for specific recommended dwell times	1- to 10-minute dwell time Read the label for specific recommended dwell times
Health effects	Mixing with ammonia, QACs, and other acidic products can create poisonous gas[5] Corrosive to eyes and skin, and a respiratory irritant.[6] Suspected cardiovascular, gastrointestinal or liver, kidney, central nervous system, respiratory, and skin or sense organ toxicant[7]	Phenols are recognized carcinogens[7] and suspected cardiovascular, developmental neurological, reproductive, respiratory, and skin and sense organ toxicants[8] Specific product MSDSs warn that the product is harmful if absorbed through the skin and that inhalation of product mist may cause respiratory irritation[3]	Can cause contact dermatitis and nasal irritation[9] QACs including benzalkonium chloride, dodecyl-dimenthyl-benzyl ammonium chloride, and lauryl dimethyl benzyl ammonium chloride are respiratory sensitizers and associated with asthma[10]	No warning or first aid statements are required on the MSDS The botanical oils in the product are either FDA approved as Food Additives or on the U.S. GRAS list Third-party certified by EcoLogo to meet environmental and human health criteria (the EPA does not allow eco labels on disinfectants)	No warning or first aid statements are required on the label	Some products using this technology have been third-party certified by EcoLogo to meet environmental and human health criteria (the EPA does not allow eco labels [i.e., Green Seal certification] on disinfectants)
Exposure controls*	PPE and/or increased ventilation should be used[9]	Requires PPE and increased ventilation[9]	Requires PPE and proper ventilation	No special requirements; regular ventilation is adequate	No special requirements; regular ventilation is adequate	No special requirements; regular ventilation is adequate

Disinfectant Characteristics	Active Ingredient in Institutional Disinfectant Products					
	Bleach (sodium hypochlorite, 5.25% concentration)	**Phenols**	**Quaternary ammonium compounds**	**Botanicals (e.g., thymol in Benefect®)**	**Silver dihydrogen citrate (e.g., in PureGreen24®)**	**Accelerated hydrogen peroxide (hydrogen peroxide/anionic surfactants)**
Environmental issues pros and cons	Toxic to aquatic organisms[11]	Toxic to aquatic organisms[12] Considered a persistent bio-accumulative toxin by Ohio EPA[13] Disposal restrictions in some states; check state and local regulations	Very toxic to aquatic life[14] See the product MSDS Associated with antimicrobial resistance[15]	Third-party certified by EcoLogo to meet environmental and human health criteria (the EPA does not allow eco labels on disinfectants)	Listed on the Grassroots Environmental Education's ChildSafe Products List[16]	Some products using this technology have been third-party certified by EcoLogo to meet environmental and human health criteria. (the EPA does not allow eco labels [i.e.,Green Seal certification] on disinfectants)
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[11] Rinsing is required in applications where direct skin or oral contact can occur (e.g., children's toys)[17]	Not for use on food or food utensils[18] May damage floor finishes and other surfaces Caution: Do not use around babies and small children[13] Generally leaves a residue, so rinsing is required	Thorough rinsing required See product label for specifics	Not yet widely available through vendors; may need to be ordered Strong odor	Not yet widely available through vendors; may need to be ordered	Rinsing is required if direct skin or oral contact can occur (e.g., children's toys)

Disinfectant Characteristics	Active Ingredient in Institutional Disinfectant Products					
	Bleach (sodium hypochlorite, 5.25% concentration)	**Phenols**	**Quaternary ammonium compounds**	**Botanicals (e.g., thymol in Benefect®)**	**Silver dihydrogen citrate (e.g., in PureGreen24®)**	**Accelerated hydrogen peroxide (hydrogen peroxide/anionic surfactants)**
Advantages	Inexpensive; easy to purchase The same product can be used for routine and special-event tasks, by changing the concentration	Readily available	Readily available	Noncorrosive No rinsing or wiping required Approved by the Canadian Food Inspection Agency for use in food processing	No rinsing required Noncorrosive; odorless EPA registered for use on toys 24-hour residual protection	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)

Abbreviations: CDC, Centers for Disease Control and Prevention; FDA, Food and Drug Administration; U.S. GRAS, United States Generally Recognized As Safe; HBV, hepatitis B virus; H1N1, a subtype of influenza virus A; HIV, human immunodeficiency virus; MRSA, methicillin-resistant *Staphylococcus aureus*; MSDS, material safety data sheet; PPE, personal protective equipment; QAC, quaternary ammonium compounds; TB, tuberculosis.

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 and the Office of Pesticide Programs – Organizations conducting a limited pilot project that would allow for the identification and labeling of the least-toxic disinfection products currently on the market. Products containing the following active ingredients will not be approved for inclusion in the project: QACs; sodium hypochlorite (bleach); ortho-phenylphenol (2 phenylphenol); thymol.

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

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 MSDS; Scorecard (http://www.scorecard.org/chemical-profiles); the Pesticide Action Network's Pesticide Database (http://www.pesticideinfo.org); 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 prediluted form. Check the label and the MSDS.

Precleaning – Except for disinfectant cleaners that are tested to disinfect in the presence of 5% organic matter, all other disinfectants require precleaning. Best practices recommend cleaning first and then disinfecting for optimal efficiency.

Blank Comparison Chart

Disinfectant Characteristics	Product and Active Ingredient	
Status of active ingredient under DfE review		
Product description		
CDC disinfection level		
EPA toxicity category		
Precleaning needed		
Storage		
Effectiveness		

Disinfectant Characteristics	Product and Active Ingredient	
Dwell time		
Health effects		
Exposure controls		
Environmental issues pros and cons		
Additional disadvantages		
Additional Advantages		

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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 usually vary for each function.

The 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 listing the effectiveness against microbes in tests of their product. These sheets were helpful when the H1N1 outbreak first occurred to determine whether the product had been tested for influenza. Schools may be able to use the information provided in these sheets to determine whether existing products may be used for current outbreaks.

The following information and the more comprehensive 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) is considered a legal document because the EPA uses the label to summarize scientific information about that formula and how it complies with the Federal Insecticide Fungicide and Rodenticide Act. 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 clearance 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' Web sites, 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
- *Before storing* the chemical
- *Before disposing* of the empty container or product

Sources

Environmental Protection Agency, Pesticides: Regulating Pesticides, "Label Review Manual." Available at: http://www.epa.gov/oppfead1/labeling/lrm.

Information in this section was 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: http://edis.ifas.ufl.edu. 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

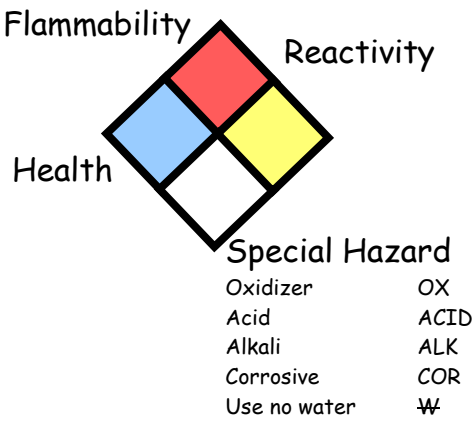
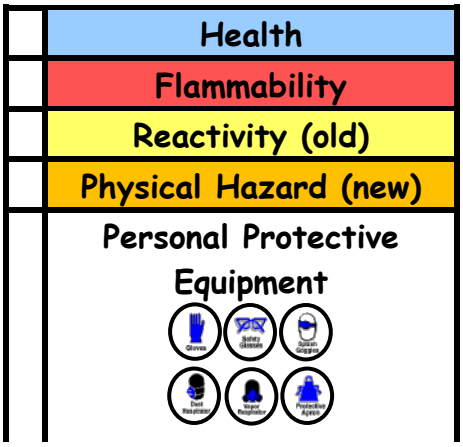
Introduction

The following chart provides a comparison of the two hazardous materials rating systems that were developed to provide an awareness of a product's hazards—the National Fire Protection Association (NFPA) system and the Hazardous Materials Information System (HMIS).

The information found on product labels and on material safety data sheets (MSDSs) can be used to interpret product hazards at a glance and to compare product options to find the least-toxic one, as illustrated in the next section, *Chapter 4.E*. For an explanation of each rating, see *Appendix B.3. Interpreting Information from Hazardous Materials Rating Systems*.

What the NFPA and HMIS rating systems are 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 newer versions of the HMIS, the yellow color (Reactivity) has been replaced by orange (Physical Hazard).

	NFPA	HMIS
Symbol		
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) As a rating system on MSDSs.**	**1) On *labels* used on secondary containers where there is no manufacturer label.** **2) As a rating system on MSDSs.**
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 symbols can help to compare the hazardous properties of products to find the least toxic one. The National Cleaning for Healthier Schools and Infection Control Workgroup recommends that schools establish a *Health and Safety Cap** that determines acceptable ratings for products before purchase and the criteria for evaluating and accepting products that exceed that 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 other alternatives are available.

2 Rating – Although products with ratings in the 2 range can be considered, 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.

Workgroup 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*
- *Chemicals that require use of a respirator*

  Respirator use requires a formal respirator program, including medical monitoring and fit testing. Realistically, this is not going to occur in the school environment.
- *Chemicals with special storage requirements*

  Consider the cost of the equipment (e.g., explosion-proof refrigerator), 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.
- *Chemicals with a regulatory designation of "extremely hazardous substance"*

  These materials can change a school's regulatory status to a more stringent one.

*The Health and Safety Cap concept was developed by Hilary Eustace of the Massachusetts Division of Occupational Safety, and modified by Lynn Rose of the Massachusetts Facilities Administrators Association.

Chapter 4.F. Using Information from Material Safety Data Sheets for Product Selection

Introduction

The following information is located on a product's MSDS 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 MSDS with a product when it is shipped. The company should be notified if the MSDS is not included. MSDSs are also available on a distributor's or manufacturer's Web-site. Under the Massachusetts Right to Know Law (or the federal OSHA Hazard Communication Standard for other states), schools are required to provide the MSDS for all hazardous products used by employees and to provide training to staff using these products on how to read the MSDS.

Volatile Organic Compounds

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

- 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, the respiratory system, and eyes.

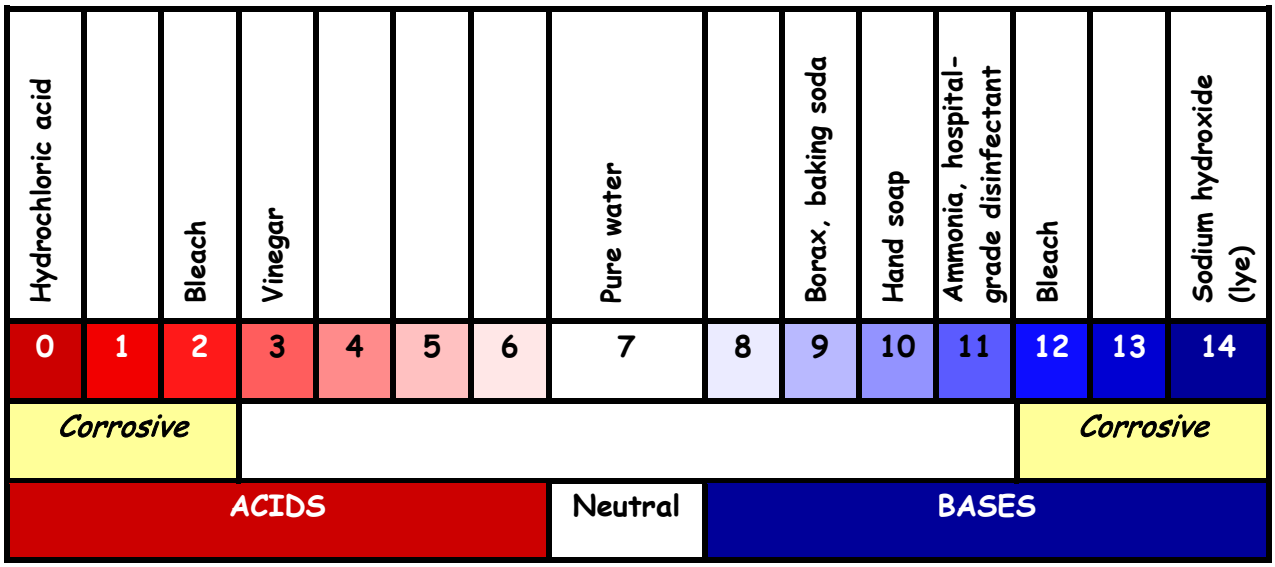
- Acids with a pH lower than 3.5 and bases with a pH higher than 10 can be dermal hazards.

- Highly alkaline products can cause blindness. Quaternary ammonium compounds (QACs) found in low-level disinfecting products are highly alkaline.

- Consider the reactivity between strong acids and bases and how these products may be used together. Reactivity is also a key consideration in proper storage because these products should be stored separately. If they happen to intentionally or unintentionally come in contact with one another, they can have violent reactions or release toxic gases.

- See the 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 create their own pH chart to help employees monitor product use and storage.

pH Chart



Chapter 4.G. Selecting a Disinfectant Application System

Introduction

Several application options are available for disinfecting surfaces or objects. The following chart provides a comparison of the 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 chart is 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.

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	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 enable it to attract, capture, and hold particulates better than other alternatives[2] The type of microfiber affects efficacy	Significantly less than microfiber	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

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
Ability to Maintain Adequate Contact/Dwell Time to Kill Microbes	Good	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	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
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 mop is difficult; one hazardous practice 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 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 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 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 proliferate	Can serve as a breeding ground for microbes and cause cross-contamination if not laundered and dried before reuse	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

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
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 There is no wringing	Because of their higher water retention capacity, microfiber cloths do not need to be wrung out repeatedly	None	None	None
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 Can be rented	Initial capital expense can be captured in life-cycle costing 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 Can be rented	Can be rented Cost is less than microfiber	Ongoing purchasing and disposing costs	Ongoing purchasing and disposing costs

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	Can be washed and reused hundreds of times	Reusable Reduced lifespan compared to microfiber	Not reusable Generates waste	Must be used before expiration date Not reusable 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*
Laundering	Must be cleaned and dried or microbes will colonize on the fibers	Laundering necessary Should only be washed with other microfiber because it can pull the lint out of other materials during the washing and drying process Avoid bleach or fabric softener when laundering Washing machines are available that fit into custodial closets	Laundering necessary Should only be washed with other microfiber because it can pull the lint out of other materials during the washing and drying process Avoid bleach or fabric softener when laundering Washing machines are available that fit into custodial closets	Must be cleaned and dried or microbes will colonize on the fibers	None	None

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 Advantages and Disadvantages	Not applicable	Not applicable	Not applicable	Not applicable	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."

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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 in an area with plumbing and electricity	Designed to dilute a single product at point-of-use without plumbing and electricity	Designed in prepackaged 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	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	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**
		Because there is no premixing before the product is used, there is no unused 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	
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 is required for products with a pH in the corrosive range (consult the MSDS)	Product cartridges are more expensive than concentrates Eyewash is required for products with a pH in the corrosive range (consult the MSDS)	After being mixed, a diluted product has a limited shelf life Costs more to ship Requires more storage space Creates more solid waste
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 MSDS Label the diluted product stored in a secondary container with the appropriate label Products must be stored in a secure place away from student access Store product in compatible groupings (check the MSDS to see what types of	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 MSDS Label the diluted product stored in a secondary container with the	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)

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**
	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	appropriate label (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 MSDS 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	Refill manually from a larger container of the same RTU product Wear the correct PPE specified in the MSDS Store products in a secure place away from student access Store product in compatible groupings (check the MSDS 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*

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 options, supporting hardware, dilution ratios for specific concentrates, backflow options, installation options, the number of products and containers that can be filled by a system, and so forth.
    - A dispensing system could be gravity-fed, pneumatic, or electronically monitored (or similar).
    - Many vendors will supply a dispensing system at no cost when a specified amount of product is purchased from them.
- *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.
    - A dispensing system should have a backflow prevention feature to prevent cross-contamination of the potable water system. Some municipalities require this.
- *Installation criteria for product-dispensing systems*
    - The installation and maintenance of the product-dispensing system should be conducted by the manufacturer in accordance with manufacturer's instructions and requirements.
    - 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 should be installed to provide instructions for start-up, operation, and shut-down.

[*]This section on product dispensers was derived from the U.S. Navy Surface Ship, *Authorized Chemical Cleaning Products and Dispensing Systems Catalog*, Revision 1, 9/30/04.

Chapter 5.A. Introduction

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

Although the National Cleaning for Healthier Schools and Infection Control Workgroup does not advocate the use of bleach and other hazardous disinfection products, the Cleaning for Healthier Schools – Infection Control Handbook provides 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 Bleach (Sodium Hypochlorite): Hazard Overview

Introduction

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), 5.25% or 6.00% solution, unless otherwise stated.

Bleach has been used for generations as a disinfectant, and the general opinion during this time has been that it is a safe chemical for this purpose. Recent research, however, has identified adverse health effects for users and the environment. 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.

What Are the Problems with Using Bleach as a Disinfectant?

- ***Health problems***
    - Bleach is suspected of causing asthma, and is known to exacerbate asthma episodes. A recent study found that asthma symptoms in domestic cleaning women were associated with exposure to bleach.[1] 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.[2] Some chlorinated VOCs are toxic and probable human carcinogens.
    - 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%. "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)."[3]
    - 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:[3] "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 may also be more vulnerable to gas exposure because of increased minute ventilation (respiration) per kg and failure to evacuate an area promptly when exposed."
    - Children have accidentally ingested bleach. The American Association of Poison Control Centers recorded over 50,000 calls regarding chlorine bleach poisoning events in 2007, making it one of the most common household substances reported to the poison control center. One third of these calls concerned children accidentally ingesting chlorine bleach.[4]
- ***Employee health and safety***
    - Bleach in a concentrated form can cause irreversible eye damage and skin burns, and requires the use of an eyewash station to flush eyes for 15 to 20 minutes. 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.[3]
    - Recommended staff handling of bleach for daily preparation requires training, a ventilated dispensing area, tools that help measure the correct amount of bleach, such as dispensing pumps, a funnel, and the proper use of personal protective equipment (PPE), including nitrile or rubber gloves and chemical splash goggles. See *Chapter 5.C. Protocol for Safe Use of Bleach*.
- ***In a school setting***
    - Bleach degrades metal and other incompatible surfaces.
    - It may damage fabrics and floor finishes.
    - Bleach is unstable 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.

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

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4. A.C. Bronstein, D.A. Spyker, L.R. Cantilena, Jr, et al, "2007 Annual Report of the American Association of Poison Control Centers' National Poison Control Data Systems (NPDS): 25th Annual Report." *Clinical Toxicology (Philadelphia, PA)* 46, no. 10 (2008): 927–1057.

Chapter 5.C. Protocol for Safe Use of Bleach

Introduction

The Workgroup does not recommend the use of bleach for disinfecting and sanitizing due to its corrosiveness and health hazards, but bleach is used in some schools and childcare centers. The Workgroup developed the following guidelines to prevent overexposure and misuse for those who choose to use it.

Purchasing Bleach Products and Supplies

1. Obtain bleach that is a 5.25% or 6.00% concentration of sodium hypochlorite, fragrance-free, and registered by the EPA for use as a disinfectant and or sanitizer.
2. Select a container/dispenser. A common spray-bottle size for staff use is a quart (32 oz., 946 mL). Product dispensers that provide portion control and eliminate mixing are also available.

Preparing a Fresh Bleach Dilution Daily

Solutions lose their strength after 24 hours. Anytime the odor of bleach is not present, discard the solution.

1. Put on PPE, including safety glasses and rubber, nitrile, or other nonlatex gloves as required on the label for pouring and mixing bleach.
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 (5.25% or 6.00%) to determine the proper dilution rate. Always check the product label for dilution rates and contact time for each specific product.
3. Prepare the container.
   - For a 1:10 solution, select a container that can hold a total of 10 measures.
   - Mark the container where the measurements for "9 of the 10 parts" and "1 of the 10 parts" are located (see Figures 1 and 2).

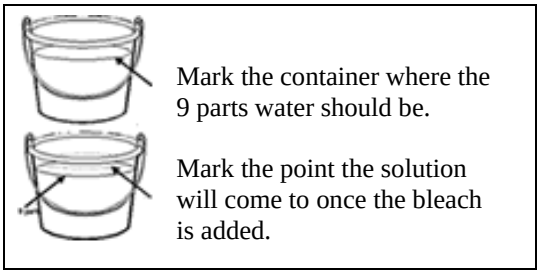

Figure 1. Containers marked for identifying portions

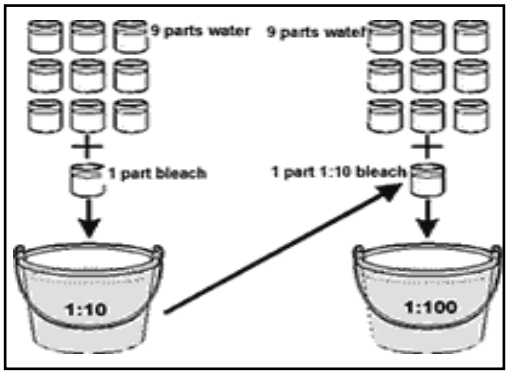

Figure 2. Sequence to prepare a solution

4. Prepare the solution. Avoid contact with eyes, skin, and clothing.
    - Fill the marked container with cool water up to the watermark.
    - Pour the bleach into the container up to the top mark.
    - Add the bleach to the water (not the water to the bleach) to reduce the release of vapors.
5. Label the dispenser bottle. Figure 3 shows the information that should be included on the dispenser bottle. The label template should be revised with each preparation date:

Name of Product: Bleach (sodium hypochlorite)

Health Hazards, Including Target Organs: Concentrate may cause severe irritation or damage to eyes and skin. Vapor or mist may irritate respiratory system. Harmful if swallowed.

Physical Hazards: Corrosive

Date Prepared:

Concentration:

Figure 3. Label Template for a Dispenser Bottle

Cleaning Up

1. Wash measuring device (if used).
2. Remove and dispose of gloves.
3. Wash hands after any direct contact with bleach.

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 dwell/contact time as specified above, or air dry. If the surface will be touched by skin, rinse after contact time is up.
    - 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.*

Storing Bleach and Bleach Solution

1. Store the diluted product and the concentrated product in a secure area inaccessible to children, where they will not spill, and below eye level to prevent them 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.
2. Diluted bleach solutions can be disposed of down the drain, but concentrated bleach must be disposed of as hazardous waste. Contact the town's Department of Public Works for hazardous waste guidance.

Sources

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Chapter 5.D. 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 change.

Work-Practice Recommendations

- *Protect workers:* Spray or squirt the product on cloths and mops whenever possible versus spraying them into the air. When the disinfectant 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 is 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 waste.
- *Allow enough time for disinfectants to react with the microbes to kill them:* Contact or kill 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.
  - Disinfectants with claims for use on food-contact surfaces must be rinsed when used in this capacity.
- *Dry:* Wipe or dry surfaces only if the product label requires this step.

Chapter 6.A. Introduction

Institutional cleaning technology has undergone rapid change over the past few years. New advances in chemical-free technology are positioning it to be one of the most environmentally friendly ways to care for public buildings while protecting the health of the users and other occupants.

One of the technologies described in this chapter—ventilation—can be designed to reduce *airborne* transmission of microbes without chemicals, whereas the three other technologies sanitize or disinfect *surfaces* without chemicals. These technologies may need to be combined with other infection-control strategies, such as personal hygiene strategies (e.g., hand washing for microbes transmitted by contact with surfaces, or cough etiquette for microbes transmitted by an airborne route).

Cleaning industry manufacturers have introduced these chemical-free cleaning devices for surface cleaning 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. Although the technology is not appropriate for all cleaning tasks, it can be successfully used as part of a Cleaning for Healthier Schools program.

Some of the surfaces for which the technology is especially appropriate are glass, mirrors, plastic, whiteboards, stone, marble, and stainless steel. It is also useful for bathroom cleaning (before disinfecting), sanitizing, routine cleaning of desks, and routine floor care.

Antimicrobial pesticides are required to be registered with the Environmental Protection Agency (EPA), and the product label must list this registration number. For antimicrobial devices, the Federal Insecticide, Fungicide, and Rodenticide Act requires registration with the EPA as a pesticide device. These registered products have an EPA establishment number rather than a registration number.

Even though the EPA considers these technologies devices, not chemicals, the product must comply with the same standards for advertising, labeling, and efficacy testing by an independent third-party organization who verifies the kill claims. A chemical-related health warning label is not required.

Benefits of Using Chemical-Free Technology

- Improved health and safety, because custodians and building occupants are exposed to fewer chemicals
- Reduced cost of purchasing, storing, and disposing of chemicals
- Ease of use
- Reduced water usage in floor scrubbers

Costs

Although the up-front cost of the devices may seem high, they can rapidly pay for themselves, as demonstrated by a pilot project at Georgia Institute of Technology. The pilot project, using handheld activated-water devices, showed that the reduction in chemical purchases enabled paying for each unit during the first 6 months of operation.[1]

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Chapter 6.B. Using Devices to Eliminate Chemical Use: Ionator, Steam Technology, and Hands-Free Technology

Introduction

The following products are now widely available and have been extensively evaluated for their efficacy. They are designed to eliminate microbes from surfaces so that contact transmission of microbes is reduced. The costs associated with these technologies range from affordable (and comparable to systems already being used) to significantly more expensive than other equipment on the market. Check with equipment vendors for details.

Equipment and Vendor	Technology	Cleaning, Sanitizing, and Disinfecting Claims and EPA Registration	Independent Research and Third-Party Certification	Comments
Activion Cleaning Solutions, LLC *Ionator HOM* – handheld device for home cleaning and sanitizing. Kills the H1N1 virus and 99.9% of other harmful bacteria in 6 seconds. *Ionator EXP* – handheld device for advanced professional cleaning and sanitizing. Certified to REMOVE greater than 99.9% of harmful bacteria through a spray-and-wipe process, and to KILL more than 99.9% of harmful bacteria through a 6-second continuous spray.	The Activeion™ technology activates and converts tap water into ionized water, through a four-step process (see Figure 1): 1. A water cell applies a slight electrical charge to the tap water. 2. The charged water passes through an ion exchange membrane, creating an oxygen-rich mixture of positive and negative nanobubbles. 3. The ionized water now attracts dirt like a magnet and lifts it from the surface, enabling it to be easily wiped away. 4. The low-level electric field created kills the germs.	Tests documented that activated-water technology can kill the H1N1 influenza A virus in 6 seconds, kills 99.9% of bacteria, including salmonella, methicillin-resistant *Staphylococcus aureus*, *Escherichia coli*, *Listeria*, vancomycin-resistant enterococci, *Pseudomonas*, and more. The Ionator HOM and Ionator EXP have EPA *establishment* numbers as sanitizing devices. Activeion is not required to have an EPA *registration* number, it is exempt as a device.	Research done by the Toxics Use Reduction Institute's (TURI) Surface Solutions Laboratory Director, Dr. Jason Marshall, found that "Activeion technology is as good or better than the traditional cleaning chemicals tested for specific applications." Activeion technology has the highest possible safety-screening profile as calculated by the TURI laboratory. Independent third-party testing verified the kill claims.	Leaves behind zero residue after use. Designed to be "quick and easy." The Ionator EXP is similar to the original Activeion Pro, but with greater germ-killing capability. The surface must be cleaned first. The Ionator can be used first for cleaning and then again for sanitizing. A chemical-related health warning label is not needed. The device must comply with the same standards for advertising, labeling, and efficacy as chemical disinfectants.

Equipment and Vendor	Technology	Cleaning, Sanitizing, and Disinfecting Claims and EPA Registration	Independent Research and Third-Party Certification	Comments
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 in any facility type.	The KaiVac No-Touch Cleaning System can be used in a chemical-free mode that reduces greater than 99.9% of targeted microbes on a surface when used as directed.	Hoosier Microbiological Laboratories, Inc. (ISO 17025 certified and accredited by the National Environmental Laboratory Accreditation Program) tested the chemical-free Kaivac process. Tests consisted of applying microbes to the target surface, applying tap water at 500 psi fan spray with the KaiVac No-Touch Cleaning machine, allowing dwell time, then vacuuming the surface. The results verified that it removed greater than 99.9% of the targeted microbes from the surface, which qualifies it as a sanitizing device.	Its versatility allows for deep cleaning of restrooms, kitchens, hallways, carpeted areas, stairwells, classrooms, gyms and fitness areas, and more. In addition, these machines accommodate a variety of accessories that enable wet or dry cleaning on hard or carpeted surfaces.

Equipment and Vendor	Technology	Cleaning, Sanitizing, and Disinfecting Claims and EPA Registration	Independent Research and Third-Party Certification	Comments
Tennant Auto Scrubbers	Uses activated-water technology, called ec-H2O™, in a line of their auto scrubbers. This is the same technology that is used in the Activeion products.	Due to the contact or dwell time requirements that the surface must remain wet to achieve sanitization or disinfection (2–10 minutes), Tennant has not pursued registration of ec-H2O because it is in contact with the flooring surface for only 2 to 3 seconds	Aspen Research Corporation in St. Paul, Minnesota, performed third-party testing. The technology has also been tested by NSF International for use in food, beverage, and drug processing locations. ec-H2O is certified by Underwriter's Laboratories (UL).	Tennant Company developed Activeion's activated-water technology (ec-H2O) and then licensed Activeion Cleaning Solutions to develop the hand sprayers. Benefits include reduced chemical and water usage, and the elimination of chemical residue on floors.
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. Creation of the nano crystals results in a micromechanical component in addition to a	Includes claims to effectively kill a broad range of microorganisms within 3 to 5 seconds, reducing surface-mediated infection risks. Classified as a disinfection device with a 3- to 5-second dwell time and is effective against a broad spectrum of microbes.	Nelson Laboratories, Inc. of Utah certified that a 7-second exposure to TANCS steam vapor produced a 5- to 7-log reduction in microbes, which was consistently achieved on all microbes tested. Test steps: 1. Microbes were grown in liquid culture or harvested from stock	Does not use chemicals, only tap water. It can penetrate deeply and quickly into nooks, crevices, and microscopic pores in surfaces. 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

Equipment and Vendor	Technology	Cleaning, Sanitizing, and Disinfecting Claims and EPA Registration	Independent Research and Third-Party Certification	Comments
	thermal one, thus enhancing the effectiveness and speed of the disinfection process. It also reduces maintenance on the boiler because scale accumulation is greatly reduced. 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.		suspensions. 2. Artificial soil was added to the culture. 3. The culture was applied to a surface. 4. Microorganisms were allowed to dry on the surface. 5. Contaminated surfaces were treated with the portable steam vapor system for various periods of time. After contact, surviving microorganisms were enumerated and percent reductions were reported.	up. Claims to eliminate biofilms and mold. It has a number of attachments for cleaning various surfaces, such as tile, carpet, and more.

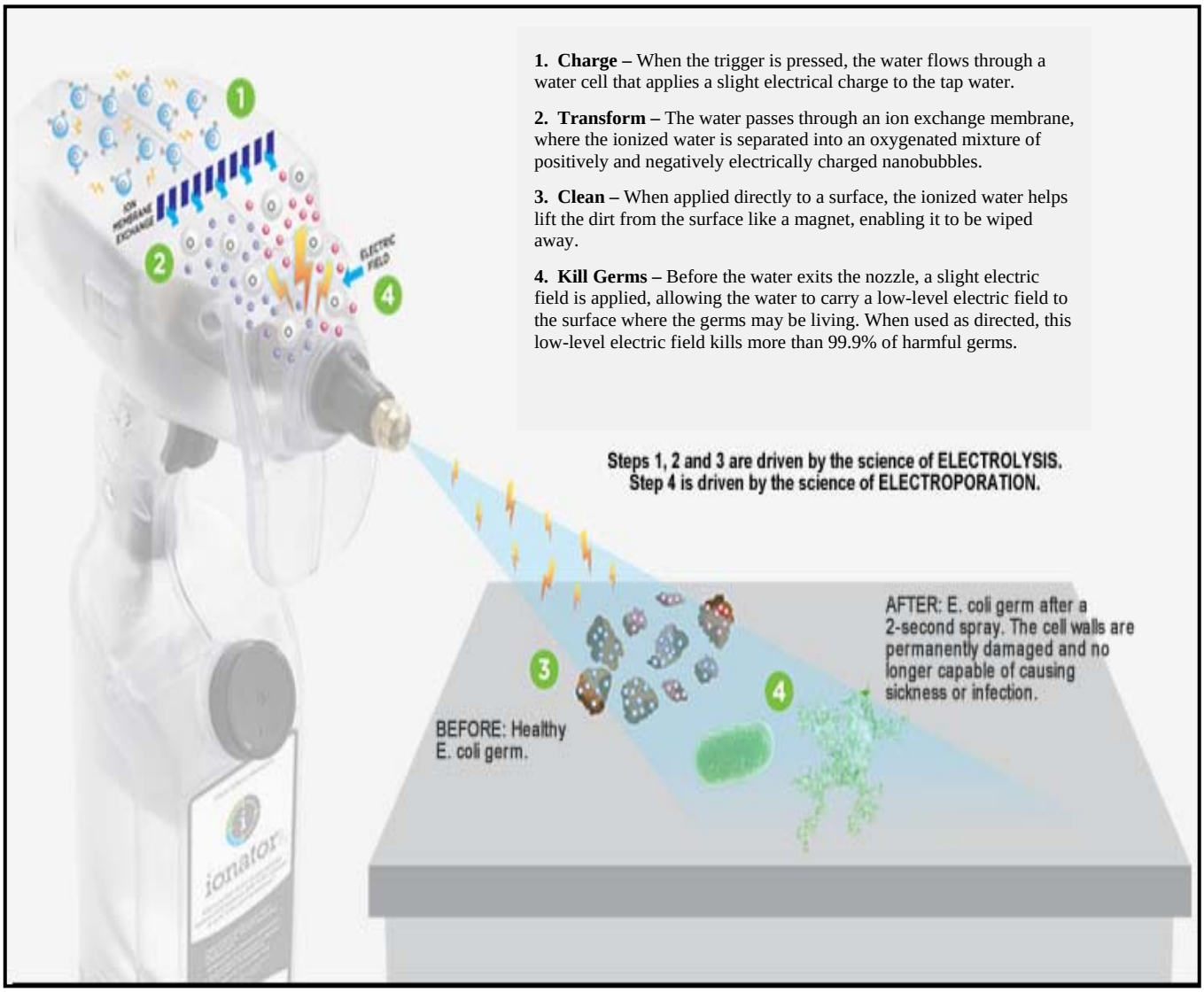

Figure 1. The science inside the Ionator. Two key scientific concepts drive the technology in the Activeion products: electrolysis and electroporation. The science of electrolysis is over 100 years old, and the science of electroporation has been around for decades. (Diagram courtesy of Activeion Cleaning Solutions, LLC., Copyright © 2010, http://www.activeion.com/science/ default.aspx.)

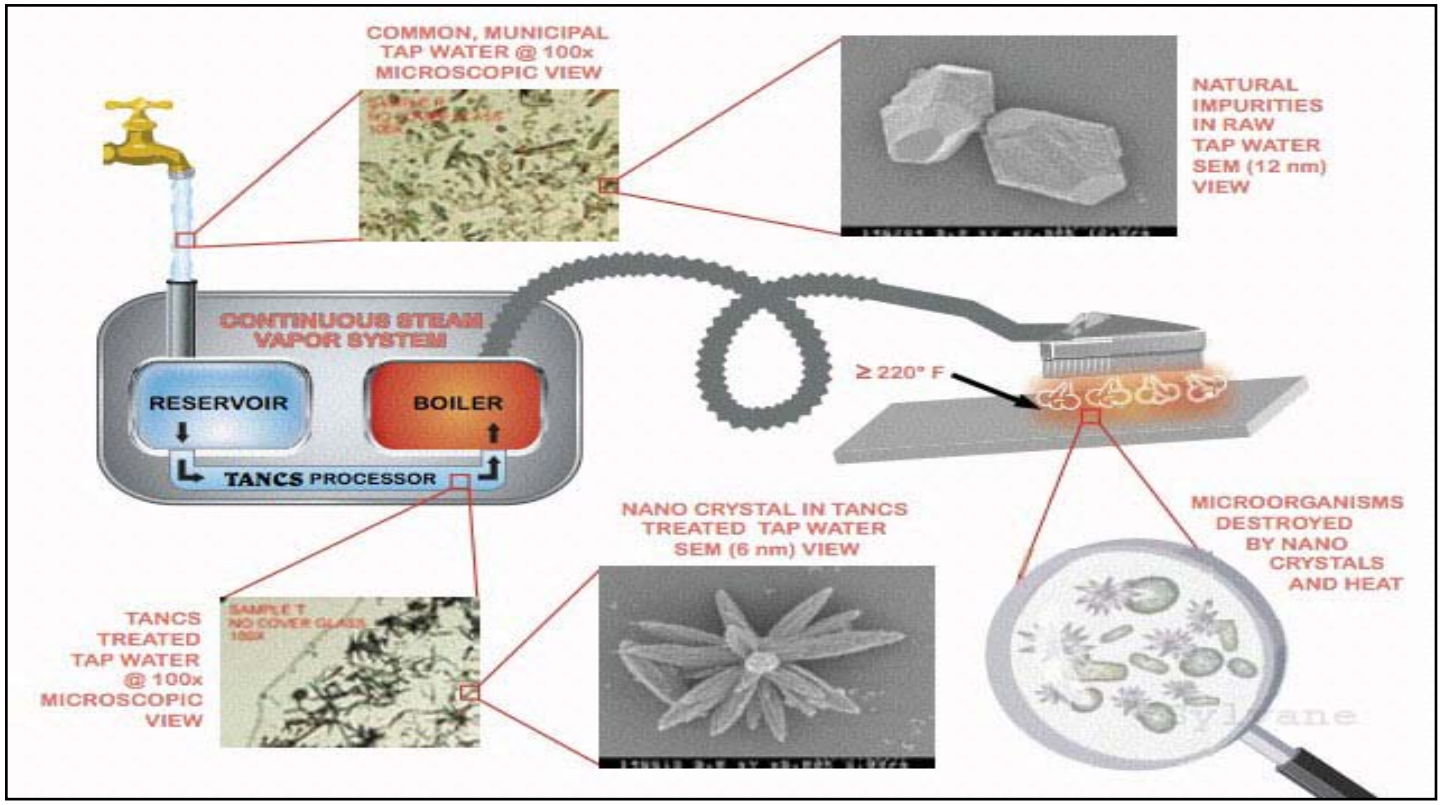

Figure 2. Thermal Accelerated Nano Crystal Sanitation Steam Vapor System. (Diagram courtesy of Sylvane, Inc., Copyright © 2010, http://www.sylvane.com/learning-center/tancs.html.)

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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.[1]

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]

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 bathrooms, 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

The University of California Davis Medical Center study[2] 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

The Sustainable Hospitals Project at the University of Massachusetts Lowell[3] 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[3] determined that because the microfiber mopping system uses less water and chemicals, it reduced the amount of water and chemicals to be handled 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 light-weight metals.
    - A typical cotton-loop mop may weigh 60 pounds when saturated with water, whereas a microfiber mop weighs less.
    - 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.

Environmental Profile

- *Composition:* Microfiber cloths and mops are currently made from petrochemicals, but can be made from recycled materials.
- *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 cotton 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 drier.
- *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. These cloths can be used by teachers to clean desktops and other classroom surfaces.
- *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, bathrooms, 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 for auto scrubbers are now available and 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.

References

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3. J. Desa, A. Bello, K. Galligan, et al, "Case Study: Are Microfiber Mops Beneficial for Hospitals?" Sustainable Hospitals Project, A Project of the Lowell Center for Sustainable Production, University of Massachusetts Lowell. 2003. Available at: http://www.sustainablehospitals.org/PDF/MicrofiberMopCS.pdf.

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

Introduction

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

Because microbes are particulate matter, this section discuss the use of two ventilation technologies appropriate for use in school buildings to remove "bioaerosols," which are biological particles suspended in the air. Air-cleaning technology is not discussed because it removes only vapors and gases (not particulates) from the air.

Ventilation Technology	How It Works	Comments
Dilution and removal of contaminated air using a general mechanical ventilation system	One of the system's roles is to exhaust a certain percentage of air from the building and to replenish that amount with fresh air. The amount of air exchange per hour can be increased for infection-control purposes.	This option enables the existing system (while it is operating) to be used as is, with air exchanges per hour increased as needed. Thus, only operating costs, not capital costs, are incurred.
Air cleaning through air filtration in general mechanical ventilation systems	The level of filtration can be increased to filter out microbes, which are microscopic.	The equipment must be designed to handle a higher-rated filter based on its fan power.

Research Findings

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.[1] In their report, the authors 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, they found that there was not enough research to specify the ventilation requirements in schools.[1]

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.[2]

Recommendations

1. Increasing air exchanges – 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.[3]

2. Increasing 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.[3]

3. Increasing 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 http://www.epa.gov/iaq/schools/pdfs/kit/checklists/ventchklstbkgd.pdf.

References

1. Y. Li, G.M. Leung, J.W. Tang, et al, "Role of ventilation in airborne transmission of infectious agents in the built environment — a multidisciplinary systematic review." *Indoor Air* 17, no.1 (2007): 2–18.

2. Environmental Protection Agency, Indoor Air Quality Tools for Schools Program, "Improved Academic Performance, Evidence from Scientific Literature." Available at: http://www.epa.gov/iaq/schools/student_performance/evidence.html.

3. Environmental Protection Agency, Indoor Air Quality (IAQ), "Residential Air Cleaners (Second Edition): A Summary of Available Information." Available at: http://www.epa.gov/iaq/pubs/residair.html.

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. Soil is a food source for pathogenic microbes, and without a food and/or water source, these organisms cannot live for long. 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" (environmentally preferable) cleaning and maintenance products, including
    - ♦ Cleaners certified by an independent third-party, such as Green Seal or EcoLogo
    - ♦ Disinfectants that carry the Environmental Protection Agency (EPA) Design for the Environment (DfE) seal on the label
    - ♦ Less-toxic alternatives that provide protection against infectious disease if no certification category exists or if no DfE-labeled disinfectants can be easily found
2. Practice state-of-the-art cleaning methods (best practices), such as
    - ♦ Green Seal GS-42 Standard for Cleaning Services (http://www.greenseal.org/certification/cleaning_services_gs_42.pdf)
    - ♦ New York State Green Cleaning Program (https://greencleaning.ny.gov/training/login.aspx)

Appendix A.1. References

1. W. Rutala, M.F. Gergen, and D.J. Weber, "Microbiologic Evaluation of Microfiber Mops for Surface Disinfection." *American Journal of Infection Control* 35, no. 9 (2007): 569–73.

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
- ☐ GS-42 Best Practices for Cleaning Services
- ☐ Vacuum entryway mats on a daily basis
- ☐ Review the Standard for other practices (http://www.greenseal.org/certification/standards/gs-42commercialcleaning.cfm)
- ☐ Monitor chemical usage

___ Cleaning chemicals for everyday use
- ☐ Third-party-certified cleaning chemicals
  - o One concentrate that is diluted for the following tasks:
    - bathroom/restroom cleaner
    - all-purpose cleaner
    - carpet spotter/extraction cleaner
    - glass & window cleaner
    - neutral floor cleaner
  - o One heavy-duty cleaning product

___ Hand soaps
- ☐ Third-party-certified foaming 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 (cfm)
- ☐ Capture 96% of particulates 0.3 microns in size

___ High-filtration floor care equipment
- ☐ Floor buffers
- ☐ Cord electric and battery burnishers

___ Microfiber cloths

___ Microfiber high-dusting tools

___ Microfiber wet mops and dry mops

___ Mop buckets or systems that separate clean and dirty water

___ 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
- ☐ Environmentally preferable disinfectant product
  - (0–1 on the Hazardous Materials Identification System health rating scale)
  - restrict use of disinfectants to predetermined high-risk areas
- ☐ Bioenzymatic cleaner for protein (urine, etc.)
- ☐ Third-party-certified floor care products
  - wax stripper
  - floor sealer and finish
- ☐ Environmentally preferable graffiti remover
- ☐ Environmentally preferable mineral build-up remover (toilets, etc.)
- ☐ Environmentally preferable whiteboard cleaner and markers
- ☐ Others

___ Training programs
- ☐ Best practices training
- ☐ Cleaning for health, safety, and appearance
- ☐ Bloodborne pathogen training
- ☐ Chemical Right to Know training
- ☐ Certified products training
- ☐ Equipment operator training
- ☐ Multilingual training for non-English-speaking work staff
- ☐ Teacher and other support staff training

___ Trash and recycling programs
- ☐ Standardized waste receptacle sizes
- ☐ Proper-size liners for receptacles
- ☐ Dedicated receptacles for recycled-product types

___ Washroom paper products
- ☐ Third-party-certified, post-consumer-waste recycled content for boxed facial tissue, toilet paper, and dispenser roll or multifold towels
- ☐ Third-party certified / sustainable forestry practices / 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 Cleaning for Healthier Schools (CfHS) Program will help schools to prepare for and respond to an infectious-disease episode. It is essential to have a Disinfection Plan in place as part of the CfHS Program infection-control protocol. If an H1N1 or other infectious-disease episode were to occur in the school, the plan would outline the appropriate steps to take, avoiding the pressure to disinfect the school by hand or to use a disinfectant bomb.

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 bacteria 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 – spread by 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, administrator).[1]
2. Implement a CfHS Program and select cleaning products certified by an independent third party such as Green Seal or EcoLogo.
3. Select the least hazardous product in its class for disinfecting. Although disinfectants are not currently evaluated by a certification program, some companies use the Hazardous Materials Identification System (HMIS) to rate their product on a spectrum from 0 to 4, with 0 being the least toxic. You can use this rating system when it is available on the product label, or a product's material safety data sheet (MSDS) to identify a low hazard rating of 0 to 1.

   You can also look for signal words:

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 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.
   a. Microfiber mops/cloths
   b. High-filtration vacuums and vacuum attachments on floor care equipment
   c. Floor care equipment with stripping pads to reduce the use of chemical floor strippers
   d. Auto scrubbers and hands-free cleaning equipment
   e. Chemical-free systems such as steam vapor devices or electrolyzed water
   f. 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.
   a. **School staff should not be allowed to bring in disinfectant products from home.**
   b. **Disinfection should be conducted by the custodial staff as part of their cleaning protocol, except in certain circumstances delineated in the policy.**
   c. It is not recommended that staff other than custodians store and use disinfectants; however, if other staff are allowed to disinfect, the school should (1) supply an approved disinfectant product in a properly labeled container, (2) train staff in its proper use and management, (3) provide recommended personal protective

equipment, and (4) 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.

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). Soil is a food source for bacteria and pathogenic microbes that can cause disease. Without a food and/or water source, these organisms cannot live. 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, the best practice is 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 dwell or kill time and then rinsed or wiped (if recommended). Because different products have different dwell times, ranging from 30 seconds to 10 minutes, the label's instructions must be checked.

Cleaning first and then applying the disinfectant for the recommended dwell 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 dwell 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.**

Appendix A: Development of Protocols

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 and disinfecting guidelines that promote cleaning; limit the use of disinfectants to bloodborne pathogens cleanup, high-risk areas, diapering areas, and food preparation surfaces where disinfection or sanitization is required.
- Write a procedure for designated staff to follow (e.g., clean first, then disinfect, leaving the product on the surface for the specified dwell 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, and so forth).
- 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. Launder cleaning cloths and mop heads/pads daily.
- 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.

Appendix A: Development of Protocols

Disinfection Protocol

1. **Select** – Identify the least toxic product that will control the targeted microbes (e.g., H1N1, methicillin-resistant *Staphylococcus aureus*). Look for an HMIS or National Fire Protection Association hazard rating of 0 to 1, found on the product's label and/or MSDS.
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).
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:
    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 dwell 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.
7. **Dwell time** – Leave the disinfectant on the surface for the required amount of dwell 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

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. A comprehensive Cleaning for Healthier Schools program
2. A disinfection strategy and protocols
3. 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 Posters at http://www.cdc.gov/flu/school/)
    - Distancing procedures – keep a 3- to 6-foot distance from others who are sneezing or coughing
    - Nonsharing practices – do not allow sharing of towels, food, drinks, or drinking cups

Expert Perspective for the H1N1 Virus

- Because H1N1 is a new type of influenza virus, we are learning about it as it develops. Check the Centers for Disease Control and Prevention Web site at http://www.cdc.gov/flu/school/ 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**. High-touch surfaces and items and high-risk areas (see later discussion) should be cleaned with the agents that are routinely used for these surfaces.[3]
- After the H1N1 influenza virus is deposited on surfaces and objects, it can survive and potentially infect a person for up to 2 to 8 hours[4] (other viruses can have a longer survival time). Therefore, by the time students and staff come to school in the morning, contaminated surfaces from the day before are longer infectious.
- Because the virus can live on a surface for only 2 to 8 hours, it is not necessary to disinfect an entire school building during an H1N1 flu outbreak. If there is any additional cleaning or disinfection necessary during an outbreak, it should be in select high-risk, high-touch areas (as defined below).
- If there is an outbreak of the H1N1 virus in your school, consult with your local 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.

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 driers
- 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
- Bathrooms, kitchens, and lunch rooms
- Nurses' offices
- 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.
- 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 pick-up by the custodial staff.

Disinfecting touch-points by custodians

1. First clean with a detergent and rinse 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 dwell time recommended on the label.
4. Rinse or wipe surfaces (if required) after dwell 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.

Disinfecting in the classroom by teachers

If the school's disinfection policy includes the use of disinfectant products by teachers or other staff, the following guidelines apply:

1. Do not ask students to use disinfectant products. 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 hormone disruptors. Use disinfectant products only after students have left the building.
2. 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 MSDS. Provide copies of the MSDS in case of an accident in the classroom.
3. Use only nonscented disinfectant products because scented products can trigger asthma and allergy episodes.
4. Provide chemically resistant gloves as specified on the product's MSDS 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 MSDS to determine how to safely store the disinfectant.

Appendix A.3. References

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2. International Federation of Infection Control, 2007. "Basics Concepts of Infection Control." Available at: http://www.theific.org/basic_concepts/index.htm.

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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
Infectious or Physically Dangerous Medical or Biological Waste: <u>Blood and blood products</u>: • Discarded bulk human blood and blood products in liquid state • Body fluids contaminated with visible blood • Materials saturated/dripping with blood <u>Waste that because of its characteristics may</u>: 1. Cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness 2. Pose a substantial potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed	Massachusetts Department of Public Health State Sanitary Code Title VIII 105 CMR 480.000 For information about California regulations, see *Notes*[a]
Physically Dangerous Medical or Biological Waste: 1. Sharps • Blood and blood products 2. Pathological wastes; cultures and stocks of infectious agents and associated biologicals; contaminated animal carcasses; contaminated bedding	Massachusetts Department of Environmental Protection 310 CMR 19.000 For information about California regulations, see *Notes*[b]
Special Waste: • Solid waste that is not hazardous waste pursuant to 310 CMR 30.000 and that exists in such quantity or a state that management controls are required to prevent an adverse impact from its collection, transport, transfer, storage, processing, treatment or disposal	Massachusetts Department of Public Health State Sanitary Code Title VIII 105 CMR 480.000
Hazardous Waste: • There are two ways a waste may be identified as hazardous: it may be	Massachusetts Department of

Definition of Waste	**Agency/Regulation**
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. 3. *Ignitable* – easily catches fire, flash point 140° F 4. *Corrosive* – easily corrodes materials or human tissue, very acidic or alkaline, pH ≤2 or ≥12.5 5. *Reactive* – explosive; produces toxic gases when mixed with water or acid) *6.* *Toxic* – can leach toxic chemicals as determined by a special laboratory test; toxic to humans and wildlife	Environmental Protection 310 CMR 30.000 For information about California regulations, see *Notes*[c]

Notes:

Information about California's Medical Waste Laws, Regulations, and Standards can be accessed at http://www.cdph.ca.gov/certlic/medicalwaste/Pages/LawsRegs.aspx.

[a]The Medical Waste Management Act (California Health and Safety Code, Sections 117600–118360) governs the management of medical waste in all jurisdictions of the state (http://www.cdph.ca.gov/certlic/medicalwaste/Documents/MedicalWaste/MedicalWasteManagementAct.pdf). This Act is overseen by the California Department of Public Health Medical Waste Management Program (http://www.cdph.ca.gov/certlic/medicalwaste/Pages/default.aspx).

[b]Enforcement of the Bloodborne Pathogen Standard in California is the responsibility of the California Occupational Safety and Health Administration. It is found in CCR Title 8, Section 5193 (http://www.cdph.ca.gov/certlic/medicalwaste/Documents/MedicalWaste/BloodbornePathogensStd.pdf).

Information about hazardous waste management in California can be accessed at the California Department of Toxic Substances Control at http://www.dtsc.ca.gov/ HazardousWaste/index.cfm.

Appendix A.5. Understanding Hand Hygiene

Introduction

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

Best Practice

The Centers for Disease Control and Prevention recommends hand washing to effectively prevent transmission of infection.[1] Best practice is to vigorously wash hands with liquid soap and water for 15 to 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.

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* **–** Two of the most commonly used ingredients in antibacterial soaps are triclosan and triclocarban. An increasing number of studies show that these ingredients can be harmful to hormone development in humans and to other organisms in the environment.[2] In 2005, a federal drug advisory panel concluded that for general use, **antibacterial soaps are no more effective than regular plain soap at removing germs**.[3] This conclusion was confirmed by a literature review of 27 publications on this topic conducted by Aiello and colleagues.[4] There is no benefit in using antibacterial soaps in settings other than health care.
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 necessarily been tested for daily use with children or other sensitive populations. Some QACs have been associated with asthma and with fertility problems in mice.[5–8] If a hand sanitizer is needed and hand washing is not an option, a nonscented, 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?

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."[9]

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?

Alcohol-based products pose several safety hazards. One concern is that children in some schools have ingested these hand sanitizers. According to the Iowa Statewide Poison Control Center, a single swallow of ethanol-based hand sanitizer could produce a blood alcohol level high enough to create ethanol intoxication symptoms in a 2-year-old child weighing 27 pounds.[10]

Another concern is the flammability of alcohol-based hand sanitizers. These products pose a fire and explosion hazard. The wall units containing the alcohol sanitizer are referred to as "bombs on the wall," and fire departments have concerns about having these incendiary products located and dispensed throughout school buildings.[11]

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, a nonscented, 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.

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.[12]

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 EcoLogo's newly developed Instant Hand Antiseptic Products standard.[13] If these are not readily available, look for products that do not contain added fragrances and that use bio-based ingredients.

Many products do not contain triclosan or triclocarban, including Cleanwell Botanical Hand Sanitizer, Purell Instant Hand Sanitizer, Dr. Bronner's Magic Soaps, and products made by Nature's

Gate, Vermont Country, Naked Soap Works, MiEssence, Ivory, Paul's Organic, Tom's of Maine, and others.[14]

How can antibacterial chemicals be avoided?

When shopping, read the labels and avoid purchasing antibacterial soaps, which contain triclosan, triclocarban, and/or QACs. To assist consumers in avoiding antibacterial chemicals, the following resources provide information, such as ingredients and safety ratings, on many products.

- Beyond Pesticides Triclosan Campaign (http://www.beyondpesticides.org/antibacterial/triclosan.htm)
- Skin Deep: Cosmetic Safety Database (http://www.cosmeticsdatabase.com)
- The Good Guide (http://www.goodguide.com/)

References:

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Appendix B: Selection of Products, Dispensing Equipment, and Application Systems

Appendix B.1. Green Product Certification and Labeling: Quick Reference

Introduction

An initiative by the U.S. Environmental Protection Agency (EPA) Office of Pesticide Programs (OPP) is underway to screen and certify disinfectants according to health and safety criteria. Although the EPA currently prohibits any type of green labeling on disinfectant products, Green Seal is developing a standard that will include disinfectants in case of future policy changes.

Pilot Project of the Design for the Environment/Office of Pesticide Programs

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 a limited pilot project that would allow for the identification and labeling of the least-toxic disinfection products currently on the market. All of 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 http://www.epa.gov/dfeprojects/gfcp/.

Label Award

When a product is identified as having met the criteria for the program, it will be allowed to display a DfE logo, with reference to the OPP Web site (www.epa.gov/pesticides/dfepilot). Products will be listed on this site after they are approved.

Ingredients Approved

Preliminary information from the pilot program has identified the following active ingredients as being the least toxic in specific formulations:

Accelerated hydrogen peroxide

Lactic acid

Citric acid

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: Selection of Products, Dispensing Equipment, and Application Systems

DfE logo

Look for the following DfE logo on approved products:

Appendix B.2. Interpreting the Disinfectant Label: Explanation and Examples

Introduction

This document 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 document 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; 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 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.

- *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 maybe 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 wetable 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 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 material safety data sheet (MSDS) 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.
- Wash thoroughly with soap and water after handling.
- Avoid breathing vapor or spray mist.
- Avoid contact with eyes.

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 (http://oaspub.epa.gov/pestlabl/ppls.home).
- For regulating antimicrobial disinfectants, visit http://www.epa.gov/oppad001/index.htm.
- For non-EPA antimicrobial information links, visit http://www.epa.gov/oppad001/ otherlinks.htm.
- For the National Pesticide Information Center, visit http://npic.orst.edu/.

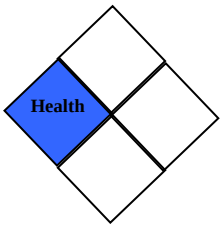
Sources

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 http://edis.ifas.ufl.edu. 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 fact sheet also utilized information from the EPA Label Review Manual (http://www.epa.gov/oppfead1/labeling/lrm/).

Appendix B.3. Interpreting Information from Hazardous Materials Rating Systems: National Fire Protection Association and Hazardous Materials Information System

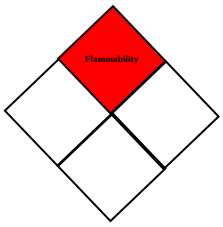
Note: This document provides a detailed explanation of the National Fire Protection Association (NFPA) and the Hazardous Materials Information System (HMIS). It complements *Chapter 4.E. Using Information from Hazardous Materials Rating Systems for Product Selection.*

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.



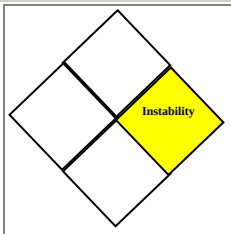
■	Health
	Flammability
	Physical Hazard
	PPE

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



	Health
■	Flammability
	Physical Hazard
	PPE

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:

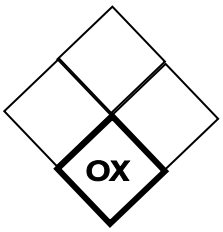
- Water reactives
- Organic peroxides
- Explosives
- Compressed gases
- Pyrophoric materials
- Oxidizers
- Unstable reactives

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

Appendix B: Selection of Products, Dispensing Equipment, and Application Systems

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.4. Environmental Protection Agency Toxicity Categories for Precautionary Statements*

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)

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.

Appendix B: Selection of Products, Dispensing Equipment, and Application Systems

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.

**From* U.S. Environmental Protection Agency, Label Review Manual, "Chapter 7: Precautionary Statements." Available at: http://www.epa.gov/oppfead1/labeling/lrm/ chap-07.pdf.

Appendix B.5. Selecting Disinfectants for Hard Surfaces: Checklist

Introduction

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 ❒ *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 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 nonstaining?	❒ 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 required dwell time?	❒ yes ❒ no	
EPA Toxicity	**Signal word** / **Category** / **On the Basis of**		

Appendix B: Selection of Products, Dispensing Equipment, and Application Systems

<table>
<tr><th>Criteria</th><th colspan="3">Product-Specific Information</th><th>Findings</th><th>Comments</th></tr>
<tr><td rowspan="6">Categories
Select the least hazardous product for the job</td><td>DANGER – POISON (skull & crossbones)</td><td>I</td><td>Oral, dermal, or inhalation toxicity</td><td>❒ yes ❒ no</td><td rowspan="6"></td></tr>
<tr><td>DANGER</td><td>I</td><td>Skin or eye irritation or dermal sensitization</td><td>❒ yes ❒ no</td></tr>
<tr><td>WARNING</td><td>II</td><td rowspan="3">The results of all required acute toxicity studies</td><td>❒ yes ❒ no</td></tr>
<tr><td>CAUTION</td><td>III</td><td>❒ yes ❒ no</td></tr>
<tr><td>CAUTION</td><td>IV</td><td>❒ yes ❒ no</td></tr>
<tr><td rowspan="4">Health Hazards to Humans and Animals</td><td colspan="3">❒ Does the label list any health hazards for people?</td><td>❒ yes ❒ no</td><td></td></tr>
<tr><td colspan="3">❒ Does the label list health hazards for women who are pregnant or of childbearing age?</td><td>❒ yes ❒ no</td><td></td></tr>
<tr><td colspan="3">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</td><td>❒ yes ❒ no</td><td></td></tr>
<tr><td colspan="3">❒ Will use of the product make certain health conditions (e.g., asthma) worse?</td><td>❒ yes ❒ no</td><td></td></tr>
<tr><td rowspan="3">Personal Protective Equipment (PPE)</td><td colspan="3">For each use of product, check off the type(s) of PPE required on the label:
 
❒ Protective Apron ❒ Vapor Respirator ❒ Boots ❒ Splash Goggles ❒ Gloves
Glove type:</td><td></td><td></td></tr>
<tr><td colspan="3">❒ Do staff members have access to PPE every time the product is used?</td><td>❒ yes ❒ no</td><td></td></tr>
<tr><td colspan="3">❒ Is the PPE reusable or affordable?</td><td>❒ yes ❒ no</td><td></td></tr>
</table>

Appendix C.1. Sample Policy: 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 disinfectant 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 only to use 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 Know Law. Right to Know 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 material safety data sheet (MSDS) 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 MSDS 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.

Appendix C.2. Sample Protocol Poster: Cleaning Surfaces for Infection Control for School Custodians

Introduction

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) and other flu types and germs. Best practice is to clean 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. Unless specified, the following surfaces need to be cleaned only. The cleaning products recommended have been independently third-party certified by Green Seal and/or EcoLogo.

	**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. During outbreak of gastrointestinal illnesses or flu: Clean in between uses or after each group session.
	**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: School Nurse

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 material 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 whenever possible instead of spraying into the air to prevent exposing yourself and building occupants.
    - 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: Resources

Appendix D.1. Organizations

Organization	Contact Information	Mission	Activities	Resources
Childcare				
California Childcare Health Program	1950 Addison St., Suite 107 Berkeley, CA 94704 Tel: (510) 204-0930 Fax: (510) 204-0931 Healthline: (800) 333-3212 (California only) www.ucsfchildcarehealth.org	Improve the quality of childcare by initiating and strengthening linkages between the health, safety, and childcare communities and the families they serve	Healthline Research Public policy	Fact sheets Survival tips poster Training curricula (Prevention of Infectious Disease and Asthma Information) Newsletter Health and safety checklists
Green Cleaning/Cleaning for Health				
Grassroots Environmental Education	52 Main Street Port Washington, NY 11050 Telephone: 516.883.0887 http://www.grassrootsinfo.org/	Founded in 2000 with a mission to educate the public about the links between common environmental exposures and human health, and to empower individuals to act as catalysts for change within their own communities.	Green Cleaning Turf Pesticides Diesel Exhaust	ChildSafe Schools Program, includes the ChildSafe Guidelines for cleaning products and the Approved Products list. Available at: http://www.grassrootsinfo.org/cslist10-11.html.
Green Schools Initiative Based in California, they collaborate with and support organizations and individuals in other states and nationally	c/o Earth Island Institute, Suite 460 The Brower Center 2150 Allston Way Berkeley, CA 94704 Tel: (510) 525-1026 www.greenschools.net	Founded in 2004 by parent environmentalists to improve the environmental health and ecological sustainability of schools by: Eliminating toxics Using resources sustainably Creating green spaces and buildings Serving healthy food Teaching stewardship	Green School Buying Guide	"Efficacy of Asthma-Safe Disinfectants" chart by Green Schools Initiative and Green Purchasing Institute assists with selection of disinfectants and contains a list of "asthma-safe" disinfectants based on a review of products that do not contain bleach, quaternary ammonium compounds, pine oil, or ortho-phenylphenol. Tools to purchase less toxic disinfectants and cleaners Sample policies and bid criteria Survey and evaluation tools Training

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Healthy Schools Campaign (HSC)	Tel: (888) HSC-1810 info@healthyschoolscampaign.org http://www.healthyschoolscampaign.org/publications/green cleaning/	Encourage schools to adopt environmentally friendly policies, practices, and products	Green Clean Schools is the HSC's national partnership to promote 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 for school administrators and design professionals on the "whys" and "how tos" of healthy, high-performing school construction and renovation Training and resources to improve indoor air quality in schools
Informed Green Solutions, Inc.	Carol Westinghouse Tel: (802) 626-8643 westies@ecoisp.com http://www.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"
National Collaborative Workgroup on Green Cleaning and Chemical Policy Reform in Schools	http://www.cleaningforhealthyschools.org/	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 nysogsesu@ogs.state.ny.us	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	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

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		the environment without sacrificing product effectiveness		
Infection Control				
Healthcare Without Harm Hospitals for a Healthy Environment (H2E)	1901 N. Moore St., Suite 509 Arlington, VA 22209 Tel: (703) 243-0056 http://noharm.org/all_regions/issues/toxins/cleaners_pesticides/ http://www.practicegreenhealth.org/	With international partners, share a vision of a health care sector that does no harm and that promotes the health of people and the environment	Implements ecologically sound and healthy alternatives to health care practices that pollute the environment and contribute to disease	"Waste Reduction Guide for Hospitals" "EPP How-To Guide for Hospitals" "Green Guide for Health Care" "Cleaning Chemical Use in Hospitals" fact sheet "Going Green: A Resource for P2 in Hospitals"
Laboratories				
Surface Solutions Laboratory, Toxics Use Reduction Institute (TURI)	TURI/University of Massachusetts Lowell One University Ave. Lowell, MA 01854-2866 Tel: (978) 934-3275 http://www.turi.org/toxics_use_home	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
Toxics Use Reduction Institute (TURI)	TURI/University of Massachusetts Lowell Wannalancet Mills 600 Suffolk Street Lowell, MA 01854 Tel: (978) 934-3275 http://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

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Organization	Contact Information	Mission	Activities	Resources
Purchasing				
Center for New American Dream **The Responsible Purchasing Network (RPN)**	6930 Carroll Ave., Suite 900 Takoma Park, MD 20912 Tel: (301) 891-3683 (877) 68-DREAM newdream@newdream.org http://www.newdream.org/	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® A partnership between GreenBlue®, the U.S. Environmental Protection Agency, and industry Developed by GreenBlue, a nonprofit institute	www.cleangredients.org/home	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	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
Massachusetts Operational Services Division (OSD) Environmentally Preferable Products (EPPs) Program	Marcia Deegler, Director of Environmental Purchasing, Operational Services Division 1 Ashburton Place, Room 1017, Boston, MA 02108-1552 Tel: (617) 720-3356 marcia.deegler@osd.state.ma.us www.mass.gov/epp	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	FAC59 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

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Organization	Contact Information	Mission	Activities	Resources
				purchasing products Benefits of EPPs EPP contracts Resources, guides, reports, tools, case studies, and EPP events
Training				
Northeastern University School Health Institute	School Health Institute, Northeastern University College of Professional Studies www.cps.neu.edu/shi	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

Appendix D.2. National Cleaning for Healthier Schools and Infection Control Workgroup Contact List

Organization	Contact Person	Contact Information	Related Work	Resources
Massachusetts				
Occupational Health Surveillance Program, MA Department of Public Health	Elise Pechter, Industrial Hygienist	Elise.Pechter@ state.ma.us Tel: (617) 624-5681 250 Washington St. Boston, MA 02108	Promotes environmentally preferable products (EPPs) in schools Provides information on occupational impacts of using disinfectants Provides training Conducts surveillance of work-related asthma Conducts training for health care providers on assessment of work-related diseases and hazards Assists in developing environmentally preferable standards	www.mass.gov/dph/workrelatedasthma Cleaning products and asthma brochure Occupational Lung Disease Bulletin
MA Department of Public Health	Barbara Mackey, School Infection Control Coordinator	Barbara.mackey@ state.ma.us Center for Community Health 250 Washington St. Boston, MA 02108	Develops materials and implements and supports school health education and services Builds relationships with community-based and statewide organizations concerned with child and school health issues to promote and support the roles of schools in achieving priority health outcomes Provides professional development training The School Health Index (SHI): A self assessment and planning guide for improving the school health environment. Maintains list-serve	http://www.mass.gov/?pageID=eohhs2subtopic&L=6&L0=Home&L1=Provider&L2=Guidelines+and+Resources&L3=Guidelines+for+Services+%26+Planning&L4=School+Health&L5=Coordinated+School+Health&sid=Eeohhs2 Newsletter
Workplace Safety and Health Program, MA Division of Occupational Safety	Maxine Garbo, Occupa-tional Health Nurse	maxine.garbo@ state.ma.us 1001 Watertown St. West Newton, MA 02465-2148 Tel: (617) 969-7177	Provides training and guidelines on OSHA Bloodborne Pathogen Standard as applied to public-sector workplaces, such as schools and fire and police departments	http://www.mass.gov/?pageID=elwdagencylanding&L=4&L0=Home&L1=Government&L2=Departments+and+Divisions+%28EOLWD%29&L3=Division+of+Occupational+Safety&sid=Elwd

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Organization	Contact Person	Contact Information	Related Work	Resources
MA Division of Occupational Safety	Mary Dozois, Industrial Hygienist	mary.dozois@ state.ma.us 1001 Watertown St. 2nd Floor West Newton, MA 02465-2148 Tel: (617) 969-7177	Offers OSHA On-site Consultation Program for small businesses	http://www.mass.gov/?pageID=elwdsubtopic&L=4&L0=Home&L1=Businesses&L2=Occupational+Safety+and+Health+Programs&L3=On-site+Consultation+Program&sid=Elwd
MA Nurses Association	Thomas Fuller, Representa-tive MNA Illinois State University Program Director/Assistant Professor, Environ-mental Health, Health Sciences Department	tpfuller@aol.com Tel: (309) 438-5142	Promotes the use of EPPs in health care	http://www.massnurses.org/ http://healthsciences.illinoisstate.edu/environmental_health
Surface Solutions Laboratory, Toxics Use Reduction Institute	Jason Marshall, Director	Jason_Marshall@ uml.edu UMass Lowell One University Ave. Lowell, MA 01854-2866 Tel: (978) 934-3249	Conducts performance analysis of products Fact Sheet: 10 Ways to Find Safer Cleaners	www.cleanersolutions.org
Community Program, Toxics Use Reduction Institute	Joy Onash, Community Program Coordinator	joy@turi.org UMass Lowell 600 Suffolk St.	Provides funding for toxic use reduction projects and information on past funded projects and other resources on the Web	www.turi.org

Organization	Contact Person	Contact Information	Related Work	Resources
		Wannalancit Mills, 5th Floor Lowell, MA 01854 Tel: (978) 934-4343	Library provides information on all toxic use reduction strategies, such as alternative processes, process modernization, product alternatives, and housekeeping Provides training	
Harvard School of Public Health	Anila Bello, Research Fellow	abello@hsph.harvard.edu 401 Park Drive Landmark Center West, 404 Boston, MA 02215 Tel: (617) 489-7093	Provides postdoctoral research at Harvard University, Department of Environmental Health degree program, Exposure, Epidemiology, and Risk	
Massachusetts Coalition for Occupational Safety and Health (MassCOSH)	Tolle Graham, Labor and Environment Coordinator, Healthy School Network Coordinator, MA Asthma Advocacy Action Partnership Healthy Schools Chair	tolle.graham@masscosh.org 1532B Dorchester Ave. Dorchester, MA 02122 Tel: (617) 825-SAFE (7233) ext. 19	Assists school staff in developing health and safety committees and school policies to address indoor air quality (IAQ) and environmental conditions using the Environmental Protection Agency (EPA) IAQ Tools For Schools model Works with residents, community groups, and unions to promote healthy and safe work environments in Massachusetts through advocacy, policy, training, and technical assistance Assists in developing environmentally preferable standards	http://www.masscosh.org
National Cleaning for Healthier Schools and Infection Control Workgroup	Lynn Rose, Consultant and Workgroup Coordinator	lynnfaith@comcast.net 3 McClelland Farm Rd. Deerfield, MA 01342 Tel: (413) 774-6540	Consults for MA Facilities Administrators Association, City of Springfield, Newton Public Schools, Worcester Public Schools, and Pioneer Valley Asthma Coalition Provides information on EPPs for facilities management of schools, departments of public works, and public buildings; Environmental Management Systems in schools; Pollution Prevention and Toxics Use Reduction	MA Statewide Contracts for Healthier Schools: How to Use MA Contracts for Pollution Prevention in Schools MassDEP School Chemical Management Guide

Organization	Contact Person	Contact Information	Related Work	Resources
			Provides research, technical assistance, training, and program and document development Leadership in Energy and Environmental Design (LEED) green cleaning	
Connecticut				
Center for Indoor Environments and Health, University of Connecticut Health Center	Nancy Simcox, Research Industrial Hygienist	simcox@uchc.edu 270 Farmington Ave. MC 6210 Farmington, CT 06030-6210 Tel: (860) 679-4634	Trains custodians on green cleaning products Conducts workplace site visits in support of clinical care of patients Manages a National Institute for Occupational Safety and Health (NIOSH)-funded green cleaning research study of custodians working in Connectitcut state institutions Collaborates with physicians, scientists, and workers to develop exposure assessment protocols for research	NIOSH study: http://oehc.uchc.edu/greencleaning.asp Tools for Schools: http://www.csiert.tfsiaq.com/index.html UCHC Occupational and Environmental Health Center: http://www.oehc.uchc.edu/
Division of Occupational and Environmental Medicine, University of Connecticut Health Center	Anne Bracker, Industrial Hygienist	bracker@nso.uchc.edu 270 Farmington Ave. MC 6210 Farmington, CT 06030-6210 Tel: (860) 679-2369	Develops documents and tools for schools to minimize exposures to hazardous products Provides consultation and training for the Division's physicians and area employers and labor unions	

Organization	Contact Person	Contact Information	Related Work	Resources
California				
Occupational Health Branch, CA Department of Public Health Work-Related Asthma Prevention Program (WRAPP) Occupational Pesticide Illness Prevention Program (OPIPP)	Justine Weinberg, Industrial Hygienist, Research Scientist	Justine.Weinberg@cdph.ca.gov 850 Marina Bay Pkwy, Bldg. P, 3rd Floor Richmond, CA 94804 Tel: (510) 620-5771	WRAPP: Collects data to identify industries, occupations, and exposures that put workers at risk for work-related asthma. Works with agencies and organizations to help develop and promote the use of safer alternatives to conventional cleaning products and disinfectants. Cleaning for Asthma-Safe Schools (CLASS): WRAPP project that works with school districts to help promote and transition to safer products that do not cause asthma or other health effects OPIPP: Collects and examines reports of suspected work-related illness due to pesticides (including disinfectants) to learn more about occupational pesticide poisoning and how to prevent it	WRAPP: http://www.cdph.ca.gov/programs/ohsep/Pages/Asthma.aspx CLASS: http://www.californiabreathing.org/index.php?option=com_content&task=view&id=42&Itemid=56 OPIPP: http://www.cdph.ca.gov/programs/ohsep/Pages/Pesticide.aspx
Occupational Health Branch, CA Department of Public Health Work-Related Asthma Prevention Program	Jennifer Flattery, Research Scientist	Jennifer.Flattery@cdph.ca.gov 850 Marina Bay Pkwy, Bldg P, 3rd Floor Richmond, CA 94804 Tel: (510) 620-5765	See above information for WRAPP Assists in developing environmentally preferable standards	See above
CA Childcare Health Program, University of California San Francisco	Victoria Leonard, Childcare Health Consultant and Healthline Nurse	vleonard@ucsfchildcarehealth.org 1950 Addison St., Suite 107 Berkeley, CA 94704 Tel: (510) 204-0935	Provides technical assistance and training on health and safety to childcare providers and parents throughout the state (funded by the CA Department of Education for more than 15 years) Conducts training for health care providers to become childcare health consultants; trains childcare providers to become childcare health advocates Provides integrated pest management (IPM) curriculum	www.ucsfchildcarehealth.org Healthline: (800) 333-3212 Materials on the Web site may be downloaded for free and most are available in Spanish

Organization	Contact Person	Contact Information	Related Work	Resources
			for the childcare community (funded by the Department of Pesticide Regulation) Provides a toll-free healthline for any provider or parent in California to call for advice on a health/safety issue Provides curricula for providers on asthma, injury prevention, oral health, and lead poisoning prevention	
CA Childcare Health Program, University of California San Francisco	Bobbie Rose, Childcare Health Consultant and Advice Nurse	brose@ucsfchildcarehealth.org Tel: (510) 204-0934	See above	See above

Organization	Contact Person	Contact Information	Related Work	Related Resources
National				
Prevention and Response Branch, Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention	Lynne Sehulster, Environ-mental Micro-biologist	lynne.sehulster@cdc.hhs.gov 1600 Clifton Rd. NE Mailstop A-35 Atlanta, GA 30333 Tel: (404) 639-2314	Focuses on environmental microbiology and transmission of infectious diseases	http://www.cdc.gov/ http://www.cdc.gov/flu/school/index.htm
Antimicrobials Division, Office of Pesticide Programs, EPA	Marcie Tidd, Micro-biologist US EPA, Anti-microbials Division, Office of Pesticide Programs	tidd.marcie@epa.gov Tel: (703) 308-0173	Provides information on the nature and data requirements of EPA-registered antimicrobial products	http://www.epa.gov/oppad001/ad_info.htm Antimicrobial Hotline: (703) 308-0127 (703) 308-6467 (Fax) 9am – 4pm ET (M–F)
Informed Green Solutions, Inc.	Carol Westing-house, President	westies@ecoisp.com PO Box 60 East Burke, VT 05832 Tel: (802) 626-8643	Developed and manages Cleaning for Health/Cleaning for Healthier Schools Program; program manager of Cleaning for Healthy Child Care Centers; service provider of Tools for Schools; and consultant for LEED green cleaning Provides technical assistance and green cleaning awareness training	www.informedgreensolutions.org Cleaning for Health/Cleaning for Healthier Schools fact sheets