



SAN MATEO COUNTY HEALTH SYSTEM

Environmental Control Measures, Cleaning and Disinfection

Routine cleaning uses detergents or abrasive cleaners and rinsing with water to remove from surfaces, lumens and objects. Disinfection is the process that eliminates many or all pathogenic organisms from inanimate objects. The disinfection process should always begin with cleaning.

The basic recommendations for choosing and using a disinfectant include:

1. Use only products that are registered with the US Environmental Protection Agency (EPA).
2. Follow the instructions on the manufacturer's label for correct use.

Sanitizing surfaces involves spraying or wiping the surface with the desired disinfectant and leaving the disinfectant on the surface WITHOUT wiping the surface dry. The disinfectant should be allowed to air dry and remain on the surface for the recommended time frame. Dipping methods for disinfecting objects are typically performed by immersing objects in an approved disinfectant and allowing them to air dry.

Routine cleaning and disinfection should be performed in all areas of a facility; the frequency of these actions could be increased when:

1. There are outbreaks of illness.
2. There is a known contamination within the facility.
3. There is visible soil, blood or other body fluids.
4. The Health Department makes specific recommendations to control infectious diseases.

In general, horizontal surfaces should be cleaned routinely because of the risk for contamination from respiratory secretions, and based on the frequency of contact. Walls, ceilings, floors, furniture, and equipment should be maintained in good repair, free from visible soil and in a clean condition. If surfaces are used for more than one purpose, for example, for meals and for projects, then the frequency of cleaning and disinfection should reflect the frequency of use. Carpets, porous fabrics and other surfaces that could trap soil should not be used in areas where surfaces need to be cleaned and disinfected frequently.

Other recommendations for surface disinfection include:

1. Use EPA-registered disinfectants in accordance with the manufacturer's instructions.

2. Do not use toxic or high-level disinfectants on common surfaces or non-critical items.
3. If no specific instructions exist for the use of a particular disinfectant, some general guidelines to follow are:
 - Clean non-critical items with a detergent or low level disinfectant.
 - Do not use alcohol-based disinfectants on large surface areas.
 - Use barrier protection on non-critical surfaces that are touched frequently and are likely to become contaminated with body fluids, or on areas that are difficult to clean, such as computer keyboards.
 - Keep surfaces such as floors, walls and table tops visibly clean and clean up spills to these areas in a timely manner.
 - Detergents are sufficient for cleaning surfaces in administrative areas, such as offices and reception areas.
 - Clean and disinfect surfaces that are touched with high frequency more regularly and as indicated above for special circumstances, such as identification of a specific infectious disease, or in an outbreak circumstance.
 - Walls, blinds, and window curtains in patient or resident care areas should be cleaned when they are visibly dusty and/or soiled.
 - Cleaning and disinfection methods that involve mists, aerosols or fogging methods should be avoided in patient/resident care areas, especially when clients are present.
 - Appropriate dusting methods include wet-dusting (apply the cleaner or disinfectant directly to the cloth) horizontal surfaces daily, and avoiding dusting methods that could disperse dust, such as feather dusting.

Spills of body fluids should be addressed by promptly cleaning and disinfecting the affected area. The proper procedure for disinfection of body fluid on surfaces or carpets includes:

1. Use of gloves and other indicated personal protective equipment (PPE).
2. If large amounts of body fluids are contained in the spill, first clean up the spill with absorbent, disposable towels, place the used materials in an appropriately labeled bag or container, disinfect the area with an approved disinfectant, and allow the area to dry completely.
3. A chlorine (bleach) solution can be used to disinfect body fluid spill sites: After cleaning the site of visibly infectious material, use a 1:100 bleach to water dilution [½ teaspoon bleach in ½ cup water; or 2 ½ tablespoons bleach in 1 gallon water].

Other cleaning and disinfection issues in facilities:

Use of carpeting in high traffic areas, or in areas where spills are likely is not recommended; however, to manage spills on carpeting, address the spill promptly with spot cleaning. If carpets have to be used, carpet tiles are an appropriate

alternative, since they can be replaced if soiled with body fluids. Carpeting should always be dried thoroughly to avoid fungal growth. Carpets that remain wet for longer than 72 hours should probably be replaced. Furniture should be maintained in good repair. Upholstered furniture is recommended, since the upholstery can be removed for cleaning and/or replacement flowers and plants should be maintained by persons not directly responsible for care of sick or immune compromised people.

Disinfection

Disinfection is a process that eliminates many or all pathogenic organisms from inanimate objects. The efficacy of disinfection on an object is determined by multiple factors:

- Previous cleaning of the object
- The amount of organism on the object
- The type of organism on the object (bacterial spores vs. mycobacterial vs. small viral vs. fungi vs. large viral)
- The concentration of and exposure to the germicide
- The physical configuration of the object
- The temperature and pH of the disinfection process

Many disinfectants are available in for use in health care settings, and in non-medical settings. These disinfectants include *alcohol, chlorine, chlorhexidine, aldehydes, hydrogen peroxide, iodophors, phenolics, and quaternary ammonium compounds*. The disinfectants are to be used for specific types of organisms, are not interchangeable, and should involve use of protective covering to decrease exposure to skin.

Alcohol, is a commonly used, low cost disinfectant. It is appropriate for use on external surfaces of some equipment and items, such as oral and rectal thermometers, rubber stoppers of multiuse medication vials, stethoscopes, ventilators, CPR manikins, and medication preparation areas. Alcohol is bactericidal, virucidal, fungicidal and tuberculocidal, but not effective against spores.

Chlorine, which comes in liquid or solid form, has broad spectrum of antimicrobial activity, is fast-acting and inexpensive. It is commonly used to disinfect hydrotherapy tanks, dialysis equipment, CPR training manikins, and surface. It is also effective in the disinfection of blood spills, provided the spill area is first cleaned before use. Chlorine has also been recommended for the disinfection of needles and syringes in needle-exchange programs for the prevention of blood-borne pathogen spread. Chlorine is, however, corrosive to metals, irritating to skin and mucous membranes, and had a definitive shelf life, especially when diluted.

Formaldehyde, in its aqueous form, is a bactericidal, fungicidal, virucidal, and tuberculocidal, and sporicidal. It is considered to be carcinogenic, and should

always be handled using appropriate protective equipment. It is considered to be a high-level disinfectant - its common uses include the preparation of viral vaccines, as an embalming agent, and for the preservation of anatomical specimens. It has been used in the dialysis setting; however, any equipment that has been disinfected with formaldehyde should be rinsed thoroughly and assessed for residual substance before use.

Glutaraldehyde, which has wide-spread use in health care settings as a high-level disinfectant, possesses bactericidal, virucidal, fungicidal and, when prepared to a specific pH range, sporicidal effectiveness. It is non-corrosive to rubber, plastic, metal, lenses and is therefore preferred for use on commonly used medical items such as endoscopic equipment, thermometers, and rubber or plastic equipment. It is too toxic and expensive to be used on non-critical, common surfaces.

Hydrogen Peroxide, which has shown to possess bactericidal, virucidal, tuberculocidal, fungicidal properties, is a relatively inexpensive and non-corrosive disinfectant.

Iodophors are combinations of iodine and a solubilizing agent. They are bactericidal, virucidal, and mycobactericidal. With prolonged contact time, they may also be capable of killing fungi and bacterial spores. Iodophors may be used to disinfect medical equipment such as hydrotherapy tanks, thermometers, and endoscopes. They are not typically used for hard surfaces since they often differ in concentration.

Peracetic Acid is a fast-acting disinfectant that is effective against ALL microorganisms, including bacterial spores. Its by-products are not harmful, and it does not leave any residue. It does have corrosive properties, however; materials such as copper, brass, bronze, steel, and iron are susceptible to corrosion. Peracetic acid, used in combination with hydrogen peroxide, is one of a few disinfectants known to inactivate bacterial spores.

Phenolics are commonly used hospital disinfectants, and are known to be bactericidal, fungicidal, virucidal, and tuberculocidal. They are usually used to disinfect medical environments, including laboratory surfaces, and non-critical medical and surgical items. Because they may leave residue on items, their use on semi-critical or critical items is not recommended. Phenolics are not recommended for use in nurseries, or environments where there are children. If used, surfaces should be thoroughly rinsed and dried before any child has contact with the surface.

Quaternary Ammonium Compounds have been widely used as disinfectants and antiseptics. More recently, they are only used as disinfectants. The compounds work well as cleaning agents - when used with cotton and gauze pads, the active ingredients are absorbed by the material, reducing their

microbicidal activity. The compounds are bactericidal, fungicidal and virucidal. Quaternary ammonium compounds are commonly used on surfaces such as floors, furniture and walls.

A table summarizing the various disinfectants and their abilities is below:

	<u>Alcohol</u>	<u>Chlorine</u>	<u>Chlorhexidine</u>	<u>Oxidizing Agents</u>	<u>Iodophors</u>	<u>Phenolics</u>	<u>Quarternary Amonium</u>
<u>Example</u>	Isopropyl Alcohol	Chlorox	Nolvasan	Virkon-S	Povidone	Lysol	Roccal-D
Effectiveness against certain organisms							
<u>Bactericidal</u>	Good	Good	Good	Good	Good	Good	Good
<u>Bacterial spores</u>	Poor	Good	Poor	Fair/good	Poor	Poor	Poor
<u>Virucidal</u>	Fair	Good	Poor	Good	Good	Poor	Poor
<u>Enveloped viruses</u>	Yes	Yes	Limited	Yes	Yes	Limited	Limited
<u>Non-enveloped viruses</u>	No	Limited	No	Yes	Limited	No	No
<u>Fungicidal</u>	Good	Good	Fair/good	Fair	Fair	Fair	Fair
<u>Protozoal parasites</u>	Poor	Fair	Poor	Poor	Poor	Poor	Fair
Other properties of disinfectants to consider							
<u>Effective in organic matter</u>	Poor	Poor	Fair	Poor	Poor	Good	Poor
<u>Inactivated by detergent</u>	No	No	No	No	Yes	No	Yes
<u>Effective in hard water</u>	Yes	Yes	Yes	Yes	No	Yes	No
<u>Residual activity</u>	Fair	Poor	Good	Poor	Poor	Poor	fair

References:

Rutala, William A. APIC Guide for Selection and Use of Disinfectants (1996). American Journal of Infection Control, Vol. 24, No. 4; 313-342.

Cozad, Ann. Disinfection and The Prevention of Infectious Disease (2003), American Journal of Infection Control, Vol. 31, No. 4; 243-254.

Centers for Disease Control and Prevention. MMWR, (2005) Vol. 54; No. RR-4. Appendix: Disinfectants and their properties.