



Pandemic Plan for the Church

Ministering to the Community in a Time of Crisis

Eliminating Viruses from Surfaces

Until an influenza virus has mutated and become human-to-human transmissible posing the threat of a pandemic, it is impossible to determine how it will conduct itself once it is loosed on people. In other words, health officials can forecast how a virus may be transmittable; however, certainty cannot be established until the virus presents itself in the population. For instance, the virus may spread more easily by droplets than aerosols. Studying characteristics of existing viruses aid in predicting what proper precautions to take by donning personal protective equipment (PPE), or to what disinfectants it is vulnerable, but all this may change depending on how the particular virus achieves transmission.

Influenza viruses can survive on surfaces, both porous and non-porous, for up to forty-eight hours. The longevity of the virus is dependent on several factors such as humidity, temperature, and porosity of the surface. Studies have shown that viruses can live on hands anywhere from five minutes to three hours; porous materials eight to twelve hours; and hard surfaces twenty-four to forty-eight hours. Some studies have shown that viruses can remain active on cotton fabric for several weeks. It has been determined that viruses are more active in the wintertime due to the colder, less humid weather. Viruses tend to survive longer on surfaces in cooler temperatures and lower humidity.

Second to wearing PPE when caring for a patient with pandemic influenza, is keeping all surfaces clean from the infectious agent. This is crucial to preventing the spread of the disease. People can acquire a virus, bacteria, or other microorganism by touching a contaminated object then touching a mucous membrane such as their eyes, nose, or mouth. Although good hand hygiene, and sneeze and cough etiquette, are all good defenses in combating the spread, keeping surfaces disinfected will be a key element in the battle. Such surfaces include telephones, counter tops, door handles, light switches, and bathroom surfaces. This section will cover strategies of effectively cleaning surfaces, and laundry.

Methods of Disinfecting Surfaces

Removing and killing an infectious agent on a surface effectively must be performed properly and methodically. There are several methods of performing this action; all following the steps of *cleaning*, *disinfecting*, and *sterilizing*.

Cleaning – is the removal of visible soil from an object.

Disinfection – eliminates many but not all pathogenic microorganisms.

Sterilization – kills all microorganisms

Although sterilization would seemingly be the goal when dealing with a pandemic influenza virus, please keep in mind this process is usually carried out in health care facilities.

Examples of sterilization methods are steam under pressure, dry heat, ethylene oxide gas, hydrogen peroxide gas plasma, and liquid chemicals.

Since the focus of this book is caring for the sick outside of the healthcare setting, and sterilizing methods will not be readily available, this section will focus on the proper ways of cleaning and disinfecting surfaces.

Proper Cleaning of Objects

Cleaning the object thoroughly is the first step to disinfection. The obvious particles must be removed so not to hinder the disinfecting process. The proper cleaning of an object can greatly affect the efficacy of disinfection. This can be done by using soap and water with wiping and rubbing to wash soil away. Methods other than routine cleansing are not necessary. The soap can be a simple detergent or an enzymatic solution. The temperature of the water should be what is recommended on the label.

Because the removal of soils from a surface is first required for a disinfectant to be effective, some disinfectants are also disinfectant cleaners. If the disinfectant contains a detergent that allows it to penetrate soil, then the cleaning and disinfectant process can be completed in one step.

Proper precautions such as donning personal protective equipment (PPE) should be practiced when cleaning and disinfecting surfaces or laundry. Please see the “Personal Protection Equipment” section of “Infection Control” for more information. PPE and precautionary measures include:

- Wear gloves, either disposable or rubber.
- Wear a surgical mask in accordance with droplet precautions.
- Use a respirator when airborne precautions are warranted by the circumstances.
- Gowns are not necessary for routine cleaning; however, wear a gown if your clothes may become exposed to the patient’s bodily fluids.
- Wear face and eye protection if the patient is coughing.
- Keep unnecessary objects at least three feet away for the patient.
- Consider covering objects that are not necessary, and not easily removed.
- Cleaning and disinfection should be performed on a daily basis.

Proper Disinfecting of Objects

Choosing the correct disinfectant to use will aid in this process. Healthcare facilities use germicidal agents that include both antiseptics and disinfectants. Antiseptics are for use on skin, disinfectants are used on surfaces. Their use is not interchangeable. These agents may have the suffix cide or cidal in the name. Virucide, fungicide, bactericide, sporicide, and tuberculocide

can kill the type of microorganism identified by the prefix. For example, a bactericide is an agent that kills bacteria. Reading the labels and following strict adherence to instructions will be vital in this second step. For example, some disinfectants are only effective after being left on the surface for more than one minute and even up to twenty or more minutes.

Influenza viruses can be eliminated by basic or intermediate level disinfectants containing any of the following ingredients:

- Chlorine or hypochlorite
- Aldehydes
- Quaternary ammonium compounds [quats]
- Phenolics
- Alcohols
- Peroxygen compounds

Use of disinfectants registered by the U.S. Environmental Protection Agency (EPA) is recommended whenever these are available. Lists of all registered disinfectants can be found at <http://www.epa.gov/oppad001/chemregindex.htm>.

Many, if not all, of these products indicate potency for several target pathogens on the label. There are approximately 400 registered disinfectants with human influenza A and/or B listed on the product label, and all will inactivate influenza viruses when used according to manufacturer instructions (USDHHS, Environmental Management of Pandemic Influenza, 2013).ⁱ

All disinfectants marketed in the United States are required to be registered by the U.S. Environmental Protection Agency (EPA). These products must be used in accordance with their label instructions; following label instructions is necessary to achieve adequate efficacy and to avoid unreasonable adverse effects.

Registered antimicrobial products with label claims for avian (bird) flu disinfectants can be found at http://www.epa.gov/pesticides/factsheets/avian_flu_products.htm#activ. These EPA disinfectant products are registered and labeled with a claim to inactivate avian influenza A viruses on hard, non-porous surfaces. The label specifies the use sites (e.g., poultry houses and farm premises) for application of the product. Although there are no antimicrobial products registered specifically against the H5N1 subtype of avian influenza A viruses, the EPA believes based on available scientific information that the currently registered avian influenza A products, when applied in strict accordance with the label directions, will be effective against the H5N1 strain (EPA, Registered Antimicrobial Products, 2015).ⁱⁱ

Cleaning and Disinfecting Surfaces

- Use any EPA-registered detergent-disinfectant.
- Be sure to include surfaces such as door knobs, light switches, TV controls, telephones, bathroom surfaces, kitchen counter tops, floors, and any horizontal surface. Also clean any items used for direct care of the patient for example a blood

pressure cuff. Read instructions for proper cleaning of equipment such as a CPAP machine.

- Follow manufacturer instructions for the use of a disinfectant. This will ensure efficacy as well as prevent ill effects. Pay attention to concentration, temperature, and the time the product needs to remain on the surface to be effective.
- Dispose of mop heads, rags, and other cleaning materials properly.
- Keep mops, cloths, and buckets separate from other household items.
- Do not wipe surfaces using a dry cloth, this may shake up dust and scatter the pathogen into the air.
- Use a vacuum with a HEPA filter.
- Keep disinfecting wipes on hand for quick clean ups.
- To avoid further contamination of surfaces, practice good hand hygiene habits.
- The use of spray disinfectants to disinfect the air is not recommended. In some situations, the use of sprayed chemicals may irritate the airways of the patient and induce coughing.

Disinfecting Thermometers and Stethoscopes

Items that are used for personal care of the patient should be cleaned properly. These would include items such as thermometers and stethoscopes. A recommended method of cleaning these items is described below:

- Place a covered container of 1:100 bleach solution in the patient area. Change the bleach solution each day.
- Use a clean cloth or paper towel and dip it in the bleach solution.
- Never dip a soiled cloth back into the bleach solution. If necessary, use a cup or dipper to pour the bleach solution on a soiled cloth.
- Wipe the thermometer with the cloth soaked in bleach solution or soak the thermometer for ten minutes in the bleach solution. Rinse thoroughly and let it air-dry.
- Use a clean cloth or new paper towel and dip it in the bleach solution.
- Wipe the metal part of the stethoscope with 1:100 bleach solution. Let it air-dry.
- Discard the cloth in the laundry container. Discard paper towels in the container labeled biohazard waste. Please see the next chapter titled, “Proper Disposal of Waste”, for more information.

Laundry

Although viruses do not survive as easily on materials such as sheets, towels, and clothing – laundry should still be handled with similar care as cleaning other items. Keep in mind

there may be wet or dry bodily secretions or fluids, including respiratory droplets on the bedding. Use the following precautions when handling laundry:

- Wear gloves and a mask when handling the laundry of a sick person.
- Place the dirty laundry into a laundry bag that is kept in the patient's room. Keep the bag closed when taking it to the laundry room. Don't carry unpackaged soiled linens out of the sick room into a clean room.
- Keep soiled linen at arm's length; don't hold laundry close to your body, or to your face.
- Make every effort to not shake or agitate the linens to unsettle any dried matter that has attached to the material. This will prevent contaminated particles from becoming airborne.
- Place laundry of sick person directly into washer from laundry bag; don't place uncovered laundry in a basket for common use.
- Soak in 1:100 bleach solution for thirty minutes. Be sure all items are completely soaked.
- Set the washer and dryer controls to hot.
- Wash items in soapy water.
- Items may be line dried if necessary.
- After handling soiled laundry, remove gloves and perform hand hygiene.
- For additional information, see the section Laundry and Bedding, in "Guidelines for Environmental Control in Health-Care Facilities" at http://www.cdc.gov/ncidod/dhqp/gl_environinfection.htmlⁱⁱⁱ.

Using Bleach

Currently there are over one-hundred disinfectant products registered with the EPA labeled with a claim to inactivate "avian influenza A" viruses on hard, non-porous surfaces. For a list of these agents, and more information, please visit the web page: http://www.epa.gov/opp00001/factsheets/avian_flu_products.htm. These solutions are available through medical supply companies, retailers supplying to poultry farms and online suppliers. They are not necessarily easily obtainable to those outside of these industries. Due to the ease of availability and the ability to stockpile, we will discuss the use of bleach which is readily on hand at the local grocery.

Household and institutional bleach solutions contain 5.25% active sodium hypochlorite. Hypochlorite solutions have been proven effective against microorganisms such as viruses, bacteria and fungi and is approved for decontamination at facilities that are a biosafety level of four (BSL-4). A biosafety level is the level of the precautions required to isolate dangerous biological agents in an enclosed facility. The levels of containment range from the lowest biosafety level one (BSL-1) to the highest at level 4 (BSL-4).

Studies have shown that hypochlorite solutions, such as bleach can be used as decontaminant and at a concentration of 1g/l (1gram per 1 liter). A higher chlorine concentration (5g/l) is recommended in the case of a spill or when dealing with a large amount of organic matter. Although it is readily available, and cheap, there are many disadvantages to using bleach, some including:

- It has no detergent agent; therefore, it cannot penetrate soils – surfaces must first be cleaned.
- It is inactivated when in contact with organic matter such as blood, tissue, and saliva.
- It is very caustic – it can burn skin and eyes.
- It is poisonous if ingested.
- Fumes can be irritating and even toxic.
- It is corrosive.
- It discolors colored items such as materials, carpets, countertops and floors.
- It can create toxic fumes when mixed with other chemicals such as ammonia, hydrochloric acid, phosphoric acid and acetic acid (vinegar), also it can become carcinogenic if mixed with formaldehyde.
- Fumes can move to other areas of the building.
- Diluted solutions cannot sit for long periods of time; they lose their effectiveness.

When using bleach be sure to note:

- Wear PPE such as gloves, mask, and eye protection.
- Different products may contain different concentrations of chlorine. Be sure the concentration is 5.25% active sodium hypochlorite.
- Use a new bottle of bleach if possible. Bleach loses its efficacy if it sits on the shelf for a long period of time. It should smell strongly of chlorine for it to be effective.
- Thick bleach solutions such as toilet bowl cleaners contain other additives that may be poisonous; these should not be used.
- Use plain bleach; do not use scented versions, as there are other additives that may affect the solution.
- Do not mix bleach with other chemicals as this can cause a reaction that can cause toxic fumes.
- Surfaces must first be cleaned with a detergent before disinfecting with bleach.
- Apply solution to a surface with a moistened cloth. Allow it to remain on the surface for at least three to five minutes and even up to ten minutes.
- After time allowed, wipe again with another clean wet cloth.

- The chlorine must be wiped away from metal objects with a more dilute solution to prevent corrosion. This can be done with clean water or 70% alcohol. Set apart cloths just for this purpose.
- If bleach gets into the eyes, immediately rinse with water for at least fifteen minutes and seek medical attention.
- Bleach is not intended as a disinfectant for hands, even a weaker solution of 1:100 should not be used. The principal means for disinfecting hands is washing with soap and water, coupled with the use of a commercial hand sanitizer with alcohol. (However, when serving in Haiti with a medical team, and dealing with cholera, we rinsed our hands in a 1:100 solution.)

Bleach Solutions

Differing solution strengths are used for different purposes:

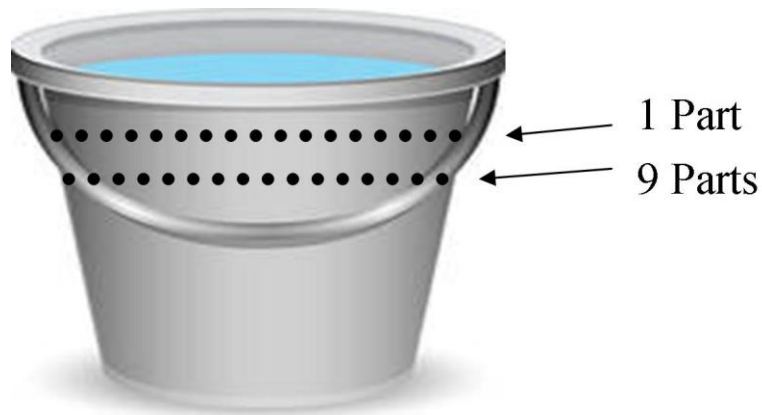
- A strong 1:10 bleach solution (0.5% chlorine concentration), is used to disinfect items exposed to blood, urine or fecal material or surfaces exposed to corpses. It is also used to prepare the 1:100 bleach solution.
- A weaker 1:100 bleach solution (contains 0.05% chlorine concentration), is used to disinfect surfaces, medical equipment, objects close to the patient, bedding, and other laundry.

Preparing Bleach Solutions

Diluted bleach solutions should be prepared fresh daily because they can lose their strength within twenty-four hours. If a strong smell of chlorine is not present, it has lost its efficacy. When preparing a bleach solution, the following is recommended:

- A solution should be prepared in a well-ventilated area.
- Use plastic containers because metal containers can corrode easily.
- Wear PPE, avoid direct contact with skin and eyes.
- Start with household bleach that contain 5% sodium hypochlorite
- Begin by making a 1:10 dilution
 1. Gather the necessary supplies:
 - One container that holds ten measures (for example, ten cups) to make the base 1:10 bleach solution
 - One large or several smaller containers (One for each station) with covers or lids to hold the 1:100 bleach solutions. These containers should be labeled clearly of the different solutions.
 - Five-gallon buckets, cat liter buckets, large dog and cat dry food containers, are examples of possible containers.
 - Chlorine bleach containing 5.25% active sodium hypochlorite

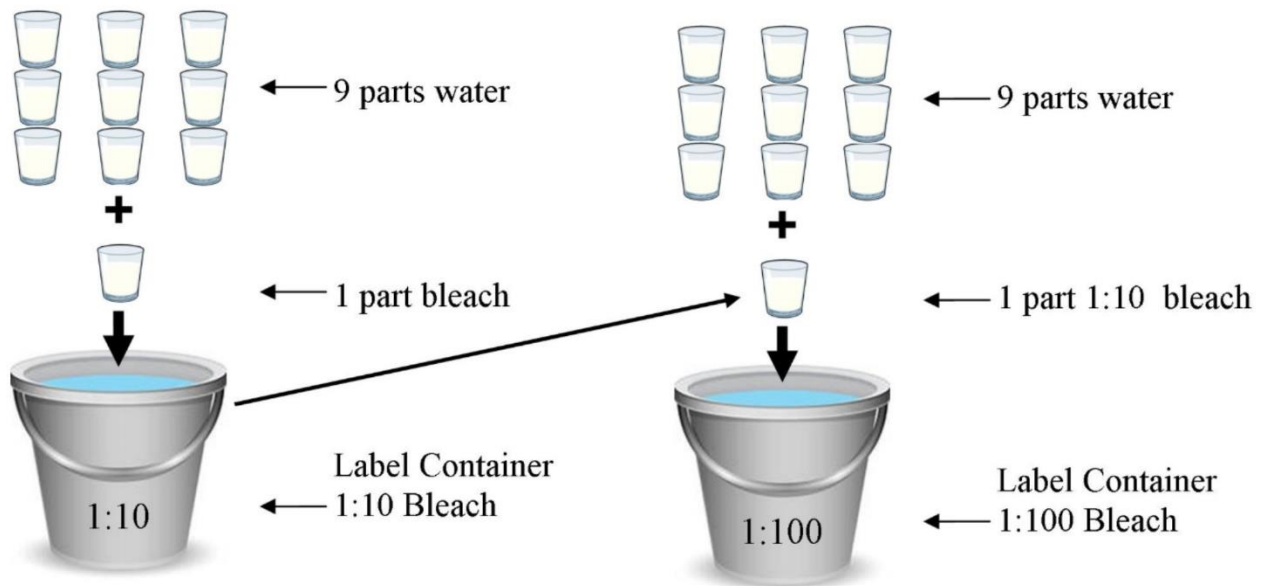
- Use clean water. Do not use dirty or used water because organic matter destroys chlorine.
- A measuring cup or other container. A bottle or jar marked with one cup, or one liter can be used.



Making a 1:10 Bleach Solution

2. Mark the large container with lines to delineate one part and nine parts to total ten parts. This will make it easier and quicker for future solutions.
 - Pour nine measures of water into the container then mark the container. You can use a permanent sharpie or scratch the plastic container.
 - Add one measure of bleach to the first nine parts then again mark a line at the total ten parts volume.
3. To prepare 1:100 bleach solution:
 - Measure and pour nine parts of water into another large container.

- Then measure and pour one part of 1:10 bleach solution into the water to make a 1:100 bleach solution.



Making a 1:100 Bleach Solution

4. Distribute a container of each solution to each station with clean cloths.
 - Be sure to label each container properly.
 - Use the 1:00 bleach solution to clean surface areas and laundry.
 - Use the 1:10 bleach solution to clean after spills.
 - When there is a large outbreak, make larger quantities.

Remove the solutions every day or when solutions become cloudy or dirty. Remember if you cannot smell chlorine in the bleach solution, the concentration is no longer strong enough for disinfection. Replace the solution with a fresh supply.

Make a schedule to bring a fresh solution into the treatment area, when to change them, and when to remove them.

How to Clean the Walls or Other Surfaces

Walls and floors are not generally involved in disease transmission. However, in a highly pathogenic situation, if walls are visibly soiled – clean them as follows:

- Wash the wall with detergent to remove any visible dirt.
- Use a sprayer or mop to wash the walls with 1:100 bleach solution.
- Rinse the mop in a fresh supply of 1:100 bleach solution.

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- If using a sprayer, apply the spray close to the surface to minimize splashing and aerosols.
 - Wipe the walls with a clean cloth
 - Discard any waste in container for collecting infectious waste.
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ⁱ Interim Guidance on Environmental Management of Pandemic Influenza Virus. U.S. Department of Health & Human Services Web site. Last modified April 4, 2013, accessed May 13, 2016. <http://www.flu.gov/planning-preparedness/hospital/influenzaguidance.html>.

ⁱⁱ Registered Antimicrobial Products with Label Claims for Avian (Bird) Flu Disinfectant. Last modified May 22, 2015, accessed June 13, 2015. http://www.epa.gov/opp00001/factsheets/avian_flu_products.htm.

ⁱⁱⁱ “Pandemic Influenza Preparedness and Response Guidance for Healthcare Workers and Healthcare Employers” Occupational Safety and Health Administration U.S. Department of Labor, OSHA 3328-05R, 2009, p33.