Common Chemicals Used for Cleaning and Decontamination Guideline

Chemicals commonly used for decontamination and cleaning of surfaces are listed below. These are **general guidelines**; if you are working with a biological agent, concentrations and/or expiration dates may need to be altered. The Institutional Biosafety Committee (IBC) will review this information in your IBC application.

Remember to follow the manufacturer's recommendations for the use of the material and the expected shelf life for stock solutions. Best practice is to label stock bottles with the date of purchase, as well as the calculated expiration date. A current MSDS for the material should also be readily available near the location where the material is stored and used.

Standard laboratory personal protective equipment should be worn while working with these materials (this includes lab coat, gloves, close-toed shoes, and goggles when a splash risk is present).

For all materials listed below, the contact time necessary when using for a biological spill is at a minimum 10 minutes.

1. **Hypochlorite (Bleach):** Bleach solution is corrosive to stainless steel; therefore, thorough rinsing must follow its use in the biosafety cabinet. **Do not autoclave bleach solutions**.

To prepare bleach solutions for **cleaning purposes**[1]:

- Using **12.5% hypochlorite** (industrial strength bleach) **in a 1:10 dilution** (one part Top-Chlor and nine parts water) yields 12,500 ppm or a 1.25% hypochlorite solution, **for use within 30 days.**
- Using **12.5% hypochlorite** (industrial strength bleach) in a **1:20 dilution** (one part Top-Chlor and nineteen parts water) yields 6,250 ppm or a 0.625% hypochlorite solution, **for use within one week.**
- Using **5.25% hypochlorite** (household bleach) in a **1:5** dilution (one part Clorox and four parts water) yields 10,500 ppm or a 1.05% hypochlorite solution, **for use within 30 days.**[2]
- Using **5.25% hypochlorite** (household bleach) in a **1:10** dilution (one part Clorox and nine parts water) yields 5,250 ppm or a 0.53% hypochlorite solution, **for use within one week.**

To prepare bleach as a disinfectant for **use in a biological materials spill, it is best to work with a fresh solution**:

- Using **5.25% hypochlorite** (i.e. Clorox) in a **1:10** dilution (one part Clorox and nine parts water) yields 5,250 ppm or a 0.53% hypochlorite solution, **for use within 24 hours.**[3]

The diluted solution should be labeled and dated with the preparation and expiration dates.

Hypochlorite solutions are classified as irritant and corrosive. Appropriate precautions should be taken when using hypochlorite products: read labels carefully, adhering to cautionary warnings and following usage directions. Chlorine solutions should never be mixed or stored with cleaning products containing ammonia, ammonium chloride, or phosphoric acid. Combining these chemicals will result in the release of a chlorine gas, which can cause nausea, eye irritation, tearing, headache, and shortness of breath. These symptoms may

last for several hours. If you are exposed to an unpleasantly strong odor following the mixing of a chlorine solution with a cleaning product, leave the room or area immediately until the fumes have cleared completely.

2. **Alcohols[1]:** A 70% ethanol or isopropanol (or isopropyl alcohol) solution is made by adding three parts water to seven parts 95% ethanol or isopropanol. Methanol should not be substituted for ethanol or isopropanol, because it is not as effective and is a health hazard. Always keep ethanol and isopropanol solutions away from potential sources of ignition. These solutions should be labeled and dated, with an expiration date of 180 days.

3. **Chlorine Dioxide[1]:** Chlorine dioxide (ClO2) is a strong and fast-acting germicide, disinfecting agent, and oxidizer, often reported to be active at concentrations lower than those needed by chlorine as bleach. However, it has a shelf-life of only one day for activated solutions, so if it is used a fresh solution must be made each day. Chlorine dioxide is unstable as a gas; however, chlorine dioxide is soluble in water and stable in an aqueous solution. Chlorine dioxide can be obtained by ordering its stabilized form, which is then activated on-site when required.

Of the oxidizing biocides, chlorine dioxide is the most selective oxidant. Ozone and chlorine are much more reactive than chlorine dioxide, and they will be consumed by most organic compounds. Chlorine dioxide, however, reacts only with reduced sulfur compounds, secondary and tertiary amines, and some other highly reduced and reactive organic compounds. A more stable residue can therefore be achieved with chlorine dioxide at much lower doses than when using either chlorine or ozone. Generated properly, chlorine dioxide can be used more effectively than ozone or chlorine in cases of higher organic loading because of its selectivity.

4. **Hydrogen Peroxide and Peracetic Acid[1]:** Like chlorine, hydrogen peroxide (H2O2) and peracetic acid are strong oxidants and can be potent broad-spectrum germicides. They are also safer than chlorine to humans and the environment. However, they have a short shelf-life of just five days for dilute solutions, so fresh solution must be made frequently if used.

Hydrogen peroxide is supplied either as a ready-to-use 3% solution or as a 30% aqueous solution to be diluted to 5-10 times its volume with sterilized water. However, such 3-6% solutions of hydrogen peroxide alone are relatively slow and limited as germicides. Products now available have other ingredients to stabilize the hydrogen peroxide content, to accelerate its germicidal action and to make it less corrosive.

Hydrogen peroxide and peracetic acid can be corrosive to metals such as aluminum, copper, brass, and zinc, and can also decolorize fabrics, hair, skin, and mucous membranes. They are also oxidizers, and should not be mixed with anything other than water. Articles treated with them must be thoroughly rinsed before contact with eyes and mucous membranes. They should always be stored in a vented container and away from heat and protected from light.

5. **Iodophor Disinfectant (Wescodyne)[1]:** Prepare this solution according to the instructions on the label. Final concentration should be 0.47%. These solutions should be labeled and dated, with an expiration date of 365 days (one year).

6. **Quaternary Ammonium Compounds (Quats)[1]:** Quats are used to disinfect at concentrations of 0.1-2% for vegetative bacteria and non-lipid-containing viruses. Quaternary ammonium compounds are not effective against spores and may be neutralized by anionic detergents. *Example: Lysol I.C.*

References

[1]adapted from Fred Hutchinson Cancer Research Center. Biosafety Procedures. http://extranet.fhcrc.org/EN/sections/ehs/hamm/chap5/section4.html

[2] Clarkson RM, Moule AJ, Podlich HM. The shelf-life of sodium hypochlorite irrigating solutions. Aust Dent J. 2001 Dec; 46(4): 269-76.

[3]NIH Office of Research Services. Decontamination and Sterilization. http://www.ors.od.nih.gov/sr/dohs/BioSafety/decon/Pages/decontamination.aspx#table1.f.c