



Policy on the Use of Bleach and Disposal of Liquid Biohazardous Waste

Approved by the Institutional Biosafety Committee on 7/11/2024.

Bleach Storage and Working Solutions

Bleach is a 3-5% solution of sodium hypochlorite (NaOCl). For disinfection of most biologicals (exception: prions and prion-like proteins), after dilution, working bleach solutions must contain between 0.5% and 2% sodium hypochlorite to be an effective disinfectant. Hypochlorite concentration in household bleach varies by manufacturer. Many household bleach solutions contain 5.25% sodium hypochlorite, and a 1:10 dilution (5250 ppm Cl) will produce a 0.53% hypochlorite solution. Use of bleach solutions with lower hypochlorite concentrations will not provide the proper level of disinfection. Care should be taken in the purchase of solutions labeled as bleach to ensure that the concentration of sodium hypochlorite is at least 5%, as discount manufacturers often sell bleach at much lower hypochlorite concentrations.

Bleach is not stable at dilute concentrations. Users should prepare a fresh bleach solution regularly. Prepare a fresh working dilution of sodium hypochlorite weekly and indicate the preparation date on the bottle. Bleach at this concentration should be stored in opaque containers to protect the solution from light, which will degrade the sodium hypochlorite.

Biohazardous Waste Disposal

Liquid biohazardous waste must be treated using one of the following disinfection methods prior to disposal in the sanitary sewer. Using both methods though permissible is not recommended.

Bleaching- Bleach may be used as a disinfectant for biohazards at the designated concentrations above. This is done by adding 10% by volume of 5.25% bleach to the container, followed by 30 minutes incubation for decontamination. The resultant solution can then be discarded in the sewer followed by 5 minutes of flushing at maximum pressure with tap water.

Autoclaving- Liquid biohazardous waste may be disinfected by steam-sterilization at 121.1 C (250 F) and 15 pounds pressure for 90 minutes. Only the autoclaves located in Biotech Center Room 119 and Room 121 are to be used for the sterilization of infectious medical waste by the autoclave technician: not the satellite autoclaves on each floor. If a liquid is treated with bleach before being autoclaved, or unknown to have been, the bleach must be neutralized. The recommended neutralization procedure for 10% bleach solutions is the addition of 0.1% (1 g/L) sodium metabisulfite/disodium disulfite or 1% (10 g/L) sodium or calcium thiosulfate to the bleach solution before sending it to be autoclaved. This can be performed by adding an equal volume of 2X solution of the neutralizing solution to the bleach.

Hazards

Bleach is an oxidizer and corrosive. Exposures may cause irritation or damage to the skin, eyes, and the respiratory tract. Vapors can cause serious discomfort or even acute distress requiring medical



attention. Sterilization of bleach solutions is discouraged as this can damage the autoclave and release toxic gases into the surrounding environment.

Bleach is incompatible with many chemicals found in the laboratory and DNA/RNA kit components. Mixing bleach with incompatible chemicals can produce toxic gases that can potentially damage the eyes, skin, lungs, vocal cords, nervous system, liver, and kidneys.

Bleach Incompatibilities

The following list is not exhaustive but includes commonly encountered chemicals used in the laboratory.

Bleach-incompatible chemicals and materials	Possible reactions and symptoms from mixing with bleach
Acids and acidic compounds e.g., hydrochloric acid, sulfuric acid, hydrofluoric acid, phosphoric acid, aluminum chloride	Forms toxic chlorine gas. Low levels of exposure may result in eye and oral mucous membrane irritation, dizziness, and nausea – while exposure to high levels may be fatal.
Alcohols e.g., ethanol, methanol, isopropanol, and propanol	Forms chloroform, hydrochloric acid, chloroacetone or dichloroacetone. Low levels of chloroform exposure could result in fatigue, dizziness, and headache. Elevated levels of chloroform may damage the liver and kidneys.
Ammonia-containing compounds e.g., Ammonium chloride, ammonium sulfate, quaternary ammonium salts	Forms toxic chlorine and chloramine gases. Low levels of exposure may result in eye and oral mucous membrane irritation, dizziness, and nausea – while exposure to high levels may be fatal.
Guanidine Salts e.g., Guanidine hydrochloride, guanidinium chloride, guanidine thiocyanate	Forms toxic gases (e.g., chloramine, chlorine, and hydrogen cyanide) and can form highly reactive compounds. Low levels of exposure may result in eye and oral mucous membrane irritation, dizziness, and nausea – while exposure to high levels may be fatal.
Metals Stainless steel, iron, copper, nickel	Mixing with bleach releases oxygen in a closed system (e.g., piping, equipment) which can lead to pressure build-up and rupture. Bleach will corrode metal including metal wastewater pipes.
Organic chemicals e.g., Organic solvents and polymers, amines, ethylene glycol, formaldehyde, paraformaldehyde, formalin, formic acid, insecticides, fuels and fuel oils	Forms chlorine gas, and chlorinated organics which are toxic and/or carcinogenic. Low levels of exposure may result in eye and oral mucous membrane irritation, dizziness, and nausea – while exposure to high levels may be fatal.
Reducing agents e.g., Sodium bisulfite, sodium hydrosulfate, sodium sulfate	Boiling or splashing hazard if mixed with bleach.