Using Bleach as a Disinfectant

Introduction

Bleach is a water-based solution commonly used as a disinfectant. It can be purchased with a concentration ranging from 5.25 to 8.25% of the active sodium hypochlorite (NaClO) ingredient. Sodium hypochlorite denatures proteins in microorganisms and is effective in killing bacteria, fungi and viruses. The dilution ratio of bleach to water is dependent on the concentration of sodium hypochlorite because the final bleach solution should have a NaClO concentration between 0.5 and 2.0% or 5,000 to 20,000 ppm.

Hazards

Bleach irritates mucous membranes, the skin and the respiratory system. It also reacts readily with other chemicals, so caution should be exercised when using this chemical. Bleach is incompatible with many other chemicals. Don't mix bleach with ammonia or acids. Mixing bleach with ammonia releases chloramines, toxic gases that cause respiratory problems. Mixing bleach with acid releases chlorine gas which irritates mucous membranes and can cause death. Check buffer and kit specs before disinfecting with bleach. Chemicals in buffers and kits used in labs may be incompatible with bleach.

Preparing and using a bleach solution

1. Ensure the area is well ventilated when diluting or using bleach.
2. Put on protective gear. Gloves, lab coat or plastic apron, and goggles are recommended when handling bleach.
3. Cold water should be used for dilution as hot water decomposes the active ingredient, sodium hypochlorite, rendering it ineffective.

NaClO Concentration		Diluted 10:1	
%	ppm	%	ppm
8.25	82,500	0.825	8,250
6.15	61,500	0.615	6,150
5.25	52,500	0.525	5,250

For a 20 L container:
1) Add 18 L of water
2) Add 2 L of bleach
3) Ensure the contents mixed thoroughly

For a 1L flask
1) Add 900 mL of water
2) Add 100 mL of bleach
3) Ensure the contents are mixed thoroughly

Using Bleach on Surfaces

Apply the bleach solution onto a surface and allow it to sit for 10 minutes. Bleach is corrosive so if you are using bleach to disinfect a biosafety cabinet, spray bleach onto a paper towel outside of the cabinet and then wipe the surface.

Using Bleach to Decontaminate Liquid Biohazardous Waste

Liquid biohazardous waste may be decontaminated by adding bleach to the liquid waste until a 1-3% concentration of sodium hypochlorite (NaClO) is achieved. For example, you can add 1 part bleach (containing 10% NaClO) into 9 parts liquid biohazardous waste, or 300 ml of household bleach into 700 ml of biohazardous waste in a 1 L container. Let bleach-waste mixture stand for at **least 30 minutes** before disposal down the sink with copious amounts of water. Only mercury-free bleach can be poured down the drain, all other chemicals must be collected in containers for chemical waste disposal. Waste containers should be leak proof, non-food grade, and compatible with the chemicals being stored in them. For more information, please review https://ehs.utoronto.ca/laboratory-hazardous-waste-management-and-disposal-manual/chemical-waste-disposal/

Mercury in Bleach

The active ingredient in bleach, sodium hypochlorite, is not a hazard to the environment and can be disposed of into the wastewater stream. Some brands of bleach, however, contain trace amounts of mercury from the manufacturing process and should **not** be used.

Bleach Storage and Expiration

The typical shelf-life of bleach with a 4-6% concentration is 3-5 months. Be sure to check the expiration date on the bleach container. Bleach should be stored in an opaque, plastic container between 10 and 20°C, and away from direct sunlight. Dilution with water causes sodium hypochlorite to degrade faster. **Bleach solutions for disinfection should be prepared daily**. Bleach must be stored and used in well-ventilated areas only.

For more information, contact EPS at hazwaste.ehs@utoronto.ca or 416-978-7000.

https://ehs.utoronto.ca/our-services/environmental-protection-services/