Environmental Health and Safety

Disinfecting with bleach

Arizona State University

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Benefits of bleach

Bleach is also known as sodium hypochlorite:

- Broad-spectrum disinfectant against many biohazards.
- Fast-acting.
- The most common disinfectant used at ASU.
- Widely available at a low cost.

Stability

- Diluted bleach solutions, such as 10 percent bleach in water, rapidly breakdown and quickly lose effectiveness.
- Most household bleaches contain 5.25 percent sodium hypochlorite.
- Shelf life is one year when stored at room temperature.
- Store in cool, dark conditions to protect from sunlight.

Effectiveness

Always check the sodium hypochlorite concentration on the label:

- Household bleach contains 5.25 to 6.15 percent sodium hypochlorite, or 52,500–61,500 ppm available chlorine.

- A 5.25 percent stock when diluted to 10 percent in water will yield a 5,250 ppm or a 0.53% hypochlorite solution.

Verify if bleach is effective for the material to be disinfected because different organisms have different requirements:

- 100 ppm of chlorine will kill ≥99.9% of *Bacillus atrophaeus* spores within five minutes.
- 100 ppm of free chlorine inactivates 10^6 to 10^7 *Staphylococcus aureus*, *Salmonella choleraesuis*, and *Pseudomonas aeruginosa* in less than10 minutes.
- Higher concentrations of 1,000 ppm or more of chlorine are required to kill *Mycobacterium tuberculosis.*
- Low concentrations of 25 to 500 ppm of chlorine are effective against mycoplasma and vegetative bacteria.

Preparation

Always prepare bleach solutions fresh before use.

For a 1:10 dilution, or 10 percent solution, mix one part bleach in nine parts water:

1. Work in a well-ventilated area.
2. Wear PPE consisting of a lab coat, eye protection and gloves.
3. Use cold water to prevent chemical decomposition.
4. Label and date solution with preparation date and initials and discard after use.
5. Remove PPE including gloves and wash hands thoroughly.

Safety

- Bleach solutions are classified as an irritant and a corrosive.
- Chlorine solutions should never be mixed or stored with cleaning products containing ammonia, ammonium chloride or phosphoric acid.
- Know where the nearest eyewash station and emergency shower are located when working with bleach.
- Review the Safety Data Sheet.
- Undiluted bleach liberates a toxic gas when exposed to sunlight.

Incident response

- Avoid touching the eyes and skin when working with bleach.
    - Contact with bleach solutions can cause eye or mucous membrane irritation and burns.
    - If bleach gets into the eyes, immediately rinse with water for at least 15 minutes.
    - If skin comes in contact with bleach, rinse with lukewarm water for at least five minutes.
- Contact with chlorine gases from bleach can cause nausea, eye irritation, tearing, headache and shortness of breath.
    - If ingested or inhaled, move to fresh air and seek medical attention immediately.
- When exposure to bleach or any hazardous materials occurs in the lab, notify the principal investigator and consider consulting with a medical professional.

Important considerations

Bleach

- Can be inactivated by organic matter such as tissue, soils and other carbon-containing residues at various stages of decomposition.
- Can discolor, fade or weaken fabrics and plastics.
- Is corrosive to metals at concentrations greater than 500 ppm.

Bleaching metal surfaces

- Recalling that a standard diluted working solution is about 5000 ppm in the lab, if used on laboratory equipment with metal surfaces such as biological safety cabinets, be sure to wipe with 70 percent ethanol to remove residue after application.
    - See ASU's Biosafety Cabinet Decontamination Guidelines: asu.edu/ehs/documents/asu-bsc-decontamination.pdf.

Hazardous waste collection

Collect liquid waste in a clean, compatible container:

1. Label the container “Hazardous Waste.”
2. Remove funnels and close the container when not in use.
3. Attach a completed hazardous waste tag.
4. Store in secondary containment in the same room where generated.
5. When two-thirds full, request a hazardous waste pickup at links.asu.edu/wastepickup.

Hazardous waste disposal

- Chemicals that are corrosive, ignitable, reactive or toxic pose substantial or potential threats to public health or the environment.

- Consider **all** chemical waste to be a hazardous waste and **do not** pour down the drain or put in the trash.
  - Approval must be received from EHS prior to drain disposal.

- Never autoclave bleach.

For waste disposal information visit: cfo.asu.edu/waste-mgmt-and-shipping.

References

ASU Biological Safety Manual
asu.edu/ehs/documents/biosafetymanual.pdf

World Health Organization Laboratory Biosafety Manual
who.int/csr/resources/publications/biosafety/Biosafety7.pdf

Selected EPA-Registered Disinfectants
epa.gov/pesticide-registration/selected-epa-registered-disinfectants

Protecting Workers Who Use Cleaning Chemicals
osha.gov/Publications/OSHA3512.pdf

Questions?

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