Chapter 5.A. Introduction

Safe work practices need to be developed for each product that is in use because each has specific hazards, precautions, and directions for maximum effectiveness. The information in this chapter is provided to ensure that all necessary factors are considered when developing cleaning protocols, with the goals of protecting employees and building occupants and using the products most effectively.

Although the use of bleach and other hazardous disinfection products is not recommended, the Handbook does provide guidelines on using them to ensure the safety of workers and building occupants should these products be deemed necessary for specific situations.

Consider that there is a corresponding relationship between the toxicity and hazard level of the products used and the number of health and safety measures required. The less toxic the product, the fewer the safety measures needed.
Chapter 5.B. Using Disinfectants

Introduction

This section provides guidelines on using disinfectants when developing a customized protocol. For specific information on how to perform the following work-practice recommendations, consult the label of each product being used. Educate school staff on the finalized disinfection protocols, and post these in accessible locations. Remember to change the protocols when products and processes (e.g., uses of application equipment) change.

Work-Practice Recommendations

- **Protect workers:** Spray or squirt the product on cloths and mops whenever possible versus spraying them into the air unless the label directions state otherwise. When the product is sprayed onto a hard surface, the mist can bounce back directly into the face and be inhaled. Always use disinfectants with the recommended PPE and adequate ventilation. Make sure the facility’s heating, ventilating, and air conditioning system (HVAC) or other forms of ventilation are operating while disinfecting tasks are being performed.

- **Protect building occupants:** Consider how to minimize exposure (of product vapors or residue) to building occupants when selecting the application process and performing the disinfecting. Although some activities need to be conducted while school is in session, tasks that only need to be done once a day should be scheduled after the students, teachers, and other personnel leave.

- **Reduce quantity:** When applying the disinfectant, use the smallest possible amount of disinfectant as recommended by the manufacturer to obtain the desired level of microbe control. More is not necessarily better—it may be more hazardous and it creates more waste.

- **Allow enough time for disinfectants to react with the microbes to kill them:** Contact times vary from product to product. Follow label directions to determine the time required for the disinfectant to be wet on the surface and in contact with microbes.

- **Rinse:** Rinse all high-touch areas if the product label requires this step. Although product labels specify whether rinsing is required, there are general requirements for the following types of products and situations:
  - Food-contact sanitizers (sanitizing rinses) are considered a final rinse when used on surfaces that come in contact with food. No water rinse following application is allowed.
  - Some disinfectants with claims for use on food-contact surfaces must be rinsed when used in this capacity. Check the label to determine if rinsing is required.

- **Dry:** Wipe or dry surfaces only if the product label requires this step.

See *Appendix G: Disinfectant Application Equipment* for information on different disinfectant application methods.
Introduction

Bleach has been used for generations as a disinfectant. Recent research, however, has identified adverse health effects for users and the environment (see below). Because of this research, many purchasers are looking for a safer alternative with a better human health and environmental profile. Manufacturers are also developing safer disinfectants to augment their “green” cleaning lines of products. See Chapter 4.B. Comparing Disinfectants: Comparison Chart for Hard-Surface Disinfectants Registered by the Environmental Protection Agency for details on alternative products.

Bleach is used extensively in childcare centers and other settings due to a number of perceived conveniences such as low up-front cost, ease of purchase, and its ability to be used at different strengths for different purposes. Because many users are not implementing the required safety measures to address a number of the hazards associated with using bleach (as illustrated below), the perceived level of convenience and cost is inaccurate.

Are all bleach products disinfectants?

Bleach is known by several names, including chlorine bleach, household bleach, and sodium hypochlorite. In this document, bleach refers to products registered by the Environmental Protection Agency (EPA). Since not all bleach products are registered as a sanitizer or disinfectant for hard surfaces, and are instead registered as a laundry additive, users must read the label to determine if the product can be used as a hard surface disinfectant. Some products are used just for sanitizing laundry and other items/surfaces, and some just for disinfecting.

Are all disinfectant bleach products diluted the same?

These different types of products are registered at specific concentrations. Previously, disinfectant concentrations were 5.25% or 6.00% unless otherwise stated. Some disinfecting bleach concentrations are now 7.00% – 8.25%. Thus, you must read the label to determine the correct dilution rate based on the initial concentration rate.

What are the problems with using bleach as a disinfectant?

- **Health problems for both children and workers**
  - Household chlorine bleach in a 5.25% to 6.00% concentration is considered an irritant to the skin, eyes, and respiratory tract. It is identified as corrosive in concentrations as low as 6.00%. The recently updated requirements of 7.00% – 8.25% pose more of a hazard.

  A corrosive product can chemically burn or irritate skin, mucous membranes and eyes. The Agency for Toxic Substances & Disease Registry (ATSDR) notes that “Inhalation of gases released from hypochlorite solutions may cause eye and nasal irritation, sore throat, and coughing at low concentrations. Inhalation of higher
concentrations can lead to respiratory distress with airway constriction and accumulation of fluid in the lungs (pulmonary edema).” \(^1\)

- **Worker health and safety**
  - Since bleach in a concentrated form is corrosive and can cause irreversible eye damage and skin burns, it requires the use of an emergency eyewash station in a workplace to flush eyes for 15 to 20 minutes in the event of an exposure.
  - It can irritate mucous membranes and the respiratory system if inhaled and can trigger respiratory conditions such as chemical irritant-induced asthma if there is prolonged exposure. \(^2,3\) According to the Association of Occupational and Environmental Clinic’s Exposure Codes, bleach is considered an asthmagen, causing new onset asthma and exacerbating asthma episodes. Studies found that asthma symptoms in domestic cleaning women were associated with exposure to bleach. \(^4\) Another study showed that bleach and organic chemicals (e.g., surfactants and fragrances) contained in several household cleaning products can react to form chlorinated volatile organic compounds (VOCs) when used during cleaning operations. \(^5\) Some chlorinated VOCs are toxic and probable human carcinogens.
  - Due to these health risks, staff handling of bleach for daily preparation requires training, a ventilated dispensing area, tools that help measure the correct amount of bleach, (e.g., dispensing pumps, a funnel), and the proper use of personal protective equipment (e.g., nitrile or rubber gloves and chemical splash goggles). See Chapter 5.D. Protocol for Safe Use of Bleach.
  - Mixing bleach with ammonia, quaternary ammonium compounds, vinegar, or other acids can create toxic gases. **Never mix bleach with another cleaning solution.**

- **Child health and safety**
  - The Agency for Toxic Substances & Disease Registry Medical Management Guidelines provides specific information on the effects of bleach on children: “Children exposed to the same levels of gases as adults may receive a larger dose because they have greater lung surface area to body weight ratios and higher minute volumes to weight ratios. Children may be more vulnerable to corrosive agents than adults because of the smaller diameter of their airways. In addition, they may be exposed to higher levels than adults in the same location because of their short stature and the higher levels of chlorine found nearer to the ground.”
  - Children have accidentally ingested bleach. In 2020 there were 18,788 bleach-exposure cases reported to US Poison Control Centers from January through May 10, a year-over-year increase of 38%. From January through March 2020 the “increase in total calls was seen across all age groups; however, exposures among children aged ≤5 years consistently represented a large percentage of total calls…. Among all cleaner categories “bleaches accounted for the largest percentage of the increase.” \(^6\)

- **In a school setting**
  - Bleach degrades metal and other incompatible surfaces.
  - It may damage fabrics and floor finishes.
- Bleach is unstable and degrades in storage, so it should be purchased monthly.
- A bleach solution must be mixed daily because the germicidal effectiveness of bleach in solution degrades after 24 hours.
- Bleach is an oxidizer and is categorized as reactive. See the specific storage requirements in the section below on *Storing Bleach and Bleach Solution*.

**Summary Note:** Chlorine bleach should be used only when proper precautions are followed and when safer alternatives are unavailable or regulations require its use.

**References**


Introduction

Although the Toxics Use Reduction Institute (TURI) does not recommend the use of bleach for disinfecting and sanitizing due to its corrosiveness and health hazards, bleach continues to be used in some schools and childcare centers. The following guidelines are provided to help prevent overexposure and misuse for those who choose to use it.

Purchasing Bleach Products and Supplies

1. Obtain bleach that is fragrance-free and registered by the EPA for use as a disinfectant and/or sanitizer.
2. Select a product dispenser that provides portion control and helps to minimize the hazards from the daily mixing process. Some examples are illustrated below. Search on the Internet for a “metered dosing container.”

Preparing a Fresh Bleach Dilution Daily

Solutions lose their strength after 24 hours and should not be used. If the solution is not labeled with a date, it may be outdated. The lack of an odor also indicates an out-of-date product and that the solution should be discarded. Safe work practices include:

1. Put on PPE, including chemical splash goggles, and rubber or nitrile gloves as required on the label for pouring and mixing the bleach solution.
2. Determine the dilution rate. Proper dilution is extremely important to ensure adequate disinfection and to reduce health hazards. Identify the product’s concentration rate to determine the proper dilution rate. Always check the product label for dilution rates and contact time for each specific product.

It is very important to note that the required concentration in the bleach sold has increased from 5.25% and 6.00% to 7.00% and 8.25% to ensure efficacy for sanitizing and disinfecting. In order to ensure you have the correct dilution rate for the type of use (e.g., disinfecting, sanitizing, disinfecting for bloodborne pathogens), determine the starting concentration and the concentration needed for the task.
The following link provides a **Chlorine Dilution Calculator** from Public Health Ontario. This calculator will help you to determine the correct dilution needed based on the concentration of bleach you are starting with.


3. Prepare the solution over a sink (if possible).
   - Avoid contact with eyes, skin, and clothing.
   - First, fill the container with the measured amount of cool water.
   - Second, add the bleach to the water to reduce the release of vapors.

4. Label the diluted solution with a “Workplace Label” on the secondary container. See Appendix H: Templates for Labeling Secondary Containers of Disinfectants and Sanitizers for information that is required to be on this label. Be sure to update the date and concentration on a daily basis when you replace the product.

The following label template can be used in addition to the “Workplace Label” on the secondary container with the diluted bleach. You can laminate the label and use a grease pencil to update the information.
Using the Prepared Bleach Solution

1. Protect yourself and building occupants.
   - Use when children are not present.
   - Wear PPE.
   - Ventilate the room well (using a fan to the outside if possible) while applying bleach.

2. Disinfect surface or item.
   - Clean the surface or item first with detergent and rinse.
   - Apply the bleach dilution after cleaning the surface.
   - Allow for a contact time as specified, or air dry. If the surface will be touched by skin, rinse after contact time is reached.
   - Allow the surfaces to completely dry before allowing children back into the area.

*NOTE:* Never mix bleach with any product, especially ammonia or products containing ammonia, because it creates toxic gas.

Cleaning Up

1. Wash measuring device (if used).
2. Remove goggles, and remove and dispose of gloves.
3. Wash hands after removing gloves.

Storing Bleach and Bleach Solution

1. Store the diluted product and the concentrated product in a secure area inaccessible to children, where it will not spill, and below eye level to prevent product from spilling into the eye when being moved.

2. Store away from incompatible products, including flammable products (such as solvent-based cleaning and degreasing products) and corrosives (which include acids such as an acid toilet bowl cleaner and bases such as ammonia-based or quaternary compound-based products).

Disposing of Bleach

1. Dispose of unused solution daily. Remember to update date and concentration (if changed) information label whenever changing out solution.

2. Diluted bleach solutions can be poured down the drain, but concentrated bleach must be disposed of as hazardous waste. Contact your school’s facilities office or the town’s Department of Public Works for hazardous waste guidance.
Sources

- Centers for Disease Control and Prevention, Special Pathogens Branch, “Infection Control for Viral Haemorrhagic Fevers in the African Health Care Setting, Section 5, Disinfect Reusable Supplies and Equipment.”

