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Disinfection with Bleach

Tech Talk

Bleach is a generic term often used to refer to a solution of sodium hypochlorite (e.g., household chlorine bleach). This solution can be an effective disinfectant when used properly. The information in this bulletin is intended to help you understand how to use bleach for disinfection. There are some commercially available bleach solutions that are registered by the Environmental Protection Agency (EPA) as disinfectants. Bleach with an EPA Registration must be used according to the directions on the EPA Label.

Understanding the concentration of your bleach solution is important for achieving effective disinfection. Bleach (usually 5.25% or 6.00%–6.15% sodium hypochlorite depending upon manufacturer) is usually diluted in water at 1:10 or 1:100. Approximate dilutions are 1-1/2 cups of bleach in a gallon of water for a 1:10 dilution (~6,000 ppm) or 1/4 cup of bleach in a gallon of water for a 1:100 dilution (~600 ppm).

Bleach Solution

5.25-6.15% sodium hypochlorite

Dilution	Chlorine (ppm)
None	52,500-61,500
1:10 or 1 ½ cup:1 gallon	5,250-6,150
1:20 or ¾ cup:1 gallon	2,625-3,075
1:100 or ¼ cup:1 gallon	525-615

It is important to know that different bleach products may have different concentrations of hypochlorite and that concentration degrades over time with storage, particularly at elevated temperatures. The graph on the next page shows data from a 3M internal study indicating that the concentration of sodium hypochlorite in two commercially available bleach products can decrease after several months of room temperature storage to a point where the standard dilution ratios will no longer provide the desired ppm concentration in the end-use solution.

There are test strips available for measuring the chlorine in your diluted bleach solution. Using these test strips periodically to verify you are using the correct chlorine ppm is recommended because it is difficult to know all the variables, such as storage temperature or dilution accuracy, which may impact your bleach concentration. These test strips are available through many commercial suppliers, but it is important to obtain the strips for the disinfecting concentration range you are using. For example, if you use a 1:10 or 1:20 dilution you need test strips for higher ranges such as — 1,000, 2,500, 5,000, 7,500, and 10,000 ppm.

While bleach can be an effective disinfectant, it is a poor cleaner, and it rapidly loses activity in the presence of organic soil. Since a mixture of bleach and water will provide only disinfectant capability, a two-step process is needed, where cleaning is performed prior to disinfection. Bleach is also a reactive material and can form toxic compounds or lose efficacy when mixed with other cleaning chemicals such as ammonia. Therefore, mixing bleach with a cleaner in an attempt to produce a one-step cleaner disinfectant on your own is not recommended. It is a good practice to let any cleaner you use completely dry before applying your bleach solution. This will help to minimize the chance for exposure to potentially toxic reaction products or possible additional dilution that lowers your bleach concentration.

Bleach solutions can be corrosive or irritating to eyes, skin and the respiratory tract. Always review the MSDS from your bleach supplier before use and implement the appropriate protective measures. Consult your facility safety professional or supervisor if you have any questions or health concerns. Mixing bleach with cold water instead of hot may minimize inhalation of airborne material while helping to maintain efficacy. Bleach may also damage surfaces and discolor materials, so it is a good idea to try using it in an inconspicuous area first, or check with the manufacturer of the surface you want to disinfect (such as medical equipment) if you are unsure if bleach should be used.

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Bleach solutions used for disinfecting must remain wet on the surface for an adequate amount of time to be effective. This is often referred to as Contact Time or Dwell Time and can vary depending on the dilution and type of microorganism you are trying to kill. For example, a ten minute contact time with a higher-strength (e.g. 1:10) solution containing at least 5000 ppm is recommended by the Center for Disease Control (CDC) for the hard-to-kill spore form of *Clostridium difficile*. After sufficient contact time, the surface should be rinsed with clean water to remove bleach residue. This helps to minimize surface damage and is especially important when using bleach to disinfect toys or food-contact surfaces.

In summary, bleach can be an effective disinfectant when used properly. However, because there are disadvantages with using bleach, it is important to weigh those factors against the need for that level of disinfectant. Using bleach prudently to minimize potential surface damage, safety concerns, and productivity impacts due to the need for a two (or possibly three) step process and helping ensure the correct concentration of chlorine is applied to the surface by maintaining fresh stock and periodic testing of your diluted solution will help you obtain the most benefit from bleach use to offset those disadvantages.

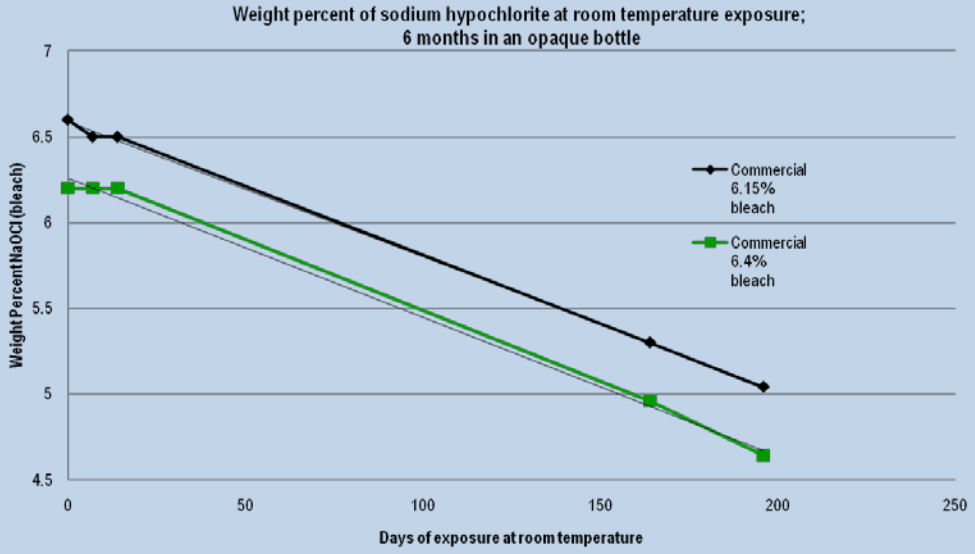
References:

Guidelines for Environmental Infection Control in Health-Care Facilities, CDC, 2003.

APIC, Guide to the Elimination of Clostridium difficile in Healthcare Settings, 2008.

Disinfection, Sterilization and Preservation, 5th Ed., Seymour S. Block, ed., 2001.

Bleach Degradation During Room Temp Storage



Extrapolation of the degradation curve shows only 2.9 weight percent remains after one year, a decrease of over half the initial concentration

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