

The following chart was taken from the DSHS Advanced Animal Control Officers Training Manual, Sanitation and Disease Control (Advanced) page 9

The Texas Department of State Health Services, Zoonosis Control Division has removed the word "bleach" from the disinfectant list and uses instead the word hypochlorites; however there is a great difference in the disinfecting properties of calcium hypochlorite (dry chlorine "bleach") and sodium hypochlorite (household "bleach") as explained in the following paper.

THE DIFFERENCE BETWEEN CALCIUM HYPOCHORITE and HOUSEHOLD BLEACH AS DISINFECTANTS

We would also like to note that CAL EPA has **not** granted household bleach or Sodium Hypochlorite a registration number for its use in animal facilities as a disinfectant

Detergents and Disinfectants

Name	Usage	Characteristics
Acid detergents	Remove dried urine particles on equipment and cages.	Corrosive; potential health hazards; need to remove residual detergent by rinsing with water.
Alkaline detergents	Remove oils left on surfaces from food, fecal material, or animal skin and hair.	Separate fat molecules so can remove by rinsing.
Iodine	Sanitizes equipment, utensils, and skin.	Stable; irritates skin less and corrodes metals less than other products; bactericide; sporocide; may stain.
Quaternary ammonium compounds (AQuats)	Kill enveloped viruses (feline rhinotracheitis).	Noncorrosive; nontoxic; can cause skin irritation; may leave a residual coating on hard surfaces that inhibits bacterial growth; can leave oily film.
Phenols	Kill enveloped viruses.	Bactericidal; fungicidal; virucidal (enveloped viruses); toxic to cats; cause skin and mucous membrane irritation; leave residual activity; corrosive.
Products containing chlorine (hypochlorites)	Kill enteroviruses (parvovirus, coronavirus).	Effective against many viruses, bacteria, and fungi; have deodorizer activity; inexpensive; may be corrosive; may irritate skin and respiratory tract; whiten materials.

DIFFERENCES BETWEEN CALCIUM HYPOCHORITE (Dry chlorine tablets or powder) and HOUSEHOLD BLEACH (Sodium hypochlorite) AS DISINFECTANTS.

Robert J. Saldivar, MS Animal Science, Texas A&M University 1958

First, we must recognize that the word **bleach** means to **whiten**, and it does not mean it contains chlorine. There are many bleaching agents that do not contain any chlorine and are still called bleach.

The biggest misconception is that liquid household bleach (sodium hypochlorite) does not lose potency until you make a sodium hypochlorite solution; **liquid household bleach is already a sodium hypochlorite solution**. One problem is that the instant "liquid household bleach" is manufactured it starts losing its chlorine content. Most people take it for granted that bleach does not lose its potency until it is mixed with water to make a diluted sodium hypochlorite solution. It already is a sodium hypochlorite solution; all we are doing is diluting an already weak sodium hypochlorite solution. Most bottles of household bleach have lost over half of the chlorine content by the time they are purchased. Calcium Hypochlorite has a one year shelf life, in the dry form.

Second, In order to keep the chlorine in solution, household bleach manufacturers have to add **lye** to the solution, raising the pH of that solution to **11.5**. **Lye** is what causes all the problems with skin burns, ruined metal cages and the release of noxious and dangerous chloramine gas among others. Lye by itself will kill some germs, it has been used for many years for that purpose, but it needs a long contact time and high concentration. Calcium Hypochlorite contains no **lye**

Third. For a chlorine **solution** to be a good disinfectant it must meet the **Chlorine Demand**.

The chlorine demand is the amount of **FREE AVAILABLE CHLORINE**, or (**FAC**) often called **HYPOCHLOROUS ACID** or **HOCl**, **needed to disinfect or oxidize organic matter before a FAC residual is reached**. If the chlorine demand is not met then complete disinfection can not be obtained. One of the best signs that the Chlorine Demand has not been met is the strong chlorine odor present, produced by chloramine gas. No chlorine smell should be present if the Chlorine Demand has been met.

Fourth. For **FREE AVAILABLE CHLORINE**, **HOCl**, to exist in a solution the pH of that solution **MUST** be below a pH of 8, otherwise you will have the $-OCl$ ion, 120 times less effective than HOCl as a disinfectant. (Fair, G.M. Harvard University)

Remember, **at the time of manufacture household bleach is a sodium hypochlorite solution with a pH of 11.5**

Also remember that HOCl (hypochlorous acid) is the strong disinfectant in chlorine and does not exist at a pH over 8. A buffered Calcium Hypochlorite solution has a pH of less than 8.

A 1:32 dilution of 5.25% FRESH liquid household bleach has a pH of 11.5

White, Geo.Clifford, "Handbook of Chlorination and Alternative Disinfectants" third edition, Van Nostrand Reinhold. 1992

HOUSHOLD BLEACH OVERRATED AND OVERUSED AS A DISINFECTANT

Reprinted and edited with permission from: Dr James H. Berino, PhD, Chemist Director of Research, The Champion Company, by Robert J. Saldivar, MS Animal Science Texas A&M University.

Dr. Berino writes:

Common house hold bleach (sodium hypochlorite) is overrated and overused as a disinfectant and should be used **only** if another alternative is not available. A CDC document that advocated the use of bleach during the AIDS scare in 1987 lunched the widespread use of “bleach as a disinfectant”. A close look at the document reveals that the CDC **did not advocate “bleach” in lieu of other disinfectants, but merely a statement that “bleach” was effective if no other registered or approved disinfectants were available for use.** The latest revision of this document (1995) calls notice to the limitations of “bleach” in high organic debris, blood and or body fluids. Even in the situation with HIV, which is a very labile virus from a disinfection standpoint, **“bleach”, (SODIUM HYPOCHLORITE) has several documented failures.**

“Bleach” disinfection: Dr, Berino writes; despite the fact that “bleach” is aqueous sodium hypochlorite, the manufacturers add sodium hydroxide (**lye**) and in most cases this is what actually disinfects in “bleach” and ruins everything. A **pure sodium hypochlorite** solution contains no sodium hydroxide (**LYE**).

The actual disinfecting species in any hypochlorite solution is **hypochlorous acid (HOCL)** not sodium or calcium hypochlorite. When one refers to the free available chlorine in a disinfectant, this denotes the sum of all chlorine species in solution and does not relate directly to the efficacy of a chlorine disinfectant (due to the pH differences that exist in varying hypochlorite solutions.)

The basic problems plaguing “bleach” as a disinfectant are two fold, **first** as any hypochlorite solution it starts loosing potency the minute it is manufactured, **second** is the fact that the % of hypochlorous acid in the solution is severely affected by the pH of the solution. Typical “bleach” has a very high pH, typically 11 (far too high for any significant HOCL (hypochlorous acid) to be present in the solution. In fact, the quantity of HOCL is only 20% at a pH of 8 and degrades to less than 0.24% at pH 11. Consequently no amount of “bleach” used will deliver a sufficient quantity of active disinfecting chlorine species, instead releasing dangerous and pungent chloramine gas during the application.

Many investigators reveal “bleach” purchased at retail consumer stores usually has degraded to less than 2% hypochlorite in solution and a pH in excess of 11, indicating that chemical dilution of the product, itself, has already occurred, offering very little chlorine disinfection, and that in most cases it is the lye that actually does the disinfecting needing long wet contact times and creating other problems as well as poor disinfection,.

Only when the pH drops around 7 does the quantity of hypochlorous acid in solution become substantial and disinfecting power increases drastically. This is the explanation for the successful use of chlorine type powders and tablets sanitizers in the swimming pool, food, animal and medical industry where most solutions are buffered to pH 7 to 8 allowing a good quantity of HOCL to be present in the disinfection solution. Most of this powders and tablets such as calcium hypochlorite and sodium dichloroisocyanurate contain large amounts of chlorine (usually 65%) and are very stable. These powders and tablets are capable of releasing large quantities of active chlorine disinfecting species in a short time frame with out the limitations of “bleach” and its dilutions.

Point of use chlorine generators using buffered and metered calcium hypochlorite tablets are very efficient and very popular in Europe, Australia and Africa, for disinfecting food products, food plants, produce packing sheds, animal facilities, public use facilities ambulances and veterinary clinics. These devices are gaining popularity in the United States. “Bleach” solutions are a poor disinfectant choice, considering the drawbacks and excellent alternatives available.