

Disinfectant Dilutions³

The following chart lists disinfectants approved by the United States Department of Agriculture for field use in the event of a foot and mouth disease outbreak but is very useful and can be applied for use anytime disinfectants are needed.

Product	Dilution	Mixing Instructions	Notes
5.25% Sodium Hypochlorite (NaOCl) (household bleach)	3%	Add 3 gallons of chlorine bleach to 2 gallons of water; mix thoroughly.	
Acetic acid*	45%	Add 6.5 ounces of glacial acetic acid to 1 gallon of water; mix thoroughly.	Vinegar is a 4% solution of acetic acid.
Potassium Peroxymonosulfate and Sodium Chloride (i.e., Virkon-S)	1%	Follow label directions.	Virkon-S
Sodium Carbonate (soda ash)*	4%	Add 5.33 ounces of sodium carbonate to 1 gallon of hot water (or 1 pound to 3 gallons of hot water); mix thoroughly.	The solution is mildly caustic but can dull paint and varnished surfaces.
Sodium Hydroxide (NaOH) (lye)*	2%	Add 1/3 cup of NaOH pellets (2.7 ounces of the lye) to 1 gallon of cold water; mix thoroughly.	This solution is highly caustic. Use protective rubber clothing, gloves and safety glasses, WARNING: Always add the lye to the water. Never pour the water over the lye.

Disinfecting a trailer²

Level of disinfection

All cleaning and disinfection will be carried out so as to reduce the risk of transmission of disease.

Transportation vehicles are required to be disinfected

1) In the case of animals transferred in the trailer

(a) the following shall be disinfected whether or not they are soiled: all the inside surfaces of those parts of the means of transport in which the animals are transported, all parts of the means of transport to which the animals may have had access during the journey; and

(b) the following shall be disinfected if they are soiled -

(i) any detachable fittings not used during the journey;

(ii) any other part of the means of transport; and

(iii) any equipment.

2) In the case of animals transported in a trailer, the interior of the trailer should be disinfected whether or not it is soiled, and the exterior of the trailer and any parts of the means of transport carrying the trailer shall be disinfected if they are soiled.

3) The wheels, mudguards and wheel arches of the means of transport shall be disinfected whether or not they are soiled.

Cleaning the trailer

Cleaning shall be by removing any feeding stuffs to which animals have had access, litter, excreta and other material of animal origin, mud and other contaminants using any appropriate means, and then cleansing with water, chemicals or chemical compounds (or, if necessary, any combination of these) until free of dirt.

Disinfecting

After cleaning of the trailer has been completed, disinfection using the proper dilutions will need to be completed.

Routine Stall Cleaning and Decontamination of a Vacated Stall

1. Vacated stalls should be mucked out, cleaned and disinfected as soon as possible after a horse leaves (certainly within 4 hours). Wear outer overalls and gloves while cleaning stall.
2. Cleaning stalls should be done in a between stall and dumpster
3. After removing all bulky and coarse materials (feed, bedding, and manure) by shoveling, attempt to completely remove the remaining (small-particle) materials by sweeping with a broom into a pile, and then sweeping the pile into the shovel.
4. No high pressure water is ever used for cleaning stalls.
5. The balance of the stall cleaning and disinfection process is as follows:
6. Gently rinse the inside of the stall door, the walls and the floor with low pressure water (no nozzles). Attempt to wash all visible loose particulate matter toward and into the drain.
7. Scrub the inside of the stall door, all four walls and the floor with foaming agent soap, using stiff-bristle brushes, and at least 20 pounds of force:
8. First, thoroughly scrub all of the corners and edges of the stall with one of the special brushes provided for this purpose.
9. Next, scrub each of the four walls, in turn. Start at the left-hand corner, as high on the wall as you can reach with your brush, and scrub an 18 to 24-inch wide area, using horizontal strokes, working toward the floor.
10. Rescrub this same area, this time using vertical strokes.
11. Move 18 to 24 inches to the right on the wall, and scrub another 18 to 24-inch wide section, slightly overlapping the area which you have just finished scrubbing.
12. Continue this process until you have double-scrubbed all four walls and the inside of the door.
13. Utilize the same double-scrubbing pattern on the floor.
14. Some areas within the stall (gate hinges; between pipes; waterers; hay racks; feed buckets; pipes; latches; ledges) should be cleaned with a designated specific designed brush.
15. Next, gently rinse off the entire foaming agent. If any manure, blood, dirt, etc. is still "caked" on the walls or floor, these spots should be rescrubbed with foaming agent until clean. Any particulate matter left in the stall at this point should be gently rinsed into the drain, or swept up and removed.
16. Finally, all surfaces within the stall are disinfected three times:
 - a. The inside of the stall door, all four walls, and the floor are sprayed with bleach 4 oz/gal, using the same stiff-bristle brushes and double-scrubbing pattern. Waterers, hayracks, feed buckets, pipes, latches, gate hinges, and ledges are also sprayed with bleach 4 oz/gal.
 - b. After allowing a minimum contact time of ten minutes for bleach 4 oz/gal to disinfect, gently rinse the inside of the door, the walls, the floor, and all other stall

surfaces and equipment with water. Then once again spray the stall with bleach 4 oz/gal.

c. After this third double-scrubbing with bleach 4 oz/gal, the disinfectant is not rinsed off, but is allowed to dry on the walls and floors.

17. Dirt floors after thorough cleaning can be saturated with bleach solution and left to dry.
18. The outer stall door should not be opened until a new horse is to be introduced.
19. After the vacated stall has been cleaned and disinfected, the associated flooring should be double-scrubbed with foaming agent soap. Then, the floors should be sprayed with bleach 4 oz/gal, and the walls, sink, faucet handles, counters, shelves, jugs, containers, buckets, pails, trash cans, fan and light switches, etc. should be sponged/wiped/sprayed/dipped with/in a single application of bleach 4 oz/gal. The disinfectant is not rinsed off. Instruments, equipment and miscellaneous tack (dose syringes, stomach tubes, twitches, halters, lead ropes, endoscopes, etc.) should also be sterilized with cold sterilization with Nolvasan (chlorhexidine) solution.
20. After the walls and floor have dried (usually in 1 to 2 hours), the stall is inspected by the supervisor, or other designee. If there is any organic matter (feces, bedding or feed) or other dirt still present, the stall must again be double-scrubbed with foaming agent, and then sprayed one more time with bleach 4 oz/gal.
21. Immediately prior to placing a horse in a stall, the stall should be visually inspected and passed by the supervisor.
22. Shovels, brooms, brushes, etc. used in cleaning a stall should be placed in a disinfectant barrel after use, and should not be used for cleaning any other stall.

Bleach as a Disinfectant

1. Chlorine solutions will gradually lose strength, so fresh solutions must be prepared frequently. Diluted solutions should be replaced after 24 hours. The stability of chlorine in solution is greatly affected by the following factors:

- chlorine concentration,
- presence and concentration of catalysts such as copper or nickel,
- pH of the solution,
- temperature of the solution,
- presence of organic material, and
- ultraviolet irradiation.

2. The chlorine solution should have the following characteristics for maximum stability:

- low chlorine concentration,
- absence or low content of catalysts such as nickel or copper,
- high alkalinity,
- low temperature,
- absence of organic materials, and shielded from ultraviolet light by storage in the dark in closed containers

3. Factors Affecting Chlorine Biocidal Activity

- pH - Chlorine is more effective at a lower pH
- Temperature - An increase in temperature produces an increase in bactericidal activity.
- Concentration - A fourfold increase of chlorine will result in a 50% reduction in killing time and a twofold increase in a 30% reduction.
- Organic Material - Organic material will consume available chlorine. If the organic material contains proteins, the reaction with chlorine will form chloramines which will have some antibacterial activity. Loss due to organic materials is more significant if minute amounts of chlorine are used.
- Hardness - Hardness of the water does not have a slowing effect on the antibacterial action of sodium hypochlorite.
- Addition of Ammonia or Amino Compounds - Addition of ammonia and nitrogen compounds will slow the bactericidal action of chlorine.

4. Other Available Chlorine Compounds

Other active chlorine compounds that are available are liquid chlorine, chlorine dioxide, inorganic chloramines, organic chloramines, and halazone.

5. Characteristics and Hazards

Chlorine combines with protein and rapidly decreases in concentration in its presence. It is also inactivated to some extent by natural non-protein material and plastics and is not compatible with cationic detergents. It is a strong oxidizing agent that is corrosive to metals. Chlorine should not be used on the metal parts of centrifuges and other machines which are subject to stress when in use.

Chlorine may cause irritation to the eyes, skin, and lungs. For additional hazard information, see the Material Safety Data Sheet for sodium hypochlorite, aqueous solution. Wear safety goggles, rubber gloves, aprons, or other protective clothing when handling undiluted solutions.

Note: The US EPA and Cal EPA have defined disinfectants (antimicrobials) as pesticides. All EPA-registered antimicrobials must be used according to