

STANDARD OPERATING PROCEDURES
DIVISION OF COMPARATIVE MEDICINE
UNIVERSITY OF SOUTH FLORIDA

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TITLE:	Chlorine Dioxide Decontamination
SCOPE:	Animal Care Personnel
RESPONSIBILITY:	Facility Manager and Technical Staff
PURPOSE:	To Outline the Proper Procedures for Decontamination of Animal Research Facilities and Equipment

I. PURPOSE

1. This procedure outlines the proper procedures to be followed for high-level disinfection of animal facility housing rooms, procedural areas, surgical suites, labs, necropsy areas, and equipment.

II. RESPONSIBILITY

1. It is the responsibility of the Facility Manager to ensure that all technical staff performing decontamination are adequately trained in the following procedures and these procedures are adhered to.
2. It is the responsibility of the technical staff assigned to decontamination procedures to read, understand, and follow the procedures outlined below.
3. It is the responsibility of the technical staff assigned to decontamination procedures to read and understand the information provided in the chlorine dioxide SDS.

III. GENERAL PROCEDURES

1. High-level disinfection of facilities/animal housing is accomplished using Clidox-S at a 1:5:1 dilution. Disinfection can be accomplished by wiping-down surfaces with Clidox-S 1:5:1, or when equipment and ventilation permits (e.g., vacant animal housing rooms), using a Cyclone aerosol fogger in accordance with **SOP #1119**.
2. Clidox-S (i.e., chlorine dioxide) is irritating to the eyes, skin, and mucous membranes. It is imperative that all personnel using Clidox-S wear the appropriate personal protection equipment.
 - a. Protective eyewear (e.g., goggles or face shield) must be worn when performing procedures that could result in Clidox-S coming in contact with the eyes.
 - b. When preparing Clidox-S solutions from concentrate, protective eyewear, and gloves are required. Wash hands after handling.
 - c. When using Clidox-S diluted solutions, protective eyewear, and gloves are recommended. Wash hands after handling.

- d. **If you must enter an area briefly during or immediately after fogging with Clidox-S solution**, Tyvek coverall with hood and boots (or long sleeves, long pants, hair cover and shoe covers), gloves, snug- fitting goggles, and half-face respirator with chlorine gas filters (e.g., 3M 6000 half face-piece respirator assembly with 3M 6001 acid gases filter cartridges) are required. **Note**, prior fit testing is required to determine what size of respirator assembly to wear. When assembling the respirator, with an indelible pen, write the expiration date of the filter cartridge on the cartridge so it will be changed prior to its expiration date or whenever the taste or smell of the irritant is detected or whenever it becomes difficult to breathe through the respirator.
3. A 1:5:1 dilution of Clidox-S is prepared by mixing **1 part base to 5 parts water to 1 part activator**. To prepare approximately one gallon (128 oz. or 3785 ml) of Clidox-S solution (1:5:1):
 - a. Place 2 $\frac{1}{4}$ cups or 18 oz. or 532 ml Clidox-S base into a one-gallon container.
 - b. Add 11 $\frac{1}{4}$ cups or 90 oz. or 2662 ml tap water.
 - c. Add 2 $\frac{1}{4}$ cups or 18 oz. or 532 ml Clidox-S activator.
 - d. Mix well and allow to sit for 15 minutes.
 - e. Clidox solution at 1:5:1 must be used within 14 days.
 4. Alternatively, for decontamination of larger room volumes, and for ease of preparation and application, mix Clidox-S 1 part base: 3.75 parts water: 1 part activator in the reservoir tank of the Cyclone Aerosol Fogger and allow 15 minutes for activation of the solution (i.e., fill the tank by adding 800 ml of base, 800 ml of activator and 3000 ml of water = 4600 ml or 1.2 gallon).

IV. SPECIFIC PROCEDURES – FOGGING ANIMAL HOUSING AREAS

1. Thoroughly read and understand all manufacturers' instructions and observe all "Cautions" and "Warnings" prior to using any equipment or solutions. **See SOP #1119 Cyclone Aerosol Fogger.**
2. Measure the area to be fogged to determine the cubic volume of space to be decontaminated (length x width x height in feet).
3. Remove all personnel and animals from area to be contaminated as well as any equipment and materials that are not compatible with chlorine and high levels of moisture.
4. Shut off HVAC to area to be decontaminated when possible.
 - a. Remove supply and exhaust vent covers, when possible, and lightly spray Clidox-S into vents and surrounding areas.
 - b. Remove and dispose of existing filters.
 - c. Wipe down vent covers with Clidox-S followed by an alcohol rinse, , or wipe down with Sporidicin before replacing covers and covering with plastic sheeting.
 - d. Cover vents with plastic sheeting and tape as needed to wall/ceiling surface to form a tight seal.

- e. If possible, when covering HVAC openings, establish a slight negative air pressure differential within the area to be treated relative to the adjoining air space to ensure Clidox-S vapor stays within the area being treated.
 - f. If possible, attach a pull string to one or more plastic sheets covering one or more exhaust plenums and have cords extend out of the area to be treated.
5. Cover any equipment, thermostats, or electrical outlets that should not be exposed to Clidox-S during the fogging procedure. Wipe surfaces with Clidox-S followed by an alcohol rinse, or Sporidicin, prior to covering with plastic sheeting/wrap, and taping securely.
6. Place fogger on a cart and place in center of room. Run an electrical cord to an outlet outside the area to be fogged. Leave unplugged. In larger areas, use two or more foggers in opposite corners of the room. Elevate fogger discharge at the highest 40 degree angle to ensure room coverage.
7. Pour Clidox-S solution into the formulation tank of the fogger. Turn the machine metering valve to a desired setting. With Cyclone Aerosol Fogger set on "5," Clidox-S solution will flow at 1.6 oz or 47 ml/min. When set on "6," flow will be at 1.8 oz or 54 ml/min.
8. Turn fogger power switch to **ON**.
9. Leave room. Plug in power cord to start fogger. Check inside room to ensure machine has started and is functioning by the presence of mist or fog. Seal outer door edges with plastic and tape.
10. Application of Clidox-S is recommended at 128 oz or 1 gallon or 3,785ml/2,100 ft³ for decontamination using Cyclone Aerosol Foggers.
11. As examples, using the formula $X \text{ ft}^3 \times 1.8 \text{ ml/ft}^3 \div 47 \text{ ml/min}$ (set "5") = minutes required for exposure \div #foggers used:
 - a. SRB room 20294 is 16'x20'x9' = 2880 ft³ with 2 foggers set at 5 = 54 minute exposure.
 - b. SRB room 20232 is 20'x20'x9' = 3600 ft³ with 2 foggers set at 6 = 60 minute exposure.
 - c. SRB room 20229 is 21'x20'x9' = 3780 ft³ with 3 foggers set at 5 = 48 minute exposure.
 - d. SRB room 20258 is 24'x20'x9' = 4320 ft³ with 3 foggers set at 5.5 = 52 minute exposure.
 - e. COM room 1360 is 17'x20'x8' = 2720 ft³ with 2 foggers set at 5 = 52 minute exposure.
 - f. COM room 1351 is 15'x20'x8' = 2400 ft³ with 2 foggers set at 5 = 46 minute exposure.
 - g. COM room 1344 is 11.5'x17'x8' = 1564 ft³ with 2 foggers set at 5 = 30 minute exposure.
 - h. COM room 1319N is 8'x11'x8' = 704 ft³ with 1 fogger set at 5 = 27 minute exposure.

12. After the appropriate dispersal time, unplug the Cyclone Aerosol Foggers outside of the area being treated, wait 15 minutes, and then, from outside of the area being treated, pull the string(s) attached to the plastic sheet covering the exhaust plenums.
13. Wait for the mist to settle before re-entering room. Wearing the appropriate PPE described above, open the decontaminated area to additional exhaust ventilation by removing the exhaust plenum covers. After the additional exhaust ventilation has cleared the room of residual mist, and wearing the appropriate PPE described above, open the decontaminated area to additional supply ventilation by removing the supply plenum covers. Check all surfaces in room to be sure that there has been adequate saturation; all surfaces must be damp to the touch to ensure decontamination of room.
 - a. Examine applicator reservoir. Enough solution should remain to cover the filtered pickup in the reservoir. Do not let the reservoir run dry.
 - b. If the reservoir is dry, you have miscalculated. Adjust the time of application or the volume of solution in the reservoir before next use.
14. Remove remaining plastic covers by first spraying gloved hands with Clidox-S solution. Using gloved hands, remove plastic and dispose of immediately. Do not leave on floor of area that has just been decontaminated.
15. Wipe covered surfaces, such as stainless steel counters, shelves, sinks, etc., with cold tap water, Sporicidin, or isopropyl alcohol to remove salt residue and limit corrosion.
16. Fogged animal housing rooms should be allowed to air out before use.
17. Dispose of any used Clidox-S solution by pouring slowly down a drain while running cold tap water into the drain.
 - a. Be sure to wear protective wear when doing this.
 - b. Caution: this does create fumes. If possible dispose of in fume hood with a drain.
18. After the disinfectant has dried and dissipated, sanitation should be validated using a NovaLum Luminometer according to SOP #1010 and 1139. At least two randomly selected walls of the room will be sampled and two fixed equipment/caging surfaces, when present

V. SPECIFIC PROCEDURES-FACILITY-WIDE DECONTAMINATION

1. In addition to the above procedures, all racks and shelving units, including those stored in hallways, will be sanitized in a rack washer when available. Facilities without rack washers will use Clidox-S 1:5:1 spray or fog.
2. All plastic caging, including all stored caging will be sanitized using the appropriate cage wash system.
3. It is suggested that a large room be decontaminated and used to store racks, caging, and portable equipment after it has been sanitized.

4. Cage bedding areas must be cleaned out. Sanitize bedding bins, scoops, barrels, and dollies.
5. All equipment, including carts, flat beds, food barrels, dollies, restraint devices, euthanasia chambers, and trashcans are to be sanitized.
6. Procedural areas, surgical suites, laboratories, and necropsy areas will have to be wiped down by hand using Clidox-S spray (1:5:1). Allow Clidox-S to remain in contact with surfaces for 5 minutes. Wipe areas clean with cold tap water.
7. Specific rooms and equipment (e.g., behavioral rooms) may require special considerations and decontamination procedures. Contact investigators for their assistance with equipment.
8. The clean side of cage wash areas should be decontaminated prior to initiating and receiving sanitized caging. The dirty side of cage wash should be decontaminated at the completion of cage washing each day. This can be done by filling a large sprayer with Clidox-S solution (1:5:1) and spraying walls, floors, and equipment; allow to sit for 5 minutes; hose down completely.
9. All floors not decontaminated as part of animal housing will be mopped with Decon-Spore 200 Plus. The floor machine may be used in hallways.

VI. SAFETY CONSIDERATIONS

1. It is imperative that all personnel using Clidox 1:5:1 wear the appropriate personal protection equipment.
 - a. Protective eyewear (e.g., goggles or face shield) must be worn when performing procedures that could result in Clidox-S coming in contact with the eyes.
 - b. When preparing Clidox-S solutions from concentrate, protective eyewear, and gloves are required. Wash hands after handling.
 - c. When using Clidox-S 1:5:1 diluted solutions, protective eyewear, and gloves are recommended. Wash hands after handling.
 - d. **If you must enter an area briefly during or immediately after fogging with Clidox-S solution**, Tyvek coverall with hood or hair cover, boots, gloves, mask, and respirator with chlorine gas filters are required (e.g., 3M 6000 half face-piece respirator assembly with 3M 6001 Organic Vapor cartridges).
2. In case of eye contact – flush with water for at least 15 minutes and contact a physician.
3. In case of skin contact – flush with water.
4. Avoid contact with and do not mix with other combustible or acidic substances to prevent the release of Chlorine Dioxide.
5. In case of spills, contain the spill with an absorbent material and notify Health & Safety at 974-4036 for evaluation or instruction.

VII. REFERENCES

1. Refer to the Dyna-Fog manual for additional fogger information or contact Curtis DYNA-FOG® customer service 317-896-2561.
2. Refer to the Clidox-S SDS for additional Chemical information.

Approved:

Date: