



North Carolina Department of Environment and Natural Resources

Dexter R. Matthews, Director

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary

January 2, 2007

Donii Fox, MSPH, CIH
Biological Safety Officer
University of North Carolina at Chapel
Department of Environment, Health, Safety
1120 Estes Drive Extension
Campus Box 1650
Chapel Hill, NC 27599-1650

Dear Donii Fox:

This is in response to your letter requesting approval of the chemical treatment of *P. aeruginosa*, *E. coli* & *Staph. aureus* using BacDown detergent disinfectant as described in the request for approval submitted to the Department.

According to 15A NCAC 13B .1207(4)(b) the Division is authorized to approve the alternative chemical treatments of microbiological wastes.

The chemical treatment of the organisms listed above as described in the procedures for treatment which was submitted with your letter of November 6, 2006, is approved.

The test descriptions and results which were submitted to the Department substantiate the efficacy of the treatment of the organisms with BacDown.

Should you have any questions regarding this matter you may contact me at (919) 508-8499 or Bill Patrakis at (919) 508- 8512.

Sincerely,

Ellen Lorscheider
Environmental Programs Manager

Cc: Bill Patrakis, Environmental Biologist



Request for Approval

Chemical Treatment of Liquid Infectious Waste

Approval for chemical treatment of liquid infectious waste must be obtained from the NC Division of Waste Management. Please provide answers to the following questions, attach supporting documents as outlined below, and submit your request to Donii Fox, EHS, CB #1650. EHS will submit your request to the NC Division of Waste Management.

Request for approval must be substantiated by results of demonstrated effectiveness of the chemical to treat the specific microbiological agent(s) of concern for the waste disposed.

I. Description of infectious waste

- a. *Describe waste to be treated (i.e. cultures, cell lines):* Microbiological cultures in tryptic soy broth (TSB) growth medium or phosphate buffered saline (PBS)
- b. *Organisms present:* *Pseudomonas aeruginosa, Escherichia coli, Staphylococcus aureus*
- c. *Estimated concentration/titer of organisms:* $\sim 10^8$ colony forming units (CFU) per mL
- d. *Other material present in waste (i.e. other organic material):* tryptic soy broth growth medium; phosphate buffered saline
- e. *Volume of waste and frequency:* 1 mL – 50 mL, average 3 – 5 times/wk

II. Description of treatment procedures

- a. *Summarize proposed procedure for treating waste:* All work is conducted in a biological safety laminar flow hood to protect the organisms from outside contamination and to contain infectious agents in case of a spill. Samples of infectious waste are placed in an Erlenmeyer flask in a secondary container and BacDown Detergent Disinfectant (BDD) is added directly to the waste at a ratio of no less than 1:4 (BDD:waste). Waste is left undisturbed for a minimum of 24 h and a maximum of 48 h at ambient temperatures. Note: The manufacturer suggests using BDD at 1:64 dilution. We use a maximum 1:4 dilution.
- b. *Disinfectant to be used (please attach MSDS):* BacDown Detergent Disinfectant containing:
 - i. Alkyl-aryl ammonium chlorides [CAS 68391-01-5] (2.25%)
 - ii. Alkyl-aryl ammonium chlorides [CAS 68956-79-6] (2.25 %)
 - iii. Nonyl Phenoxyethoxyethanol [CAS 9016-45-9] (<10%)

BacDown Detergent Disinfectant is an EPA registered disinfectant (#1839-95-56753) and meets OSHA bloodborne pathogen disinfectant requirements.

- c. *Disinfectant concentration:* Starting concentrations listed above in part II. b. i-iii. Final concentrations after maximum 1:4 dilution:
 - i. Alkyl-aryl ammonium chlorides [CAS 68391-01-5] = 0.56%
 - ii. Alkyl-aryl ammonium chlorides [CAS 68956-79-6] = 0.56%
 - iii. Nonyl Phenoxyethoxyethanol [CAS 9016-45-9] = <2.50%



- d. *Ratio of disinfectant (ml) to liquid waste (ml):* BDD:waste = $\geq 1:4$ (Note: Manufacturer recommends a dilution 1:64. A 1:4 dilution is thus 16x more concentrated than recommended.)
- e. *Contact time of disinfectant with liquid waste prior to disposal:* 24 - 48 h at ambient temperatures
- f. *Small variations in temperature, time, pH, concentration and state of dispersion, penetrability, reactivity of organic material may make large differences in the effectiveness of disinfection. List the factors that may affect disinfection:* The temperature is constant at ~ 25 °C. Waste samples are always in either TSB or PBS.

III. Verification of efficacy of treatment procedures

- a. *Submit results of experiments that verify the proposed procedures are effective. Such studies may include attempts to recover and quantitate the agent from liquid or swab samples, or sealed patches, by animal inoculation, plaque assay, agar or broth cultivation and similar methods, following controlled decontamination under the same experimental conditions envisioned for proposed studies. Reports of these studies should be provided with this document in support of your request.*

To verify the effectiveness of the above-outlined sterilization procedures, agar cultivation assays were performed. For the agar cultivation assay (essentially a reproductive viability assay), 100 μ L of disinfected waste that had been exposed to BDD for 24 h (1:4 BDD:waste) was plated on tryptic soy agar nutrient plates. The nutrient plates were incubated at 37 °C overnight, and were examined for colony growth the following day. No visible colonies formed on any of the test plates (n=3), indicating that the above-outlined chemical sterilization procedure is effective.

- b. *Please attach any publications that will support the use of this disinfectant under the proposed conditions. These publications cannot be provided in lieu of the experiments described above unless the publication describes the same treatment procedures for the infectious waste described in Section I (including concentration of organism, organic material present, type of waste, organisms).*

The seminal publications identifying the antimicrobial properties of quaternary ammonium salts are listed below. Neither is available in the UNC-CH libraries and as a result neither is attached as an appendix.

Domagk, G. A. A new class of disinfectants. *Dtsch. Med. Wochenschr.* **1935**, *61*, 829-832.

Shimizu, M.; Okuzumi, K.; Yoneyama, A.; Kunisada, T.; Araake, M.; Ogawa, H.; Kimura, S. In vitro antiseptic susceptibility of clinical isolates from nosocomial infections. *Dermatology.* **2002**, *204*(Suppl. 1), 21-27.

I would also direct your attention to certain books and book chapters that outline the broad-spectrum antibacterial properties of quaternary ammonium salts:

Tortora, G. J.; Funke, B. R.; Case, C. L., *Microbiology: An Introduction*. The Benjamin/Cummings Publishing Company, Inc.: New York, 1992, pp. 182-184.



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Hugo, W. B.; Russel, A. D. In *Types of antimicrobial agents, Principles and practice of disinfection, preservation*, 2nd ed.; Russel, A. D., Hugo, W. B., Ayliffe, G. A. J. Eds.; Blackwell Scientific Publications: Oxford, 1992; pp 7-68.

Merianos, J. J. Quaternary ammonium antimicrobial compounds. In *Disinfection, sterilization, and preservation*, 4th ed.; Block, S. S., Ed.; Lea and Febiger: Philadelphia, 1991; pp 225-255.

Appendices

- A. MSDS Sheet – BacDown Detergent Disinfectant.
- B. Technical Notes – BacDown Detergent Disinfectant.

Material Safety Data Sheet

(MSDS)

Date of Issue: 10/31/1995

Date of Revision: 08/05/2005

SECTION I - MANUFACTURER INFORMATION

Manufacturer Name: Decon Laboratories, Inc.

Trade Name:
BDD Bacdown® Detergent Disinfectant

Emergency Telephone
U.S.: (800) 424-9300
Canada: (703) 527-3887

Chemical Name or Synonym: N/A

Info Telephone: 610-755-0800

Mfg. Address: 460 Glennie Circle

City: King of Prussia

State, Zip: PA 19406

SECTION II - HAZARDOUS INGREDIENTS

CAS #	Chemical Name	Percent	PEL	C	S	TLV	C	S	Units	313
68391-01-5	Alkyl-aryl ammonium chlorides	2.25							N/A	N
68956-79-6	Alkyl-aryl ammonium chlorides	2.25							N/A	N
9016-45-9	Nonyl Phenoxy polyethoxyethanol	<10							N/A	N

CAS Numbers beginning with letters are codes for items with no valid CAS assignments; "PEL" is OSHA Permissible Exposure Limit; "C" indicates the standard is a Ceiling value; "S" indicates the chemical has a "Skin Contact" notation; "TLV" is Threshold Limit Value; "313" indicates ingredient is reportable under SARA Title III, Section 313. NA-Not Applicable; NE-Not Established; UN-Unknown

Additional Information: HMIS RATING: HEALTH: 1; FLAMMABILITY: 0; REACTIVITY: 0
Unidentified ingredients are not considered hazardous under the Federal Hazard Communication Standard (29 CFR 1910.1200)

SECTION III - PHYSICAL DATA

Boiling Point (°F):	>212	Specific Gravity:	1.035
Vapor Pressure (mm of Hg):	<18	% Volatiles:	> 80
Vapor Density (Air=1):	N/A	pH:	10.7-12.7
Solubility:	Complete	Evaporation Rate:	<1 BuAc = 1
Appearance:	Yellow Liquid; mild floral or citrus scent.		

SECTION IV - FIRE AND EXPLOSION DATA

Flash Point:	N/A	LEL:	N/A	UEL:	N/A
Extinguishing Media:	Use media suitable for surrounding materials.				
Special Procedures:	No special procedures required.				
Unusual Fire / Explosion Hazards:	None known.				

Additional Information:

Hazard Ratings

HMIS: Health = 2 Flammability = 0 Reactivity = 0 Personal Protection = C

NFPA: Health = 2 Flammability = 0 Reactivity = 0

BDD Bacdown® Detergent Disinfectant**SECTION V - HEALTH HAZARD DATA****ACUTE HEALTH EFFECTS / SYMPTOMS:**

Inhalation of mist may cause respiratory irritation. Eye contact may cause burning or irritation. Pre-existing skin conditions and detergent allergies may be aggravated by exposure.

CHRONIC HEALTH EFFECTS / SYMPTOMS: Prolonged skin contact may lead to skin irritation and dermatitis.

Carcinogenicity Data:	NTP: N	IARC: N	OSHA: N	OTHER: N/A
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First Aid

Eyes: Immediately flush eyes with large amounts of water for at least 15 minutes, while holding eyelids open. Seek prompt medical attention.

Skin: Wash affected area with large amounts of water. If irritation persists, seek medical attention.

Inhalation: Move victim to fresh air. Seek medical attention if irritation persists.

Ingestion: Contact local Poison Control Center or physician immediately.

SECTION VI - REACTIVITY DATA

Stability: Normally stable

Incompatibility (Materials to Avoid): Strong acids and oxidizers.

Hazardous Decomposition or By-Products: Carbon Monoxide, carbon dioxide, ammonia.

Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Spill Procedures: Wear personal protective equipment (see Section VIII). Clean up spill with absorbent material.

Waste Disposal Procedures: Dispose in accordance with federal, state, and local regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Respiratory: None required under normal use conditions.

Eyes: Wear safety glasses.

Clothing / Protective Gloves: Not normally required. In situations of extended skin contact, neoprene or other Chemical Resistant Gloves are recommended.

Ventilation: Local exhaust not needed under normal use conditions.

SECTION IX - ADDITIONAL INFORMATION

Safe Handling and Storage: Store in a closed container. Do not freeze.

SECTION X - TRANSPORTATION INFORMATION

DOT Hazard Class: Non-Hazardous (Not Regulated)

The information contained herein has been developed based upon current available scientific data. New information may be developed from time to time which may render the conclusions of this report obsolete. Therefore, no warranty is extended as to the applicability of this information to the user's intended purpose or for the consequences of its use or misuse.