

Noroxycdiff is a Peracetic Acid (PAA) based sterilant that has specific claims against even the hardest class of organisms – spores. While Noroxycdiff has been shown effective against the AOAC spore test organism – *Bacillus subtilis* – this white paper examines the effectiveness of current germicides, as well as Noroxycdiff against *Clostridium difficile* spores. Noroxycdiff a Peracetic acid (also known as peroxyacetic acid, or PAA), is an organic compound. It is a colorless liquid with a characteristic odor controlled by the end user in our application. All commercially available PAA products contain an equilibrium of PAA, hydrogen peroxide, acetic acid, and water. Its formula is $\text{CH}_3\text{CO}_3\text{H}$.

Noroxycdiff peracetic acid is an ideal antimicrobial agent due to its high oxidizing potential. It is highly effective against a broad range of microorganisms. In addition, PAA breaks down in food to safe and environmentally friendly residues (acetic acid and hydrogen peroxide) and therefore can be used in non-rinse applications. PAA is one of the most environmentally friendly antimicrobial agents since resulting wastewater can be land-applied for irrigation and is generally eligible for NPDES permits to discharge to natural waterways.

The United States Environmental Protection Agency first registered peracetic acid as an antimicrobial in 1985 for indoor use on hard surfaces. Today, registered applications have expanded to include: sanitation at food and beverage plants, agricultural premises, wineries and breweries, greenhouse facilities and equipment, as well as animal housing. Peracetic acid is also approved for use in dairy/cheese processing plants, and directly on fruits and vegetables, as well as on meat, poultry, and seafood products. It is also used to prevent biofilm formation in paper and pulp industries, and as a disinfectant for municipal effluent. As the interest in “green chemistries” increases, PAA is finding use as a biocide in industrial cooling water systems.

C. difficile has two states: vegetative and endospore. In the vegetative state, *C. difficile* is readily destroyed by a large number of germicides such as quaternary ammoniums, dilute hypochlorite (bleach) solutions (1%), phenols, and alcohols.⁴ In contrast, *C. difficile* in the endospore state is characterized by a thickened cell wall, which provides protection against drying out and acidic environments. This cellular structure enables the *C. difficile* endospore to be resistant to the previously-mentioned germicides. In a study reported by Dr. William Rutala in 2006, the following disinfectants demonstrated no measurable activity at 20 minutes against *C. difficile* spores: (1) Chlorhexidine, (2) Vesphene (phenol), (3) 70% isopropyl alcohol, (4) 95% ethanol, (5) 3% hydrogen peroxide, (6) Clorox disinfecting spray (65% ethanol, 0.6% quaternary ammonium), (7) Novaplus (10% povidone-iodine) and (8) Virox’s Accel (0.5% hydrogen peroxide).⁵ In fact, in one study performed in England, two disinfectant compounds – quaternary ammonium and hydrogen peroxide – appeared to even encourage the growth of *C. difficile* spores.

Noroxycdiff is a broad spectrum germicide with sporicidal claims. In testing conducted under AOAC Sporicidal Test Protocols, was successful with a complete kill against *Bacillus subtilis* and *Clostridium sporogenes*. Noroxycdiff PAA has been shown to be effective against spores in general, a more specific test was conducted to look at its effectiveness in a short time period against *C. difficile* spores. This test is summarized below: Test Methodology: ASTM E 2197-02 – Conducted with ATCC 700792 (*C. difficile* spore)

Test Results: The inoculated carriers had a starting population of 4×10^5 CFU. 10 carriers were exposed for 2 minutes to Noroxycdiff PAA. The results at the end of the 2 minute period were:

Research Report: *Clostridium Difficile* Endospores and PAA Germicides MAR COR Competent, Consistent, & Compliant Germicide Carriers % Reduction to (99.999)



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CHEMICAL SAFETY AND POLLUTION PREVENTION December 2, 2014, DEC 01

Clostridium difficile {(ATCC 43598)} DISINFECTION PERFORMANCE IN INSTITUTIONS {(Hospitals, Dental Offices, Nursing Homes, and Other Health Care Institutions)} AND NON-MEDICAL FACILITIES {(Households, Schools, Restaurants, Food Services, Dairies, Farms, Beverage and Food Processing Plants and Other Non-Medical Facilities)}:

Corrosion Assay

(NOROXYCDIFF) PAA-Based Disinfectant EPA REG NO: 10324-214-92089

Noroxycdiff readily decomposes and its primary and secondary products are all deemed non-harmful to the environment. Noroxycdiff PAA-based sanitizers are environmentally friendly as the compounds therein break down into acetic acid, oxygen, and water. These sanitizers are also less corrosive to equipment than hypochlorites.

NOROXYCDIFF

EPA REG NO: 10324-214-92089

Corrosive Effects of NOROXYCDIFF at USE Dilution

Experimental Methods:

Corrosion coupons of the various metals were suspended in the various concentrations of NOROXYCDIFF PAA for 30 days. A solution was prepared in the laboratory at 250 ppm hardness to which each indicated amount of NOROXYCDIFF PAA was added. The NOROXYCDIFF PAA solution was kept at 70° F throughout the test and changed every other day for 30 days. At the end of the test, each coupon was rinsed and cleaned in accordance with ASTM procedures and reweighed.

The Corrosion rates were then calculated and expressed in mpy (Mils Per Year) which is thousandths of an inch per year. 1 mpy is equivalent to 0.0010 inches per year. General industry standards are: <5 mpy is very good; 5.1-10 mpy is acceptable/marginal, and >10 mpy is corrosive in relative degrees.

Results:

All corrosion rates are presented in MPY (mils per year).

Corrosion Rate (mpy)

Metal	100 ppm	200 ppm	400 ppm
• Aluminum 99.5%	0 mpy	0 mpy	0 mpy
• Stainless Steel 304	0	0	0
• Stainless Steel 316	0	0	0
• Tinned Iron	0	0	0
• Glass	0	0	0
• Plastics	0	0	0

Category: Disinfectants

11.3.1 Sandwich Corrosion PASS

11.3.2 Immersion Corrosion Test PASS

11.3.3 Rubber Test PASS

11.3.4 Sealant Test PASS

11.3.5 Painted Surface Test PASS

11.3.6 Tedlar Surface Test PASS

11.3.7 Vinyl Surface Test PASS

11.3.8 Fabric and Carpet Test PASS

11.3.9 Leather & Naugahyde Test PASS

11.3.10 Flash Point Test PASS

11.3.11 Polycarbonate Crazing Test (Lexan 9600 & BMS8-400) PASS

Conclusions: Non-corrosive for Aluminum, Glass, Plastics, Stainless and non-staining

(MATERIAL COMPATABILITY)

(NOROXYCDIFF) PAA-Based Disinfectant

EPA REG NO: 10324-214-92089

(MATERIAL COMPATABILITY)

glass surfaces, aluminum, laminated surfaces, metal, plated steel, stainless steel, glazed porcelain, glazed {restroom} tile, glazed {restroom} ceramic, sealed granite, sealed marble, plastic {such as polycarbonate, polyvinylchloride, polystyrene or polypropylene}, sealed limestone, sealed slate, sealed stone, sealed terra cotta, sealed terrazzo, chrome, Plexiglass®, enameled surfaces, painted {finished} woodwork, Formica®, vinyl and plastic upholstery, washable wallpaper, windows, mirrors, painted surfaces • {countertops} {counters}, countertop laminates, stovetops {stoves}, {bathroom, kitchen} sinks, tub surfaces, shelves, racks, carts, appliances, refrigerators, ice machines, microwave ovens • dishes, {glassware}{glasses}, silverware, cooking utensils, eating utensils, plastic and other hard, non-porous cutting boards, plastic and other hard, non-porous chopping blocks, coolers, ice chests, refrigerator bins used for meat, vegetables, fruit and eggs, Tupperware® • floors, finished floors, high speed burnished floors, conductive flooring, walls, ceilings, fixtures • highchairs, baby cribs, diaper changing stations, infant bassinets/cribs/warmers/incubators/care equipment, folding tables, hampers, laundry pails, empty diaper pails • shower stalls, shower doors and curtains, bathtubs and glazed tiles, chrome plated intakes, vanity tops, and restroom fixtures, bathroom fixtures, bathroom bowls, basins, tubs • tables, chairs, desks, folding tables, bed frames, lifts, washable walls, cabinets, doorknobs and garbage cans/pails, trash barrels, trash cans, trash containers, cuspidors spittoons, industrial waste receptacles and garbage handling equipment, shelves, racks and carts, door knobs and handles • sealed foundations, steps, plumbing fixtures, finished baseboards and windowsills.

Market Claims and Uses

NOROXYCDIFF

EPA REG NO: 10324-214-92089

May be used with the prefix "This product". • acts as a virucide* and bactericide while also cleaning. Also eliminates odors leaving surfaces smelling clean and fresh. Eliminates odors caused by bacteria and non-fresh foods leaving restroom kitchen surfaces smelling clean and fresh. Can be used to disinfect, clean and deodorize terrarium and small animal cages, substrate and other hard, non-porous cage equipment furniture, plastic terrarium ornaments heat caves and water dishes. (Do not use on porous rocks, hot rocks, or driftwood.) • can be used for daily cleaning. • can be used where odors are a problem. Cleans, disinfects and deodorizes on hard, non-porous surfaces. f c c c £ c • cleans, disinfects and deodorizes hard, non-porous surfaces by killing many odor-causing microorganisms. c • cleans, disinfects and eliminates odors leaving hard, non-porous surfaces smelling clean and fresh. f 11 L c • cleans, disinfects and deodorizes hard, non-porous surfaces by killing odor-causing microorganisms. L • cleans, disinfects and deodorizes hard, non-porous hospital medical surfaces in one step with no rinsing required. J' c 1; 1 • cleans, disinfects and deodorizes.hard, non-porous surfaces such as flower buckets, walls, floors of coolers, shippers, greenhouse packing areas, garbage pails, design and packing benches, and countertops, and other areas where obnoxious odors develop^ ic ^ i •' cleans and disinfects non-medical (i.e., industrial and firefighting) respirators in industrial, commercial and institutional premises. c c • cleans quickly by removing dirt, grime, food residue, body oils, dead skin, blood and other organic matter commonly round site from Locations "This product" can be substituted with actual product name.) t EPA Approved 10-30-14 L c *•c • cleans, sanitizes and disinfec(lard, non-

porous surfaces of personal protective equipment, safety equipment, protective headgear, athletic helmets, wrestling/boxing headgear, athletic shoe soles, hard hats, headphones, half mask respirators, full face breathing apparatus, gas masks, goggles, spectacles, face shields, hearing protectors and ear muffs. Rinse all equipment that comes in prolonged contact with skin before reuse with clean warm water (about 120°F), and allow to air dry. (Precaution: Cleaning at 120°F temperature will avoid overheating and distortion of the personal safety equipment that would necessitate

replacement.) • cleans, shines, deodorizes and disinfects all hard, non-porous {household} surfaces {listed on the label}. • clear drying formula. • closed loop automated dispensing reduces employee exposure to concentrate product. • closed loop automated dispensing reduces the risk of spills. • {concentrate} {concentrated}. • concentrated broad-spectrum disinfectant/virucide* with efficacy against {Clostridium difficile} {C. difficile} {C. diff} spores. • {controls} {reduces} {eliminates} {neutralizes} {destroys} odors to make your {home} {kitchen} {bathroom} sanitary. • contains hydrogen peroxide. • cross-contamination is a major housekeeping concern not only in hospitals, but also in schools, institutions and industry. • cuts cleaning time. • daily use product with {Clostridium difficile} {C. difficile} {C. diff} spore efficacy {allows for product standardization}{eliminates need for} {separate sporicide}{bleach}. • daily defense against {Clostridium difficile} {C. difficile} {C. diff} spores. • designed for daily use on common materials found in hospitals. • {deodorizes}{deodorant}{deodorizer}. • deodorizes by killing microorganisms that cause offensive odors. • deodorizes hard, non-porous surfaces in restroom areas, behind and under sinks and counters, garbage cans and garbage storage areas, and other places where bacterial growth can cause malodors. • designed for healthcare {{non-critical}}{hard, non-porous} surfaces}. • {disinfects} {disinfectant}. • . • disinfects {and sanitizes} kitchen surfaces {bathroom surfaces and floors}. • economical concentrate sporicide designed for daily cleaning and easy on surfaces. • effective in 2 minutes against {Clostridium difficile} {C. difficile} {C. diff} spores. • effective one-step disinfectant-cleaner for use in hospitals {ambulatory care centers,} {long term care facilities,} {and} {other healthcare settings}. • effective {for daily use} against (insert any organism from list of organisms) {and} {{Clostridium difficile} {C. difficile} {C. diff} {spores} {in hospitals}}. • effective against Multidrug Resistant Organisms {{MDROs}} {Staphylococcus aureus, {Resistant to Methicillin} {{(MRSA)}}}, {Staphylococcus aureus, {{(Genotype USA300)}} {Community Associated Methicillin Resistant} {{(CA-MRSA)}}}, {Staphylococcus aureus, {{(Genotype USA400)}} {Community Associated Methicillin Resistant} {{(CA-MRSA)}}}, {Staphylococcus aureus, {Intermediate Vancomycin Resistance} {{(VISA)}}}, {Enterococcus faecalis {Resistant to Vancomycin} {{(VRE)}}}, {Escherichia coli {ExtendedSpectrum Beta-Lactamase resistant}}{(ESBL)}, {Klebsiella pneumoniae} {Carbapenem resistant}}{(KPC)}}. • evaporates completely. • good for use with microfiber cloths. • has been formulated to aid in the reduction of cross-contamination on hard, non-porous surfaces not only in hospitals, but also in schools, institutions and industry. • has passed the Virucidal* Efficacy of a Disinfectant for Use on Environmental Surfaces utilizing {{Duck} Hepatitis B Virus} {and} {Bovine Viral Diarrhea Virus} {{(BVDV)}} {Hepatitis C Virus} {{(Surrogate for Human Hepatitis C Virus)}}. (The description "Duck" and "Surrogate for Human Hepatitis C Virus" must be used in California. Use of only "Hepatitis C Virus" is not allowed in CA). • has passed the Virucidal* Efficacy of a Disinfectant for Use on Environmental Surfaces utilizing Feline Calicivirus {{(surrogate for Norovirus)}}. • has demonstrated effectiveness against Influenza A {{(H1N1)}} Virus. • has passed the Virucidal* Efficacy of a Disinfectant for Use on Environmental Surfaces utilizing Influenza A {{(H1N1)}} Virus. • helps prevent cross-contamination on hard, non-porous surfaces. • inhibits bacterial growth on moist surfaces and deodorizes by killing microorganisms that cause offensive odors. (Not for use in CA.) • is an economical concentrate {that can be diluted for use} {with a mop and bucket, cloth, microfiber cloth, sponge, coarse spray device or by soaking}. • intended for use with the (insert company name and/or name of appropriate dispenser). • (insert company name and/or name of appropriate dispenser) controls dilution to reduce waste of concentrate. • (insert company name and/or name of appropriate dispenser) ensures appropriate ppm levels of actives in use solution. • (insert company name and/or name of appropriate dispenser) makes accurate dispensing quick and easy. • is a concentrated hospital use disinfectant that is effective against a broad spectrum of bacteria, is virucidal*, {and} eliminates odor causing bacteria when used as directed c • is a {concentrated} non-acid {bowl and} bathroom cleaner, which cleans, disinfects and deodorizes. • is a disinfectant for cleanroom and laboratory areas to disinfect washable, hard, non-porous, non-food contact surfaces GuchL 8s: laminar-airflow equipment and BioSafety cabinet work surfaces and exterior surfaces of the following: countertops: sinks, plumbing fixture surfaces, and incubators, refrigerators and centrifuge surfaces of metal, stainless steel, glass, plastic {such as polystyrene or polypropylene}, Formica®, and vinyl. • {is a heavy duty disinfectant cleaner that} cleans, disinfects and deodorizes in one labor saving step. is a multi-surface cleaner, deodorizer and disinfectant.



GEORGIA DEPARTMENT OF AGRICULTURE

Capitol Square, Atlanta, Georgia 30334-4201

Certificate of Registration

Prevasive, Inc.
P.O. Box 1391
Dacula, GA 30019

Attn: Jerry Bond

GA Certificate of Pesticide Registration

Certificate Date:
8/17/2016 3:24:15 PM

Company Information

Company	Prevasive, Inc.	Co. EPA Reg Num	92089
Email	JERRYBOND@PREVASIVE.COM		
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Website			

The following registrations have been approved

EPA Reg Num	State ID	Product Name	Product Status	Disc Year	Expiration Date
10324-214-92089	901674354	Noroxyclyff	approved		12/31/2017

References:

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