

RESEARCH REPORT

ACTRIL™ Cold Sterilant CLOSTRIDIUM DIFFICILE ENDOSPORES AND PERACETIC ACID GERMICIDES

INTRODUCTION

ACTRIL™ Cold Sterilant is a Peracetic Acid (PAA) based sterilant that has specific claims against even the hardest class of organisms — spores. While ACTRIL Cold Sterilant has been shown effective against the AOAC spore test organism — *Bacillus subtilis* — this white paper examines the effectiveness of current germicides, as well as, ACTRIL Cold Sterilant against *Clostridium difficile* (*C. difficile*).

HISTORY OF CLOSTRIDIUM DIFFICILE

While identified in the literature for over 70 years, *C. difficile* began to be increasingly recognized in the 1970s as an organism that had adapted and was becoming progressively more antibiotic resistant. *C. difficile* is a spore forming, gram positive bacteria that is highly resistant to acidic environments such as those seen in the gastrointestinal (GI) system. Because they can thrive in the intestinal tract, *C. difficile* releases toxins directly into the GI system, destroying the intestinal lining resulting in diarrhea and extreme dehydration.¹

From 1999 to 2004, *C. difficile* related deaths almost quintupled with the death rate increasing by 35% per year in the United States.² In other nations, *C. difficile* has surpassed MRSA as the “superbug” of greatest concern in terms of numbers of deaths and continued growth rates.³

GERMICIDES AND CLOSTRIDIUM DIFFICILE

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:

- Chlorhexadine,
- Vesphene (phenol)
- 70% isopropyl alcohol
- 95% ethanol
- 3% hydrogen peroxide
- Clorox disinfecting spray (65% ethanol, 0.6% quaternary ammonium)
- Novaplus (10% povidone iodine)
- 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.⁶



ACTRIL COLD STERILANT VS. SPORES

ACTRIL Cold Sterilant is a broad-spectrum germicide with sporicidal claims. In testing conducted under AOAC Sporicidal Test Protocols, ACTRIL Cold Sterilant was successful with complete kill against *Bacillus subtilis* and *Clostridium sporogenes*.⁷

ACTRIL Cold Sterilant 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.⁸ 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. Ten carriers were exposed for ten minutes to ACTRIL Cold Sterilant solution. The results at the end of the ten-minute period were:

GERMICIDE	NUMBER OF CARRIERS	% REDUCTION
ACTRIL™ Cold Sterilant	10	99.999

DISCUSSION

While a few antibiotic regimes such as vancomycin continue to be effective for the most part against *C. difficile* spores, good infection control practices dictate environmental reduction of the organism before infection. As previously indicated, not all germicides are effective against *C. difficile* spores and some may even promote growth.

In third party GLP testing, ACTRIL Cold Sterilant significantly reduced the populations of *C. difficile* spores 99.999% in 10 minutes at ambient temperatures.⁸

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5. Rutula William, et. al. Surface Disinfection: New Processes and Products. Presentation at 2006 APIC National Meeting. 2006.
6. Fawley Warren N., et.al. Efficacy of Hospital Cleaning Agents and Germicides Against Epidemic *Clostridium difficile* Strains. *Infect Control Hosp Epidemiol*. 2007 Aug; 28 (8):920-5.
7. ACTRIL Cold Sterilant: Research Data Report. 2003.
8. ATS Labs GLP Test Report A06238. June 2008.

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