

DISINFECTTM & SHIELD



Technical Summary

**Sanitizers, Disinfectants, Virucidal
and Derivative Products**

A. Introduction

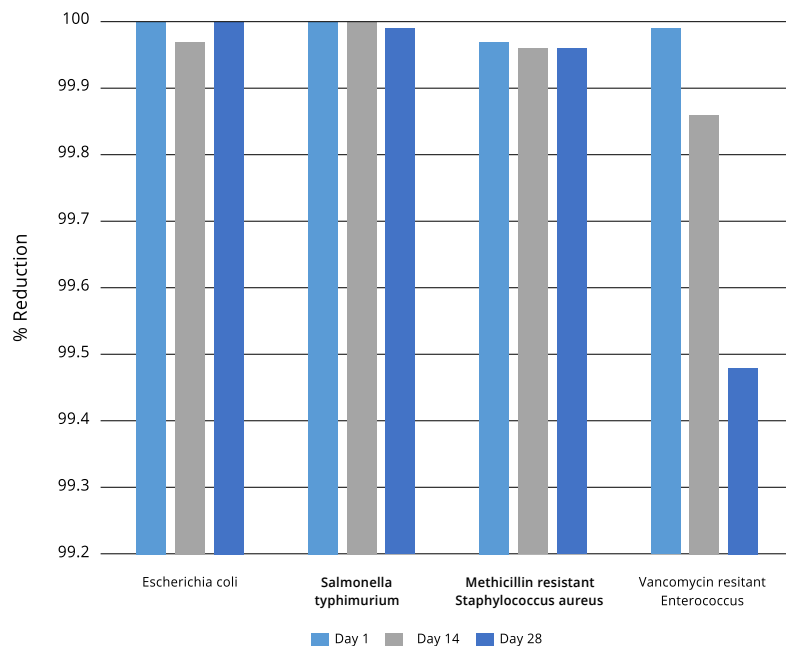
Disinfect & Shield Surface Disinfectants is a uniquely formulated disinfectant for use in medical environments. It utilizes cutting edge antimicrobial nanotechnology to kill the leading causes of hospital associated infections (HAIs) on contact and create a silane biofilm that delivers persistent kill activity up to 28 days on surfaces. The core of this technology is a proprietary blend of quaternary amines which allow the active antimicrobial ingredient to be delivered in a long-lasting, efficient mechanism. In the U.S each year, more people die from hospital infections than from AIDS, breast cancer and auto accidents combined. These infections are the fourth leading cause of death, with current annual estimates of 2,000,000 infections, more than 100,000 deaths, and added costs of \$45 billion¹. Between 5-10% of all patients admitted to a hospital acquire an infection while in that hospital and nursing homes infections rates are almost 20% annually. Even with such extreme statistics, many industry experts consider the problem to be severely underestimated. Clostridium difficile accounts for about 500,000 infections and 30,000 deaths². The average total cost for a single inpatient C. difficile infection (CDI) is more than \$35,000, while the estimated annual cost burden for the US healthcare system exceeds \$3 billion³. The majority of HAIs acquired today are preventable by improving cleaning and disinfecting activities through increased awareness, enhanced data collection and analysis, and additional advanced disinfecting measures.

B. Efficacy Testing

Biotest Laboratories Pty Ltd conducted a 28-day challenge test on Disinfectant's to determine the efficacy of the product against Escherichia coli (ATCC 8739), Salmonella typhimurium (ATCC 74), Methicillin Resistant Staphylococcus aureus (MRSA) (ATCC 43300), and Vancomycin Resistant Enterococci (VRE). 10 cm x 10 cm stainless steel plates were sprayed with Disinfect & Shield Disinfectant's, left to dry, and then resprayed with the hospital grade disinfectant. The test plates and untreated stainless-steel plates were then inoculated with 0.5 mL of test culture to cover the entire surface of the stainless-steel plates and left at room temperature for 1 hour.

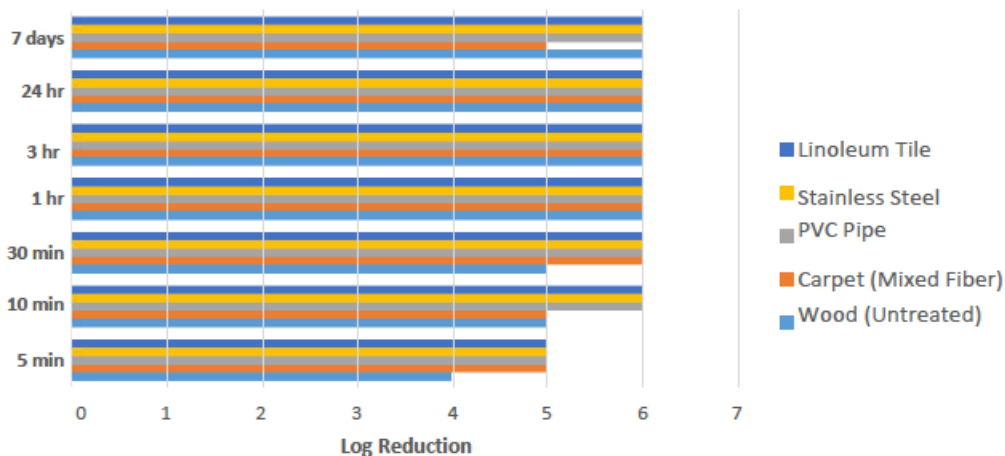
Recoveries were performed by rinsing a test plate and an untreated plate with 100 mL of nutrient broth and 3% tween. Serial dilutions were then performed from the rinse solutions, plated with tryptone soya agar, and incubated at 36C for 48 hours. The results are displayed below in Figure 14. As shown in Figure 1, Disinfect & Shield Disinfectant's were able to provide persistent log 3 or above reductions even after 28-days for all organisms tested with the exception of VRE, where the log reduction was still an impressive 2.28 after the 28-day test period. These data clearly demonstrate the superior, long-lasting protection provided by Disinfect & Shield Disinfectant and its unique, patented technology.

Figure 1 - Results of 28 Day Challenge Test for Disinfect & Shield Disinfectant's - Biotest Labs



In a series of tests performed by Triad Laboratories on unfinished wood, carpet, stainless steel, polyvinyl chloride (PVC) plastic, and linoleum (PVC type), it was observed surfaces coated with Disinfect & Shield Disinfectant's would kill Feline calcivirus placed on surfaces up to 7 days after surfaces were treated. Figure 2 shows results when those surfaces were sampled after various contact times with the virus. A high-level of efficacy (>99.999%) can be seen with decay of antiviral properties being very slight.⁵

Figure 2 - Efficacy of Disinfect & Shield Disinfectant's on Various Surfaces against Feline calcivirus



Testing by the Guangdong Detection Center of Microbiology completed on April 3rd, 2018, further demonstrated of the efficacy of Disinfect & Shield Disinfectant by testing to the Technical Standard of Disinfection (2002 Ministry of Health P.R. China) - 2.1.1.7.4 Suspension Quantitative Germicidal Test standards. Disinfect & Shield Hospital Grade Disinfectant was able to achieve an impressive greater than log 5 reduction in the organisms tested for as shown in Figure 3⁶.

1.检测项目: 悬液定量杀菌试验 Test Item: Suspension quantitative germicidal test 1.1 检测方法: 《消毒技术规范》2002 年版-2.1.1.7.4 悬液定量杀菌试验 Test Method: Technical Standard for Disinfection (2002 Ministry of Health P.R.China)-2.1.1.7.4 Suspension quantitative germicidal test 1.2 试验结果 Test Result							
作用浓度 及时间 Action concentration and action time	测试微生物 The tested organism	序号 Serial Number	对照组 菌落总数 The number of bacteria in the control sample (cfu/mL)	对照组平均 菌落总数 The average number of colonies in the control group (cfu/mL)	试验组 菌落总数 The number of bacteria in the test sample (cfu/mL)	杀灭对 数值 Sterilizati on logarithm	杀灭率 (%)
1:10 10 min	大肠杆菌 (<i>Escherichia coli</i>) 8099	1	3.0×10 ⁷	3.3×10 ⁷	<10	≥5.00	>99.999
		2	3.3×10 ⁷		<10	≥5.00	>99.999
		3	3.5×10 ⁷		<10	≥5.00	>99.999
	金黄色葡萄球菌 (<i>Staphylococcus aureus</i>) ATCC 6538	1	4.2×10 ⁷	4.2×10 ⁷	<10	≥5.00	>99.999
		2	3.9×10 ⁷		<10	≥5.00	>99.999
		3	4.5×10 ⁷		<10	≥5.00	>99.999
	铜绿假单胞菌 (<i>Pseudomonas aeruginosa</i>) ATCC 15442	1	1.2×10 ⁷	1.3×10 ⁷	<10	≥5.00	>99.999
		2	1.4×10 ⁷		<10	≥5.00	>99.999
		3	1.2×10 ⁷		<10	≥5.00	>99.999

Figure 3 - Guangdong Detection Center of Microbiology Analysis of Efficacy of Disinfect & Shield Hospital Grade Disinfectant to PRC Regulatory Standards

In 2015, Accuratus Lab Services of Eagan, MN, USA conducted a test to determine the efficacy of Disinfect & Shield Surface Sanitizer (a diluted form of Disinfect & Shield Hospital Grade Disinfectant) against Clostridium difficile spores (ATCC 43598). Results of the study show Disinfect & Shield Surface Sanitizer to be effective in excess of a log 4 reduction against the strain of C. diff spores tested. As the surface sanitizer formula is a dilution of the hospital grade formula, it would well be expected Disinfectant's would perform even better in similar testing. The results of the test are provided below in Figure 4⁷.

Figure 4 - Test Results for Disinfect & Shield Surface Sanitizer					
Test Organism	Carrier #	# Survivors/ Test Carrier (Log ₁₀)	Geometric Mean Survivors of Test Carriers (Average Log ₁₀ of Test Carriers)	Geometric Mean Survivors of Control Carriers (Average Log ₁₀ of Control Carriers)	Percent Reduction (Log ₁₀ Reduction)
Clostridium difficile - spore form (ATCC 43598)	1	>2.00 x 10 ² (>2.30)	>2.00 x 10 ² (>2.30)	>2.45 x 10 ⁶ (6.39)	<99.9918% (<4.09)
	2	>2.00 x 10 ² (>2.30)			
	3	>2.00 x 10 ² (>2.30)			
	4	>2.00 x 10 ² (>2.30)			
	5	>2.00 x 10 ² (>2.30)			

In preparation for introducing Disinfect & Shield Disinfectant's and derivative products for use in the aviation industry, the required Boeing D6-7127 Rev P tests for disinfectant products being used in US commercial aircraft were completed in April 2018. The testing concluded Disinfect & Shield Disinfectant's and derivative products conformed to the standards established for the following tests: Immersion Corrosion, Rubber, Sealant, Painted Surface, Tedlar Surface, Vinyl Surface, Fabric and Carpet, Leather and Naugahyde, Flash Point, and Polycarbonate Cracking⁸.

References

1. Department of Health & Human Services USA: CDC American Recovery and Reinvestment Act Epidemiology and Laboratory Capacity (ELC) for Infectious Disease Program; Healthcare-Associated Infections (HAIs) Grantee Meeting; CDR; Arjun Srinivasan, MD; October 19-20, 2009
2. "One Bacteria, 30,000 Deaths", USA TODAY, August 16, 2012
3. APIC Implementation Guide: Guide to Preventing Clostridium difficile Infections: ©2013 by the Association for Professionals in Infection Control and Epidemiology, Inc. (APIC); Walsh N. C. difficile Inpatient Stays Long, Costly. MedPage Today. December
4. Ross, N. (2014). Disinfect & Shield Hospital Grade Sanitizer Challenge Test (pp. 1-3, Lab Report). Underwood, QLD: Biotest Laboratories Pty.
5. Stainback, L. (2010). Rate of Kill Testing for Product Efficacy Against Feline calicivirus; Strain: F-9(pp. 1-6, Lab Report). Winston-Salem, NC: Triad Forensics Independent Service Laboratory.
6. Luedtke, J., M.S. (2015). Standard Quantitative Disk Carrier Test Method - Project No. A18997(pp. 1-6, Study Report). Eagan, MN: Accuratus Lab Services.
7. Viani, P. D. (2018). Disinfect & Shield Disinfectant's - Boeing D6-7127 Rev P -Cleaning Interiors of Commercial Transport Aircraft (pp. 1-5, Rep. No. 1802-530). Miami, FL: Scientific Material International.
8. Fanuel, S (2019). Disinfect & Shield Disinfectant- VIRUCIDAL HARD-SURFACE EFFICACY TEST - Influenza A Virus Project No 985102 [GLP Efficacy Test Report] Fanuel, Microbac Laboratories Inc Sterling, VA