

NON-GLP STUDY REPORT**STUDY TITLE**

Evaluation of Antimicrobial Effectiveness of Hand-Held Sterilray Far-UV Generating Device
on Hard Nonporous Glass and Porous Fabric Surfaces

Test Organisms:

Methicillin Resistant *Staphylococcus aureus* - MRSA (ATCC 33592)
Pseudomonas aeruginosa (ATCC 15442)
Acinetobacter baumannii (ATCC 19606)
Clostridium difficile - spore form (ATCC 700792)
Bacillus subtilis - spore form (ATCC 19659)

PRODUCT IDENTITY

Sterilray

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STUDY COMPLETION DATE

March 30, 2010

PERFORMING LABORATORY

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PROJECT NUMBER

A09049

This study was not performed under
EPA Good Laboratory Practice Regulations
(40 CFR Part 160)

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TABLE 3: TESTING EXPOSURE VALUES

Test Substance/Surface: Sterilray, Glass Slides				
Organism Carrier Type	Carrier #	Sterilray on High/Low	Neutralization Confirmation Dose (mj/cm²)/ Time to Reach Dose	Test Dose (mj/cm²)/ Time to Reach Dose
Methicillin Resistant <i>Staphylococcus aureus</i> - MRSA (ATCC 33592)	1	Low	51 5 seconds	49.2 5 seconds
	2		44.8 5 seconds	48 5 seconds
<i>Pseudomonas aeruginosa</i> (ATCC 15442)	1		51.4 5 seconds	47.7 4 seconds
	2		53.5 6 seconds	53.2 6 seconds
<i>Acinetobacter baumannii</i> (ATCC 19606)	1		53 5 seconds	47.7 5 seconds
	2		46.6 5 seconds	48.8 5 seconds
<i>Clostridium difficile</i> - spore form (ATCC 700792)	1	High	103.9 7 seconds	103.1 7 seconds
	2		106 7 seconds	101.7 7 seconds
<i>Bacillus subtilis</i> (ATCC 19659)	1		*49.8 *6 seconds	99.6 7 seconds
	2		*49.8 *5 seconds	103.5 7 seconds

*The Neutralization Confirmation carriers were treated on low with a lower dose, this was changed for the test carriers to the high setting and higher dose once the Sponsor realized the *Bacillus subtilis* was a spore culture.

****HEI conducted all tests with a special low-power Far-UV Sterilray lamp in order to control the total dose. The lamp is approximately 1/5 the irradiance used in commercial units. Exposures of 1 second should achieve a dose greater than 50 mJ/cm² and may be significantly higher with the next generation power supply.**

TABLE 3: TESTING EXPOSURE VALUES (continued)

Test Substance/Surface: Sterilray, Fabric Carriers						
Organism Carrier Type	Carrier #	Sterilray on High/Low	*Neutralization Confirmation Dose (mj/cm²)/ Time to Reach Dose		Test Dose (mj/cm²)/ Time to Reach Dose	
			Side 1	Side 2	Side 1	Side 2
Methicillin Resistant <i>Staphylococcus aureus</i> - MRSA (ATCC 33592)	1	Low	48.4 3 seconds	47 3 seconds	49.9 5 seconds	50.6 5 seconds
	2		48.7 3 seconds	70 4 seconds	51 5 seconds	53.4 5 seconds
<i>Pseudomonas aeruginosa</i> (ATCC 15442)	1		48.8 3 seconds	54.8 4 seconds	41 4 seconds	52 5 seconds
	2		54.3 4 seconds	53 3 seconds	49 5 seconds	51.2 5 seconds
<i>Acinetobacter baumannii</i> (ATCC 19606)	1		54.8 3 seconds	51.3 3 seconds	49.5 4 seconds	53.4 3 seconds
	2		53.1 4 seconds	51.1 3 seconds	54.7 4 seconds	52.6 3 seconds
<i>Clostridium difficile</i> - spore form (ATCC 700792)	1	High	52.5 4 seconds	51.4 3 seconds	51.6 3 seconds	52.6 4 seconds
	2		57.5 4 seconds	50.2 3 seconds	52.2 3 seconds	48 3 seconds
<i>Bacillus subtilis</i> (ATCC 19659)	1		54.5 3 seconds	49.8 3 seconds	52.1 3 seconds	57.8 3 seconds
	2		51.1 3 seconds	53.6 3 seconds	49.1 3 seconds	52.4 3 seconds

*All Neutralization Confirmation carriers were treated on both sides of the fabric with Sterilray on High

The inoculated fabric carriers in the Petri dish were irradiated, turned over in the same dish, and irradiated a second time. There is a possibility that the lower log reduction for *Clostridium difficile* and *Bacillus subtilis* may be the result of leftover organism being transferred from the dish to the first side of the fabric after turning it over.

****HEI conducted all tests with a special low-power Far-UV Sterilray lamp in order to control the total dose. The lamp is approximately 1/5 the irradiance used in commercial units. Exposures of 1 second should achieve a dose greater than 50 mJ/cm² and may be significantly higher with the next generation power supply.**

TABLE 6: CALCULATED VALUES

Test Substance/Surface: Sterilray, Glass Slides						
Organism Carrier Type	Carrier #	# Survivors/ Carrier	Log ₁₀	Average Log ₁₀	Geometric Mean	Percent Reduction
Methicillin Resistant <i>Staphylococcus aureus</i> - MRSA (ATCC 33592)	1	4 x 10 ¹	1.60	1.45	2.82 x 10 ¹	>99.99% (4.83)
	2	2 x 10 ¹	1.30			
<i>Pseudomonas aeruginosa</i> (ATCC 15442)	1	6 x 10 ¹	1.78	1.54	3.5 x 10 ¹	>99.99% (4.86)
	2	2 x 10 ¹	1.30			
<i>Acinetobacter baumannii</i> (ATCC 19606)	1	1.5 x 10 ³	3.18	<2.24	<1.74 x 10 ²	>99.9% (>3.97)
	2	<2 x 10 ¹	<1.30			
<i>Clostridium difficile</i> - spore form (ATCC 700792)	1	2 x 10 ²	2.30	3.21	1.62 x 10 ³	99.8% (2.65)
	2	1.3 x 10 ⁴	4.11			
<i>Bacillus subtilis</i> (ATCC 19659)	1	6 x 10 ¹	1.78	2.15	1.41 x 10 ²	99.99% (4.13)
	2	3.2 x 10 ²	2.51			

TABLE 6: CALCULATED VALUES (continued)

Test Substance/Surface: Sterilray, Fabric Carriers						
Organism Carrier Type	Carrier #	# Survivors/ Carrier	Log ₁₀	Average Log ₁₀	Geometric Mean	Percent Reduction/ Log ₁₀ Reduction
Methicillin Resistant <i>Staphylococcus</i> <i>aureus</i> - MRSA (ATCC 33592)	1	4 x 10 ¹	1.60	<1.45	<2.82 x 10 ¹	>99.99% (4.53)
	2	<2 x 10 ¹	<1.30			
<i>Pseudomonas</i> <i>aeruginosa</i> (ATCC 15442)	1	<2 x 10 ¹	<1.30	<1.54	<3.47 x 10 ¹	>99.9% (>3.37)
	2	6 x 10 ¹	1.78			
<i>Acinetobacter</i> <i>baumannii</i> (ATCC 19606)	1	<2 x 10 ¹	<1.30	<1.30	<2.00 x 10 ¹	>99.99% (>4.75)
	2	<2 x 10 ¹	<1.30			
<i>Clostridium</i> <i>difficile</i> - spore form (ATCC 700792)	1	3.8 x 10 ³	3.58	3.52	3.31 x 10 ³	91.3% (1.06)
	2	2.8 x 10 ³	3.45			
<i>Bacillus subtilis</i> (ATCC 19659)	1	6.0 x 10 ³	3.78	3.80	6.31 x 10 ³	98.6% (1.85)
	2	6.6 x 10 ³	3.82			

CONTROL RESULTS

The results of controls run for culture purity, carrier sterility, neutralizing subculture medium sterility, neutralization confirmation, antibiotic resistance, and carrier quantitation were all acceptable.

The inoculated fabric carriers in the Petri dish were irradiated, turned over in the same dish, and irradiated a second time. There is a possibility that the lower log reduction for *Clostridium difficile* and *Bacillus subtilis* may be the result of leftover organism being transferred from the dish to the first side of the fabric after turning it over.