

Laboratory “Time Kill Test” Results

Summary Report

Test Agents:
PureWorks Antibacterial Foam/Spray
PureWorks Antibacterial Lotion

Performing Laboratory:
Microbiotest
Sterling, Virginia

Test Materials: PureWorks supplied the PureWorks Antibacterial Foam/Spray and the PureWorks Antibacterial Lotion to be tested.

MICROBIOTEST: Microbiotest are industry leaders providing efficiency product testing for the EPA and FDA on all personal care products. Their professional staff has over 40 years of applied research testing and diagnostic services.

Test Conditions

Active ingredient in test product: 0.2% Benzothonium Chloride
Contact temperature: 32°C

Challenge Organisms:

- 1- *Staphylococcus aureus*, ATCC 6538
- 2- *Escherichia coli*, ATCC 11229
- 3- *Pseudomonas aeruginosa*, ATCC 9027
- 4- *Staphylococcus epidermidis*, ATCC 12228
- 5- *Staphylococcus aureus*, ATCC 33952 (MRSA)
- 6- *Klebsiella pneumoniae*, ATCC 10031
- 7- *Burkholderia cepacia*, ATCC 25416
- 8- *Streptococcus pyogenes*, ATCC 19615
- 9- *Streptococcus pneumoniae*, ATCC 6303
- 10- *Serratia marcescens*, ATCC 14756
- 11- *Enterococcus faecalis*, ATCC 51299 (MDR)
- 12- *Clostridium difficile*, ATCC 9689

Results: Each challenge organism was confirmed by Gram stain and colony morphology. The sterility controls exhibited no growth. The antibiotic resistance evaluation for *Staphylococcus aureus* MRSA has a 0.0 mm zone inhibition, which confirms resistance. The antibiotic resistance evaluation for *Enterococcus faecalis* MDR had a 2.0 mm zone of inhibition, which confirms resistance.

Log₁₀ reduction and percent reduction were calculated using this formula:

$$\frac{\text{Average Initial Counts Control} - \text{Test Results}}{\text{Average Initial Counts Control}} \times 100 = \text{Percent Reduction}$$

$$\text{Log}_{10} (\text{Average Initial Counts Control}) - \text{Log}_{10} (\text{Test Results}) = \text{Log}_{10} \text{ Reduction}$$

Table 1
Initial Count and Test Results

Challenge Microorganism Initial Count	Calculation Units	Replicate 1	Replicate 2	Replicate 3	Replicate 4
<i>Staphylococcus aureus</i> ATCC 6538 Initial Count: 2.0×10^7	CFU Recovered	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰
	Percent Reduction	100	100	100	100
	Log ₁₀ Reduction	7.30	7.30	7.30	7.30
<i>Escherichia coli</i> ATCC 11229 Initial Count: 2.6×10^7	CFU Recovered	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰
	Percent Reduction	100	100	100	100
	Log ₁₀ Reduction	7.41	7.41	7.41	7.41
<i>Pseudomonas aeruginosa</i> ATCC 9027 Initial Count: 2.0×10^7	CFU Recovered	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰
	Percent Reduction	100	100	100	100
	Log ₁₀ Reduction	7.30	7.30	7.30	7.30
<i>Staphylococcus epidermidis</i> ATCC 12228 Initial Count: 3.0×10^7	CFU Recovered	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰
	Percent Reduction	100	100	100	100
	Log ₁₀ Reduction	7.48	7.48	7.48	7.48
<i>Staphylococcus aureus</i> MRSA ATCC 33592 Initial Count: 3.5×10^7	CFU Recovered	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰
	Percent Reduction	100	100	100	100
	Log ₁₀ Reduction	7.54	7.54	7.54	7.54
<i>Klebsiella pneumoniae</i> ATCC 10031 Initial Count: 3.1×10^7	CFU Recovered	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰
	Percent Reduction	100	100	100	100
	Log ₁₀ Reduction	7.49	7.49	7.49	7.49
<i>Burkholderia cepacia</i> ATCC 25416 Initial Count: 9.7×10^6	CFU Recovered	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰
	Percent Reduction	100	100	100	100
	Log ₁₀ Reduction	6.99	6.99	6.99	6.99
<i>Streptococcus pyogenes</i> ATCC 19615 Initial Count 1.4×10^7	CFU Recovered	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰
	Percent Reduction	100	100	100	100
	Log ₁₀ Reduction	7.15	7.15	7.15	7.15
<i>Streptococcus pneumoniae</i> ATCC 6303 Initial Count: 3.1×10^7	CFU Recovered	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰
	Percent Reduction	100	100	100	100
	Log ₁₀ Reduction	7.49	7.49	7.49	7.49
<i>Serratia marcescens</i> ATCC 14756 Initial Count: 1.9×10^7	CFU Recovered	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰
	Percent Reduction	100	100	100	100
	Log ₁₀ Reduction	7.28	7.28	7.28	7.28
<i>Enterococcus faecalis</i> MDR ATCC 51299 Initial Count: 3.2×10^7	CFU Recovered	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰
	Percent Reduction	100	100	100	100
	Log ₁₀ Reduction	7.51	7.51	7.51	7.51
<i>Clostridium difficile</i> ATCC 9689 Initial Count: 2.7×10^7	CFU Recovered	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰	<5.0 x 10 ⁰
	Percent Reduction	100	100	100	100
	Log ₁₀ Reduction	7.43	7.43	7.43	7.43

Quality Assurance: This study was compliant with current Good Laboratory Practice regulations.

Conclusions

All bacteria in this study were reduced 6-Log₁₀ or more after exposure to PureWorks Antibacterial Foam/Spray and PureWorks Antibacterial Lotion for 5 minutes at 32C.



Independent Laboratory Test Results

Reduction of Bacteria by Skin-care Products								
			Foam		Spray		Lotion	
Test Organism	ATCC#	Initial CFM	Log10	%	Log10	%	Log10	%
<i>Burkholderia cepacia</i>	25416	9.70E+06	6.99	100%	6.99	100%	6.99	100%
<i>Clostridium difficile</i>	9689	2.70E+07	7.43	100%	7.43	100%	7.43	100%
<i>Enterococcus faecalis MDR</i>	51299	3.20E+07	7.51	100%	7.51	100%	7.51	100%
<i>Escherichia coli</i>	11229	2.60E+07	7.41	100%	7.41	100%	7.41	100%
<i>Klebsiella pneumoniae</i>	10031	3.10E+07	7.49	100%	7.49	100%	7.49	100%
<i>Pseudomonas aeruginosa</i>	9027	2.00E+07	7.30	100%	7.30	100%	7.30	100%
<i>Serratia marcescens</i>	14756	1.90E+07	7.28	100%	7.28	100%	7.28	100%
<i>Staphylococcus aureus MRSA</i>	33592	3.50E+07	7.54	100%	7.54	100%	7.54	100%
<i>Staphylococcus aureus</i>	6538	2.00E+07	7.30	100%	7.30	100%	7.30	100%
<i>Staphylococcus epidermidis</i>	12228	3.00E+07	7.48	100%	7.48	100%	7.48	100%
<i>Streptococcus pneumoniae</i>	6303	3.10E+07	7.49	100%	7.49	100%	7.49	100%
<i>Streptococcus pyogenes</i>	19615	1.40E+07	7.15	100%	7.15	100%	7.15	100%

Contact Time: 5 minutes @ 32°C

Tests performed by MicrobioTest, Inc, Serling, VA