

Bioscience Labs Inc., (now part of Nelson Labs) an independent testing organization used the in vitro Kinetic Time-Kill Method to evaluate the properties of Irrisept solution containing 0.05% Chlorhexidine Gluconate when the bottled solution was challenged with several different microorganism species. CHG acts as a preservative to inhibit microbial growth in the bottled solution. All testing was performed in accordance with Good Laboratory Practices, as specified in FDA 21 CFR Part 58.



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Chlorhexidine Gluconate 0.05% in Sterile Water, USP (99.95%)					
Bacteria	Challenge Suspension* (CFU/ml)	Exposure Time	Post-Exposure Population (CFU/ml)	Log10 Reduction	Percent Reduction
<i>Achromobacter xylosoxidans</i> (ATCC# 27061) Report# 1605248-201	5.40 x 10 ⁸	1 minute	3.49 x 10 ⁷	1.19	93.54%
		5 minutes	3.00 x 10 ⁵	3.26	99.94%
		30 minutes	1.03 x 10 ³	5.72	99.99%
<i>Acinetobacter baumannii</i> (ATCC# 19606) Report# 130377-201	1.60 x 10 ⁹	1 minute	1.36 x 10 ⁷	2.07	99.15%
		5 minutes	3.35 x 10 ⁵	3.68	99.98%
		30 minutes	<1.00 x 10 ³	6.20	99.99%
<i>Acinetobacter baumannii</i> (BSLI# 092216Asp1) Report# 1705193-201	2.46 x 10 ⁷	1 minute	2.74 x 10 ⁶	0.97	88.85%
		5 minutes	1.58 x 10 ⁴	3.19	99.94%
		30 minutes	<5.92 x 10 ³	5.31	99.98%
<i>Acinetobacter baumannii</i> MDR (ATCC# BAA-1605) Report# 130377-201	4.25 x 10 ⁹	1 minute	1.20 x 10 ⁸	1.55	97.19%
		5 minutes	8.50 x 10 ³	5.70	99.99%
		30 minutes	<1.00 x 10 ³	6.63	99.99%

Bacteria	Initial Population (CFU/ml)	Exposure Time	Mean Post-Exposure Population (CFU/ml)	Mean Log10 Reduction	Mean Percent Reduction
<i>Bacteroides fragilis</i>** (BSLI #080916Bf1) Report # 1710439-201.01	1.67 x 10 ¹⁰	1 minute	2.43 x 10 ⁴	3.31	99.95%
		5 minutes	<1.00 x 10 ¹	6.68	99.99%
		30 minutes	<1.00 x 10 ¹	6.68	99.99%
<i>Clostridium difficile</i>** Spore suspension (ATCC# 43598) Report # 1710439-201.01	2.33 x 10 ⁹	1 minute	2.23 x 10 ⁷	0.03	6.55%
		5 minutes	2.18 x 10 ⁷	0.05	10.04%
		30 minutes	2.06 x 10 ⁷	0.07	13.81%
<i>Clostridium difficile</i>** Vegetative cells (ATCC# 43598) Report# 1710439-201.01	6.05 x 10 ⁷	1 minute	7.72 x 10 ⁵	0.14	27.88%
		5 minutes	7.83 x 10 ⁵	0.14	26.79%
		30 minutes	7.25 x 10 ⁵	0.17	32.24%
<i>Cutibacterium acnes</i> (formerly <i>Propionibacterium acnes</i> ***) (ATCC# 6919) Report# 140946-201	2.23 X 10 ⁹	1 minute	2.10 x 10 ⁷	1.55	96.62%
		3 minutes	2.09 x 10 ⁷	2.25	99.39%
		30 minutes	2.14 x 10 ⁷	4.30	99.99%

*Reference study protocols for the calculations of reductions from the challenge suspensions.

**Testing was based upon recommendations outlined in ASTM E2783-11 (2016).

***Testing was based upon recommendations outlined in ASTM E2783-11, using a numbers control per the method at each time point because of the fastidious nature of *P. acnes*. This avoids the possible attribution of the product efficacy to die-off of the organism due to the length of the exposure time to environmental conditions, allowing for a more accurate and actual assessment of the inoculum level.

MDR = Multi-Drug Resistant.

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Bacteria	Challenge Suspension* (CFU/ml)	Exposure Time	Post-Exposure Population (CFU/ml)	Log10 Reduction	Percent Reduction
<i>Enterobacter cloacae</i> MDR¹ (ATCC# BAA-2468) Report# 130377-201	3.80 x 10 ⁹	1 minute	4.55 x 10 ⁵	3.92	99.99%
		5 minutes	<1.00 x 10 ³	6.58	99.99%
		30 minutes	<1.00 x 10 ³	6.58	99.99%
<i>Enterococcus faecalis</i> (BSLI# 092216Efs7) Report# 1708328-201	6.68 x 10 ⁷	1 minute	>2.99 x 10 ⁷	0.35	55.24%
		5 minutes	9.10 x 10 ⁶	0.87	86.38%
		30 minutes	1.88 x 10 ⁴	3.71	99.97%
<i>Enterococcus faecium</i> VRE (BSLI# 060613VRE9) Report# 1705193-201	3.61 x 10 ⁷	1 minute	3.04 x 10 ⁷	0.08	16.02%
		5 minutes	1.95 x 10 ⁷	0.27	46.00%
		30 minutes	1.65 x 10 ⁵	3.17	99.54%
<i>Enterococcus faecium</i> VSE (BSLI# 112613VSEfm10) Report# 1705193-201	4.75 x 10 ⁷	1 minute	3.89 x 10 ⁷	0.09	18.08%
		5 minutes	1.32 x 10 ⁷	0.99	72.22%
		30 minutes	7.32 x 10 ³	3.86	99.98%
<i>Escherichia coli</i> (ATCC# BAA-2469) ¹⁻⁴ Report# 1605248-201	2.95 x 10 ⁷	1 minute	2.06 x 10 ⁴	3.16	99.93%
		5 minutes	2.50 x 10 ²	5.07	99.99%
		30 minutes	<1.00 x 10 ¹	6.47	99.99%
<i>Escherichia coli</i> 0157:H7 (ATCC# 43888) Report# 130377-201	2.70 x 10 ⁹	1 minute	2.35 x 10 ⁴	5.06	99.99%
		5 minutes	<1.00 x 10 ³	6.43	99.99%
		30 minutes	<1.00 x 10 ³	6.43	99.99%
<i>Escherichia coli</i> (BSLI# 083116Ec2) Report# 1705193-201	1.34 x 10 ⁷	1 minute	<9.15 x 10 ²	5.31	99.99%
		5 minutes	<5.83 x 10 ¹	5.73	99.99%
		30 minutes	<9.00 x 10 ¹	5.66	99.99%
<i>Haemophilus influenzae</i> (ATCC# 19418) Report# 2204217-201	3.00 x 10 ⁸	1 minute	<1.00 x 10 ²	4.45	99.99%
		5 minutes	<1.00 x 10 ²	4.45	99.99%
		10 minutes	<1.00 x 10 ²	4.45	99.99%
		15 minutes	<1.00 x 10 ²	4.45	99.99%
<i>Klebsiella pneumoniae</i> (BSLI# 030116Kpn2) Report# 1705193-201	1.09 x 10 ⁷	1 minute	1.47 x 10 ²	4.91	99.99%
		5 minutes	<1.00 x 10 ¹	6.04	99.99%
		30 minutes	<1.00 x 10 ¹	6.04	99.99%
<i>Klebsiella pneumoniae pneumoniae</i> (ATCC# BAA-2146) ¹⁻⁴ Report# 1605248-201	3.60 x 10 ⁷	1 minute	1.10 x 10 ²	5.51	99.99%
		5 minutes	<1.00 x 10 ¹	6.56	99.99%
		30 minutes	<1.00 x 10 ¹	6.56	99.99%

*Reference study protocols for the calculations of reductions from the challenge suspensions.

1. New Delhi metallo-beta-lactamase (NDM-1) positive
2. *blaKPC* negative by PCR
3. *blaNDM* positive by PCR
4. Carbapenem-resistant (Imipenem and Ertapenem)

MDR = Multi-Drug Resistant

VRE = Vancomycin Resistant *Enterococcus*

VSE = Vancomycin Susceptible *Enterococcus*

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Bacteria	Challenge Suspension* (CFU/ml)	Exposure Time	Mean Post-Exposure Population (CFU/ml)	Mean Log10 Reduction	Mean Percent Reduction
<i>Lactobacillus iners</i> (ATCC# 55195) Formerly known as <i>Gardnerella vaginalis</i> Report# 2204217-201	1.40 x 10 ⁷	1 minute	4.40 x 10 ³	1.53	97.03%
		5 minutes	1.35 x 10 ³	2.05	99.09%
		10 minutes	0.87 x 10 ³	2.25	99.41%
		15 minutes	2.83 x 10 ²	2.72	99.81%
<i>Moraxella catarrhalis</i> (ATCC #25240) Report# 2204217-201	3.95 x 10 ⁸	1 minute	2.18 x 10 ²	4.24	99.99%
		5 minutes	<1.00 x 10 ¹	5.57	99.99%
		10 minutes	<1.00 x 10 ¹	5.57	99.99%
		15 minutes	<1.00 x 10 ¹	5.57	99.99%
<i>Prevotella intermedia</i> (ATCC# 25611) Report# 1710439-201.01	4.25 x 10 ⁸	1 minute	1.00 x 10 ⁴	2.51	99.42%
		5 minutes	1.35 x 10 ²	5.07	99.99%
		30 minutes	<1.00 x 10 ¹	5.39	99.99%
<i>Pseudomonas aeruginosa</i> (BSL# 083116Pa18) Report# 1708328-201	9.75 x 10 ⁶	1 minute	<1.00 x 10 ¹	5.99	99.99%
		5 minutes	<1.00 x 10 ¹	5.99	99.99%
		30 minutes	<1.00 x 10 ¹	5.99	99.99%
<i>Ralstonia pickettii</i> (ATCC# 27512) Report# 1710439-201.01	1.19 x 10 ¹⁰	1 minute	>4.56 x 10 ⁷	<0.30	<49.58%
		5 minutes	>4.81 x 10 ⁷	<0.28	<46.85%
		30 minutes	>4.32 x 10 ⁷	<0.33	<52.23%
<i>Serratia marcescens</i> (ATCC# 14756) Report# 2204217-201	3.75 x 10 ⁸	1 minute	7.13 x 10 ²	3.48	99.97%
		5 minutes	<1.16 x 10 ¹	5.26	99.99%
		10 minutes	<1.00 x 10 ¹	5.32	99.99%
		15 minutes	<1.00 x 10 ¹	5.32	99.99%

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1. New Delhi metallo-beta-lactamase (NDM-1) positive
2. *blaKPC* negative by PCR
3. *blaNDM* positive by PCR
4. Carbapenem-resistant (Imipenem and Ertapenem)

MDR = Multi-Drug Resistant

VRE = Vancomycin Resistant *Enterococcus*

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Bacteria	Challenge Suspension* (CFU/ml)	Exposure Time	Post- Exposure Population (CFU/ml)	Log10 Reduction	Percent Reduction
<i>Streptococcus pneumoniae</i> (ATCC# 49619) Report# 2204217-201	5.05 x 10 ⁷	1 minute	1.89 x 10 ⁵	0.34	53.34%
		5 minutes	1.62 x 10 ⁴	1.42	96.01%
		10 minutes	0.65 x 10 ³	2.96	99.84%
		15 minutes	<1.00 x 10 ²	3.61	99.98%
<i>Staphylococcus aureus</i> MRSA^{CI} (BSLI# 042511MRSA) Report# 130417-201	1.89 x 10 ⁹	1 minute	1.03 x 10 ⁸	1.26	94.56%
		3 minutes	5.80 x 10 ⁶	2.51	99.69%
		15 minutes	1.17 x 10 ⁵	4.21	99.99%
<i>Staphylococcus aureus</i> MRSA^{CI} (BSLI# 092211SaMRSA1) Report# 130417-201	2.01 x 10 ⁹	1 minute	5.80 x 10 ⁸	0.54	71.07%
		3 minutes	6.40 x 10 ⁷	1.50	96.81%
		15 minutes	3.80 x 10 ⁴	4.72	99.99%
<i>Staphylococcus epidermidis</i> (BSLI# 080916Se1) Report# 1705193-201	2.27 x 10 ⁷	1 minute	1.57 x 10 ³	4.19	99.99%
		5 minutes	<1.00 x 10 ¹	6.36	99.99%
		30 minutes	<1.00 x 10 ¹	6.36	99.99%
<i>Staphylococcus epidermidis</i> (BSLI# 092216Se1) Report# 1705193-201	2.06 x 10 ⁷	1 minute	2.68 x 10 ²	4.89	99.99%
		5 minutes	<1.00 x 10 ¹	6.31	99.99%
		30 minutes	<1.00 x 10 ¹	6.31	99.99%
<i>Streptococcus pyogenes</i> (BSLI# 092216Spy1) Report# 1705193-201	2.93 x 10 ⁶	1 minute	8.20 x 10 ⁵	0.55	71.97%
		5 minutes	7.77 x 10 ³	2.59	99.73%
		30 minutes	3.25 x 10 ²	4.03	99.99%

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CI- Clinical Isolate

MRSA = Methicillin Resistant *Staphylococcus aureus*

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Fungi	Challenge Suspension* (CFU/ml)	Exposure Time	Post-Exposure Population (CFU/ml)	Log10 Reduction	Percent Reduction
<i>Aspergillus niger van Tiegham</i> (ATCC# 6275) Report# 130377-201	2.75 x 10 ⁹	10 minutes	3.90 x 10 ⁸	0.85	85.82%
		30 minutes	4.20 x 10 ⁸	0.82	84.73%
		60 minutes	3.05 x 10 ⁸	0.96	88.91%
<i>Candida albicans</i> (ATCC# 10231) Report# 130377-201	4.05 x 10 ⁹	1 minute	7.30 x 10 ⁵	3.74	99.98%
		5 minutes	1.65 x 10 ⁴	5.39	99.99%
		30 minutes	<1.00 x 10 ³	6.61	99.99%
<i>Candida auris</i> (AR-BANK# 0381) Report# 1605248-201	3.80 x 10 ⁷	1 minute	5.80 x 10 ⁵	1.82	98.47%
		5 minutes	1.56 x 10 ³	4.39	99.99%
		30 minutes	<1.00 x 10 ¹	6.58	99.99%
<i>Candida auris</i> (AR-BANK# 0382) Report# 1605248-201	5.10 x 10 ⁷	1 minute	3.30 x 10 ⁶	1.19	93.53%
		5 minutes	1.21 x 10 ⁵	2.63	99.76%
		30 minutes	<1.00 x 10 ¹	6.71	99.99%
<i>Candida auris</i> (AR-BANK# 0383) Report# 1605248-201	6.30 x 10 ⁷	1 minute	1.84 x 10 ⁷	0.54	70.87%
		5 minutes	4.25 x 10 ⁴	3.17	99.93%
		30 minutes	<1.00 x 10 ¹	6.80	99.99%
<i>Candida glabrata</i> (ATCC# 2001) Report# 130377-201	1.16 x 10 ¹⁰	1 minute	4.03 x 10 ⁹	0.46	65.11%
		5 minutes	6.40 x 10 ⁷	2.26	99.45%
		30 minutes	<1.00 x 10 ³	7.06	99.99%

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Virus	Exposure Time	TCID50 (Log10) Post-Exposure Infectivity	Log10 Reduction	Percent Reduction
Hepatitis B Virus Surrogate: Duck Hepatitis B Virus (DHBV) Report# 130378-402	1 minute	5.00	1.00	90.00%
	5 minutes	4.75	1.25	94.38%
	30 minutes	4.00	2.00	99.00%
Hepatitis C Virus Surrogate: Bovine Viral Diarrhea Virus (BVDV) Report# 130378-402	1 minute	5.50	0.75	82.22%
	5 minutes	5.00	1.25	94.38%
	30 minutes	4.50	1.75	98.22%
Human Immunodeficiency Virus Type 1 (HIV-1) Report# 130378-402	1 minute	4.25	1.75	98.22%
	5 minutes	3.50	2.50	99.68%
	30 minutes	2.00	4.00	99.99%

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