

# The Anti-Bacterial Efficacy of a New Super-Oxidized Solution

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**OBJECTIVE:** To perform an In-Vitro Time-Kill evaluation using Super-Oxidized Solution, SOS (Microcyn®)

**BACKGROUND:** A pH neutral, super-oxidized solution (SOS), Microcyn®, has been shown to possess *in vitro* antibacterial, sporocidal and antiviral activities. This study was conducted to evaluate the range of anti-bacterial activity of this SOS when challenged with diverse species of bacteria of clinical significance, including antibiotic-resistant strains, using an *in vitro* time-kill method. Forty-six (46) representative species of bacteria, including Gram-positive, Gram-negative, aerobes and anaerobes, were selected from both ATCC and banked clinical isolates.

**MATERIALS & METHODS:** SOS (Microcyn®) was evaluated versus challenge suspensions of fifty (50) different microorganism strains -- twenty-five (25) American Type Culture Collection (ATCC) strains and twenty-five (25) Clinical Isolates of those same species, as described in the Tentative Final Monograph, Federal Register, 17 June 1994, vol. 59:116, p. 31444.

The percent reductions and the Log<sub>10</sub> reductions from the initial population of each challenge strain were determined following exposures to the products for thirty (30) seconds and 1, 3, 5, 7, 9, 11, 13, 15 & 20 minutes. The test product and the reference products each were evaluated at a 99% (v/v) concentration.

**RESULTS:** SOS demonstrated rapid antibacterial activity against a broad spectrum of challenge organisms. Populations of forty-five (45) of the forty-six (46) bacterial species tested were reduced by > 5 Log<sub>10</sub> within thirty (30) seconds of exposure to this SOS. All values were at the limit of sensitivity for the assays. A thirty (30) second exposure of one *Streptococcus pneumoniae* isolate achieved a reduction >4.5 Log<sub>10</sub>, which was the limit of detection for this species.

**CONCLUSIONS:** These results demonstrate that a spectrum of bacterial species exposed to this SOS for at least 30 sec were reduced by a log<sub>10</sub> factor ≥ 4.5. In light of the significant antibacterial activity of Microcyn®, clinical applications should be further investigated.

Microorganism Species	Initial Population (CFU/mL)	Post-exposure Population (CFU/mL)	Log Reduction	Percent Reduction	Microorganism Species	Initial Population (CFU/mL)	Post-exposure Population (CFU/mL)	Log 10 Reduction	Percent Reduction
<i>Acinetobacter baumannii</i> (ATCC #19003)	2.34 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.3	99.9999	<i>Proteus mirabilis</i> (ATCC #7002)	1.60 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.2	99.9999
<i>Acinetobacter baumannii</i> Clinical Isolate BSLI #061901Ab3	1.82 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.2	99.9999	<i>Proteus mirabilis</i> Clinical Isolate BSLI #061901Pm2	2.10 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.3	99.9999
<i>Bacteroides fragilis</i> (ATCC #43859)	4.40 x 10 <sup>10</sup>	< 1.00 x 10 <sup>3</sup>	7.6	99.9999	<i>Pseudomonas aeruginosa</i> (ATCC #15442)	6.45 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	5.8	99.9999
<i>Bacteroides fragilis</i> Clinical Isolate BSLI #061901Bf6	2.70 x 10 <sup>10</sup>	< 1.00 x 10 <sup>3</sup>	7.4	99.9999	<i>Pseudomonas aeruginosa</i> Clinical Isolate BSLI #072605Pa	1.39 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.1	99.9999
<i>Enterobacter aerogenes</i> (ATCC #29007)	1.23 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.0	99.9999	<i>Pseudomonas aeruginosa</i> (ATCC #27853)	5.55 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	5.7	99.9999
<i>Enterobacter aerogenes</i> Clinical Isolate BSLI #042905Ea	1.02 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.0	99.9999	<i>Pseudomonas aeruginosa</i> Clinical Isolate BSLI #061901Pa2	1.17 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.3	99.9999
<i>Enterococcus faecalis</i> (ATCC #29212)	2.61 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.4	99.9999	<i>Serratia marcescens</i> (ATCC #14756)	9.95 x 10 <sup>8</sup>	< 1.00 x 10 <sup>3</sup>	5.9	99.9999
<i>Enterococcus faecalis</i> Clinical Isolate BSLI #061901Efs2	1.26 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.1	99.9999	<i>Serratia marcescens</i> Clinical Isolate BSLI #042905Sm	3.67 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.5	99.9999
<i>Enterococcus faecium</i> VRE, MDR (ATCC #51559)	3.25 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.5	99.9999	<i>Staphylococcus aureus</i> (ATCC #6538)	1.51 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.1	99.9999
<i>Enterococcus faecium</i> Clinical Isolate BSLI #061901Efm1	1.13 X 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.0	99.9999	<i>Staphylococcus aureus</i> Clinical Isolate BSLI #061901Sa1	1.25 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.0	99.9999
<i>Escherichia coli</i> (ATCC #11229)	5.00 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	5.6	99.9999	<i>Staphylococcus aureus</i> (ATCC #29213)	1.74 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.2	99.9999
<i>Escherichia coli</i> Clinical Isolate BSLI #042905Ec1	3.95 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	5.5	99.9999	<i>Staphylococcus aureus</i> Clinical Isolate BSLI #061901Sa2	1.11 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.0	99.9999
<i>Escherichia coli</i> (ATCC #25922)	6.65 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	5.8	99.9999	<i>Staphylococcus epidermidis</i> (ATCC #12228)	1.06 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.0	99.9999
<i>Escherichia coli</i> Clinical Isolate BSLI #042905Ec2	7.40 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	5.8	99.9999	<i>Staphylococcus epidermidis</i> Clinical Isolate	4.40 x 10 <sup>8</sup>	< 1.00 x 10 <sup>3</sup>	5.6	99.9999
<i>Haemophilus influenzae</i> (ATCC #8149)	1.51 x 10 <sup>9</sup>	< 1.00 x 10 <sup>4</sup>	5.1	99.9999	<i>Staphylococcus epidermidis</i> Clinical Isolate	8.15 x 10 <sup>8</sup>	< 1.00 x 10 <sup>3</sup>	5.9	99.9999
<i>Haemophilus influenzae</i> Clinical Isolate BSLI #072605H	1.90 x 10 <sup>9</sup>	< 1.00 x 10 <sup>4</sup>	5.2	99.9999	<i>Staphylococcus haemolyticus</i> (ATCC #29970)	8.35 x 10 <sup>8</sup>	< 1.00 x 10 <sup>3</sup>	5.9	99.9999
<i>Klebsiella oxytoca</i> MDR (ATCC #15764)	1.12 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.0	99.9999	<i>Staphylococcus haemolyticus</i> Clinical Isolate BSLI #042905Sha	2.79 x 10 <sup>8</sup>	< 1.00 x 10 <sup>3</sup>	5.4	99.9999
<i>Klebsiella oxytoca</i> Clinical Isolate BSLI #061901Ko1	1.81 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.2	99.9999	<i>Staphylococcus hominis</i> (ATCC #27844)	5.20 x 10 <sup>8</sup>	< 1.00 x 10 <sup>3</sup>	5.7	99.9999
<i>Klebsiella pneumoniae</i> subsp. ozaenae (ATCC #29019)	1.39 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.1	99.9999	<i>Staphylococcus hominis</i> Clinical Isolate BSLI #042905Sho	9.10 x 10 <sup>8</sup>	< 1.00 x 10 <sup>3</sup>	5.9	99.9999
<i>Klebsiella pneumoniae</i> Clinical Isolate BSLI #061901Kpn2	9.95 x 10 <sup>8</sup>	< 1.00 x 10 <sup>3</sup>	5.9	99.9999	<i>Staphylococcus saprophyticus</i> (ATCC #35552)	1.42 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.1	99.9999
<i>Micrococcus luteus</i> (ATCC #7468)	6.95 x 10 <sup>8</sup>	< 1.00 x 10 <sup>3</sup>	5.8	99.9999	<i>Staphylococcus saprophyticus</i> Clinical Isolate BSLI #042905Ss	2.15 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	5.3	99.9999
<i>Micrococcus luteus</i> Clinical Isolate BSLI #061901Ml2	1.52 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.1	99.9999	<i>Streptococcus pneumoniae</i> (ATCC #33400)	3.55 x 10 <sup>8</sup>	< 1.00 x 10 <sup>4</sup>	4.5	99.9970
					<i>Streptococcus pneumoniae</i> Clinical Isolate BSLI #072605Spn1	5.20 x 10 <sup>8</sup>	< 1.00 x 10 <sup>3</sup>	6.7	99.9999
					<i>Streptococcus pyogenes</i> (ATCC #19615)	2.59 x 10 <sup>9</sup>	< 1.00 x 10 <sup>3</sup>	6.4	99.9999
					<i>Streptococcus pyogenes</i> Clinical Isolate BSLI #061901Spy7				