

### A Compilation of Data Showing Mixed Oxidant Solution Superiority in Microbial Inactivation Compared to Hypochlorite (Bleach)

MIOX mixed oxidants have been proven in numerous laboratory studies to achieve more rapid and thorough inactivation of a wider range of microbial contaminants, including species highly resistant to chlorination, than conventional chlorine. The table below illustrates this point. Further, The MSR MIOX Purifier, the hand-held version of MIOX technology, passes the Environmental Protection Agency's (EPA's) Guide Standard and Protocol for Microbiological Purifiers, achieving more than the required inactivation level for viruses (4 log), bacteria (6 log), and protozoan oocysts (3 log) in both clean and dirty waters.

Microorganism	MIOX Dose (mg/L)	Bleach Dose (mg/L)	Contact Time MIOX (min.)	Contact Time Bleach (min.)	Inactivation (log)	Differentiating Parameter	Reference
<b>BACTERIA</b>							
<i>Vibrio cholerae</i>	2	2	1.8	4.0	4 log	Time	Venczel et al, 2004
<i>Escherichia coli</i>	2	2	3.8	5.0	4 log	Time	Venczel et al, 2004
<i>Pseudomonas aeruginosa</i>	2	2	10	10	>4.8 MIOX 2.2 Bleach	Efficacy	Barton, 1996
<i>Legionella pneumophila</i>	2	2	10	10	>5.0 MIOX 4.7 Bleach	Efficacy	Barton, 1996
<i>Staphylococcus aureus</i>	2	2	60	60	1.6 MIOX 0.8 Bleach	Efficacy	Russell, 2001*
	4	4	60	60	3.7 MIOX 2.3 Bleach		
<i>Listeria monocytogenes</i>	2	2	60	60	2.0 MIOX 0.8 Bleach		
	4	4	60	60	3.7 MIOX 1.2 Bleach		
<b>BACTERIAL SPORES</b>							
<i>Bacillus sterothermophilus</i>	2	2	30	30	>5 MIOX 2.5 Bleach	Efficacy	Barton, 1996
<i>Clostridium perfringens</i> spore	2	2	13	18	2 log	Time	Venczel et al, 2004
<i>Bacillus globigii</i> spores <i>Bacillus anthracis</i> (Sterne) spores	2.5	2.5	15	15	3.6 MIOX 2.4 Bleach	Efficacy	Bajszar, 2008 and CDC, 2009†
<b>VIRUS</b>							
MS2 Coliphage	2	2	70	168	4 log	Time	Venczel et al, 2004

Vaccinia (Smallpox Surrogate)	5	~70	20	10	4 log MIOX 3 log Bleach	Concentration Time Efficacy	Wright et al, 2001 Groupé, V. et al, 1955
Poliovirus Vaccine Strain 1	>4	NA	30	NA	>5.5 log MIOX	NA	Biovir, 2002
Rotavirus SA-11	>4	NA	30	NA	>5.5 log MIOX	NA	Biovir, 2002
<b>PROTOZOAN OOCYSTS</b>							
<i>Giardia lamblia</i>	>4	NA	30	NA	>4 log MIOX	NA	Biovir, 2002
<i>Cryptosporidium parvum</i> oocyst	5	5	240	1440	3, MIOX None, Bleach	Time and Efficacy	Venczel et al, 1997
<i>Cryptosporidium parvum</i> oocyst	25	25	240	240	>1, MIOX 0.25 Bleach	Efficacy, qRT-PCR and tissue culture infectivity	Bajszár & Dekonenko 2009

\*These data were collected using the Impedance Detection Method (IDT) at pHs ranging from 6.5-9.0.

† Researchers at the Centers for Disease Control obtained similar results using a different strain of spore.

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