

**THE  Aceptsis™**  
**CHLORINE DIOXIDE**  
**TECHNOLOGIES**  
**Characteristics &**  
**Antimicrobial Testing**

Confidential

# Advanced Hygiene Technology

One technology providing a complete range of hygiene protection

Animal Hygiene	Facility Hygiene	Biosecurity	Water / Sand Treatment
			
<ul style="list-style-type: none"><li>• Pre-milking</li><li>• Post milking</li><li>• Hoof bath w/copper</li><li>• Hoof bath (no copper)</li><li>• Topical hoof treatment</li></ul>	<ul style="list-style-type: none"><li>• Calf hutches / calf housing / maternity &amp; hospital areas</li><li>• Calf bottles</li><li>• External equipment cleaning</li><li>• CIP cleaning</li><li>• Laundry</li></ul>	<ul style="list-style-type: none"><li>• Air / fumigation</li><li>• Boot baths</li><li>• Trailer wash</li><li>• Truck wash</li></ul>	<ul style="list-style-type: none"><li>• Biofilm removal</li><li>• Pathogen removal</li><li>• Sand Bedding Treatment</li><li>• Water remediation</li><li>• Waste water treatment</li></ul>

# Chlorine Dioxide: The Technology



## 10 Characteristics of Chlorine Dioxide:

1. Chlorine dioxide is a powerhouse disinfectant, with powerful, proven performance against a wide spectrum of disease-causing bacteria, viruses, molds, fungi and parasites;
2. Chlorine dioxide has been approved by the U.S. Food and Drug Administration (FDA), and by the Environmental Protection Agency (EPA) as a disinfecting agent and safe to use as a food contact surface sanitizer;
3. Chlorine dioxide is used in a wide range of applications, including: hospitals, food processing and water & waste treatment;
4. Chlorine dioxide prohibits both aerobic and anaerobic bacteria (treponemes) from developing resistance and eliminates the need to alternate biocide treatments.
5. Chlorine dioxide has 2.6 times the oxidizing power as sodium hypochlorite (bleach) as a disinfectant, requiring much lower contact times and concentrations;

# Chlorine Dioxide: The Technology



## 10 Advantages of Chlorine Dioxide:

6. Chlorine dioxide has better solubility in water than chlorine, and is active over a wider pH activity range (2 – 12), allowing it to be used within detergent formulations and germicidal rinses at low concentrations;
7. Chlorine dioxide is a dissolved gas in water which allows it to readily penetrate the biofilm by partition and oxidize the "glue" holding the biofilm together;
8. There is less corrosion associated with high chlorine dioxide concentrations than with chlorine disinfection, reducing long term maintenance costs;
9. It is better at oxidizing and removing iron and magnesia compounds than chlorine, especially complex chemical bonds;
10. Because chlorine dioxide has been proven effective in a wide range of applications, and at low dilution concentrations, it is extremely economical to use.

# ORP Values in Pathogen Disinfection

## Measurement of Oxidizing Agent ORP Values In Pathogen Disinfection\*

OXIDIZING AGENT | OXIDIZING AGENT ORP VALUE RANGE (mV)

**CHLORINE DIOXIDE (ClO<sub>2</sub>)** | **600 → 1000 MV**

**OZONE\* (O<sub>2</sub>)** | **700 → 1000 MV**

**IODOPHORS (I<sub>2</sub>)** | **400 → 600 MV**

**HYDROGEN PEROXIDE** | **300 → 500 MV**

**SODIUM HYPOCHLORITE** | **250 → 500 MV**



\***Oxidation Reduction Potential (ORP) for Disinfection Monitoring, Control and Documentation**; University of California, **Trevor Suslow**, Department of Vegetable Crops, University of California - Davis

# ORP Values in Pathogen Disinfection

## ORP Values In Pathogen Disinfection\*\*

PATHOGEN SURVIVAL IN SECONDS (S) OR HOURS (H) AT ORP LEVELS (mV)

Pathogens	<500 ORP (mV)	500 - 600	600 - 700	700+
<b>E. COLI (O157:H7)</b>	> 300 S	< 60 S	< 10 S	< 1 S
<b>SALMONELLA SPP.</b>	> 300 S	> 300 S	< 20 S	< 1 S
<b>LISTERIA MONOCYTOGENES</b>	> 300 S	> 300 S	< 30 S	< 1 S
<b>THERMO-TOLERANT COLIFORM</b>	> 48 H	> 48 H	< 30 S	< 1 S

\***Oxidation Reduction Potential (ORP) for Disinfection Monitoring, Control and Documentation**; University of California, Trevor Suslow, Department of Vegetable Crops, University of California - Davis

# Better hygiene for calf scours prevention

Recommendations from Dr. Donald Sockett, DVM, MS, PhD, ACVIM  
at the Wisconsin Veterinary Diagnostic Laboratory

*"Vaccines, general cleaning and conventional management can only do so much in preventing neo-natal calf scours in dairy-calf facilities, as scour pathogens routinely persist even in environments that appear clean. A comprehensive program of testing, proper cleaning, sanitation and monitoring can reduce the economic and emotional toll of calf scours."*



Dr. Sockett grew up on a dairy farm in Southern Ontario, Canada and graduated from veterinary school at the University of Guelph in 1981. He obtained his PhD degree from the University of Wisconsin-Madison in 1991. Dr. Sockett has authored over 100 articles on infectious diseases of dairy cattle in scientific and lay journals. Currently, he works as a veterinary microbiologist /epidemiologist at the University of Wisconsin, Veterinary Diagnostic Laboratory.

# Better hygiene for calf scours prevention

Recommendations from Dr. Donald Sockett, DVM, MS, PhD, ACVIM  
at the Wisconsin Veterinary Diagnostic Laboratory

*"Looking clean is no longer adequate for good calf hygiene, removing visible manure, soil, milk or other substances from surfaces and equipment is a critical starting point. **You can't sanitize filth.** After removing the gross soils a critical sanitation step is to address pathogens embedded in **biofilm**"*



Dr. Sockett grew up on a dairy farm in Southern Ontario, Canada and graduated from veterinary school at the University of Guelph in 1981. He obtained his PhD degree from the University of Wisconsin-Madison in 1991. Dr. Sockett has authored over 100 articles on infectious diseases of dairy cattle in scientific and lay journals. Currently, he works as a veterinary microbiologist /epidemiologist at the University of Wisconsin, Veterinary Diagnostic Laboratory.



## DISINFECTANT EFFICACY VS. CRYPTOSPORIDIUM PARVUM

DISINFECTANT	CONCENTRATION (PPM)	CONTACT TIME
Ammonia	50,000	18 hours
Benzalkonium chloride (1%)	10,000	Not Effective
Chlorhexidine (2%)	20,000	Not Effective
Chlorine dioxide (ClO <sub>2</sub> )	100	<1 minute
Cresylic acid (5%)	50,000	Not effective
Hydrogen Peroxide (6%)	60,000	4 minutes
Isopropanol (70%)	700,000	Not effective
Peracetic Acid	3,500	5 minutes
Sodium hydroxide	200	Not effective
Sodium hypochlorite (6%)	60,000	Not effective



Dr. Sockett grew up on a dairy farm in Southern Ontario, Canada and graduated from veterinary school at the University of Guelph in 1981. He obtained his PhD degree from the University of Wisconsin-Madison in 1991. Dr. Sockett has authored over 100 articles on infectious diseases of dairy cattle in scientific and lay journals. Currently, he works as a veterinary microbiologist /epidemiologist at the University of Wisconsin, Veterinary Diagnostic Laboratory.

## DISINFECTANT EFFICACY VS. CRYPTOSPORIDIUM PARVUM

DISINFECTANT	CONCENTRATION (PPM)	CONTACT TIME
Ammonia	50,000	18 hours
Benzalkonium chloride (1%)	10,000	Not Effective
Chlorhexidine (2%)	20,000	Not Effective
Chlorine dioxide (ClO <sub>2</sub> )	100	< 1 minute



Dr. Sockett grew up on a dairy farm in Southern Ontario, Canada and graduated from veterinary school at the University of Guelph in 1981. He obtained his PhD degree from the University of

*“Chlorine dioxide (ClO<sub>2</sub>) is the most effective disinfectant for Cryptosporidium, providing the quickest action at the lowest concentration among available disinfectants. The product has good biocidal activity against Mycoplasma, Gram-positive and Gram-negative bacteria, algae, yeast, enveloped viruses, chlamydia, non-enveloped viruses, fungal spores, parvovirus, acid-fast bacteria, bacterial spores and protozoan cysts. Among scour pathogens, ClO<sub>2</sub> provides a quick kill and concentration and time values on coccidian, crypto and giardia oocysts.”*

# Table 1: Common Cleaning Chemical Characteristics

COMPARISON COMPONENT	OZONE (O <sup>2</sup> )	HYDROGEN PEROXIDE (H <sub>2</sub> O <sub>2</sub> )	PEROXYACETIC ACID (POA)	HYPOCHLOROUS ACID (HOCL)	SODIUM HYPOCHLORITE (NaClO)	CHLORINE (Cl <sub>2</sub> )	CHLORINE DIOXIDE (ClO <sub>2</sub> )	QUATERNARY AMMONIA	PHENOLS	IODOPHOR
E. COLI	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
GIARDIA	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO
CRYPTOSPORIDIUM PARVUM	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO
ROTAVIRUS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
CORONAVIRUS	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO
PEDv	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO
BIOFILM REMOVAL	YES	VARIABLES	VARIABLES	NO	NO	NO	YES	NO	NO	NO
AFFECTED BY pH	NO	YES	YES	YES	YES	YES	NO	YES	YES	YES
CORROSIVE	YES	YES	YES	YES	YES	YES	NO	VARIABLES	YES	YES
CARCINOGENETIC	NO	NO	NO	YES	NO	YES	NO	YES	YES	YES
INACTIVATED BY ORGANICS	NO	YES	YES	YES	YES	YES	NO	NO	NO	YES
WATER SANITIZER / DISINFECTANT	NO	Yes	NO	NO	YES	YES	YES	NO	NO	NO
EPA APPROVED WATER SANITIZER	NO	NO	NO	NO	YES	YES	YES	NO	NO	NO
USED WITH DETERGENTS	NO	NO	YES	NO	YES	NO	YES	YES	YES	YES
PRODUCED ON-SITE	YES	RARELY	RARELY	RARELY	NO	NO	YES	NO	NO	NO



United States  
Environmental Protection  
Agency

## Chlorine Dioxide Overview:

Chlorine dioxide is a chlorine compound in the +IV oxidation state. As such, it is a powerful oxidant and disinfectant. Chlorine dioxide is frequently used to improve the removal of taste and odor compounds, oxidation and removal of iron and manganese, removal of color, and inactivation of chlorine-resistant microorganisms such as *Cryptosporidium*. Pathogen inactivation with chlorine dioxide is much less affected by pH in the 6.0 to 8.5 range than with chlorine. However, the inactivation of *Cryptosporidium* oocysts and *Giardia* cysts using chlorine dioxide occurs more rapidly and is more efficient at higher pH. Iron concentration, manganese concentration, sunlight exposure, and aeration are among the parameters that exert additional chlorine dioxide demand.

<https://iaspub.epa.gov/tdb/pages/treatment/treatmentOverview.do?treatmentProcessId=-1277754943>



**EPA**

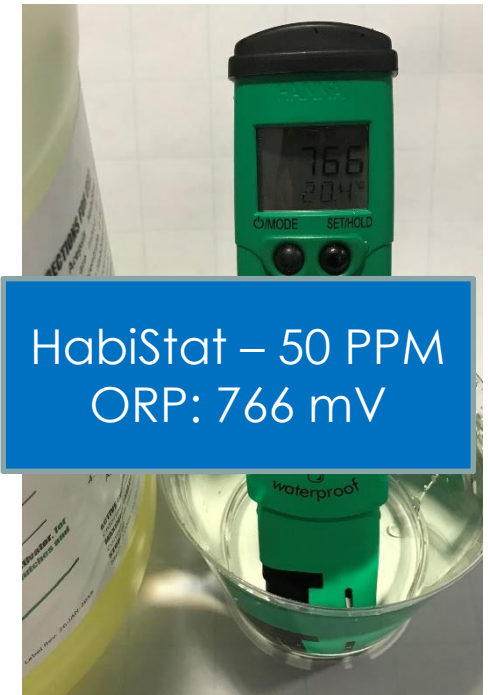
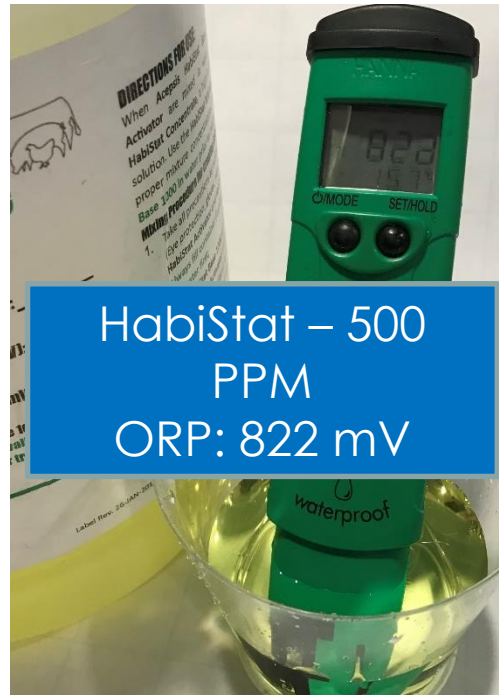
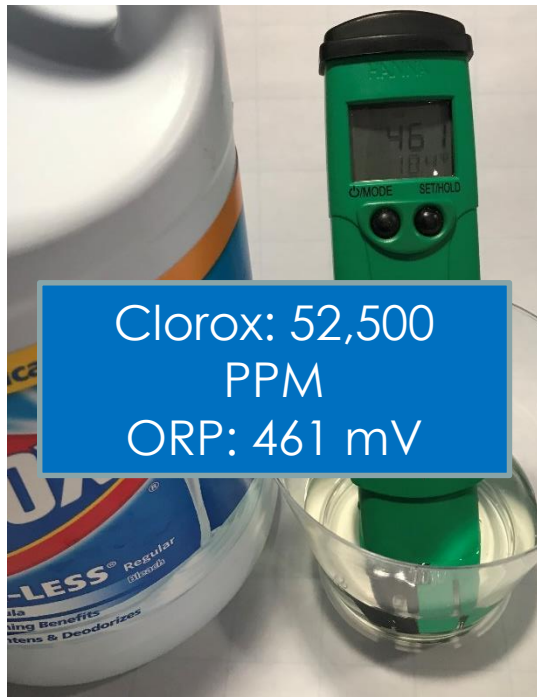
United States  
Environmental Protection  
Agency

## Hydrogen Peroxide Overview:


Hydrogen peroxide ( $H_2O_2$ ) is rarely used in drinking water treatment as a stand-alone treatment process.  $H_2O_2$  is a weak microbicide compared to chlorine, ozone, and other commonly used disinfectants. Consequently, it is not approved by regulatory agencies as a stand-alone disinfection treatment process.

<https://iaspub.epa.gov/tdb/pages/treatment/treatmentOverview.do?treatmentProcessId=-1234021623>

# ORP Comparison: Clorox vs. HabiStat




# WSLH Germicidal Spectrum Evaluation:

2601 Agriculture Drive		Wisconsin State Lab of Hygiene (WSLH)											
Madison, WI 53718													
Phone: (608) 224-6268		Biomonitoring / Sanitizer Laboratory: Alan J. Degnan - Senior Microbiologist											
E-mail: alan.degnan@slh.wisc.edu													
<b>TABLE 1: Comparison of chlorine (Sodium hypochlorite) at three concentrations (200, 100, 50 PPM) against commercial product concentrations (chlorine dioxide - 3 concentrations: 100, 50, 10 PPM) in the prevention of growth of ten incremental additions of eight individual targeted bacterial strains.</b>													
Date: February 4, 2014			CHLORINE RESIDUAL BENCH SHEET SUBCULTURE SERIES										
Organism strain	"+" Indicates survival of strain	PPM	1	2	3	4	5	6	7	8	9	10	
<i>Salmonella enteritidis</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	-	-	+	+
		100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	+	+	+	+	+	+	+
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-
<i>Salmonella typhimurium</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	-	-	-	+
		100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-
<i>Corynebacterium bovis</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	-	-	-	+
		100	-	-	-	-	-	-	-	-	+	+	+
		50	-	-	-	-	-	-	+	+	+	+	+
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-
<i>Escherichia coli 0157:H7</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	+	+	+	+	+	+
		100	-	-	-	-	+	+	+	+	+	+	+
		50	-	-	-	+	+	+	+	+	+	+	+
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-

10 consecutive bacterial inoculations every 90 seconds. "+" bacterial denotes growth.

# WSLH Germicidal Spectrum Evaluation:

2601 Agriculture Drive		Wisconsin State Lab of Hygiene (WSLH)											
Madison, WI 53718													
Phone: (608) 224-6268		Biomonitoring / Sanitizer Laboratory: Alan J. Degnan - Senior Microbiologist											
E-mail: alan.degnan@slh.wisc.edu													
<b>TABLE 1: Comparison of chlorine (Sodium hypochlorite) at three concentrations (200, 100, 50 PPM) against commercial product concentrations (chlorine dioxide - 3 concentrations: 100, 50, 10 PPM) in the prevention of growth of ten incremental additions of eight individual targeted bacterial strains.</b>													
Date: February 4, 2014			CHLORINE RESIDUAL BENCH SHEET SUBCULTURE SERIES										
Organism strain	"+" Indicates survival of strain	PPM	1	2	3	4	5	6	7	8	9	10	
<i>Salmonella enteritidis</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	-	-	+	
		100	-	-	-	-	-	-	-	-	-	-	+
		50	-	-	-	-	-	+	+	+	+	+	+
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-
<i>Salmonella typhimurium</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	-	-	-	+
		100	-	-	-	-	-	-	-	-	+	+	+
		50	-	-	-	-	-	-	+	+	+	+	+
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-
<i>Corynebacterium bovis</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	-	-	-	+
		100	-	-	-	-	-	-	-	-	+	+	+
		50	-	-	-	-	-	-	+	+	+	+	+
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-
<i>Escherichia coli</i> 0157:H7	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	+	+	+	+	+	+
		100	-	-	-	-	-	+	+	+	+	+	+
		50	-	-	-	-	-	+	+	+	+	+	+
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-

Control solution PPM's (Sodium Hypochlorite)

Test solution (Chlorine dioxide) PPM's


Spectrum of organisms (Gram + and Gram -)

Growth (+)


No growth (-)




# WSLH Germicidal Spectrum Evaluation:

2601 Agriculture Drive		Wisconsin State Lab of Hygiene (WSLH)											
Madison, WI 53718													
Phone: (608) 224-6268		Biomonitoring / Sanitizer Laboratory: Alan J. Degnan - Senior Microbiologist											
E-mail: alan.degnan@slh.wisc.edu													
<b>TABLE 1: Comparison of chlorine (Sodium hypochlorite) at three concentrations (200, 100, 50 PPM) against commercial product concentrations (chlorine dioxide - 3 concentrations: 100, 50, 10 PPM) in the prevention of growth of ten incremental additions of eight individual targeted bacterial strains.</b>													
Date: February 4, 2014			CHLORINE RESIDUAL BENCH SHEET SUBCULTURE SERIES										
Organism strain	"+" Indicates survival of strain	PPM	1	2	3	4	5	6	7	8	9	10	
<i>Listeria monocytogenes</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	-	+	+	
		100	-	-	-	-	-	-	-	+	+	+	
		50	-	-	-	-	+	+	+	+	+	+	
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-
<i>Pseudomonas aeruginosa</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	+	+	+	
		100	-	-	-	-	+	+	+	+	+	+	
		50	-	-	+	+	+	+	+	+	+	+	
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-
<i>Streptococcus dysgalactiae</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	-	-	+	
		100	-	-	-	-	-	-	-	+	+	+	
		50	-	-	-	-	+	+	+	+	+	+	
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-
<i>Mycoplasma bovis</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	-	-	+	
		100	-	-	-	-	-	-	-	-	-	+	
		50	-	-	-	-	-	-	-	-	-	+	
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-

# WSLH Germicidal Spectrum Evaluation:

2601 Agriculture Drive		Wisconsin State Lab of Hygiene (WSLH)											
Madison, WI 53718													
Phone: (608) 224-6268		Biomonitoring / Sanitizer Laboratory: Alan J. Degnan - Senior Microbiologist											
E-mail: alan.degnan@slh.wisc.edu													
<b>TABLE 1: Comparison of chlorine (Sodium hypochlorite) at three concentrations (200, 100, 50 PPM) against commercial product concentrations (chlorine dioxide - 3 concentrations: 100, 50, 10 PPM) in the prevention of growth of ten incremental additions of eight individual targeted bacterial strains.</b>													
Date: February 4, 2014			CHLORINE RESIDUAL BENCH SHEET SUBCULTURE SERIES										
Organism strain	"+" Indicates survival of strain	PPM	1	2	3	4	5	6	7	8	9	10	
<i>Salmonella enteritidis</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	-	+	+	
		100	-	-	-	-	-	-	-	+	+	+	
		50	-	-	-	-	+	+	+	+	+	+	
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-
<i>Salmonella typhimurium</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	-	-	+	
		100	-	-	-	-	-	-	-	+	+	+	
		50	-	-	-	-	-	+	+	+	+	+	
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-
<i>Corynebacterium bovis</i>	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	-	-	-	-	+	
		100	-	-	-	-	-	-	-	+	+	+	
		50	-	-	-	-	-	+	+	+	+	+	
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-
<i>Escherichia coli</i> 0157:H7	Chlorine standards for comparison against commercial products (Sodium hypochlorite control)	200	-	-	-	-	-	+	+	+	+	+	
		100	-	-	-	-	+	+	+	+	+	+	
		50	-	-	-	+	+	+	+	+	+	+	
	Chlorine dioxide test concentrations	100	-	-	-	-	-	-	-	-	-	-	-
		50	-	-	-	-	-	-	-	-	-	-	-
		10	-	-	-	-	-	-	-	-	-	-	-

# WSLH Germicidal Spectrum Evaluation:

2601 Agriculture Drive		Wisconsin State Lab of Hygiene (WSLH)								
Madison, WI 53718										
Phone: (608) 224-6268		Biomonitoring / Sanitizer Laboratory: Alan J. Degnan - Senior Microbiologist								
E-mail: alan.degnan@slh.wisc.edu										
<b>TABLE 2: Speed of kill / germicidal and detergent sanitizer end point evaluation (AOAC 4.001 - 4.0028) with Escherichia coli (E. coli - ATCC #11239). Average bacterial population 81.5 X 10<sup>6</sup>. Surviving bacteria inoculated with range of of colony forming units (CFU of species - X 10<sup>6</sup>)</b>										
Date: February 18, 2014			CHLORINE RESIDUAL BENCH SHEET SUBCULTURE SERIES							
Organism strain	Test Date	PPM	SAMPLE NUMBER	Contact time (Seconds)	Surviving bacteria inoculated with range of of colony forming units (CFU of species - X 10 <sup>6</sup> )					
					PLATE 1: 88**	PLATE 2: 71	PLATE 3: 94	PLATE 4: 73	Average Surviving Organisms	% Reduction
<i>Escherichia coli</i> (E. coli - ATCC #11239)	02/18/2014	2,000	2014-22813	5	0	0	0	0	0	100%
				15	0	0	0	0	0	100%
				30	0	0	0	0	0	100%
		200	2014-22814	5	0	0	0	0	0	100%
				15	0	0	0	0	0	100%
				30	0	0	0	0	0	100%
		20	2014-22815	5	0	0	0	0	0	100%
				15	0	0	0	0	0	100%
				30	0	0	0	0	0	100%
		2	2014-22816	5	0	0	0	0	0	100%
				15	0	0	0	0	0	100%
				30	0	0	0	0	0	100%
		~0.2	2014-22817	5	*7000	7000	7000	7000	7000	99.91%
				15	86	100	71	70	82	99.999%
				30	2	9	0	4	4	99.999%
		~0.02	2014-22818	5	**TNTC	TNTC	TNTC	TNTC	***NA	0.0%
				15	TNTC	TNTC	TNTC	TNTC	NA	0.0%
				30	TNTC	TNTC	TNTC	TNTC	NA	0.0%
		~0.002	2014-22819	5	TNTC	TNTC	TNTC	TNTC	NA	0.0%
				15	TNTC	TNTC	TNTC	TNTC	NA	0.0%
				30	TNTC	TNTC	TNTC	TNTC	NA	0.0%



## **The Aceptsis product line overview**



# HabiStat™:



Advanced Animal Habitat / Hygiene  
Technology

# HabiStat Tablets:

# 20 G & 100 G



**Advanced Hygiene Technology**

## HabiStat Tablets

**Net Contents:**      **±10 x 20 grams (100/1020)**  
                                  **±5 x 100 grams (100/1100)**

**Production Date:** \_\_\_\_\_


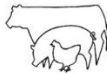
Ultra-concentrated HabiStat Tablets, are used for superior animal facility hygiene. Use for cleaning and disinfection of facility walls, floors, hutches and feeding equipment with or without animals present. Use the HabiStat Tablet Application / Dilution Guide for suggested usages.

**Use only as directed.**

**Acepasis, LLC**  
 1522 BELT AVENUE, IRONVILLE, WI 53548  
 (800) 752-8576  
 www.acepasis.com

CONSUMER COMPLIANT  
**ORM-D**

**Advanced Hygiene Technology**

## HabiStat Tablets Concentrate

**Volume:** \_\_\_\_\_

**Storage :**      Keep out of sunlight in cool, dry location

**Date produced:** \_\_\_\_\_ **PPM:** \_\_\_\_\_

**Date produced:** \_\_\_\_\_ **PPM:** \_\_\_\_\_

**Date produced:** \_\_\_\_\_ **PPM:** \_\_\_\_\_

Ultra-concentrated HabiStat Tablets, are used for superior animal facility hygiene. Use for cleaning and disinfection of facility walls, floors, hutches and feeding equipment with or without animals present. Use the HabiStat Tablet Application / Dilution Guide for suggested usages.

**Use only as directed.**

**Acepasis, LLC**  
 1522 BELT AVENUE, IRONVILLE, WI 53548  
 (800) 752-8576  
 www.acepasis.com

**DIRECTIONS FOR USE:**  
 Use the HabiStat Hygiene Application / Dilution Guide to ensure proper mixtures. Mixing HabiStat Tablets with water will generate a high level of cleaning and disinfection power.

**Mixing Procedure for HabiStat Tablets:**

- Take all precautions as outlined within the product directions (eye protection, gloves, mask) when handling HabiStat Tablets
- Fill container with the desired amount of cold tap water ;
- Add HabiStat Tablet, as directed to container and allow tablet to completely dissolve before use.
- Chlorine dioxide solution will be generated and ready for use.


**HabiStat Tablet Application / Dilution Guide**

Dilution Ratio	TABLET CONCENTRATION / CONCENTRATE QUANTITY			
	100/1020	100/1100	100/1100	100/1100
1:1000	10	10	10	10
1:500	5	5	5	5
1:250	2.5	2.5	2.5	2.5
1:125	1.25	1.25	1.25	1.25

**ACTIVE INGREDIENT:**  
 HabiStat Tablets contain specially formulated levels of sodium chlorite and sodium bisulfate, when mixed with water will produce a ready to use chlorine dioxide solution.

**MAXIMUM USAGE:**  
 Consult the HabiStat Hygiene Application / Dilution Guide for dilution guidelines.

**STORAGE:**  
 Store in cool, dry location. Keep out of sunlight. Do not freeze. Keep in well ventilated area.



**DANGER**

Contact with water releases flammable gas.  
 May intensify fire/oxidizer.  
 Harmful if swallowed.  
 Toxic in contact with skin or if inhaled.  
 Causes skin irritation and serious eye damage.

Keep out of reach of children. Read label before use. Do not breathe dusts or mists. Get medical advice and attention if you feel unwell. Collect spillage. Store in a dry place. Store in a closed container.

**FIRST AID:** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF ON SKIN: Wash with plenty of water. If INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

SEE SAFETY DATA SHEET FOR MORE INFORMATION

**KEEP OUT OF REACH OF CHILDREN**

Label Rev: 05-JAN-2018

**DIRECTIONS FOR USE:**  
 Use the HabiStat Hygiene Application / Dilution Guide to ensure proper mixtures. Mixing HabiStat Tablets with water will generate a high level of cleaning and disinfection power.

**Mixing Procedure for HabiStat Tablets:**

- Take all precautions as outlined within the product directions (eye protection, gloves, mask) when handling HabiStat Tablets
- Fill container with the desired amount of cold tap water ;
- Add HabiStat Tablet, as directed to container and allow tablet to completely dissolve before use.
- Chlorine dioxide solution will be generated and ready for use.


**HabiStat Tablet Application / Dilution Guide**

Dilution Ratio	TABLET CONCENTRATION / CONCENTRATE QUANTITY			
	100/1020	100/1100	100/1100	100/1100
1:1000	10	10	10	10
1:500	5	5	5	5
1:250	2.5	2.5	2.5	2.5
1:125	1.25	1.25	1.25	1.25

**ACTIVE INGREDIENT:**  
 HabiStat Tablets contain specially formulated levels of sodium chlorite and sodium bisulfate, when mixed with water will produce a ready to use chlorine dioxide solution.

**MAXIMUM USAGE:**  
 Consult the HabiStat Hygiene Application / Dilution Guide for dilution guidelines.

**STORAGE:**  
 Store in cool, dry location. Keep out of sunlight. Do not freeze. Keep in well ventilated area.



**DANGER**

Contact with water releases flammable gas.  
 May intensify fire/oxidizer.  
 Harmful if swallowed.  
 Toxic in contact with skin or if inhaled.  
 Causes skin irritation and serious eye damage.

Keep out of reach of children. Read label before use. Do not breathe dusts or mists. Get medical advice and attention if you feel unwell. Collect spillage. Store in a dry place. Store in a closed container.

**FIRST AID:** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF ON SKIN: Wash with plenty of water. If INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

SEE SAFETY DATA SHEET FOR MORE INFORMATION

**KEEP OUT OF REACH OF CHILDREN**

Label Rev: 05-JAN-2018



# HabiStat liquids:

# Activator & Base 1000

**Advanced Hygiene Technology**



**Part Number:** 2011004  
**Volume:** 1 Gallon (3.78 L)  
**Lot Number:** 11704009  
**Usage code date:** Feb-2019  
**Storage temperature:** >40°F / >5°C

**Ultra-concentrated activator, used exclusively with HabiStat Base 1000 for superior facility hygiene. Use for cleaning and hygiene of facility walls, floors, hatches and loading equipment, with or without animals present.**

**Use only as directed.**

Acepsis, LLC  
 1929 BELT ROAD ANNEVILLE, MD 21524  
 (800) 253-2525  
 WWW.ACEPSIS.COM

Label Ref: 04-AN-1038

**DIRECTIONS FOR USE:**  
 When Acepsis HabiStat Base 1000 and HabiStat Activator are mixed in water, they create Acepsis HabiStat Concentrate, a high level of cleaning / hygiene solution. Use the HabiStat Mixing Guide below to ensure proper mixture concentrations. Always dilute HabiStat Base 1000 in water prior to mixing with Activator.

**Mixing Procedure for creating HabiStat Concentrate:**

1. Take all precautions as outlined within the product (Eye protection, gloves, mask) when handling HabiStat Activator and HabiStat Base.
2. Always fill container (1 gallon or 5 gallon) with cold tap water first.
3. Add HabiStat Base 1000 to container as directed.
4. Add HabiStat Activator to container as directed. Cap container and let sit for approximately one hour. Apply / clean with power sprayer.

**WARNING / ATTENTION**  
 Harmful if Swallowed  
 Not for use if ingestion  
 Irritation to Eyes  
 Irritate your eyes

**FIRST AID: IF IN EYES:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **IF ON SKIN:** Wash with plenty of water. **IF INHALED:** Remove victim to fresh air and keep at rest in a position comfortable for breathing. **IF SWALLOWED:** Rinse mouth. Do NOT induce vomiting.

**SEE SAFETY DATA SHEET FOR MORE INFORMATION**

**KEEP OUT OF REACH OF CHILDREN**

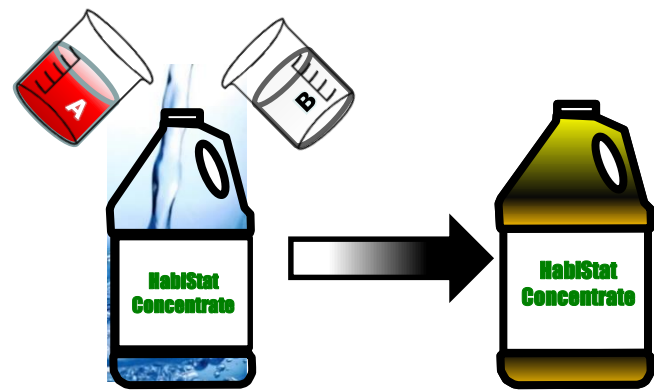
**HabiStat Mixing Guide**

CONTAINER SIZE	WATER	ACTIVATOR	BASE
1 GALLON (3.78 L)	500	815	16,450
5 GALLON (18.9 L)	2500	4075	82250


**ACTIVE INGREDIENT:**  
 A 100-1500 mg/l of specialty formulation to activate HabiStat Base 1000.

**MAXIMUM RESIDUE:**  
 Consult the HabiStat Application / Mixing Guide for dilution guidelines.

**STORAGE:**  
 Store in cool, dry location. Keep out of sunlight. Do not let freeze.



**Advanced Hygiene Technology**



**Part Number:** 2011004  
**Volume:** 1 Gallon (3.78 L)  
**Lot Number:** 11704009  
**Usage code date:** Feb-2019  
**Storage temperature:** >40°F / >5°C

**Ultra-concentrated base, used exclusively with Acepsis HabiStat Activator for superior facility hygiene. Use for cleaning and hygiene of facility walls, floors, hatches and loading equipment, with or without animals present.**

**Use only as directed.**

Acepsis, LLC  
 1929 BELT ROAD ANNEVILLE, MD 21524  
 (800) 253-2525  
 WWW.ACEPSIS.COM

Label Ref: 04-AN-1038

**DIRECTIONS FOR USE:**  
 When Acepsis HabiStat Base 1000 and HabiStat Activator are mixed in water, they create Acepsis HabiStat Concentrate, a high level of cleaning / hygiene solution. Use the HabiStat Mixing Guide below to ensure proper mixture concentrations. Always dilute HabiStat Base 1000 in water prior to mixing with Activator.

**Mixing Procedure for creating HabiStat Concentrate:**

1. Take all precautions as outlined within the product (Eye protection, gloves, mask) when handling HabiStat Activator and HabiStat Base.
2. Always fill container (1 gallon or 5 gallon) with cold tap water first.
3. Add HabiStat Base 1000 to container as directed.
4. Add HabiStat Activator to container as directed. Cap container and let sit for approximately one hour. Apply / clean with power sprayer.

**DANGER / DANGER**  
 Irritation to skin and contact with skin.  
 Harmful if Swallowed  
 Not for use if ingestion  
 Irritation to Eyes  
 Irritate your eyes

**FIRST AID: IF IN EYES:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **IF ON SKIN:** Wash with plenty of water. **IF INHALED:** Remove victim to fresh air and keep at rest in a position comfortable for breathing. **IF SWALLOWED:** Rinse mouth. Do NOT induce vomiting.

**SEE SAFETY DATA SHEET FOR MORE INFORMATION**

**KEEP OUT OF REACH OF CHILDREN**

**HabiStat Mixing Guide**


CONTAINER SIZE	WATER	ACTIVATOR	BASE
1 GALLON (3.78 L)	500	815	16,450
5 GALLON (18.9 L)	2500	4075	82250

**ACTIVE INGREDIENT:**  
 A specially formulated mixture of sodium chloride (20 - 25%) and cleaning agents activated by HabiStat Activator, creating HabiStat Concentrate.

**MAXIMUM RESIDUE:**  
 Consult the HabiStat Application / Mixing Guide for dilution guidelines.

**STORAGE:**  
 Store in cool, dry location. Keep out of sunlight. Do not let freeze.

**Advanced Hygiene Technology**



**Volume:** \_\_\_\_\_

**Date Produced:** \_\_\_\_\_ **ppm:** \_\_\_\_\_ **ORP (mV):** \_\_\_\_\_

**Date Produced:** \_\_\_\_\_ **ppm:** \_\_\_\_\_ **ORP (mV):** \_\_\_\_\_

**Date Produced:** \_\_\_\_\_ **ppm:** \_\_\_\_\_ **ORP (mV):** \_\_\_\_\_

**Ultra-concentrated solution, created exclusively with HabiStat Base 1000 and Activator for superior facility hygiene. Use for cleaning and hygiene of facility walls, floors, hatches and loading equipment, with or without animals present, and for water treatment.**

**Use only as directed.**

Acepsis, LLC  
 1929 BELT ROAD ANNEVILLE, MD 21524  
 (800) 253-2525  
 WWW.ACEPSIS.COM

Label Ref: 04-AN-1038

**DIRECTIONS FOR USE:**  
 When Acepsis HabiStat Base 1000 and HabiStat Activator are mixed in water, they create Acepsis HabiStat Concentrate, a high level of cleaning / hygiene solution. Use the HabiStat Mixing Guide below to ensure proper mixture concentrations. Always dilute HabiStat Base 1000 in water prior to mixing with Activator.

**Mixing Procedure for creating HabiStat Concentrate:**

1. Take all precautions as outlined within the product (Eye protection, gloves, mask) when handling HabiStat Activator and HabiStat Base.
2. Always fill container (1 gallon or 5 gallon) with cold tap water first.
3. Add HabiStat Base 1000 to container as directed.
4. Add HabiStat Activator to container as directed. Cap container and let sit for approximately one hour. Apply / clean with power sprayer.

**WARNING / ATTENTION**  
 Harmful if Swallowed  
 Not for use if ingestion  
 Irritation to Eyes  
 Irritate your eyes

**FIRST AID: IF IN EYES:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **IF ON SKIN:** Wash with plenty of water. **IF INHALED:** Remove victim to fresh air and keep at rest in a position comfortable for breathing. **IF SWALLOWED:** Rinse mouth. Do NOT induce vomiting.

**SEE SAFETY DATA SHEET FOR MORE INFORMATION**

**KEEP OUT OF REACH OF CHILDREN**

**HabiStat Mixing Guide**

CONTAINER SIZE	WATER	ACTIVATOR	BASE
1 GALLON (3.78 L)	500	815	16,450
5 GALLON (18.9 L)	2500	4075	82250



# AquaSoar: Water & Sand Treatment

**Advanced Hygiene Technology**



**Part Number:** 5101501  
**Volume:** 1 Gallon (3.78 l)  
**Lot Number:** 11704009  
**Release code date:** Feb-2019  
**Storage temperature:** >40° / <5°C

**Ultra-concentrated activator, used exclusively with AquaSoar Base 1000 for superior water purification, hygiene and treatment.**

**Use only as directed.**

**Directions for Use:**  
 1. Take all precautions as outlined within the product SDS (Eye protection, gloves, mask) when handling AquaSoar Activator and AquaSoar Base.  
 2. Always fill container (1 gallon or 5 gallon) with cold tap water first.  
 3. Add AquaSoar Base 1000 to container as directed.  
 4. Add AquaSoar Activator to container as directed. Cap container and let sit for approximately one hour. Apply / clean with power sprayer.

**ACTIVE INGREDIENT:**  
 0.25% Chlorine and specially formulated to activate AquaSoar Base 1000.


**HAZARDOUS INGREDIENT:**  
 Consult the AquaSoar Mixing Guide for dilution guidelines.

**STORAGE:**  
 Store in cool, dry location. Keep out of sunlight. Do not use trash.

**Label No. 21-000-0228**

**Acepasis, LLC**  
 1023 BELMONT AVENUE, MARSHVILLE, WI 53546  
 (608) 792-0070  
 www.acepasis.com

**Advanced Hygiene Technology**



**Part Number:** 5201501  
**Volume:** 1 Gallon (3.78 l)  
**Lot Number:** 11704009  
**Release code date:** Feb-2019  
**Storage temperature:** >40° / <5°C

**Ultra-concentrated activator, used exclusively with AquaSoar Base 1000 for superior water purification, hygiene and treatment.**

**Use only as directed.**

**Directions for Use:**  
 When Acepasis AquaSoar Base 1000 and AquaSoar Activator are mixed in water, they create Acepasis AquaSoar Concentrate, a high level of cleaning / hygiene solution. Use the AquaSoar Mixing Guide below to ensure proper mixture concentrations. Always dilute AquaSoar Base 1000 in water prior to mixing with AquaSoar Activator.

**Mixing Procedure for creating AquaSoar Concentrate:**  
 1. Take all precautions as outlined within the product SDS (Eye protection, gloves, mask) when handling AquaSoar Activator and AquaSoar Base.  
 2. Always fill container (1 gallon or 5 gallon) with cold tap water first.  
 3. Add AquaSoar Base 1000 to container as directed.  
 4. Add AquaSoar Activator to container as directed. Cap container and let sit for approximately one hour. Apply / clean with power sprayer.

**ACTIVE INGREDIENT:**  
 0.25% Chlorine and specially formulated to activate AquaSoar Base 1000 and AquaSoar Activator, creating AquaSoar Concentrate.

**HAZARDOUS INGREDIENT:**  
 Consult the AquaSoar Mixing Guide for dilution guidelines.

**STORAGE:**  
 Store in cool, dry location. Keep out of sunlight. Do not use trash.

**Label No. 21-000-0228**

**Acepasis, LLC**  
 1023 BELMONT AVENUE, MARSHVILLE, WI 53546  
 (608) 792-0070  
 www.acepasis.com

**DANGER / DANGER**  
 Causes severe skin burns and eye damage.  
 Causes serious eye damage.  
 Causes serious eye damage.  
 Causes skin irritation.

**PREPARE FOR EMERGENCY:**  
 IF ON SKIN: Wash with plenty of water. IF SWALLOWED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

**SEE SAFETY DATA SHEET FOR MORE INFORMATION**

**KEEP OUT OF REACH OF CHILDREN**

**Acepasis AquaSoar Mixing Guide**

CONTAINER SIZE	WATER	ACTIVATOR	BASE
1 GALLON (3.78 L)	500	150	100
5 GALLON (18.9 L)	500	150	100

**DANGER / DANGER**  
 Causes severe skin burns and eye damage.  
 Causes serious eye damage.  
 Causes skin irritation.

**PREPARE FOR EMERGENCY:**  
 IF ON SKIN: Wash with plenty of water. IF SWALLOWED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.


**SEE SAFETY DATA SHEET FOR MORE INFORMATION**

**KEEP OUT OF REACH OF CHILDREN**

**Acepasis AquaSoar Mixing Guide**

CONTAINER SIZE	WATER	ACTIVATOR	BASE
1 GALLON (3.78 L)	500	150	100
5 GALLON (18.9 L)	500	150	100

**Advanced Hygiene Technology**



**Volume:** \_\_\_\_\_

**Date Produced:** \_\_\_\_\_ **ppm:** \_\_\_\_\_ **ORP (mV):** \_\_\_\_\_

**Date Produced:** \_\_\_\_\_ **ppm:** \_\_\_\_\_ **ORP (mV):** \_\_\_\_\_

**Date Produced:** \_\_\_\_\_ **ppm:** \_\_\_\_\_ **ORP (mV):** \_\_\_\_\_

**Ultra-concentrated concentrate, produced exclusively with the mixing of AquaSoar Activator and AquaSoar Base 1000, with water for superior water purification and treatment. Used a wide variety of hygiene cleaning and sanitation processes.**

**Use only as directed.**

**Directions for Use:**  
 When Acepasis AquaSoar Base 1000 and AquaSoar Activator are mixed in water, they create Acepasis AquaSoar Concentrate, a high level of cleaning / hygiene solution. Use the AquaSoar Mixing Guide below to ensure proper mixture concentrations. Always dilute AquaSoar Base 1000 in water prior to mixing with AquaSoar Activator.

**Mixing Procedure for creating AquaSoar Concentrate:**  
 1. Take all precautions as outlined within the product SDS (Eye protection, gloves, mask) when handling AquaSoar Activator and AquaSoar Base.  
 2. Always fill container (1 gallon or 5 gallon) with cold tap water first.  
 3. Add AquaSoar Base 1000 to container as directed.  
 4. Add AquaSoar Activator to container as directed. Cap container and let sit for approximately one hour. Apply / clean with power sprayer.

**ACTIVE INGREDIENT:**  
 Chlorine Dioxide, 500ppm

**HAZARDOUS INGREDIENT:**  
 Consult the AquaSoar Mixing Guide for dilution guidelines.

**STORAGE:**  
 Store in cool, dry location. Keep out of sunlight. Do not use trash.

**Label No. 21-000-0228**

**Acepasis, LLC**  
 1023 BELMONT AVENUE, MARSHVILLE, WI 53546  
 (608) 792-0070  
 www.acepasis.com

**WARNING / ATTENTION**  
 Harmful if swallowed.  
 Not for use as ingestion.  
 Irritating to eyes.  
 Irritant greater than year.

**PREPARE FOR EMERGENCY:**  
 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF ON SKIN: Wash with plenty of water. IF SWALLOWED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

**SEE SAFETY DATA SHEET FOR MORE INFORMATION**

**KEEP OUT OF REACH OF CHILDREN**

**Acepasis AquaSoar Mixing Guide**

CONTAINER SIZE	WATER	ACTIVATOR	BASE
1 GALLON (3.78 L)	500	150	100
5 GALLON (18.9 L)	500	150	100





# Acepsis Management / Contacts:



Michael Pawlak:  
Acepsis President and Chief Advocate  
Will lead relationships with market development partners  
Will lead product development projects



Dr. David Kolb, DVM:  
Acepsis Chief Scientific / Financial Officer  
Will assist in relationships with market partners & technical support  
Responsible for legal structuring of LLC



Randy Stevenson:  
DeVere Chemical President  
R & D / Product Development / Production / Logistics  
Primary chemical development resource