AgroVet Alliance

SCAN ME

AQUATIZE®

Concentrated Water Disinfectant

AQUATIZE® is a USEPA-approved antimicrobial, livestock drinking water disinfectant. The active ingredient of AQUATIZE® is sodium chlorite ($NaClO_2$), and is balanced by sodium chlorate ($NaClO_3$) and various inactive stabilizers. It is a proprietary and trademarked product.

AQUATIZE® has the following unique properties:

- non-corrosive: not harmful to humans and equipment
- non-volatile: very safe to handle
- soluble as well as stable in water: maintaining a long-lasting anti-microbial effect
- a bio-selective reaction mechanism: reducing the inflammation-induced intestinal dysbiosis
- Due to its unique mechanism, AQUATIZE® will not harm the fermentative microbes (*Lactobacillus*, yeast, etc.)

AQUATIZE® offers a scientifically validated, healthy, safe, and effective alternative to bleach, hydrogen peroxide, and chlorine dioxide-based products. The US Environmental Protection Agency (EPA) allows the AQUATIZE® label to list its effectiveness against the following pathogens:

Campylobacter jejuni	*Salmonella enteridis*
Escherichia coli	*Salmonella typhimurium*
E. coli 0157:H7	*Shigella sonnet*
Listeria monocytogenes	*Streptococcus faecalis*
Pasteurella multocida	*Streptococcus suis*
Pseudomonas aeruginosa	

- At the recommended level of 2000 folds dilution, the application of AQUATIZE® improves feed conversion by about 3-7.5 points, reduces mortality by up to 3% and improves flock uniformity by up to 38%.

AQUATIZE® is USEPA Registered

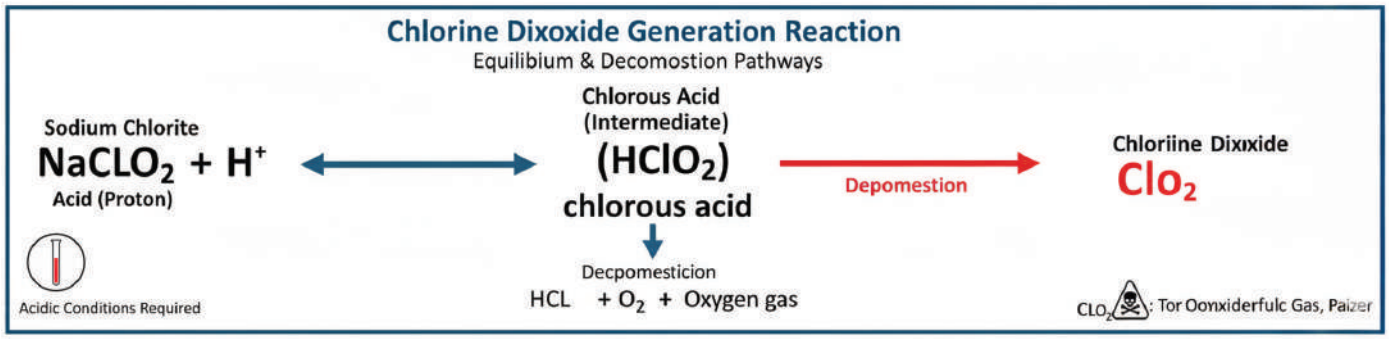
- EPA Register Number 64449-1 & 64449-NC-001

AQUATIZE® available packaging forms

- 5.0-gallon jugs,
- 55-gallon drums

Mechanism

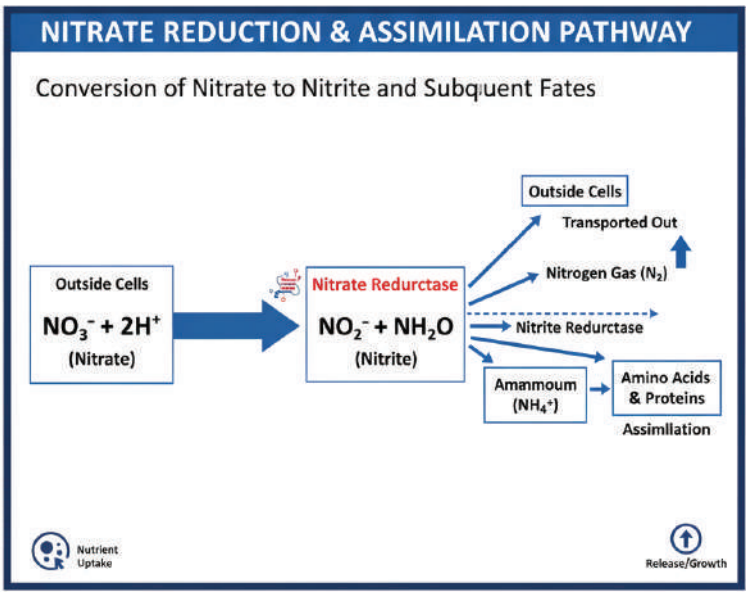
- AQUATIZE® has two main components: sodium chlorite and sodium chlorate
  These two components work differently in the water line and the animal's digestive tract
- Sodium chlorite ($NaClO_2$)



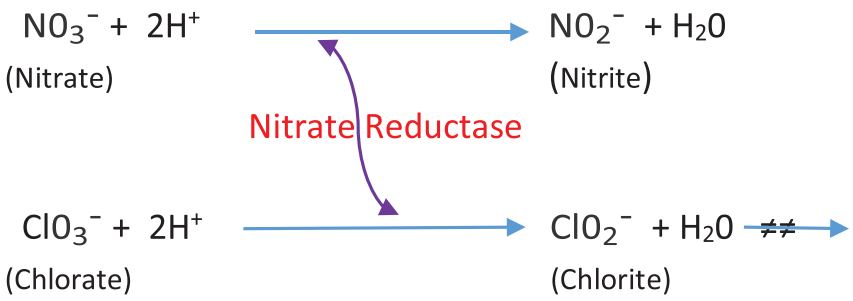
- Sodium chlorite is in equilibrium with chlorous acid, and the shift of the equilibrium is influenced by the pH value. AQUATIZE® is specially formulated at alkaline pH to shift the equilibrium almost 100% to sodium chlorite and makes it a very stable compound.
- Once diluted and encountered weak acids (as in the animal drinking system- water pipes, biofilm, drinking water, etc.), the equilibrium is gradually shifted to chlorous acid.
- Chlorous acid is unstable and will quickly break down to Chlorine dioxide.
- ***AQUATIZE® functions as a reservoir for the slow release of chlorine oxide, driven by environmental pH and temperature.***
- ***In the animal's upper digestive tract, the conversion rate of sodium chlorite to chlorine oxide will gradually increase as the gut pH becomes lower. The gradually released chlorine oxide is an effective anti-microbial agent.***

Sodium Chlorate: Reducing the gut dysbiosis

- Sodium chlorate is a pH-stable compound.
- When facing an environment of low oxygen or absence of oxygen, facultative or obligate anaerobic microbes shift to use chemical compounds such as nitrate (NO_3^-) to complete their respiratory chain to obtain energy for growth[1]. (Some microbes adapt to use a fermentative pathway for energy.)
- The first key step of "nitrate respiration" is carried out by nitrate reductase, as shown below:



- All members of the *Enterobacteriaceae* family (including many of the more familiar pathogens, such as *Salmonella, Shigella, and Escherichia coli*) reduce nitrate, but some members further metabolize nitrite to other compounds.
- Nitrate Reductase also reduces chlorate to chlorite [2]. Chlorite is unable to be further metabolized and, thus, accumulates inside cells.
- Chlorite has been demonstrated to deactivate Nitrate Reductase and is also a well-known cytotoxin to cells via an unknown mechanism [3,4,5].



- During the intestinal inflammation, nitrate is formed in the intestinal lumen and causes phylum-level changes in the microbiota composition in favor of pathogens capable of nitrate respiration (Intestinal Dysbiosis)[6].
- ***Sodium chlorate in AQUATIZE®, being co-reduced by nitrate reductase, can kill pathogens capable of nitrate respiration and, thus, reduce the inflammation-induced intestinal dysbiosis.***
- The fermentative microbes, such as yeast or lactic acid-producing bacteria of the following Genera, for example, do very well in the presence of AQUATIZE®:
  - *Streptococcus*
  - *Leuconostoc*
  - *Pediococcus*
  - *Lactococcus*
  - *Enterococcus*
  - *Lactobacillus*

Applications and Performance

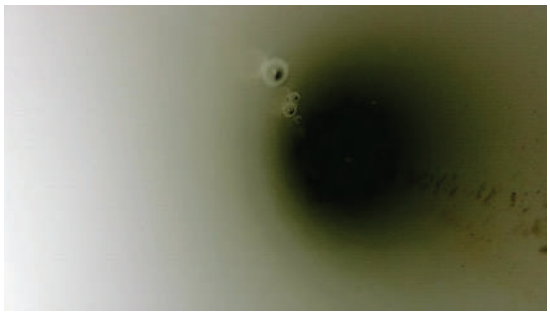
1. WATER LINE SANITATION:

- Application Protocol:
  a. 48 hours before placement, fill water lines with AQUATIZE® at the 1:2000 dilution level.
  b. 24 hours before placement, thoroughly flush water lines to clean out the killed biofilm and refill lines with AQUATIZE® at the 1:2000 dilution level.

- Summary of US field trial results on lightweight Cornish Hens

Borescope Photograph of Biofilm in Poultry Drinking Water Line

Biofilm before use of AQUATIZE®



The Interior of waterlines after AQUATIZE® sanitation

House	16-day weight, g	% improvement	16-day CVs, %	% improvement	Harvest weights, g	Days at harvest	ADG g/day g/day	% improvement
1	440.4	-3.95	16.0	-3.13	921.6	25	36.8	-1.08
2	440.4	-3.95	17.1	-9.36	921.6	25	36.8	-1.08
3	444.9	-2.97	17.2	-9.88	921.6	25	36.8	-1.08
4	449.5	-1.96	16.1	-2.42	967.0	26	37.2	-0.00
5	**517.6**	**12.9**	**11.2**	**38.4**	**917.1**	**24**	**38.2**	**2.07**
Average	458.5		15.5				37.2	

House 1,2,3: No disinfectant treatment
House 4: Competing disinfectant
House 5: AQUATIZE® applied at 1/2000 dilution

Trial Results:

- Malaysia trial: Native color birds

  Water samples were taken from the Product B (a competing disinfectant) and AQUATIZE groups 5 days after application. The water source is the same for the two groups.

  Results of microbial content in water samples:

	Product B	AQUATIZE®	Product B / AQUATIZE®
Std. plate counts (cfu/ml)	$4.9x10^5$	$5.2x10^4$	9.4
Coliforms (cfu/100ml)	85	1	85
E. Coli (cfu/100ml)	69	<1	>69
Salmonella in 100ml	ND	ND	-

Fecal samples from Product B and AQUATIZE® groups were taken 31 days after the application.

Results of microbial content in fecal samples (cfu/g):

	Product B	AQUATIZE®	Product B / AQUATIZE®
Std. plate counts	$1.2x10^9$	$1.7x10^8$	7.06
Coliforms	$7.4x10^6$	$3.5x10^6$	2.11
E. Coli	$5.4x10^6$	$2.7x10^6$	2.00
Salmonella	ND	ND	-
Pseudomonas aeruginosa	< 10	< 10	-
Clostridium perfringens	240	<10	>24
Total Yeast count	6,900	18,000	0.383
Total mold count	$2x10^4$	$4x10^3$	5.00

AQUATIZE® continues to gain recognition as a highly effective and exceptionally safe solution for the removal of biofilm from water lines across all animal species.

2. Application in broiler growth performance

- US broiler pen trial at Tennessee Tech University
  24 pens per treatment, 23 birds/pen
  A very clean environment (including water system)
  AQUATIZE® was applied at 1/2000 dilution for the entire growth period

  The growth performance at day 35

	Avg. body wt. kg	FCR-Raw	FCR-
Control	3.116	1.333	1.355
AQUATIZE®: 1/2000	3.154	1.302	1.318
p value	0.154	0.0019	0.0096
Improvement	0.038	3.1 points	3.7 points

- US field trial:

  8 farms from 5 to US broiler companies
  AQUATIZE® at 1/2000 dilution was applied only for the 14-day grow-out period
  The performance of the Aquatize®-treated farm was compared to that of its entire complex.

Farm	Body Weight grams	Feed conversion	Birds sold	Adjusted* conversion improvement
1	2645.8	1.604	71,654	-0.0414
2	2556.0	1.630	200,706	-0.0181
3	2487.9	1.626	131,401	-0.0152
4	2528.8	1.608	101,353	-0.0240
5	2447.1	1.580	139,779	-0.0205
6	2606.1	1.609	102,652	-0.0518
7	2583.3	1.598	201,806	-0.0926
8	2764.9	1.579	84.537	-0.0590
			Average FCR improvement	**-0.0404**

*adjusted to the same weight

The variation in performance improvement was influenced by the various degrees of bacterial loads in the field.

- US commercial trial

The complex settles 1.2 million birds/week. Grow 2.5kg birds around 35 days. About 400,000 birds on AQUATIZE® vs. 800,000 birds on acidifier (currently using). AQUATIZE® at 1/2000 dilution was applied for the entire growth period. Pathogen analysis and growth performance were followed.

Pathogen analysis of cloacal swab samples

*	*Salmonella*, %		*Campylobacter* (CFU/mL)		*Enterobacteriaceae* (CFU/mL)	
	Control	AQUATIZE®	Control	AQUATIZE®	Control	AQUATIZE®
Day 4*	0	0	0	0	34	26
Day 23*	20	0	0.78	0	481,200	203,200

e birds were identified and used for sample collection

Results of growth performance

Items	Net benefits over Control
% Livability	-0.2%
Weight Gain, g	+156.5
ADG, g/day	+4.54
Raw Feed Conversion	-0.023
Weight-adjusted Feed Conversion	-0.075

3. BROILER BREEDERS

Similar outcomes reported in broilers administered AQUATIZE® have likewise been recorded among broiler breeders. Integrators have observed sustained health improvements originating in pullet houses and extending through the breeder lifecycle. These findings are attributed to maintaining water lines free from pathogenic bacteria. Industry data reveal that flocks utilizing AQUATIZE® experience improved hatchability rates, which align with lower incidences of pathogenic bacteria in rooster reproductive tracts. Additionally, a decrease in early embryonic mortality in hatcheries has been correlated with increased male sperm counts. The data further indicate diminished dependence on spike males, as highlighted by the performance results presented below.

Breeder Performance
2 houses, ≈9,000 hens/house, Cobb 500
AQUATIZE® was applied at a dilution of 1/2000 for the entire period.

Test period	AQUATIZE[6]	Mortality %	Total Eggs/HH*	Hatching Eggs/HH*	Hatch. %	Kgs Feed/ Dozen eggs	Roosters spiked**
2012-13 (26-62 wks)	No	18.3	150.0	144.7	85.4	3.173	1,000
2013-14 (26-65 wks)	Yes	13.2	176.3	171.8	87.5	2.727	530
Improvement		5.1	17.5%	18.7%	2.1%	14.0%	47%
Cobb Std. 26-65 wks)		7.74	179.9	175.3	86.1		

SUMMARY

AQUATIZE® is used to eliminate pathogens and biofilm from water and enhance broiler and breeder performance. Positive results have also been seen in turkeys, swine, veal, and quail, with further data expected.

AQUATIZE® is manufactured exclusively by Clean Water International LLC, a Virginia-based company with plant operations in North Carolina and Virginia.

Exclusive Distributor for Middle East Region

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