



Complete your circle of protection

BIO-CIDE BIO-PROTECTANTS

Complete the circle of protection for your livestock production with Kemin's disinfectants, your most effective tool for water management. Keep the bacteria levels down in the water lines and prevent biofilm from developing with PRO-OXINE® and OXINE®.

KEMIN[®]

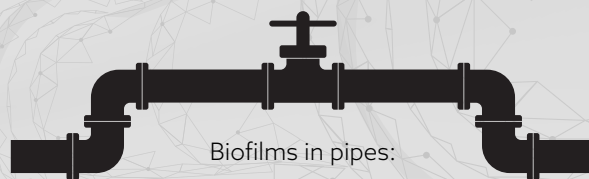
Importance of water:

- Water is one of the most important nutrients but the most neglected.
- Water has long been recognized as the most critical nutrient in livestock production.
- Animals can survive for longer periods without the other nutrients except for water
- Almost 70% of the bodies of animals are made of water
- Water is the highest single constituent of the body

McCreery et al., 2015; Manning et al., 2007; Fairchild BD and Casey WR. 2015, Almond 1995

Water is susceptible to microbial contamination regardless of how good a farm's water management system.

Pipes are lined with biofilm, and it affects water quality by releasing bacteria into the drinking water.



are reservoirs for pathogens

play a role in corrosion

impact the aesthetics of water

Maharjan, 2016

What are biofilms?

Biofilms are composed of complex microbial structures derived from extracellular polymeric substances (EPSs). EPSs are formed mainly of proteins and carbohydrates.

The formation of biofilms depends mainly on microorganism type and density, temperature, pH, nutrient availability and type of materials.

Biofilms decrease the efficacy of disinfectants due to their limited penetrability into the biofilm matrix.



Nakanishi et al., 2021; Maharjan, 2016

Biofilms sources of contamination

Biofilms in the water system can harbor pathogens such as:

Actinobacillus pleuropneumoniae

Escherichia coli

Campylobacter

Pseudomonas

Salmonella

Protozoans

Viruses

including avian pathogenic (APEC) strains

PRO-OXINE®

OXINE®

PRO-OXINE® and OXINE® are the most effective tool for water management in animal facilities. PRO-OXINE® and OXINE® keep the bacteria level down in the water lines and prevent biofilm from developing, thus keeping the animals healthier by keeping down the pathogen level that could potentially travel from one animal to another.

- Colorless liquid with a slight odor
- Solution of oxy-chloro species, primarily sodium chlorite
- Produce chlorine dioxide when activated

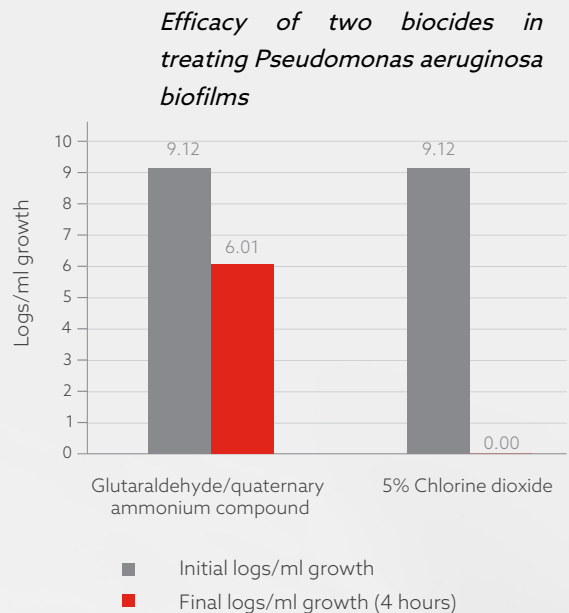
PRO-OXINE® - 5% ClO₂
 OXINE® - 2% ClO₂



Benefits of using PRO-OXINE® and OXINE®

- Low toxicity
- Cost-effective
- Low corrosivity
- Broad-spectrum
- High antimicrobial activity
- Effective over a wide pH range
- Kill bacteria, viruses, fungi and protozoa
- Not affected by temperature variations
- Remove biofilm - keep plumbing clog-free
- Easily implemented and fed to the system
- Selective chemistry - no reaction with ammonia
- Resists neutralization by organic-load and water hardness
- Does not chlorinate to form halogenated organics (e.g., THMs, HAAs)
- Highly soluble, permitting it to homogenize throughout the system
- Excellent oxidizer for iron and manganese, eliminating the buildup of sludge
- Controls taste and odor problems associated with hydrogen sulfide, chlorophenols and biological organisms

Efficacy of PRO-OXINE® and OXINE® against biofilms



Comparison with other sanitizers

Concentration (ppm) of biocide required for > 5 log reduction in 60 seconds

Molecule	<i>P. aeruginosa</i>	<i>S. aureus</i>	<i>S. cerevisiae</i>	<i>E. coli</i> (O157:H7)
Chlorine dioxide	5	30	30	6
Sodium hypochlorite	200	200	400	600
Peracetic acid	30	60	300	20
Dodecylbenzenesulfonic acid	40	80	600	90

Comparison of using PRO-OXINE® and OXINE® versus chlorine

PRO-OXINE® | OXINE®

VS

Chlorine

✓	Greater antimicrobial efficacy		✗
✓	More organic-load bearing capability		✗
✓	Do not impart offensive odor or taste to drinking water		✗
✓	Less corrosive to equipment		✗
✓	Work in a wider pH range <i>(hypochlorites typically lose biocidal efficacy above pH 7; whereas PRO-OXINE® and OXINE® is effective pH range of 3-10, providing microbial control during pH swings in incoming water)</i>		✗
✓	Do not create toxic trihalomethanes (THMs)		✗
✓	Safer for workers and environment		✗
✓	2.6 times more powerful oxidizing capacity		✗
✓	Require much lower use of solution than hypochlorites		✗
✓	Remove biofilms more effectively		✗

Direction of use

Water Sanitation: 3 to 5 ppm of ClO₂

It can be used with Bio-Cide International, Inc., a Kemin Company automated activation equipment to generate an aqueous chlorine dioxide solution or manually activated.

Automated Activation Equipment Method:

An automated activation equipment may be used to generate an aqueous chlorine dioxide solution for metering into the water supply to treat 3 to 5 ppm activated PRO-OXINE® concentration.

Manual Activation Method:

Activated PRO-OXINE® and OXINE® concentrate may be prepared by manual mixing and subsequent dilution for treatment of the water supply at 3 to 5 ppm according to the activation and dilution charts.

Delivery equipment

Contact your distributor for more information about the variety of available equipment for the delivery of PRO-OXINE® and OXINE®.

