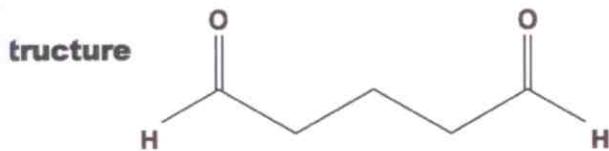


## AQUCAR IG 50 Water Treatment Microbiocides

AQUCAR IG 50 504, 514, 515, 542, 545 and 550 CAS Reg. No. 111-30-8

**General** AQUCAR IG 50™ Water Treatment Microbiocides are aqueous solutions of glutaraldehyde containing varying levels of active ingredient. They are especially effective in controlling slime-forming bacteria, sulfate-reducing bacteria and algae in water cooling towers, air washers, pasteurizers, and other recirculating water systems.



The following are typical properties of AQUCAR IG 50 Water Treatment Microbiocides; they are not to be considered product specifications.

Active, % Glutaraldehyde (w/w) ..... 4  
pH at 25°C: ..... 3.1 to 4.5  
Solubility in Water, 20°C: ..... Miscible

### Physical Properties

Boiling Point ..... 100.5°C/213°F  
Freezing Point: ..... -4°C/25°F  
Specific Gravity, at 20/20°C: ..... 1.013  
Vapor Pressure at 20°C: ..... 0.2 mm Hg based on glutaraldehyde (0.27 hPa)

### AQUCAR IG 50 Water Treatment Microbiocide

### Special Features and Benefits

AQUCAR IG 50 Water Treatment Microbiocides, which kill microorganisms by reacting with the cell wall, have many important features:

- Ability to remove established biofilm and to inhibit regrowth
- Broad spectrum of activity - kill aerobic and anaerobic microorganisms and algae
- Chemically compatible with most common scale and corrosion inhibitors and dispersants
- Reduce populations of sessile microorganisms known to cause corrosion and reduce heat exchange efficiency
- Effective over a broad pH and temperature range
- Non-foaming
- Water-soluble; therefore, easy to mix and dilute uniformly
- Effective against organisms that produce H<sub>2</sub>S, which causes corrosion and foul odors
- Active concentrations as low as 1 ppm can be measured using the Alden, Glutatest field test kit
- Can be transported and stored in bulk
- Compatible with chlorine
- Non-corrosive at end use concentrations
- Non-halogenated material
- Does not contain heavy metals

### Product Performance

The evaluation of antimicrobial compounds has traditionally relied on measurements of efficacy against free-floating (planktonic) microorganisms. However, attention in recent years has begun to focus on the effects of microorganisms which adhere to surfaces, giving rise to types of deposits known as biofouling. These deposits contain not only colonies of microorganisms, but also a combination of cellular by-products, entrained debris, and inorganic materials. Biofilms can cause significant energy losses in water distribution systems as a result of increased fluid frictional resistance. In heat transfer equipment, biofilms can decrease heat transfer efficiency. Microbial fouling can occur under both

aerobic and anaerobic conditions and can accelerate corrosion of metals and deterioration processes in wood.

AQUCAR IG 50 Water Treatment Microbiocides have shown substantial effectiveness in controlling microorganisms in water-handling systems where fouling and/or microbially influenced corrosion present problems. This utility has been demonstrated in both aerobic systems, such as recirculating cooling towers, and anaerobic systems, where sulfate-reducing bacteria cause corrosion. Combined field and laboratory data have substantiated the ability of AQUCAR IG 50 Water Treatment Microbiocides to both penetrate biofilms and destroy "protected" microbial cells. In addition to killing microorganisms, AQUCAR IG 50 Water Treatment Microbiocides appear to accelerate the erosion rate of cells from the biofilm. When fouled systems are effectively treated with AQUCAR IG 50 Water Treatment Microbiocides, biofilms are removed from the system. As a result, the systems operate more efficiently and corrosion rates are significantly reduced.

**Efficacy against  
*Legionella  
pneumophila***

*Legionella pneumophila*, also known as Legionnaire's Disease Bacteria (LDB), is the causative agent of Legionnaire's Disease. It was discovered following an outbreak of this often fatal disease at the American Legion Convention in Philadelphia in 1976. The bacterium, a Gram-negative rod, has since been found in many sources of water, including both natural waterways and industrial cooling water. Its presence in cooling towers has on several occasions, been linked to disease outbreak, and its control is of critical importance to the success of any cooling water biocide program.

The effectiveness of AQUCAR IG 50 Water Treatment Microbiocides in killing *Legionella pneumophila* was evaluated under laboratory conditions at pH 6.7 and 8.0. The results of these experiments are shown in Table 1. In all cases, the biocides completely killed the test organisms at both pH 6.7 and 8.0, even at the lowest concentration tested (25 parts per million active). In addition, this activity was achieved extremely rapidly, with all of the organisms destroyed in less than one hour. This speed of kill is critical in evaporative cooling towers where biocide depletion, because of blowdown and low cycles, may result in relatively low biocide residence times in the system.

**Table 1  
Efficacy of  
AQUCAR IG 50  
Water Treatment  
Microbiocides,  
against  
*Legionella  
pneumophila***

Test Solution	ppm active	pH	<i>Legionella</i> Population, CFU/mL at Time =			
			1 hr.	3 hr.	7 hr.	2 hr.
Control	0	6.7	1 x 10 <sup>7</sup>	4.5 x 10 <sup>6</sup>	2.5 x 10 <sup>7</sup>	2 x 10.
AQUCAR IG 50 545	25	6.7	ND*	ND	ND	ND
	50	6.7	ND	ND	ND	ND
	100	6.7	ND	ND	ND	ND
Control	0	8.0	3.5 x 10 <sup>6</sup>	4.5 x 10 <sup>6</sup>	2.8 x 10 <sup>7</sup>	2 x 10.
AQUCAR IG 50 545	25	8.0	ND	ND	ND	ND
	50	8.0	ND	ND	ND	ND
	100	8.0	ND	ND	ND	ND

\*ND = None Detected (< 10<sup>2</sup> CFU/mL)

†Similar results were obtained for both AQUCAR IG 50 514 and 542

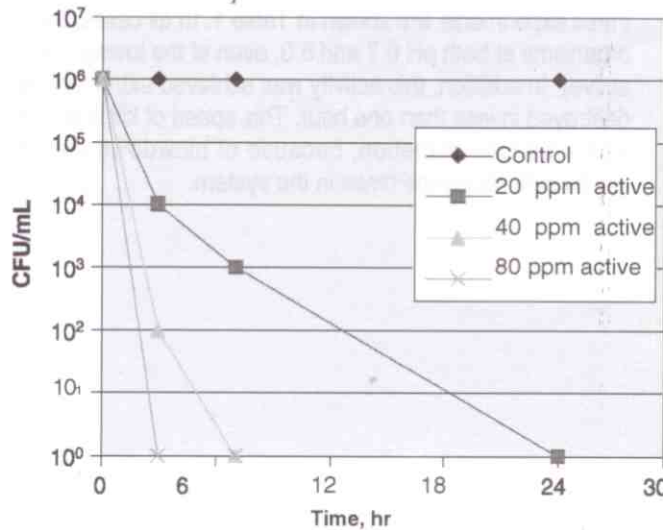
In preliminary laboratory tests, AQUCAR IG 50 Water Treatment Microbiocides have been shown to inactivate pure cultures of LDB. However, the ability of these formulations to control the growth or inactivate LDB in operating cooling towers exposed to ultraviolet light, organic material, other microbial contamination and aeration, has not been studied. These findings also do not address the problem of long-term preventative maintenance of water cooling towers. Even in the absence of complete knowledge about LDB levels and the disease outbreak, it is prudent to minimize slime growth and excessive bacterial contamination in cooling towers. This precaution is supported by limited ecological studies on LDB that have shown the presence of the organism is usually associated with heavy fouling of the cooling systems.

**Efficacy vs. Sulfate-Reducing Bacteria**

Sulfate-reducing bacteria (SRB) are anaerobic microorganisms often found under slime deposits where the oxygen tension is low. These organisms are responsible for corrosion of equipment and odor problems. A series of experiments was performed to determine the effectiveness of AQUCAR IG 50 542 Water Treatment Microbiocide against *Desulfovibrio desulfuricans*, a well-known species of SRB. The experiments were designed to test the effectiveness of the microbiocide in a system that contained high levels of the SRB.

Figure 1 summarizes the results of the experiment. AQUCAR IG 50 542 Water Treatment Microbiocide concentrations are in parts per million (ppm) active ingredient. The bacteria was exposed to the microbiocides for periods of 3, 7 and 24 hours at which point the solutions were enumerated by serial dilution. The graph illustrates the outstanding ability of AQUCAR IG 50 542 Water Treatment Microbiocide to reduce the level of SRB present in the solutions at all contact times tested.

**Figure 1  
AQUCAR IG 50  
542 Water  
Treatment  
Microbiocide  
Efficacy vs.  
Sulfate-Reducing**



**Efficacy vs. Algae**

Algae, relatively simple organisms which utilize sunlight for growth, can be found on distribution decks, sidewalls, louvers and other exposed areas of a cooling tower. When larger masses of algae break free they can plug screens and pipes and also coat the packing material, leading to a reduction in the cooling efficiency of the tower.

Table 2 illustrates the efficacy of AQUCAR IG 50 542 Water Treatment Microbiocide against *Chlorella*, *Scenedesmus*, and *Ulothrix*, species commonly found in cooling water systems. As demonstrated, the biocide was able to reduce algal growth against all species, even at the lowest concentration tested. (25 ppm a.i.)

