

THE SILVER STORY

The antiseptic qualities of silver have been known for centuries. The Romans used silver jars to store liquids contamination free. American settlers travelling west used silver coins in their milk pots to delay spoilage. In the 1900's silver foil was used extensively as an infection-control wound dressing.

William Briggs, an inventor has brought the use of silver as water sanitiser into the present day with a revolutionary new process. The Silver Colloid Formulator (Owned by Omega International Pty Ltd – after slight modification now called Omega Colloid Generator “OCG”) releases silver ions at trace levels (well below the World Health Organisation's maximum standards for silver in water) killing harmful bacteria. This sanitised water can then filtered to remove a range of chemicals and contaminants that can impart colour and unpleasant odour and taste to water. The water that results is pure and safe and retains a trace of silver ions so that its purity can be maintained in sealed storage for many days.

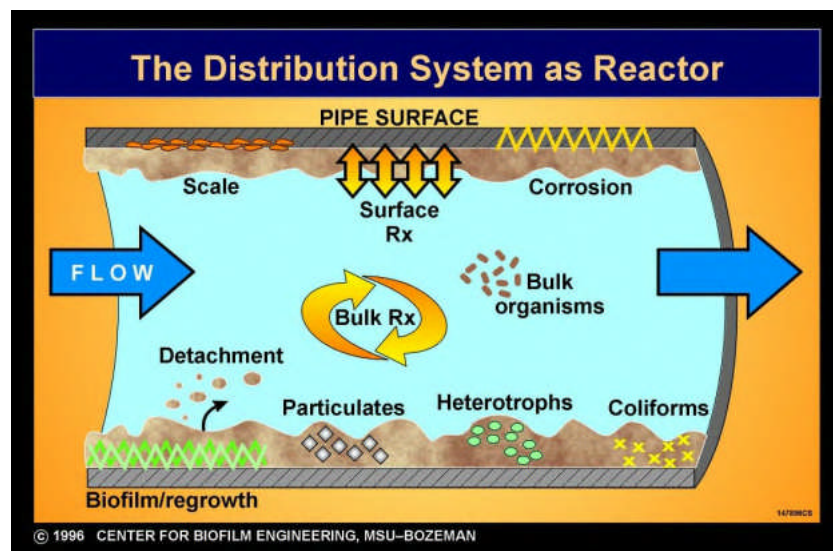
The Omega Water System range of products is tailored to deliver this unique sanitisation and filtration process in units with configurations and flow rates suitable for almost every application. The Omega Colloid Generator process, with continued research will ensure that Omega Water Systems will maintain its leadership in water purification technology.

This technology is suited to controlling microbiological growth in water and is particularly effective in controlling Biofilm growth.

What is biofilm?

You may not be familiar with the term "biofilm," but you have certainly encountered biofilm on a regular basis. The plaque that forms on your teeth and causes tooth decay is a type of bacterial biofilm. The "gunk" that clogs your drains is also biofilm. If you have ever walked in a stream or river, you may have slipped on the biofilm-coated rocks.

Biofilm forms when bacteria adhere to surfaces in aqueous environments and begin to excrete a slimy, glue-like substance that can anchor them to all kinds of material – such as metals, plastics, soil particles, medical implant materials, and tissue. A biofilm can be formed by a single bacterial species, but more often biofilms consist of many species of bacteria, as well as fungi, algae, protozoa, debris and corrosion products. Essentially, biofilm may form on any surface exposed to bacteria and some amount of water. Once anchored to a surface, biofilm microorganisms carry out a variety of detrimental or beneficial reactions (by human standards), depending on the surrounding environmental conditions.



What being in a biofilm means to bacteria

Lots of bacteria are *planktonic* – they float around in water; microbiologists since the time of Pasteur have conducted most bacterial studies using suspended bacterial cultures.

But most of the bacteria that cause us problems are *sessile* – attached to a surface – and they live in biofilms. Once bacteria attach to a surface, they change. The most obvious change is that they begin to excrete a slimy material (which has provided the basis for coining the word *biofilm*). But we are learning that other changes made by attached bacteria are profound, though invisible. In fact, researchers have now shown that a bacterium which attaches to a surface "turns on" a whole different set of genes, which makes it effectively a *significantly different organism to deal with*. If researchers continue to study cells in suspended cultures, when the actual problems involve biofilm bacteria, the control strategies derived from the studies will target what, phenotypically, amounts to the wrong organism!

The CDC implicates biofilms in 65% of human bacterial infections. Bacterial biofilms also cause fouling, product contamination, equipment failure, and decreased productivity due to downtime for system cleaning and replacement. We have plenty of evidence that control strategies based on suspended cells are less effective on biofilm cells. Antibiotic doses which kill suspended cells, for example, need to be increased as much as 1,000x to kill biofilm cells (and these amounts would kill the patient first!). Disinfection rates for biofilm cells are also far below planktonic kills by antimicrobials.

Biofilm bacterial behavior is much more complex than suspended cell behavior, because biofilm bacteria live in communities. According to the CBE's Dr. Gill Geesey, recent studies have revealed that there are significant differences in the level of expression of genes involved in nutrient cycling among members of a single species bacterial population exposed to the same apparent conditions. Within these populations, there appears to be "division of labor" whereby some cells utilize available energy to turn on metabolic pathways that effect partial degradation of dead particulate matter, while other adjacent cells of the same population utilize the degradation products to produce new cells that are dispersed in the environment.

Source: Centre for Biofilm Engineering (Montana State University - Bozeman)

<http://www.erc.montana.edu/research/Control/default.htm>

Biocides

Many biocide programs are available to chemically treat water including oxidizing types (chlorine, chlorine dioxide, ozone etc) and non-oxidizing types (gluteraldehyde, quaternary amines etc) and others (ie colloidal silver). Of the systems available, the colloidal silver offers a most effective, non-toxic and cost effective method of treating water.

Colloidal Silver

Prior to the use of penicillin and sulfa drugs during World War II, Medicine's most commonly utilized infection fighter was Colloidal Silver (a solution of extremely fine particles of pure silver suspended in water). A powerful germicidal, silver is an exceptional metal in that it is non-toxic to the human body, but lethal to over 650 types of bacteria, viruses, fungi, parasites, and molds. Conventional pharmaceutical antibiotics are typically effective against only 6 or 7 types of bacteria and are useless against viruses.

In the middle of this century, Colloids of Silver were rediscovered when researchers sought to find effective treatments for infections on burns victims. Many antibiotics were tested, but researchers were led to FDA approved, Silver Nitrate (the same liquid dropped into babies eyes at birth to prevent Syphilis infections which led to blindness). It worked well, but caused excruciating pain to the burn patient due to its corrosive properties. However, they felt it was the

Silver that was the active ingredient, and experimented with true Colloids of Silver and found that they had wonderful benefits, caused no pain or side effects. Modern knowledge of electricity led to a more effective method of producing true colloids using an electrolysis process. This new technique produced a dispersion of much smaller particles of Silver and at much lower concentrations.

Today, through research of the metabolic processes of pathogens, we now know why pure elemental Silver works so well. Silver atoms attach at essential receptor sites for a transfer enzyme necessary for respiration of the pathogens. The result is that the pathogenic cell cannot exchange gasses and dies. The silver never enters the cell, and therefore the pathogen is unable to develop resistance through genetic mutation. As a consequence most pathogenic bacteria, yeast and fungi are easily controlled with Silver and they do not develop resistance as some have to the toxic chemical antibiotics.

Some soil-borne type bacteria are not affected by Silver. This type of bacteria included the 'good bacteria' of our bodies, Acidophilus, Lactobacillus, Bacillus, Licheniformis, Doderean and others. Consequently when you take Silver orally, it does not induce the side effects of diarrhoea, vaginal yeast infections like Allopathic Antibiotics. Unfortunately though, some bladder infections and digestive upsets caused by E. Coli type bacteria are not well controlled by Silver Colloids.

(Extract from an article by David C. Beebe, Bio-chemist at Electro-Pure)

The Omega supplied Omega Colloid Generator releases silver ions at trace levels (well below the World Health Organisation's maximum standards for silver in water) killing harmful bacteria. The water that results is pure and safe and retains a trace of silver ions so that its purity can be maintained in sealed storage for many days. Omega offer a number of the water treatment options above in combination with Omega's major advantage, the silver colloid sanitiser. Water from these units will be bacteria-static, free from all bacteria, and will remain free from re-infection in a closed container for about six days.

The Omega Water System will produce silver colloid at 0.03mg/litre. This is not hazardous but is effective on microorganisms including those that form the Biofilm layer.

The example below is the dental unit but units suitable for industrial, medical, and other applications are now in operation. Some of the industrial units treat considerable volumes of water to effectively control microbiological activity in these applications.

Is It Safe?

Drinking water supplies in the United States have been found to contain silver levels of up to 80 ppb. Surveys show that one-tenth to one-third of samples taken from drinking water supplies (both groundwater and surface water) contain silver at levels greater than 30 ppb. The (US) Environmental Protection Agency (EPA) suggests that the level of silver in drinking water not be more than 0.05 milligrams per liter of water (mg/L) (which is equal to 50 parts of silver per billion parts of water or ppb). However, in May 1989, the EPA announced that this restriction on silver levels in drinking water might be removed. For short-term exposures (1-10 days), EPA suggests that drinking water levels of silver not be more than 1.142 mg/L (which is equal to 1.142 parts of silver per million parts of water or ppm).

Extracts from USA ATSDR _ Pubic Health Statement: Silver 1992
(<http://www.atsdr.cdc.gov/ToxProfiles/phs9024.htm>)

Where silver salts are used to maintain the bacteriological quality of drinking water.... levels of silver, up to 0.1 mg/litre, could then be tolerated without risk to health.

Extract from World Health Organization Web Page

http://www.who.int/water_sanitation_health/GDWQ/Chemicals/silverfull.htm#humans

Summary

Omega can provide effective solutions for many water treatment problems. Systems can be tailor made to suit many applications and these units range in capacity from small domestic to large industrial units.

Omega's major advantage is the silver colloid technology, which sanitises the water providing a lasting effect on water quality. The sanitisation of the water allows longer filter life as biofilm fouling of the filter media is prevented.

Omega systems are simple, very cost effective compared to other systems and safe.