Biomaster
ANTIMICROBIAL ADDITIVES

Core Narrative

WHY ANTIMICROBIALS?

The first question to ask is "why should antimicrobial additives be used at all?"

There are two main reasons:

- **Health – protection of patients in hospitals etc.**

Over recent years there has been an increasing concern over Hospital Acquired Infections (HAI's). These infections are caused by wide range of bacteria as shown. There is particular concern about the number of cases of Methicillin-Resistant Staphylococcus Aureus (MRSA). This is a strain of Staphylococcus Aureus which has built up resistance to Methicillin - the strongest type of Penicillin available

In the UK for example deaths from MRSA are reported to be around 5,000 per year, and the cost to the National Health Service (NHS) of trying to reduce the incidence of MRSA is some £ 1,000,000,000 p.a.

It has also been shown that bacteria such as MRSA can survive for up to 38 weeks or even longer on contaminated surfaces.

- **Food and Hygiene – avoiding infection and body odour**

Bacteria are very easily spread from surface to surface by hand-contact and other methods. This is particularly relevant to food-preparation areas where a large number of potentially lethal bacteria can be present such as:

E.coli, etc.

In the field of hygiene, antimicrobials are used to protect against Pseudomonas Aeruginosa which is an odour-causing bacterium.

Antimicrobials are also used to combat the growth of fungi, yeasts and moulds.

OLD TECHNOLOGY

Over the last 20-30 years a large number of synthetic organic chemicals have been used in the fight against bacteria. These types of products (such as Triclosan) work by destroying the bacterial cell membrane and "killing" the bacteria. Over a period of time however, bacteria have mutated and the slight changes in their structure now effectively protect them against these chemicals. These chemicals are also now being found widely distributed in the environment, and there are many countries in the world which are beginning to prohibit their use.

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WHY USE SILVER?

Silver has been used as an antibacterial agent for more than two thousand years, but it's mode of action has only been understood during the last few decades.

Silver is a multifunctional antibacterial agent acting in the following ways:

1 - Bacterial uptake of silver ions (Ag^+) occurs by several mechanisms, including passive diffusion and active transport by systems that normally transport essential ions, causing disruptions in cellular membrane function.

2 - Silver ions target the cellular thiol (-SH) groups, commonly found in critical proteins called enzymes. Enzymes become denatured because of conformational changes in the molecule that result from silver ion binding.

Many of the enzymes that silver ions denature are necessary in the cellular generation of energy. If the energy source of the cell is incapacitated, the cell cannot maintain osmotic pressure, necessary substances leak out of the cell and the microbe will quickly die.

3 - Silver ions react with the base pairs of DNA, preventing DNA replication.

HOW IS SILVER RELEASED?

In the TD-series of products, the active silver ions are present in the form of silver chloride supported on titanium dioxide. Silver chloride is almost insoluble in water, releasing only between 3 and 20 parts per billion (ppb) of silver ions. Equilibrium exists between silver chloride and silver ions in the presence of moisture, such that if silver ions are taken up by bacteria, then further silver ions are released in order to maintain the equilibrium.

In the GC-series of products the active silver ions are incorporated into the matrix of a magnesium-aluminium-phosphate complex. This complex is slightly soluble in water and the silver ions are released during the dissolution of the glass.

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HOW DOES SILVER BECOME ACTIVE?

Silver contained in any products using Biomaster only becomes "active" in the presence of moisture (which is also necessary for the survival and reproduction of bacteria). As all "normal" environments contain moisture, then the silver ions diffuse into the moisture layer and become active against any bacteria present.

DOES IT WORK?

Bacteria multiply exponentially, and if not checked, complete colonisation of infected surfaces will be seen after some time.

Silver is not an antiseptic in that it does not have an instant effect upon bacteria – as can be seen silver ions begin to reduce the level of bacterial colonisation within a few hours of exposure, and then complete eradication takes place during a further time scale. This is why the main test method used for testing the efficacy of silver - JIS Z 2801 – is a 24-hour test, which gives a more realistic result than other types of test.

Biomaster products generally achieve a bacterial reduction of 99.9% (Log3) in the JIS Z 2801 test.

WHAT CAN IT BE USED IN?

A few examples are shown:

PLASTICS	-	FOOD HANDLING EQUIPMENT
	-	KEYBOARDS
	-	PACKAGING FILMS
TEXTILES	-	HOSIERY
	-	CLINICAL UNIFORMS
	-	CATERING GARMENTS
COATINGS	-	POWDER COATINGS
	-	PAINTS
	-	LAQUERS
PAPERS	-	PHARMACEUTICAL PACKAGING
	-	X-RAY FILM FOLDERS
	-	PATIENT CASE-NOTE HOLDERS

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