

## BioArmour™ – Antimicrobial Solution for Textiles

### Introduction

Resistant bacteria can live on surfaces in many environments for days. Individuals come in constant contact with these surfaces, but thorough cleaning is difficult and time consuming. In applications such as consumer textiles, the existing issues are: a) odors are caused by bacteria, b) mildew exists due to biofilm, c) people would like to reduce transmission of illness among family members, and d) the marketplace is in need of durable textile resistant to effects of bio-deterioration.

It is known that bacteria colonies are health risks for individuals with an illness, whether it is one with a wound, poor circulation or having a compromised immune system. Given that bacteria can thrive in the fibers of textiles, and multi-drug resistant bacteria thrive in hospital and home settings (mattress, sheets, towels), there is a continual need to provide a level of safety on textile products for consumers. Coupled with the fact that these same bacteria can cause discoloration, odors, degradation of the fibers, solutions for antimicrobial chemistries being integrated into textile fabrics is an important application for the industry at large. The below table briefly shows some of the more dangerous bacteria that exist.

#### METHICILLIN-RESISTANT STAPH AUREUS (MRSA)

MRSA infections occur in approximately 94,000 persons each year and are associated with approximately 19,000 deaths. Of these infections, about 86% are healthcare-associated and 14% are community-associated.

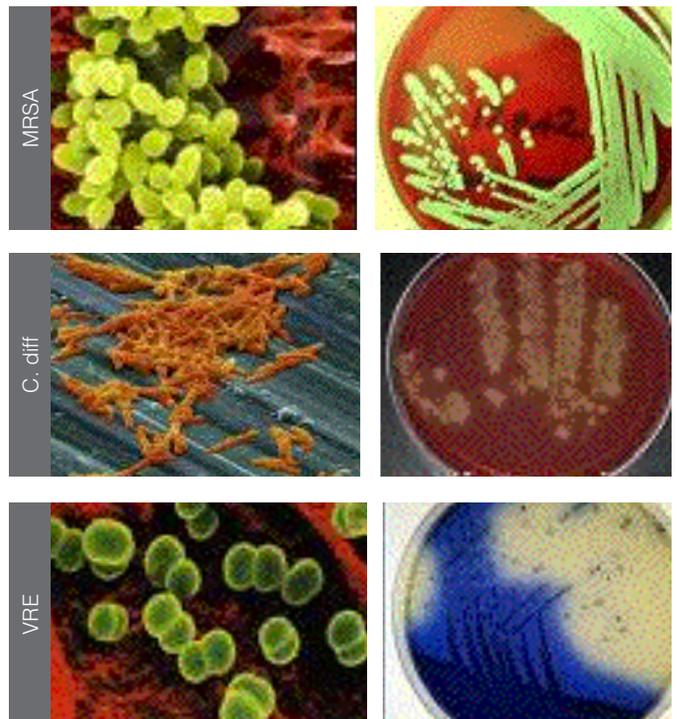
Deadly MRSA outbreaks have been linked to wounds, locker rooms, contact sporting events, and skin-skin contact.

#### CLOSTRIDIUM DIFFICILE (C.DIFF)

This is an opportunistic pathogen whose growth is often encouraged via the use of antibiotics. Unfortunately, a C.diff infection can spread very quickly and it is not easily killed by cleaning agents that most organizations will use. C. diff forms spores which infected people can transfer by contact with each other and surfaces and those spores can live for up to five months.

#### VANCOMYCIN-RESISTANT ENTEROCOCCUS (VRE)

VRE is usually spread by direct contact with hands, environmental surfaces or equipment that has been contaminated by the feces of an infected person. VRE has been cultured from locations such as hospital equipment, doorknobs, and bedrails. It has also been cultured on the hands of health care personnel.



One available antimicrobial solution is BioArmour™, a durable silver/polymer additive for coated fabrics, films and plastics. BioArmour™ even works well with cotton and synthetic fabrics.

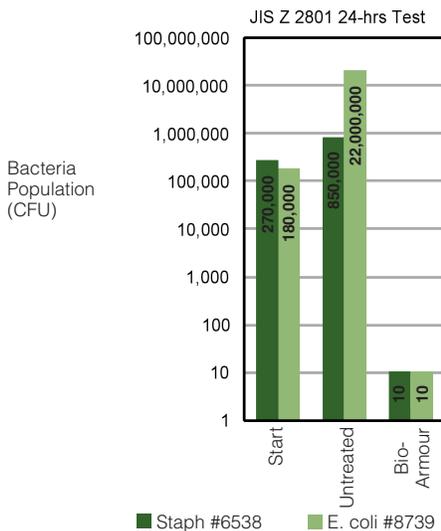
Bacteria are killed promptly when they contact a BioArmour™ surface and the action is persistent.



**Key benefits of BioArmour™ are:**

- Makes the fibers in the textile resistant to bacteria growth, simply kills the organisms before they multiply and cause problems.
- Reduces the risk of cross-contamination and transmission and spread of pathogens.
- Has passed stringent bio-compatibility and performance testing.
- Uses technology that is safe and has extended wash durability.
- Can be easily applied on cotton, polyester, blends *et. al.*
- Does not impart discoloration or a harsh feel.
- Insures a clear regulatory path with EPA.
- Can be formulated to meet the needs and requirements of FDA medical devices.

In regards to testing and efficacy, as seen below BioArmour™ mattress fabrics have been rigorously tested internally and in leading commercial labs. Typical performance data indicates 4-log reduction in bacterial populations in the fabric over a 24-hour period; that's a 99.99% kill rate. This means far fewer pathogenic bacteria on the loose to cause illness and infection.



It is difficult to formulate the exceptionally rapid and powerful performance of product with fast initial response while maintaining long-term efficacy all with minimal cytotoxicity. Such requirements are familiar to Biovation and have resulted in formulation options and directions to assist our customer partners in multiple end-uses for many applications.

With engineering and manufacturing expertise in-house, Biovation has applied methods so that BioArmour™ is readily applied in existing manufacturing processes, with the below highlights:

- BioArmour™ textiles are treated in the wet finishing operation.
- This is a liquid chemistry applied to 100% of the fibers.
- The chemistry binds to the fiber and internally cross-links to form a tough yet flexible coating.
- Optically clear.
- Polymer additive or masterbatch formulations are in-use in fiber and films
- Hard-surface protective films and coatings have been formulated.
- High-speed disinfection of nonwovens and via liquid (moist) cleaners is possible.

With ease of application into existing manufacturing processes, BioArmour™ functions in the following way:

- The BioArmour™ system is custom formulated for each application and material.
- We often utilize a unique molecular silver-ion technology that is polymerized.
- This polymer is applied to the fibers where it continuously releases silver ions “on demand” to maintain a biocidal equilibrium around each fiber.

Silver is effective at reducing the population counts

of bacteria. Silver is well proven and very effective; however it has historically been too costly for everyday use. Biovation has been able to formulate silver with our compounds to and operate at lower concentrations with equivalent performance and hence lower in cost.

#### **Some of the advantages of silver technology are:**

- Silver as an infection-control agent is old and well-established technology that is well-received by the FDA and EPA.
- BioArmour™ is a new and very advanced technology utilizing a controlled-release of silver ions from a polymer.
- Silver-ions are very effective at controlling bacteria, a broad-spectrum control.
- Mold, mildew, fungus are also inhibited.

With this break-through technology by Biovation in the formulation and product manufacturing of fabric and textile (for example, mattress) surfaces allows BioArmour™ to deliver superior protection at a competitive price.

## **Biovation Expertise**

Biovation is chemical technology agnostic; meaning, Biovation does not limit itself to any particular set of antimicrobial platforms available in the commercial market. Rather, based on decades of research and development of formulations, it compounds and formulates customized and unique solutions for targeted specific applications. Hence, as part of chemical platforms available to Biovation, we can consider metals (for example, there are commercially available silver releasing powders that have obtained FDA and EPA approvals), metal compounds, surface active agents, surfactants, quaternary ammonium compounds, organic acids, inorganic acids, biopolymers, antioxidants, oxygen scavengers, carbon dioxide emitters and others provided in any combination and concentration. The combination and concentration of the various elements depends on the several factors such as the specific textile type, type of targeted end-use, the nature of the microbes to be controlled and hindered and other synergistic affects with the conditions present in the application environment.

## **Contact Us**

Biovation's expertise is in infection control formulations and we look forward to partnering up with you. We invite you to contact us [solutions@biovation.com](mailto:solutions@biovation.com) to discuss how Biovation can help you with our portfolio of technologies and solutions.

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