WHITE PAPER

Infusing silver ions in cable tie material to inhibit growth of bacteria and microbes

Silver is well known in the medical industry to be effective against the growth of a broad spectrum of microorganisms, while also being safe for human contact.

ABB Ty-Fast® Ag+® cable ties use the power of silver ion technology to provide protection against bacteria and other microbe growth, which potentially cause infections, foul odors, stains and discoloration. These specialized cable ties inhibit bacterial growth by interfering with reproduction and spread of bacterial metabolisms. As a result, Ty-Fast Ag+ cable ties offer an excellent solution in a variety of applications, including medical, dental or health care environments, food packaging, food processing equipment, commercial food preparation areas, and medical and healthcare equipment.

Healthcare-associated infections (HAIs) pose a formidable challenge in hospitals and other health care facilities. In addition to the physical trauma that they cause, HAIs also increase costs to individuals, families and communities. Under current health care guidelines, HAIs that are a cause for readmission can result in a penalty to the hospital. And, many consumer rankings of hospitals are based on HAIs, readmissions, complications and other adverse events.

To mitigate HAIs, medical institutions have adopted a number of initiatives, including surveillance, rigorous hand hygiene, and cleaning and disinfection. Yet, strict adherence to guidelines at all times is challenging, and some facilities are considering newer technologies to help control HAIs. Among the options being explored is the addition of antimicrobials, not only to medical devices that may come in contact with blood or other bodily fluids, but also to equipment and building products that have surfaces that may become contaminated with pathogens and aid infectious disease transmission. Surfaces on products and materials in patient care areas are of particular interest because they can provide a reservoir for pathogens along the transmission pathway from one person to another.

Silver as an antimicrobial

Silver has been used since the time of the Phoenicians as a way to preserve food and water by discouraging the growth of microbes. One hundred years ago, the antibacterial effectiveness of various metals was noted and this property was named the oligodynamic effect. It was later found that out of all the metals with antimicrobial properties, silver has the most effective antibacterial action and the least toxicity to animal cells.

Once antibiotics were discovered, the use of silver as a bactericidal agent decreased. However, with the discovery of antibiotics came the emergence of antibiotic-resistant bacterial strains. Due to increasing antibiotic resistance, there has recently been a renewed interest in using silver as an antibacterial agent. In recent years, the availability of new laboratory technologies, such as radioactive isotopes and electron microscopy, has greatly enhanced the investigation of the antibacterial mechanism of silver.

Ty-Fast cable ties with antimicrobial silver additive
Ty-Fast antimicrobial-treated cable ties are made from an FDA-compliant material, a fungus-inert nylon 66 resin and a custom-blended, EPA-registered antimicrobial silver ion additive. The proprietary material protects the cable tie from microbes growing on or under the tie that can cause infections, stains or odors.

The presence of heat, moisture and organic materials in food processing plants and health care facilities creates an ideal environment for bacteria, fungi and mold growth. In these settings, stringent cleaning requirements are daily rituals. With antimicrobial properties, Ty-Fast Ag+ cable ties offer another level of defense.

Ty-Fast Ag+ cable ties were tested in an independent testing laboratory to ISO22196 (Measurement of Antibacterial Activity on Plastic Surfaces), and eliminated greater than 99 percent of common surface bacteria that came in contact with the cable tie surface. This efficacy will last a minimum of two years from manufacture under normal-use conditions. Recognized to UL62275 Type 1, these cable ties are a perfect fit for wire and cable management around hospital rooms, healthcare facilities, schools, and food and beverage manufacturing areas.

Eliminates 99 percent of bacteria
The ISO 22196 (equivalent to JISZ2801, Japanese Test for Antimicrobial Activity and Efficacy) test is an excellent way to quantify the antimicrobial activity level of an antimicrobial surface. Among the various tests for antimicrobial activity of surfaces, this has emerged as one of the industry standards. Ty-Fast Ag+ cable ties were tested by an independent testing laboratory to ISO 22196 standards using procedures as outlined below in their report:

- The test microorganism is prepared, usually by growth in a liquid culture medium. According to the method, two representative microorganisms are specified: E. coli and S. aureus.

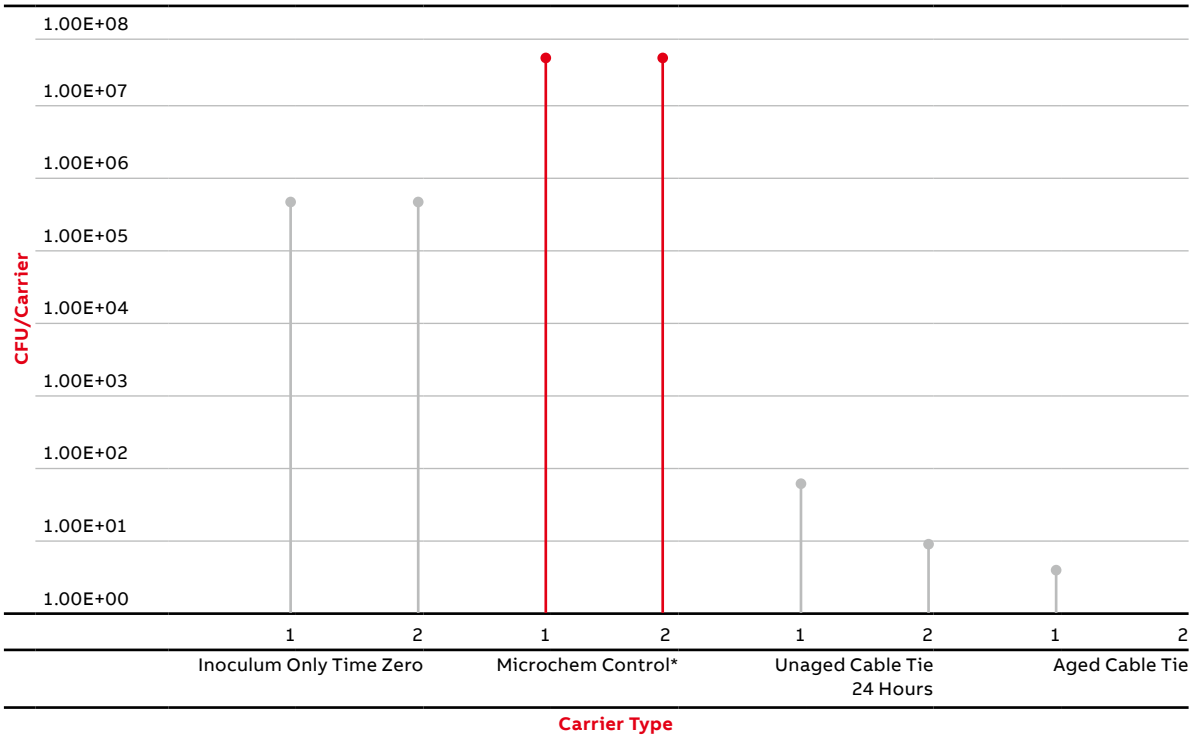
Escherichia coli 8739
This bacterium is a Gram-negative, rod-shaped, facultative anaerobe commonly found in the gastrointestinal tract of mammals. Even though most serotypes of this microorganism are harmless, there are pathogenic groups of E. coli, such as enterohemorrhagic (EHEC), verocytotoxin producing (VTEC) and Shiga-like toxin producing (STEC) that can cause a multitude of illnesses. E. coli is relatively susceptible to disinfection when dried on a surface, yet it can be a challenging microorganism to mitigate in solution.

Staphylococcus aureus 6538
This bacterium is a Gram-positive, spherical-shaped, facultative anaerobe. Staphylococcus species are known to demonstrate resistance to antibiotics, such as methicillin. S. aureus pathogenicity can range from commensal skin colonization to more severe diseases, such as pneumonia and toxic shock syndrome (TSS). S. aureus is commonly used in several test methods as a model for Gram-positive bacteria. It can be difficult to disinfect, but does demonstrate susceptibility to low-level disinfectants.

- The suspension of the test microorganism is standardized by dilution in a nutritive broth (this affords microorganisms the potential to grow during the test).
- Control and test surfaces are inoculated with microorganisms, in triplicate, and then the microbial inoculum is covered with a thin, sterile film. Covering the inoculum spreads it, prevents it from evaporating and ensures close contact with the antimicrobial surface.
- Microbiological assays are performed with the necessary parallel controls to provide adequate comparisons at both the start of the test, as well as after the contact time; in this case, 24 hours.
- These controls allow for full evaluation of the antimicrobial efficacy that can be attributed to the treated article‘s technology, and only this technology. This is achieved by including the proper controls, which control for any other variables that could affect the bacterial reduction being evaluated.
- Microbial concentrations are determined at “time zero” by elution, followed by dilution and plating.
- A control is run to verify that the neutralization/ elution method effectively neutralizes the antimicrobial agent in the antimicrobial surface being tested.
- Inoculated, covered control and antimicrobial test surfaces are allowed to incubate undisturbed in a humid environment for 24 hours.

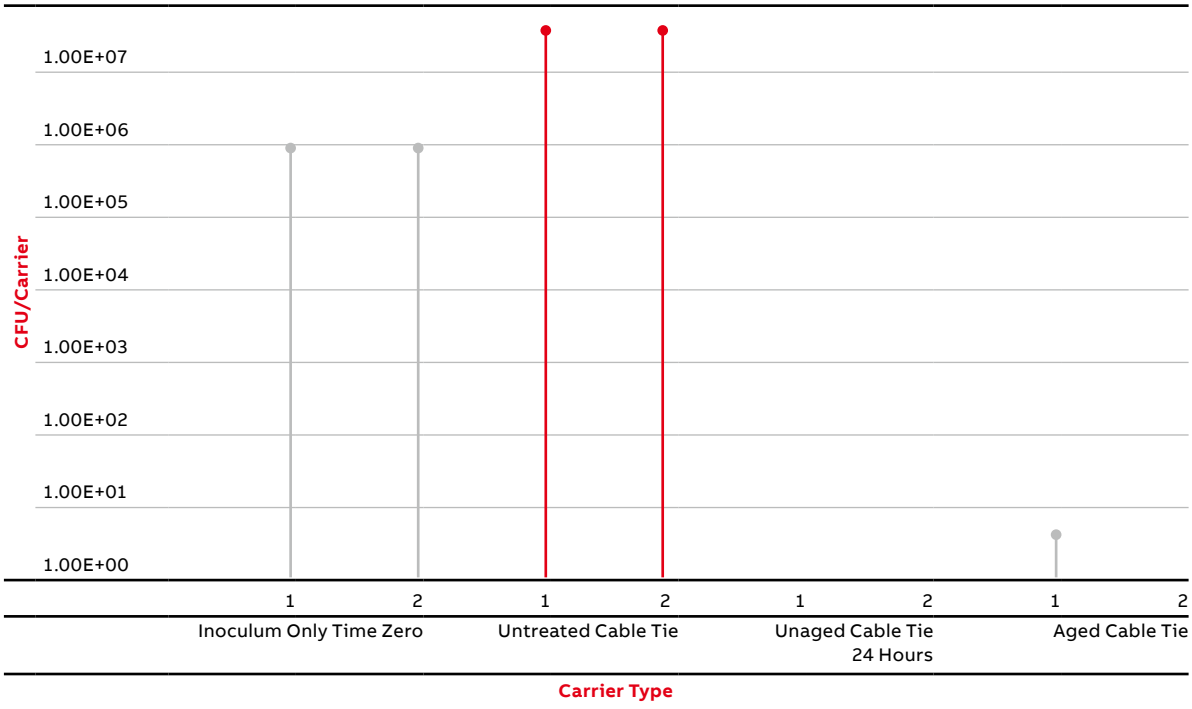
- After incubation, microbial concentrations are determined. The reduction of microorganisms relative to initial concentrations and the control surface is calculated.
- By including the proper controls and being able to make these reduction calculations, this assay allows for the interpretation of whether the test substance is bacteriostatic, having the ability to inhibit the growth of microorganisms, or if the test substance is bactericidal, having the ability to kill them.

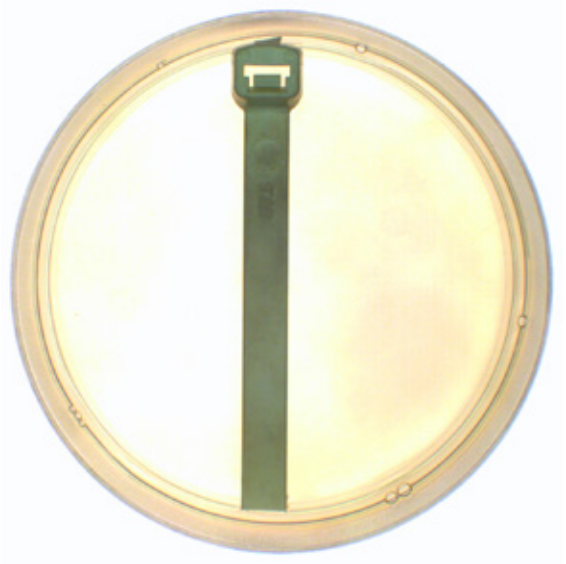
Results of the Study: E. coli 8739



* Percent and log reductions were calculated using the Microchem control due to drying of the untreated cable tie upon conclusion of the contact time.

Results of the Study: S. aureus 6538





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01

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The photos above demonstrate the growth of common bacteria on Ty-Fast antimicrobial-treated cable ties and standard, off-the-shelf cable ties. For testing purposes only, the ties were subjected to E. coli and S. aureus bacteria.

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01 Ty-Fast Ag+ after 24 hours of exposure to bacteria

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02 Standard cable tie after 24 hours of exposure to bacteria

Conclusions

ABB recognizes that keeping cable ties used in healthcare facilities free from bacteria, mold and fungus is a constant challenge. Infusing the Ty-Fast cable tie material with silver ions has been shown to protect the product against odor and stain causing bacteria and microbes. The silver ions interfere with bacterial metabolisms, preventing their reproduction and spread. Silver is well known to be safe for human contact and effective against a broad spectrum of micro-organisms.

Please note that ABB does not make any claims of inhibitory activity beyond protection of the product itself. It does not provide protection against specific pathogenic organisms. The cable ties do not prevent growth on adjacent or nearby surfaces.

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