CleanAccess

WHITE PAPER

OPTIMIZATION OF FOOD PRODUCTION SAFETY BY APPLICATION OF ANTIMICROBIAL EQUIPMENT OF WASHING SYSTEMS

INTRODUCTION

Washing processes are a key element in food safety and quality management. Proper cleaning and hygiene maintenance by the food industry is essential to minimize the risk of microbial spread, allergen contamination and foreign body contamination. A safe and optimized washing process brings many benefits, improves production and product safety, reduces product waste, minimizes the risk of product recall and protects the company's image and the health of customers.

Hygiene equipment (hand tools, washing systems) can also be a source of pathogens. Using the highest quality wash system equipment and accessories, including hygienic wash hoses and wash system accessories with antimicrobial properties, significantly improves the quality of work. It eliminates the risk of microbial contamination and reduces production costs, guaranteeing the highest standards of hygiene.

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1. WHY IS IT IMPORTANT TO KEEP HIGH STANDARDS OF HYGIENE IN FOOD PRODUCTION?

PATHOGEN HAZARDS

Growing requirements relating to the level of food safety make consumers and producers more and more aware of the risks, and the danger of potential health and financial problems affects the activities of food industry producers. They protect themselves at every stage of production or transport against possible contamination of the product. The path of contamination can be diverse and different for each type of product.

The most common bacteria in food production are **Salmonella, Staph. Aureus, E. Coli, Listeria Monocytogens and Clostridium botulinum**. These bacteria are difficult to eliminate and have very dangerous health effects.

For example, the viability of E. Coli bacteria is high. The pathogen is found in undercooked meat, most often beef, unpasteurized milk, juices and vegetables. It is sensitive to pasteurization at 75°C, resistant to freezing (it can survive even several months at -20°C). It survives fermentation or drying.

Staphylococcus aureus is able to easily acquire resistance to antibiotics, two hours of incubation is enough for it, which is why it spreads so quickly. S. aureus are capable of producing toxins in a wide range of temperatures from 10°C to about 45°C, with an optimum in the range of 34-40°C. They are ubiquitous and impossible to eliminate from the environment. They have the ability to grow in environments with low levels of water activity and a high tolerance to sodium chloride. The most common food environments are meat products, poultry, egg products, raw milk and milk products, confectionery stuffed with cream.

Listeria M. microorganisms are able to grow in aerobic or relatively anaerobic conditions at temperatures from 0 to 45 ℃. This pathogen tolerates short-term pasteurization, long-term drying and deep freezing. It also has the ability to increase immunity and evolve, can quickly adapt to a new environment, and has a natural resistance to some antibiotics, which is why it belongs to one of the most dangerous microorganisms for human health. Failure to observe proper hygiene in the production process and insufficient heat treatment of products is the main cause of food contamination. The main products that may be the source of infection are: soft and ripened cheeses, raw milk, cream, eggs, ice cream, meat, smoked fish, pork, sausages, raw vegetables and fruits, as well as frozen foods or ready-to-eat meal sets.

If affected surfaces are not properly cleaned, some microorganisms can survive and persist by secreting a slimy, extracellular polymeric substance that can bind other organisms to moisture, forming a biofilm. Disinfection should only take place after proper cleaning and rinsing of the surface. Manual cleaning and the use of a cleaning detergent to reduce the biofilm load, rather than immersing the dirty item in a chemical solution, is more effective.

ELEMENTS OF WASHING SYSTEMS THAT ARE EXPOSED TO THE GREATEST RISK OF PATHOGENS

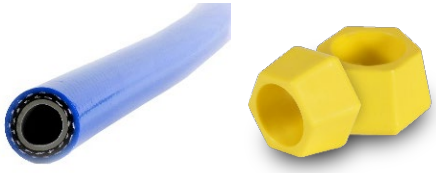
Food production is exposed to various threats from many sides. Good equipment with hand hygiene equipment and washing system accessories is half the battle. This equipment should also be cleaned on a regular basis.

The equipment of washing systems that is most exposed to contact with pathogens are the elements that have the closest contact with the user and direct production areas. These will be sections of the wash hose that rub against dirty appliances, dirty floors, around drains, debris on the floor or appliances. This will also include any washing ends that the employee touches. The hose cover, around the valve or gun, the protection cover on the lance, and any fitting covers are the most vulnerable areas.

It is also extremely important to use color coding of cleaning and washing equipment. Assigning a given color to the appropriate risk zone in the plant will significantly reduce the migration of pollutants, which in turn will limit cross-contamination between different production areas.

2. EQUIPMENT OF WASHING SYSTEMS WITH ANTIMICROBIAL PROPERTIES PROTECTS MORE EFFECTIVELY AGAINST THE PROPILATION OF BACTERIA AND FUNGI

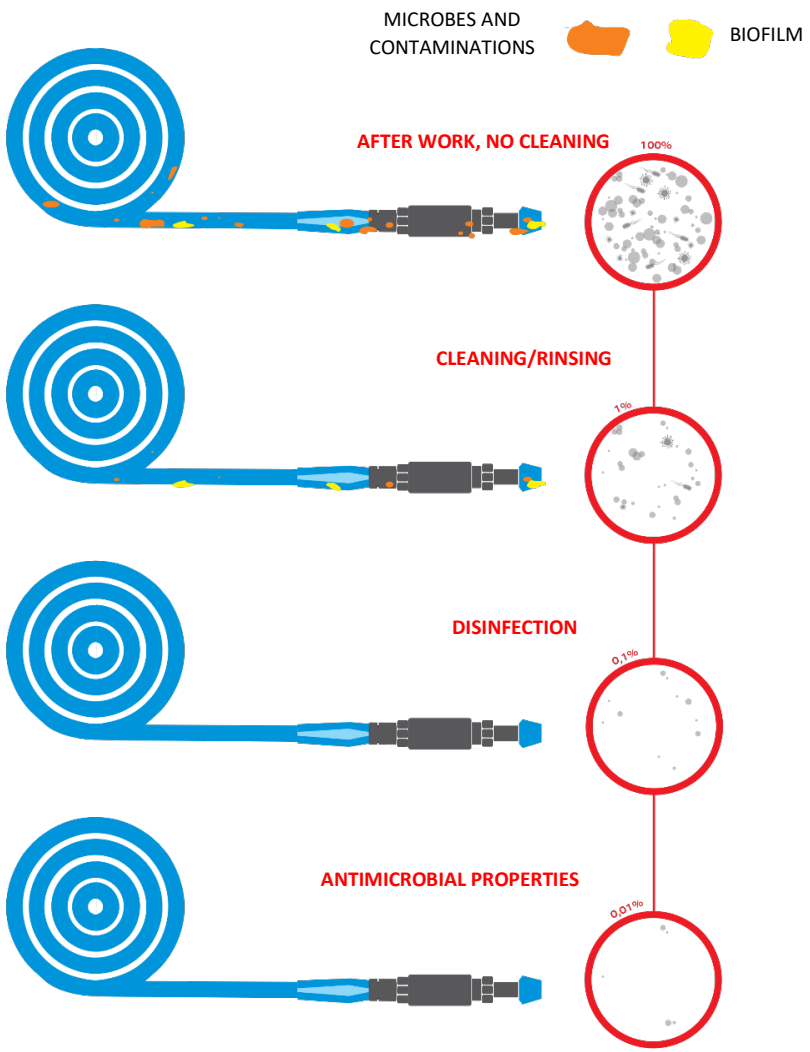
Equipment and accessories of washing systems are most often made of stainless steel or plastics with appropriate properties. Plastics are lighter, flexible and allow color coding. Steel is more durable, does not wear out as quickly and has a different structure. All protected fittings can be replaced with stainless steel and a stainless steel valve can be used instead of plastic guns. However, washing hoses cannot be replaced.



The elements of the equipment of plastic washing systems have an additional feature, they can be supplemented with ingredients with antimicrobial properties, inhibiting the growth of fungi and bacteria.

Even thorough and appropriate hygiene maintenance processes may not be sufficient to stop the formation of biofilms and the proliferation of pathogens under certain conditions of humidity and temperature. In such cases, the use of antimicrobial equipment will be one of the additional factors influencing the level of hygiene during food production.

CLEANING STEPS - IMPACT ON THE LEVEL OF CONTAMINATION ON THE SURFACE OF WASHING SYSTEMS EQUIPMENT



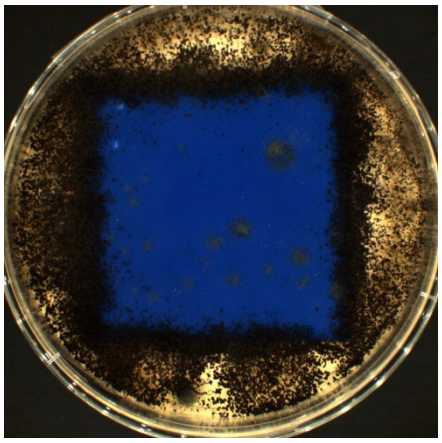
RESEARCH ON ANTIMICROBIAL PROPERTIES OF HYGIENIC HOSES

In order to verify the antimicrobial properties of the ULTRA HYGIENIC® hygienic hoses, tests were carried out to determine the antibacterial and fungistatic properties of the polymer material from which they are made.

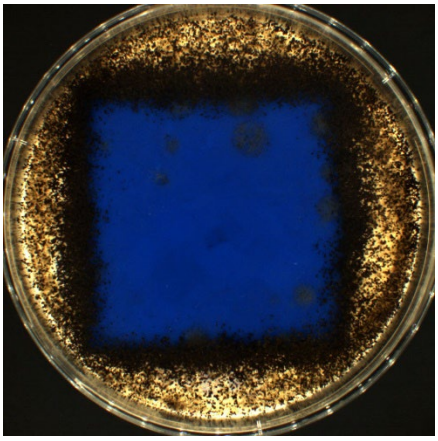
The fungistatic properties of polymeric materials were determined in accordance with the PN-EN ISO 846:2019 standard, *Plastics. Assessment of the action of microorganisms (Method B*).
Five model strains of fungi were used in the research: *Aspergillus niger* (ATCC 6275), *Penicillium pinophilum* (ATCC 36839), *Paecilomyces variotii* (ATCC 18502), *Trichoderma virens* (ATCC 9645) and *Chaetomium globosum* (ATCC 6205).

The size, shape of the sample, materials, test methodology and guidelines described in the PN-EN ISO 846:2019 standard were used for testing.

Fungicidal research - samples were divided into test batches, which were incubated at 29 °C ± 1 °C for 28 days.



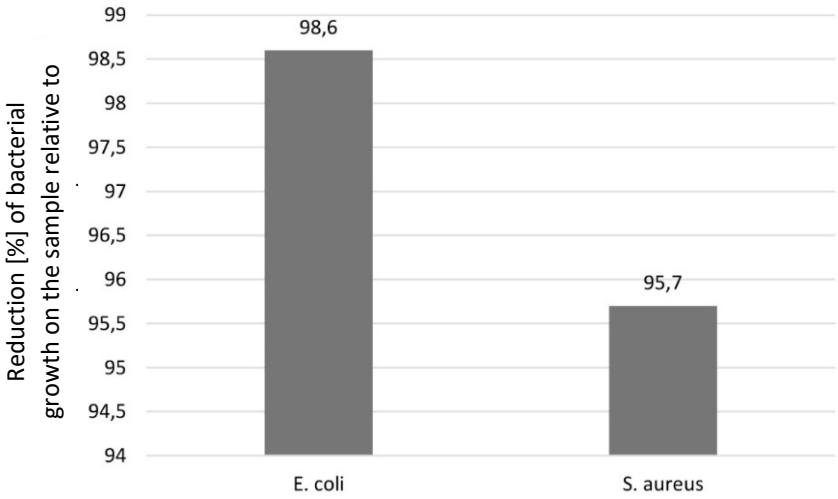
Fungicidal test
Control 4-BIO-I-4



Fungicidal test
Sample 5-BIO-I-4

The test sample showed naked eye growth covering up to 25% of the test area, while the control sample showed significant growth covering more than 50% of the test area. Any inhibition of growth on both the sample and the medium (zone of inhibition) relative to the control sample (no biocide) indicates **fungistatic activity of the material.**

Bactericidal tests – after incubation on sample 5/BIO/2022, a decrease in the number of *E. Coli* (98.6%) and *Staphylococcus aureus* (95.7%) was observed compared to the control sample.



3. SUMMARY

Tests to determine the antibacterial and fungistatic properties of the polymer material from which the ULTRA HYGIENIC® hoses are made have shown that the product actively inhibits the multiplication of microbes.

Antimicrobial equipment is one of the elements of effective protection of the production space against pathogens, and the addition of an active substance to materials can reduce their migration. Especially in situations where the cleaning and disinfection processes fail. However, this does not mean that antimicrobial equipment is self-cleaning.

CONCLUSIONS

The antimicrobial additive significantly affects cleanliness - it inhibits the growth of fungi and bacteria .

Antimicrobial additives work on a clean surface and the surface must not be damaged, cracked or contain food residue .

The antimicrobial additive does not neutralize visible soiling, foreign matter or allergens .