# Improvement of food quality and safety by intrinsic antimicrobial food contact surfaces

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## Introduction

Quality and safety of perishable food products are influenced by the environmental conditions during producing and processing [1]. The hygienic conditions in the food chains are of high relevance, because bacteria adhering to surface can cross over to food. Cross-contamination of spoilage microorganism results in a reduced shelf life, and cross-contamination with pathogenic microorganism increases the risk for food born diseases [2]. To generate long shelf life and to increase food safety the bacteria load of food contact surface has to be reduced. Next to cleaning and disinfection, antimicrobial surfaces can have an additional benefit for prolonged reduction of surface counts [3]. A new class of functional surfaces are Sustainable Active Microbicidal (SAM) polymers [4]. According to Thölmann et al. [5] the intrinsic antimicrobial activity of these polymers is based on their high density of amino functionalised groups at the surface and their three dimensional structure. Active components do not migrate out of the surface [6]. Furthermore good antimicrobial properties against a wide range of microorganism were investigated whereas the toxicity against mammalian cells is low [5]. SAM-polymers show great potential for the implementation in food contact surface to achieve reduced bacterial counts, but until now there are not enough data with the regard to applicability for the specific conditions in perishable food chain. Thus the objective of this study was the investigation of SAM-polymers in terms of their ability to reduce surface counts of bacteria in food plants.

## Materials and Methods

The antimicrobial activity of the SAM-polymers in contact with food was tested by modifying the test method ISO 22196 (2007), which is a quantitative method to determine the level of antimicrobial activity of plastic surfaces by comparing the surface count on reference materials and sample materials after inoculation and incubation at defined conditions. The influence of environmental factors (temperature and contact time), bacterial strain and food components on the rate of antimicrobial activity has been investigated by varying these parameters in the tests.

## Results & Discussion

Figure 1 shows the surface counts on reference and SAM-polymer surfaces after inoculation and incubation at 35°C depending on contact time. SAM-polymers reduce the bacterial counts of *Staph. aureus* below the detection limit even after one hour contact time. High level of antimicrobial activity is also detected against various pathogens and spoilage bacteria. Investigation with *Pseudomonas*, *Klebsiella*, *Aeromonas*, *Escherichia*, *Listeria*, *Salmonella* and *Bacillus* as inoculums shows reduction levels between 2.9 and 5.6 log-steps within two hours of incubation at 35°C. Reduced temperature while incubation (7°C) leads to a slower reduction of the surface counts, but anyway after a few hours contact time good antimicrobial properties could be detected. The presence of food components influences the activity only marginally.

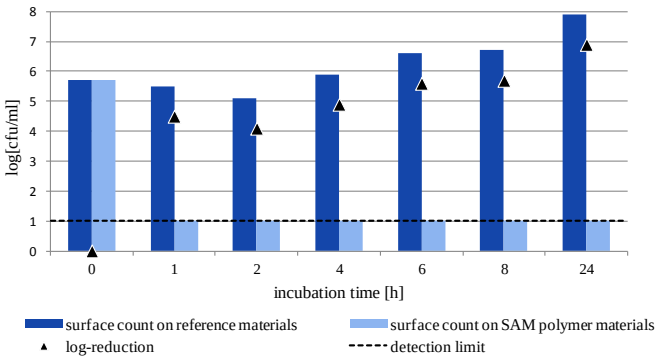


Figure 1: Surface counts on reference and sample materials and reduction levels after incubation at 35°C at various contact times

## Conclusion

The results show the high reduction potential of SAM-polymers, despite low temperature conditions, against a broad range of pathogens, spoilage bacteria, in the presence of food residues and furthermore a long term stability. Thus the antimicrobial profile of the material bears good prospects for application in perishable food chain, e.g. in conveyer belts, cutting boards or pipes. Implementing of SAM-polymer in food contact surfaces can reduce the bacterial counts and thus also cross-contamination via surfaces in the food industries. Moreover intrinsic antimicrobial surfaces can be used to improve the quality and safety of food. However, further investigations of the chemical and physical properties as well as influencing parameters are necessary before SAM-polymers can be introduced to perishable food chain.

## REFERENCES


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