Title: FOOD PROCESSING SURFACE FUNCTIONALIZED WITH SILVER NANOPARTICLES

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Abstract:

Nanotechnology represents a major breakthrough in science in various fields with development of new materials with different features and potential application. Thus, silver nanoparticles (Ag NPs) are promising antimicrobial agent for inhibiting bacterial adhesion in food processing surfaces. In this context, this study aimed to evaluate the antimicrobial action of stainless steel AISI 304 and polyethylene surfaces, commonly used in food processing, functionalized with silver nanoparticles. Furthermore was determined the minimum inhibitory concentration (MIC) of Ag NPs in dispersion and dried to *Escherichia coli* and *Staphylococcus aureus*. The surfaces were provided by a Brazilian company and the Ag NPs adsorbed to stainless steel by dip coating technique. Polyethylene (PE) was produced by injection / blow then the Ag NPs were incorporated into the PE resin before injection. In the experiment for evaluating the antimicrobial effectiveness, the cells of *E. coli* and *S. aureus* were adhered for 24 hours in the control coupons (without Ag NPs) and in the functionalized coupons with AgNPs. The MIC was determined by micro dilution method in broth, in vitro, using the micro plates for reading spectrophotometric in ELISA reader. We observed that there was no significant difference ($p < 0.05$) in the number of cells of *E. coli* and *S. aureus* adhered on the surface of the stainless steel as on the surface of the polyethylene, regardless of the coupon to be functionalized or not with Ag NPs. The technique used to functionalize the surface was not useful so the Ag NPs may have become unavailable for interaction with the microorganism and its inactivation. The MIC of the Ag NPs in the dispersion was 12.50 mg L^{-1} for both species. This dispersion was used for conditioning the surface of stainless steel. Already the MIC of the Ag NPs dried, used to prepare the polyethylene surface, was 6.50 mg L^{-1} also for the two studied strains. These results showed that the problem actually lies in the unavailability of the antimicrobial in processing surface. Therefore, more physic-chemical studies are required to understand this interaction of Ag NPs in the two processing surfaces is its low antimicrobial efficiency.

Key-words: silver nanoparticle, adhesion, stainless steel, polyethylene.

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