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Dissertation

Title *Biofilm Production by Food-Transmitted Bacteria and the Use of Selected Nanoparticles to Control their Biofilm Production*

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Defense Date 26 May 2015

Abstract Biofilm is a population of bacteria attached to any types of surfaces and impeded in a self-produced matrix of extracellular polymeric substances. Biofilm exhibit up to 1000 fold antibiotic increased resistance to a broad range of antimicrobial agents. Several food-transmitted microorganisms are capable of forming biofilms and considered as a major source of contamination, transmission and infection. In the last few decades, nanoparticles has gained a great attention for their potential applications as antimicrobial agents. The aim of this work was to assess the biofilm formation capacity of food-transmitted bacteria under various environmental conditions and to investigate the efficacy of different nanoparticles (i.e. Ag-Cu-B, Ag-Na-B, and Ag-Cu-B) to kill microbial pathogens in biofilms. Nanoparticles were synthesized by using co-precipitation and microwave techniques and characterized for their physiochemical properties by transmission electron microscopy and light dynamic scattering. The antibiofilm and antimicrobial properties of the synthesized nanoparticles were investigated using *S. aureus* (10 strains), *P. aeruginosa* and *E. coli* (3strains). The findings revealed that all NPs significantly inhibited planktonic cells and biomass of the grown biofilms. Moreover, the sanitization efficacy of nanoparticles were assessed on stainless steel surface that commonly come into contact with food. The surfaces were inoculated with strains of *S. aureus* and *Salmonella* and cleaned with NPs saturated sanitary wipes. A significant reduction was observed in viability of the cells on the stainless steel surfaces. The results demonstrated that the use of NPs incorporated into sanitary wipes is useful method to eliminate bacteria on food contact surfaces.

Research Relevance and Potential Impact

In recent years, the development of new technology such as nanotechnology has gained the attention of the scientific community. However, the application of nanotechnology in the food systems is still in infancy. It is well known that metallic nanoparticles have anti-microbial effects and have been used as external sanitizers, disinfectants and in non-food applications. In the meantime, food safety has become a global issue due to continuously and repeatably of outbreaks of foodborne pathogens such as *Listeria mon-ocytogenes*, *Salmonella* sp. and *E. coli* O157:H7.

Relevant Publications

Abushelaibi, A. A., Mariam. S. Alshamsi, Hanan Afifi. Use of antimicrobial agent in food processing systems. Resent patent in Food, nutrition and agriculture. April 2012. 4 (1)2-7.

Career Aspirations

Highly motivated, research and development manager at Abu Dhabi Quality and Conformity Council. My career mission is to develop into an outstanding person in my work and to use my technical skills to direct and utilize research to deliver benefits for the community and support the development of evidence based innovative practices.