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Karen A.M. O'Callaghan, Joseph P. Kerry

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Preparation of low- and medium-molecular weight chitosan nanoparticles and their antimicrobial evaluation against a panel of microorganisms, including cheese-derived cultures

Karen A. M. O' Callaghan and Joseph P. Kerry*

Food Packaging Group, School of Food and Nutritional Sciences, University College Cork, Ireland

* Corresponding author, Tel + 353-490-3798; fax: + 353-21-42-70001 E-mail address: joe.kerry@ucc.ie

Abstract

This study employed the technique of ionic gelation in the manufacture of low- and medium-molecular weight chitosan nanoparticles. Nanoparticles were characterised (size, size distribution, surface charge and morphology) and their antimicrobial activity assessed against cheese-derived cultures, as well as a select panel of Gram-positive and Gram-negative microorganisms. Antimicrobial activity was determined by the minimum inhibition concentration via the micro dilution method using 96-well microplates. Synthesised particles were small-sized, with a moderate size distribution and positive zeta potential. Generated nanoparticles exhibited successful solubility in both water and acetic acid. Acidic nanosuspensions demonstrated greater microbial reduction than water-based nanoparticles, with no difference in activity observed between molecular weights. Cheese-derived cultures were effectively controlled, and Gram-negative species were more susceptible than Gram-positive species to the action of nanoparticles in acetic acid. Nanoparticles suspended in an acidic-based medium show promise as antimicrobial agents, particularly for use with cheese products.