Interfering with the Pathogenesis Pathway of *Cronobacter* spp using Novel Antimicrobials

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**Abstract.** *Cronobacter* spp. (previously Enterobacter sakazakii) are bacteria described as emerging opportunistic food-borne pathogens. Neonates and infants are most at risk from infection and powdered infant formula (PIF) has been implicated as the source of infection in the majority of outbreaks. The sources of contamination, ecology and virulence characteristics of this genus are, as yet, poorly understood. There is a need to identify traits related to its pathogenesis and persistence in suspected food sources, especially PIF. An impressive 15% of the world’s PIF is made in Ireland and an outbreak of *Cronobacter* would have serious detrimental consequences to the economy. This study aims to develop a novel food grade antimicrobial effective in interfering with the pathogenesis of *Cronobacter* spp. The development of such an agent, and its possible inclusion in PIF is a conceptually encouraging solution to the potentially devastating effects of a *Cronobacter* outbreak in Ireland.

Novel applications of Food Grade antimicrobial Lipids

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**Abstract.** With the rise of a health conscious population and antibiotic resistance prevailing as a major global health issue; this study investigates the bioactive properties of various edible fats, lipids and fatty acids. The tailoring of a microbicidal lipid derived formulation thereby offers industries a natural anti-microbial as well as satisfying public demands. The efficacy of long-chain fatty acids, Oleic (C18:1) and Linoleic (C18:2) acid, and medium chain Capric (C10.0) acid were evaluated on the growth of *Streptococcus mutans*. *S. mutans* is one of the primary etiological agents associated with the onset of dental caries which is considered to be an oral health epidemic in industrialized countries. Results of the screening process found a considerable difference in the antimicrobial activities of the tree fatty acids. Linoleic acid showed a more potent antimicrobial effect towards *S. mutans* in comparison to Oleic acid. Capric acid showed sustained and effective inhibition at higher concentrations. Incorporation of these compounds into commercially available dental hygiene products could further aid in the prevention of oral diseases and infections.

Hydrogels for Bone Tissue Engineering

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**Abstract.** Hydrogels are polymeric networks with three-dimensional configurations capable of imbibing large amounts of water or biological fluids. Hydrogels can be tailored by varying porosity, pore size, surface to volume ratio, compressive modulus, topography and wettability which makes them promising candidate materials for bone regeneration. Clinically bone tissue engineering has not yet been a success. For a successful outcome, four conditions need to be satisfied:
- sufficient numbers of cells with osteogenic capacity
- an appropriate scaffold to seed the cells
- factors to stimulate osteogenic differentiation in vivo
- sufficient vascular supply

The first three conditions can be fulfilled by engineering, while condition number four is dependent on patient factors, such as the size of the defect. Lack of sufficient vascular supply, resulting in immediate cell death after implantation, is generally thought to be the cause of failure of bone tissue engineering in patients.