

142bj Blending Chitosan with Polycaprolactone: Effect on Physicochemical Characteristics and Anti-Bacterial Activity

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Chitosan is a well sought-after polysaccharide in biomedical applications due to its biocompatibility, biodegradability to non-toxic substances, anti-bacterial properties and ease of fabrication into various configurations. However, weak mechanical properties and slow biodegradation rate have prevented its complete exploitation. Therefore it has been blended with Polycaprolactone (PCL) which is noted for its excellent tensile properties, flexibility and biodegradability. These blends have shown favorable results in terms of increased biological activity and alterable mechanical properties as reported in our previous work [1]. Thermal Analysis by Differential Scanning Calorimetry (DSC) indicated partial miscibility of the two polymers. In this work, the physico-chemical properties of the blends were further characterized by Wide Angle X-Ray Diffraction (WAXD), Dynamic Mechanical Thermal Analysis (DMTA), Atomic Force Microscopy and FTIR. In addition, anti-bacterial properties of membranes were evaluated using oral pathogens *S. mutans* and *A. actinomycetemcomitans*. The bactericidal effect (by optical density measurements and agar plating) and bacterial adhesion (by digital imaging, Scanning Electron Microscopy and live/dead fluorescence bacterial staining) of the membranes were evaluated during a 24hr study. These analyses indicated that there is no interaction between the two components and their crystal structure is unaffected in the blends. However, the anti-bacterial properties of chitosan are compromised in the blends relative to chitosan. This could be probably due to the changes in the surface characteristics such as roughness and charge distribution.

1. Sarasam A, Madihally SV. Characterization of Chitosan-Polycaprolactone Blends for Tissue Engineering Applications. *Biomaterials*. 26 (27): 5500-5508, 2005.