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Abstract

Bacterial Nanocellulose Films Loaded with Nisin Z-Antibacterial Efficacy against *Staphylococcus aureus* Strains †

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Abstract: Burn wounds can lead to numerous severe complications including bacterial infections causing patient morbidity and mortality, mostly in low- and middle-income countries. The Gram-positive bacteria *Staphylococcus aureus* is one of the major causes of nosocomial infections in burn patients. Furthermore, the considerable increase of the microbial resistance against traditional antibiotics is leading towards alternative strategies to treat bacterial infections. Nisin Z is an antimicrobial peptide which exhibits a significant antibacterial activity against Gram-positive bacteria. The incorporation of peptide and other biomolecules within a biopolymer matrix provides protection maintaining their antimicrobial potential. Bacterial nanocellulose (BNC) has been widely used as wound dressings. Its impressive water retention capacity (>99%) and porosity are beneficial to manage wounds due to its potential to absorb exudates, providing a breathable and humid environment. In this work, the functionalization of BNC with nisin Z (BNC-NZ) via vacuum filtration is reported. The entrapment of the peptide inside the BNC films was confirmed through morphological characterization using Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR) spectrometry. Typical absorbance peaks of nisin Z are easily identifiable at 1647 cm^{-1} (amide group) and 1520 cm^{-1} (bending of primary amines). Thermal Gravimetric Analysis (TGA) suggested that nisin Z did not interfere with the BNC matrix. The antimicrobial activity of nisin Z against *S. aureus* strains including a multiple drug-resistant, was verified by Minimum Bactericidal Concentration (MBC). Agar Diffusion and Shake Flask methods revealed the potential of BNC-NZ for prospective applications in burn wound dressings.

Keywords: antimicrobial peptides; nisin Z; bacterial nanocellulose; wound dressing

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