

Facile preparation of a novel biogenic silver-loaded Nanofilm with intrinsic anti-bacterial and oxidant scavenging activities for wound healing

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Abstract

To eliminate the microbial infection from an injury site, various modalities have been developed such as dressings and human skin substitutes. However, the high amount of reactive oxygen species, microbial infection, and damaging extracellular matrix remain as the main challenges for the wound healing process. In this study, for the first time, green synthesized silver nanoparticles (AgNPs) using Teucrium polium extract were embedded in poly lactic acid/poly ethylene glycol (PLA/PEG) film to provide absorbable wound dressing, with antioxidant and antibacterial features. The physicochemical analysis demonstrated, production of AgNPs with size approximately 32.2nm and confirmed the presence of phytoconstituents on their surface. The antibacterial assessments exhibited a concentration-dependent sensitivity of Staphylococcus aureus and Pseudomonas aeruginosa toward biosynthesized AgNPs, which showed a suitable safety profile in human macrophage cells. Furthermore, oxidant scavenging assays demonstrated exploitation of plant extract as a reducing agent, endows antioxidant activity to biogenic AgNPs. The formation of PLA/PEG nanofilm and entrapment of AgNPs into their matrix were clearly confirmed by scanning electron microscopy. More importantly, antibacterial examination demonstrated that the introduction of biogenic AgNPs into PLA/PEG nanofibers led to complete growth inhibition of P. aeruginosa and S. aureus. In summary, the simultaneous antioxidant activity and antimicrobial activity of the novel biogenic AgNPs/PLA/PEG nanofilm showed its potential for application as wound dressing.

Keywords

KeyWords Plus: POLYLACTIC ACID PLA; GREEN

SYNTHESIS; NANOPARTICLES; ANTIOXIDANT; EXTRACT; FILM; BIOSYNTHESIS; CHITOSAN ; RELEASE; MATS