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Abstract

Antibacterial assessment of sodium alginate/gelatin films loaded with propolis extract †

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Antimicrobial resistance has been increasing owing to the excessive use of antibiotics, contributing thus to the exploration of plant extracts as potential alternatives. Propolis extract (PE) for instance, has been applied as antimicrobial agent against the most prevalent bacteria found in infected wounds (e.g. Staphylococcus aureus and Pseudomonas aeruginosa). Moreover, PE can induce tissue regeneration; however, to increase its effectiveness, delivery platforms such as polymeric films composed of biocompatible materials must be applied. In this scenario, the goal of this work was to produce PE-loaded biodegradable/biocompatible polymeric films, composed of sodium alginate (SA)/gelatin (GN) (2wt% SA concentration, polymer ratio 70/30 v/v), via the solvent casting/phase inversion technique, followed by cross-linking with CaCl2 at 2wt% in dH2O. First, PE's minimum inhibitory concentration (MIC) was obtained (0.338 mg/mL for S. aureus and 1.353 mg/mL for P. aeruginosa). Subsequently, SA/GN films were fabricated and functionalized with PE (at P. aeruginosa MIC) before (blended within polymeric solution) and after (via adsorption) its production. Successful incorporation of PE was confirmed via Fourier-transformed infrared spectroscopy (FTIR). The antibacterial activity of the films was evaluated via agar diffusion (qualitative) and killing-time kinetics (quantitative) assays. Results showed that PE-loaded SA/GN films were capable of efficiently inhibit the growth of by S. aureus and P. aeruginosa, and thus, SA/GN/PE films can be considered as potential delivery platforms of PE for applications in wound healing.

Keywords: bacterial infections; propolis extract; pseudomonas aeruginosa; targeted drug delivery; infected wounds; staphylococcus aureus