The 1st International Electronic Conference on Antibiotics—The Equal Power of Antibiotics And Antimicrobial Resistance
Session: Antimicrobial Discovery, Development, Stewardship and Susceptibility Testing

Title: Eugenol-containing essential oils loaded onto chitosan/polyvinyl alcohol blended films and their ability to eradicate Staphylococcus aureus or Pseudomonas aeruginosa from infected microenvironments

Authors: Joana C. Antunes, Tânia D. Tavares, Marta A. Teixeira, Marta O. Teixeira, Natália C. Homem, M. Teresa P. Amorim, Helena P. Felgueiras
Affiliations: Centre for Textile Science and Technology (2C2T), University of Minho, Campus de Azurém 4800-058 Guimarães, Portugal

Emails:
joana.antunes@2c2t.uminho.pt
taniatav@2c2t.uminho.pt
martaalbertinateixeira@gmail.com
pg35037@alunos.uminho.pt
natalia.homem@2c2t.uminho.pt
mtamorim@det.uminho.pt
helena.felgueiras@2c2t.uminho.pt

Abstract
Chronic wounds (CW) create numerous entry ways for pathogen invasion and prosperity, further damaging host tissue and hindering tissue remodeling and repair. Essential oils (EOs) exert quick and efficient antimicrobial (AM) action, unlikely to induce bacterial resistance. Cinnamon leaf and clove oils (CLO and CO) exert strong AM activity, namely against Staphylococcus aureus and Pseudomonas aeruginosa. Chitosan (CS) is a natural and biodegradable cationic polysaccharide, also widely known for its AM features. CS and poly (vinyl alcohol) (PVA) films were prepared (ratio 30/70; 9%wt) by solvent casting and phase inversion method. Film's thermal stability and chemical composition data reinforced polymer blending and EO entrapment. Films were supplemented with 1 and 10wt% of EO in relation to total polymeric mass. Film's thickness and degree of swelling (DS) tended to increase with EO loading amount, particularly with 10wt% CLO (*$p<0.05$). AM testing (agar diffusion assay and time-kill kinetics) revealed that CS films alone were effective against both bacteria, and capable of eradicating all P. aeruginosa within the hour (***$p<0.001$). Still, loaded CS/PVA films showed significantly improved AM traits in relation to unloaded films right after 2h of contact. This study is a first proof of concept that CLO and CO can be dispersed into CS/PVA films and show bactericidal effects, particularly against S. aureus, this way paving the way for efficient CW therapeutics.

Keywords: bactericidal; chitosan; plant extracts; eugenol; blended films; wound dressings; wound healing.