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BOOK OF ABSTRACTS

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BOOK OF ABSTRACTS OF THE 8TH MEETING ON MEDICINAL BIOTECHNOLOGY

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Antimicrobial properties of PLA scaffolds functionalized via LbL method with Manuka and multifloral honey

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Background: Tissue engineering and chronic wound management face obstacles due to the global rise of resistances. Natural bioactive agents, such as Manuka honey, offer a unique therapeutic profile by combining antimicrobial activity with the ability to modulate the biochemical wound environment and promote cellular regeneration. However, the seamless integration of these biological compounds into synthetic matrices, such as polylactic acid (PLA), remains a challenge. 2

Objective: This study aims to develop PLA scaffolds functionalised with honey using the Layer-by-Layer (LbL) technique and evaluate their inhibitory capacity against microbial growth. Two honey types are compared, MGO 263+/UMF10+ Manuka honey and a Portuguese multifloral honey.

Methodology: Concentrations of 15%, 20%, 25%, 30% and 35% will be tested by diluting the honey in 3M sodium acetate buffer and adjusting pH to 5.5. The method has currently been successfully optimized for the 15% concentration. The LbL process consisted of three immersion cycles, alternating with coating in the honey solutions, washing in acetate buffer and short periods of drying. As a negative control, PLA scaffolds were subjected only to the washing steps. Biological activity was assessed against *Escherichia coli* and *Staphylococcus aureus*. In the disc diffusion test, the plates were inoculated uniformly and the scaffolds arranged in quadrants, including positive controls of ciprofloxacin for *E. coli* and penicillin G for *S. aureus*. After incubation, inhibition was quantified by two perpendicular measurements of the halo. Quantification of Colony-Forming Units (CFU) was performed after recovery of the microorganisms from the scaffolds by vortexing and centrifugation in saline solution. **Results:** The study is currently in the optimization phase. Sterilization has been successfully achieved by immersing the scaffolds in 70% ethanol for 2 hours with gentle stirring, followed by vacuum drying in a Petry dish for 24 hours. Microscopic observation of the scaffolds showed a clear coating layer in functionalized samples. **Conclusions:** This research seeks to validate LbL functionalisation as a simple strategy for developing bioactive scaffolds. The present work establishes a foundation for subsequent phases involving various honey concentrations, with the goal of demonstrating a synergistic effect between the PLA scaffold and natural antimicrobial agents.

KEYWORDS: *antimicrobial, biomaterials, honey, scaffolds*