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Novel biomolecules delivery strategies for infection control in chronic wounds

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Abstract

Typically, acute wound healing is a well-organized process that evolves in a predictable amount of time. Chronic wounds (CW) result from gradual tissue degradation, and are characterized by defective cell matrix, high bacteria counts, prolonged inflammation and moisture imbalance. Antimicrobial dressings, that combine dressing and antibiotics, have been suggested as potential strategies to treat CW. However, the rising of antibiotic-resistant pathogens has turned these systems less effective, revealing other biomolecules such as antimicrobial-peptides (AMPs) or essential oils (EOs) as viable alternatives.

In our research group, different polymeric platforms are being engineered to deliver these antimicrobial cues at infected wound beds. From porous hydrogel-like films to wet-spun fibers and electrospun mats, different polymeric combinations, made from biodegradable natural and synthetic polymers, are being examined. Hydrogel-like films have been combined with LL37 peptide and eugenol-containing essential oils, revealing important effects against the most common bacteria colonizing wounds (*Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Escherichia coli*). A new antimicrobial peptide, the Tiger 17, loaded onto cellulose acetate/polycaprolactone electrospun fibers has also been disclosed as a potential antimicrobial molecule in the fight against these pathogens. More recently, cinnamon leaf oil, cajeput oil and clove oil have been examined on wet-spun fibers made from the same polymer combinations. Data revealed their accelerated release rate and an optimal interaction between oils and fibers. The peptide Nisin Z has also demonstrated increased performance when conjugated with wet-spun constructs. In the end, multiple successful combinations of polymers and biomolecules were uncovered for prospective applications in CW healing.

Biography

Dr. Helena Felgueiras is a Biomedical Engineering from University of Minho (Portugal) with a PhD in the same field (specialization in biomaterials) from Université Paris 13 (France). Presently, she works has a Junior Researcher at the Centre for Textile Science and Technology (2C2T, Portugal), developing antimicrobial surfaces resorting to biological cues, and heading the line of research in medical textiles. She is the author of 51 publications, with a h-factor of 14 (scopus). HF has international collaborations with 10 countries, reflected in published work (85 co-authors). She has given 63 national/international communications and has received 6 awards and 17 distinctions.

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