Electrospinning: From Design and Processing to Advanced Nanomaterials and Applications

Electrospun silk-elastin fibres functionalized with silver nanoparticles as antibacterial wound dressings

André da Costa[1], Andreia M. Silva[1], Ana M. Pereira[1], Andreia C. Gomes[1], Vitor Sencadas[2,3], Margarida Casal[1] and Raul Machado[1*]

[1] CBMA (Centre of Molecular and Environmental Biology), Department of Biology, University of Minho, Campus of Gualtar 4710-057 Braga, Portugal
[2] Centro/Departamento de Física, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal
[3] School of Mechanical, Materials and Mechatronics Engineering, University of Wollongong, Wollongong, NSW 2522, Australia
* Corresponding author's e-mail address: raulmachado@bio.uminho.pt

Main Body

Silk-elastin-like proteins (SELPs) are a class of bioinspired, genetically engineered block copolymers, composed of silk and elastin repeating units. As base materials for biomedical purposes, SELP nanofibre mats demonstrate potential to be applied as wound dressing materials [1]. The increasing antimicrobial resistance associated with the excessive and inappropriate use of antibiotics demands the research for new pathogen-free healthcare polymeric materials with enhanced biological performance. In this regard, silver (Ag) is a metal with well-known antimicrobial activity against a broad spectrum of microorganisms. In this work, we report the fabrication of antimicrobial SELP/Ag materials by electrospinning, using formic acid as solvent and $AgNO_3$ at different concentrations (1, 3, 5 wt%) as the antimicrobial filler. Results indicate the formation of silver nanoparticles during the fabrication process, in one-step method without the need of additional reducing agents. As the produced materials are highly water soluble, water insolubility was rendered by exposure to methanol-saturated air. FTIR analysis of the methanol-treated samples demonstrated that water insolubility is mediated through a β-sheet conformation-driven mechanism. The antimicrobial performance of the SELP/Ag materials by disk diffusion assays revealed a strong antibacterial activity against both Gram+ and Gram– bacteria. Finally, the silver-containing materials did not revealed a cytotoxic effect against normal human skin fibroblasts suggesting its potential application as antimicrobial wound dressing medical devices.

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References

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