Antibacterial protein-based fibres: combining recombinant DNA technology with electrospinning

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Main Body

With the increasing healthcare-associated infections and antibiotic-resistant microorganisms there is a demand not only for new antimicrobial compounds but also for antimicrobial materials. Genetically engineered protein polymers functionalized with bioactive domains offer potential as multifunctional versatile materials for biomedical use. The present work describes the fabrication and characterization of antimicrobial fibre mats comprising the antimicrobial elastin-like recombinamer CM4-A200 [1]. The CM4-A200 protein derives from the genetic fusion of the ABP-CM4 antimicrobial peptide from *Bombyx mori*, with 200 repetitions of the pentamer VPAVG. We demonstrate that non-crosslinked electrospun fibres of CM4-A200 are stable at warm temperatures, even in solution, which contrasts with previous works with electrospun fibres of ELRs. This avoids the use of crosslinking procedures that may react with fundamental amino acids of the antimicrobial domain potentially affecting its activity. Thermal gravimetric analysis of CM4-A200 materials with different dimensional arrangements (fibres and films) was assessed, revealing one single degradation step at temperatures above 300 ºC with fibres displaying a higher thermal degradation activation. The electrospun materials displayed a time-dependent high antimicrobial activity against clinically relevant Gram-negative and Gram-positive bacteria, and proved to be non-cytotoxic in *in vitro* cultures of human keratinocytes and normal human skin fibroblasts, even presenting a slight proliferative effect for the latter.

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References

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