

Development of biodegradable electrospun dressing based on PVA/CA with antimicrobial potential for chronic wounds

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Introduction

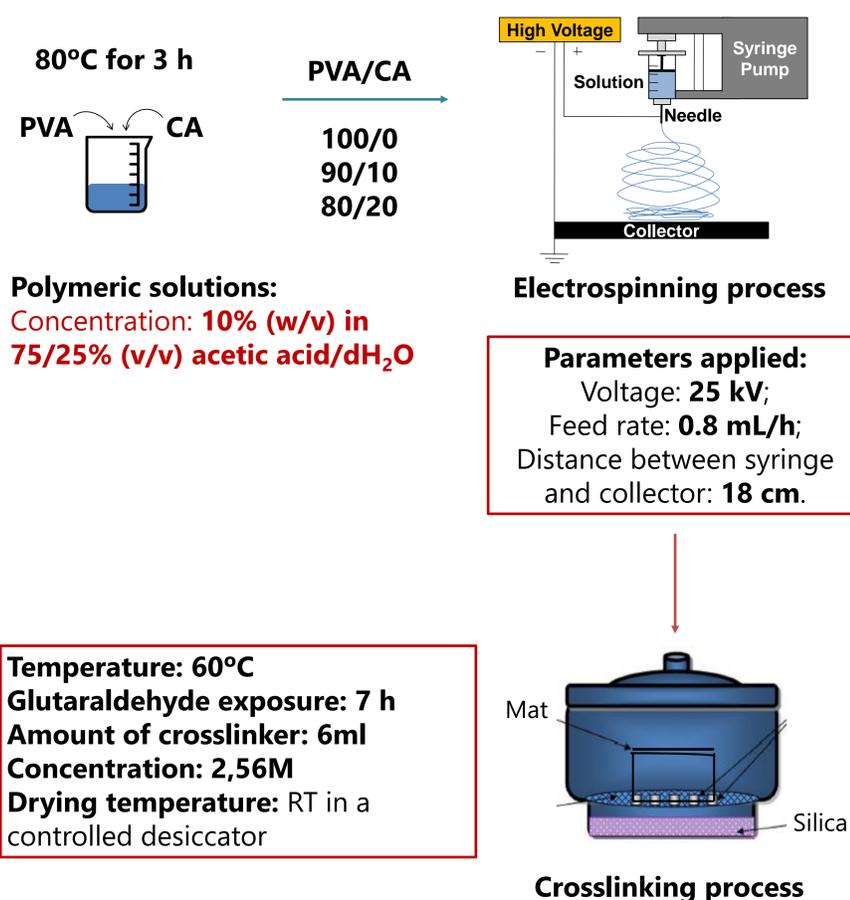
The incidence of chronic wounds (CW) is growing at an accelerated rate around the world. CW are unable to follow the normal healing steps, stalling at a self-perpetuating inflammatory stage. Pressure, excessive proteases and inappropriate treatment are some of the factors that hinder the healing process, but the main cause of the problem remains the increased bacterial load [1].

To address this problem, wound dressings with a new intricate nano-architecture and functionalized with active biomolecules are being developed to treat CW. The introduction of antimicrobial peptides (AMPs), as pexiganan (or MSI-78), which display a broad spectrum of antibacterial activity against both Gram-negative and Gram-positive and reduce bacterial resistance, has been considered a viable solution [2].

Our main goal focuses on the development, through electrospinning technique, of a biodegradable and 3D nano-structured dressing based on poly(vinyl alcohol) (PVA) and cellulose acetate (CA), functionalized with pexiganan, as potential antimicrobial agent.

Electrospun mats production

PVA (88% hydrolyzed and Mw 78,000) was purchased from Polysciences, Warrington, USA. CA (Mw 30,000) was acquired from Sigma Aldrich, USA. The acetic acid (glacial) 100% was purchased from Merck, Darmstadt, Germany. Glutaraldehyde (GA, 25% aqueous solution) was obtained from Sigma Aldrich.



Characterization

Morphological evaluations of the produced nanofibers

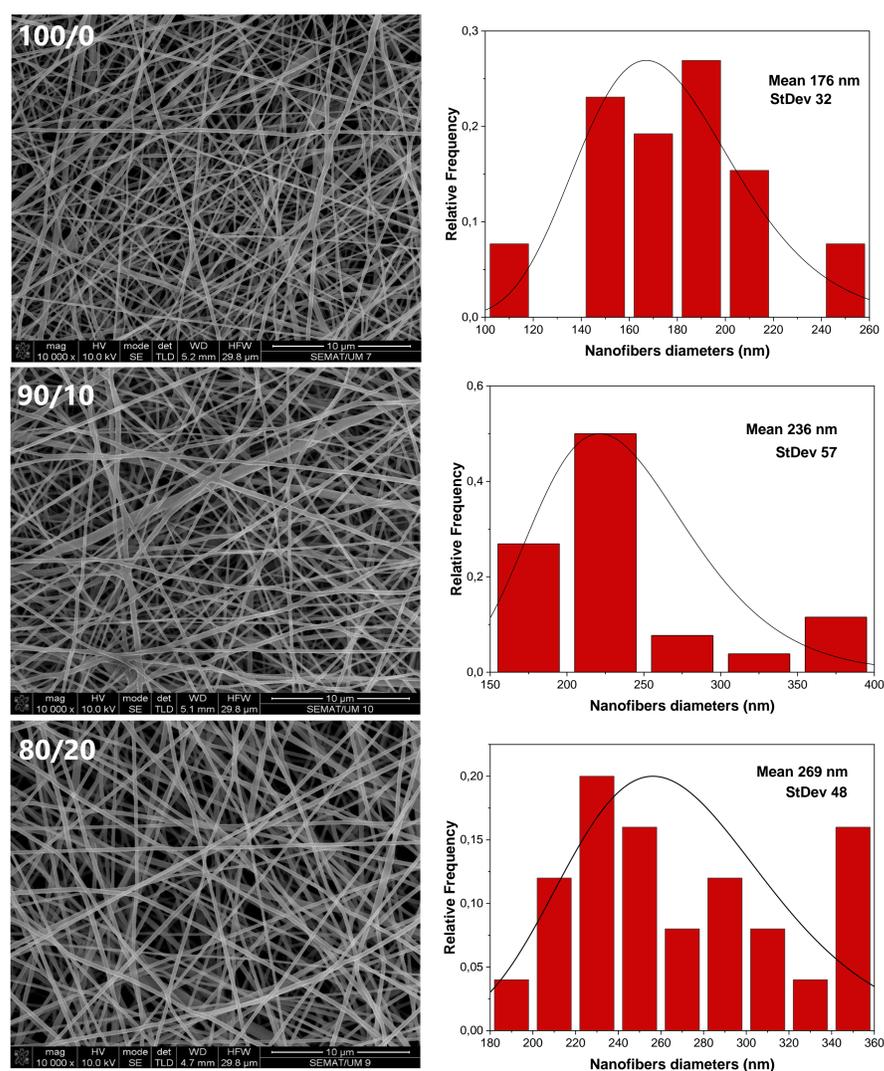
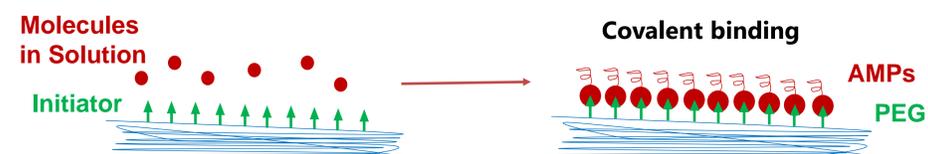


Figure 1. FEG-SEM micrographs and diameter distribution of 100/0, 90/10, 80/20 PVA/CA mats crosslinked with glutaraldehyde (n=50). Formation of uniform and bead-free fibers.

Functionalization of electrospun mats with Pexiganan

"Surface Initiated": N-terminal cysteine-modified Pexiganan is immobilized on the surface of electrospun mats by succinimidyl-ester (NHS)-PEG2-maleimide.



Conclusions

Preliminary data demonstrated Pexiganan activity against *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Pseudomonas aeruginosa* and *Escherichia coli* with values of minimum inhibitory concentrations (MIC) ranging from 7.8 to 62.5 µg/mL.

References: [1] Felgueiras H.P. et al., Appl. Polym., 137, 2020; [2] Felgueiras H.P. et al., Colloids Surf. B, 156:133, 2017.

Acknowledgments

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