DEVELOPMENT OF A NOVEL ELECTROSPUN ASYMMETRIC MEMBRANE TO ENHANCE THE WOUND HEALING PROCESS

Mariana F. P. Graça[1], Sónia P. Miguel[2], Cátia S. D. Cabral[1], Ilídio J. Correia[1, 3 (*)]

[1] CICS-UBI – Centro de Investigação em Ciências da Saúde, Universidade da Beira Interior, 6200-506 Covilhã, Portugal

[2] CPIRN-IPG – Centro de Potencial e Inovação de Recursos Naturais, Instituto Politécnico da Guarda, 6300-559, Guarda, Portugal

[3] CIEPQPF – Departamento de Engenharia Química, Universidade de Coimbra, 3030-790, Coimbra, Portugal

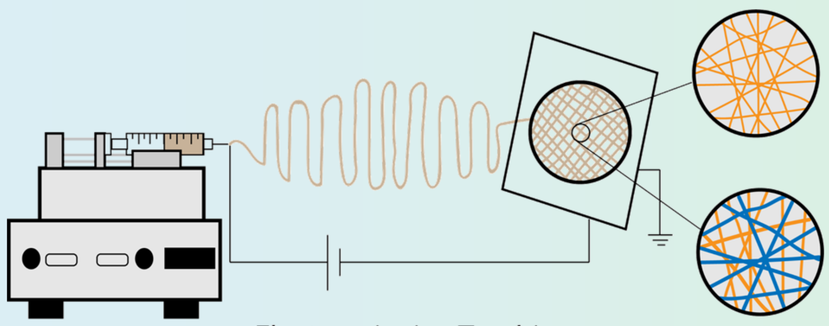
*icorreia@fcsaude.ubi.pt

Introduction

Asymmetric membranes have emerged as a promising therapeutic approach to treat skin injuries, since they are fully capable to re-establish the structure and functions of both epidermis and dermis layers of the native skin, while acting as temporary matrixes to support and promote the healing process [1]. Herein, an asymmetric bilayer membrane (BM) was produced using electrospinning technique, aimed to be applied as a wound dressing in skin regeneration.

Materials and Methods

1. Production of the asymmetric bilayer membrane



PCL_CA
Top membrane

PVA_HA
Bottom membrane

2. Asymmetric bilayer membrane characterization

- Physicochemical properties
- Cell viability

Results and Discussion

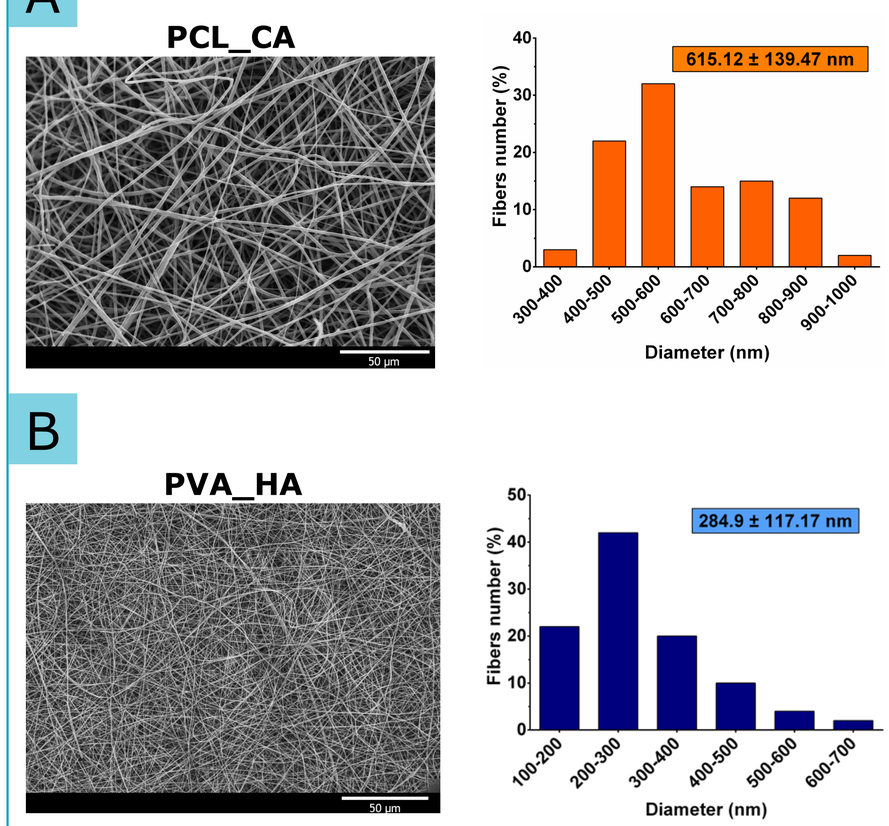


Figure 1. Characterization of the morphological and biological properties of the produced membranes: Scanning Electron Microscopy (SEM) images and distribution of the fibers' diameters of the PCL_CA (A) and PVA_HA (B); Determination of the electrospun membranes' porosity (C) and swelling profile at pH=5 and pH=8 (D); Evaluation of the membranes' cytotoxic profile through MTS assay (E) and dsDNA assay (F); SEM images of NHDF cells seeded in contact with the produced membranes over a period of 1 and 7 days (G).

Conclusions

- The bilayered membrane reproduce the morphology of native epidermis and dermis.
- The produced asymmetric membrane presented suitable porosity and absorption capacity to provide a moist environment at wound site.
- The electrospun membranes were biocompatible and did not induce any cytotoxic effect in fibroblasts cells.

References:

[1] Miguel, S.P., Moreira, A.F. and Correia, I.J., Chitosan based-asymmetric membranes for wound healing: A review. International journal of biological macromolecules, 2019. 127: p. 460-475.

Acknowledgements:

This work was financial supported by the following projects (POCI-01-0145-FEDER-007491, UID/Multi/00709/2013, CENTRO-01-0145-FEDER-028989 and POCI-01-0145-FEDER-031462). Cátia S. D. Cabral acknowledge funding from the grant UBI Santander/Totta.