Silk fibroin aerogel particles via emulsion-gelation method for the treatment of chronic wounds

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***Keywords**: Aerogel, Wound healing, Biopolymer, silk, supercritical CO_2*

The healing process of an injury comprises a series of steps: haemostasis, inflammation, proliferation/maturation and remodeling. During wound healing, a fluid (exudate) can be produced as a natural response towards healing. However, its excessive production can be detrimental, delaying the inflammatory phase, which represents a challenge for wound management. Aerogels can provide advanced performance for wound healing due to their high porosity, large surface area and water uptake, which can be tailored for a fast and directional fluid transfer of the exudate. Aerogels can also act as carriers for bioactive compounds. SF obtained from *Bombyx Mori* has demonstrated to be an excellent stabilizer of bioactive compounds while supporting cell proliferation, being presently used in wound healing and regeneration. In this work, silk fibroin (SF) aerogel particles were developed and studied in terms of textural properties for potential drug loading with wound healing applications.

Aerogel particles were produced by emulsion-gelation using solutions of different concentrations of SF (3% and 5% (w/v)) followed by drying with supercritical CO_2. The obtained aerogels were characterized in terms of textural, chemical and morphological properties. All aerogels presented high surface area (515 ± 26 m^2/g and 458 ± 23 m^2/g for 5%SF and 3%SF, respectively). The diameter of the particles (Dv10 and Dv90) was 509 ± 3 µm and 1073 ± 91 µm for 5% SF

aerogel particles and 368 ± 2 µm and 1075 ± 22 µm for 3% SF aerogel particles, considering the average size of all the methodologies adopted.

Physicochemical and textural characterization of the aerogels showed excellent textural properties and low particle size deviation, suggesting that the method is suitable for the production of particles for wound healing applications.

Acknowledgments

This research was funded by Xunta de Galicia [ED431C 2020/17], MCIUN [RTI2018-094131-A-I00], Agencia Estatal de Investigación [AEI] and FEDER funds. B.B. acknowledges to the COST Action CA18125 “Advanced Engineering and Research of aeroGels for Environment and Life Sciences” (AERoGELS), funded by the European Commission, for the granted Short Term Scientific Mission to perform the aerogels synthesis in the Universidade de Santiago de Compostela.