Abstract Template

Title: The use of statistics to evaluate the impact of Ginepin on the physical properties of a Solid Silk Fibroin scaffold

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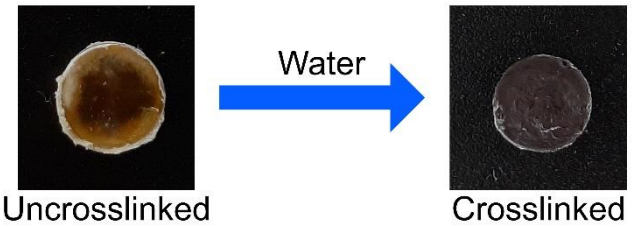
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Keywords: Solid Silk Fibroin, Design of Experiment, Mechanical Properties

I. Abstract Body (up to 250 words)

Solid silk fibroin is a bulk non-porous material that has been recently investigated by our group[1] as a promising material for tissue engineering. This material produced by compression molding starting from the well-known silk fibroin is extremely resistant in dry conditions. However, in wet conditions tends to plasticize, significantly reducing its compressive modulus. In the present study, we investigated the possibility to chemically crosslink the silk fibroin protein by the addition of Genipin an aglycone extracted from a fruit that act as a crosslinker by reacting with the amine side groups of the aminoacidic chain. Genipin is quite general crosslinker for proteins and has been proved to be non-cytotoxic[2]. This crosslinker has been added to the fibroin previous to the compression molding, then activated by sowing the resultant scaffold in water. The crosslinking was optically visible by the soaking of from a partially transparent yellowish color to blue and opaque, as results of the reaction between Ginipin and the aminoacidic chain. The compressive modulus has been then evaluated by the use of a compression test, the thermal response by DSC and the secondary structure by FTIR. The entire experiment has been conducted by the use of a statistical method, called Design of Experiment (DOE)[3]. DOE allowed us to model all the material properties by empirical equations that relate the property of interest to the parameters used to produce the material.

II. Image:



III. Reference:

1 Bucciarelli, A. et al. A Thermal-Reflow-Based Low-Temperature, High-Pressure Sintering of Lyophilized Silk Fibroin for the Fast Fabrication of Biosubstrates. Adv. Funct. Mater. 1901134, 1901134 (2019)

2. Fessel, G., Cadby, J., Wunderli, S., Van Weeren, R. & Snedeker, J. G. Dose- and time-dependent effects of genipin crosslinking on cell viability and tissue mechanics - Toward clinical application for tendon repair. Acta Biomater. (2014). doi:10.1016/j.actbio.2013.12.048

3. Bucciarelli, A. et al. Preparation and Statistical Characterization of Tunable Porous Sponge Scaffolds using UV Cross-linking of Methacrylate-Modified Silk Fibroin. ACS Biomater. Sci. Eng. (2019). doi:10.1021/acsbiomaterials.9b00814

IV. Biography:

Alessio Bucciarelli has recently completed his PhD in Tissue Engineering in the University of Trento, working inside the BioTech Research Center. During its PhD he collaborated with the Virginia Commonwealth University and the Chonbuk National University as a researcher for the REMIX project inside the Marie Skłodowska-Curie programme. The focus of his research is the application of statistic and data science to understand the impact of the fabrication processes on the physical and biological property of the scaffolds. This innovative approach allowed him to publish in high-impact journal as Advanced Functional Material. He is currently teaching statistical related courses in its institution. He is also active in the field of process optimization and he works as an external consultant for several industries and universities.

V. Presenting author details



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Track 5: Scaffolds Used In Tissue Engineering