

Topic for submission:
Burns

CUTTING-EDGE HYBRID DRESSINGS: COMBINING SILK MEDICAL TEXTILES AND DECELLULARIZED BIOLOGICAL TISSUE FOR ADVANCED BURN WOUND CARE

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Aim

Burns affect 11 million people globally each year, with 180,000 fatalities [1]. This study investigates a multilayer burn dressing combining silk fibroin (SF) fabric with highly-preserved decellularized porcine small intestine (dPSI) to support tissue regeneration and wound integration [2]. A silk sericin (SS) hydrogel is included as interface for structural integrity and anti-inflammatory benefits, enhancing the hybrid dressing's biological performance.

Methods

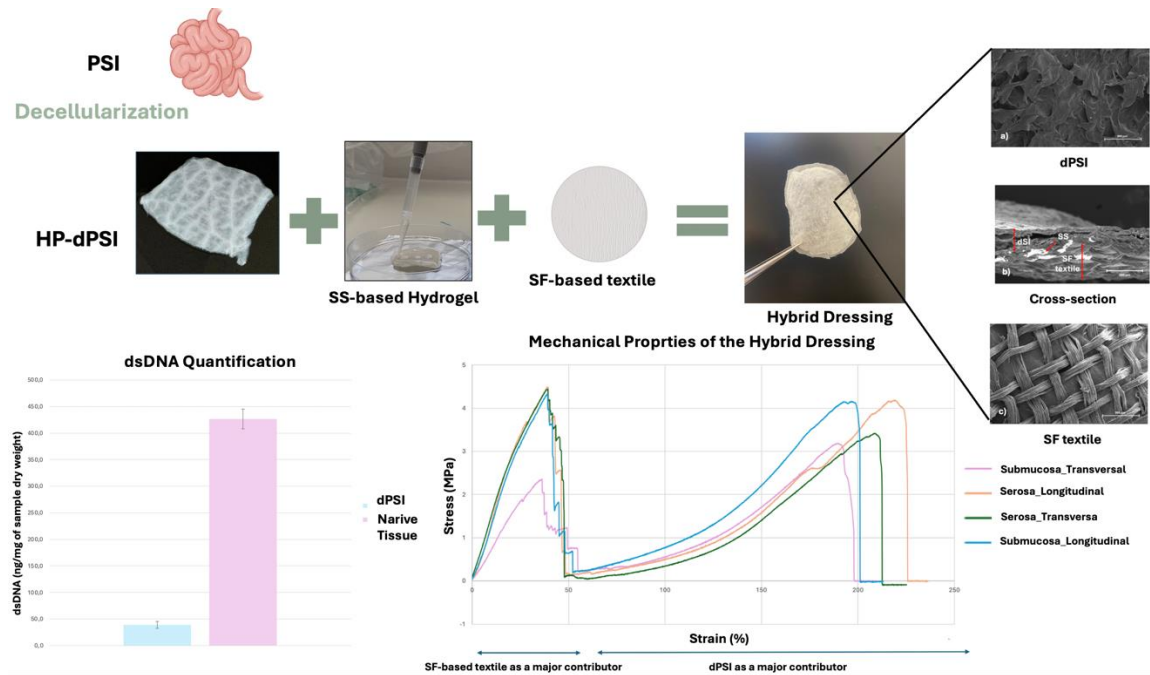
An innovative decellularization protocol was proposed to obtain dPSI, maintaining submucosa, serosa, and muscle layers, using cycles of decellularizing agents (SDS, SDC, DMSO), washing agents (upH \square O, PBS), and sterilization (PAA/ethanol). The serosa and submucosa of dPSI were integrated with SF-based textiles using HRP-crosslinked SS hydrogels. Decellularization and integrity were assessed via DNA quantification and histology, while hybrid dressings' morphology and mechanics were evaluated by SEM and tensile tests. Degradation profile was tested in simulated wound fluid, and biological performance was assessed by culturing human dermal fibroblasts (hDFs) on the submucosa layer up to 10 days.

Results

The dPSI was successfully achieved (<50 ng/mg dsDNA). SEM images confirmed the full integration of the dPSI with SF-based textiles, especially when serosa faced the textile. The presence of the textile structure resulted in an enhancement of the mechanical strength. dPSI was able to degrade first in the multilayer dressing, and hDFs adhered and proliferated on the submucosa over 10 days, supporting hybrid structural integrity.

Conclusions

This study is pioneer in confirming promising results for the first multilayer hybrid dressing combining medical textiles and dPSI for burn wound applications.



References

- [1] A. Markiewicz-Gospodarek et al, *Int. J. Environ. Res. Public Health* **2022**, 19(3), 1338.
- [2] M. Rosadas et al, *Front. Mater.* **2024**, 10:1285948.

Acknowledgements

FCT - Fundação para a Ciência e a Tecnologia (FCT) projects 2022.08713.PTDC, UIDB/50016/2020, and individual fundings 2023.07374.CEECIND, 2021.05919.BD. Be@t-Textile Bioeconomy (TC-C12-i01, Sustainable Bioeconomy No. 02/C12-i01.01/2022), promoted by the Recovery and Resilience Program (RRP), Next Generation EU, 2021-2026.