sciforum-173965: Sustainable biomaterials for smart multifunctional active wound dressings

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Introduction: The main requirements for active wound dressings are the ability to absorb exudate, reduce bleeding, and prevent infections. In reality, commercially available active wound dressings do not meet all these needs and are very expensive. The aim of this work is to obtain sustainable and low-cost materials with multifunctional action as antibacterial, antioxidant and anti-inflammatory agents, together with the ability to detect infection by color change.

Methods: Keratin was extracted from discarded wool and electrospun to obtain nanofiber mats. Polyphenols were extracted from grape pomaces and pomegranate peels and seeds. keratin dressings were functionalized with natural polyphenols and fully characterized from physical, chemical and biological standpoints.

Results: Stable dressings of randomly oriented keratin nanofibers were obtained and functionalized, with grape and pomegranate extracts maintaining polyphenol activity. Samples were biocompatible and possessed effective antioxidant activity. Functionalized fibers were able to change color upon acidification (typical of bacterial contamination), offering a smart solution for rapid infection detection. Pomegranate functionalized materials also exhibit significant antibacterial action against S epidermidis.

Conclusions: The combination of keratin obtained from discarded wool and polyphenols from agri-food byproducts is a promising strategy for obtaining sustainable biomaterials for smart multifunctional active wound dressings.

This work was carried out within the PROTECTED project (P2022XT785) financed by the European Union through the Next GenerationEU plan, Mission 4, Component C2, Investment 1.1. as part of the PRIN 2022 PNRR Call (D.D.1409 of 14/09/2022) of the Italian Ministry of University and Research (MUR).



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