Exploring new biobased material sources as platforms to advance skin wound healing and regeneration

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Chronic wounds are one of the major therapeutic and healthcare challenges affecting the population globally. One of the research interests of the Biomaterials and Biomedical Technology Lab (BBT Lab) is to explore the potential of biobased material platforms to advance skin wound healing and regeneration solutions. From the use of natural based biopolymers such as silk fibroin (SF) or sulfated exopolysaccharides (EPS), to the processing of more complex matrices such as the extracellular matrices, the group has been collaborating with some strategic partners in IBEROS+ to process, functionalize and characterize the materials for their physicochemical properties, structural adaptability, biocompatibility and bioactivity.

SF microparticulate aerogels loaded with adenosine have been developed via supercritical fluid technology in collaboration with the University of Santiago de Compostela. These particles exhibit a high porosity, biocompatibility, and positive interactions with skin cells towards regeneration, highlighting their promise in wound healing. A new Exopolysaccharide (EPS) produced by *Porphyridium cruentum* microalgae was developed as a novel biomaterial platform, offering bioactive properties, high molecular weight, thermal stability, and cytocompatibility for complex wound healing. An extensive characterization is ongoing, with contribution of the University of Vigo.

For extensive burn wounds, where autologous grafts are impractical, skin xenografts may provide a viable alternative, mostly if depleted from its immunogenic load. To achieve this, our group has developed and optimized methods for obtaining highly-preserved animal-origin decellularized tissues for human skin healing and regeneration. An important example is the valorization of rabbit skin, a valuable agro-food by-product that exceeds 5000 skins/day only in Europe. Our group has recently developed decellularized rabbit dermal matrices with preserved microarchitecture and human-like biochemical properties and expects to continue further developments in collaboration with the IBEROS+ consortium.

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