

Chemistry Department

Dressings for Skin Wound Healing

Group of Polymer Synthesis & Processing (GPS&P)

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Objectives

According to the US Wound Healing Society, about 15% of older adults suffer from chronic, hard-to-heal wounds [1]. Wound healing is a complex biological process, which includes a wide range of cellular, molecular and physiological pathways.

In this project, we will develop hydrogel membranes based on renewable materials (e.g. natural polysaccharides) able to maintain, protect and release continuously a cocktail of drugs and growth factors fundamental to restore the skin barrier and its functions.

Advanced and sustainable 2D and 3D processing methods developed in the REQUIMTE/NOVA and the expertise in cellular biology and animal experimentation CICS/UBI teams will conquer to fabricate the loaded hydrogel materials at reasonable cost.

Methodology

Supercritical carbon dioxide (scCO₂) assisted phase inversion and electrospinning will be the elected techniques to produce the 3D wound dressings.

The wound dressings will be characterized in terms of morphology, porosity, swelling behavior, biodegradability, biocompatibility, gaseous exchange and mechanical properties.

Bioactive molecules as drugs and growth factors will be loaded into the membranes either using scCO₂ assisted impregnation technique or bulk loading.

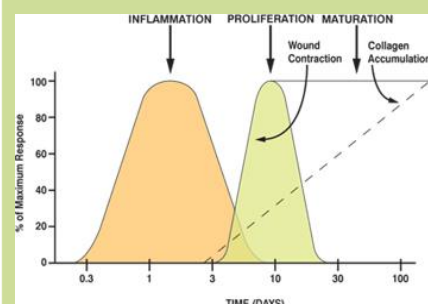
In vitro and *in vivo* studies will be performed in order to evaluate the cytotoxicity of the membranes and their effect on burn wounds.

Expected Results

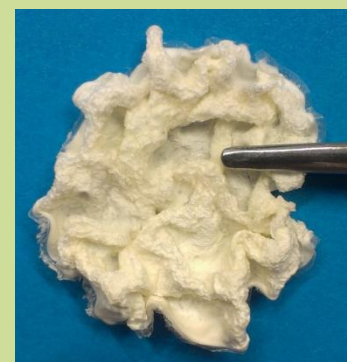
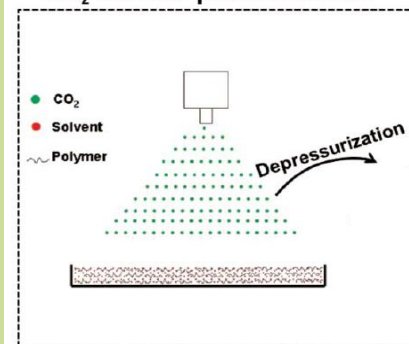
The wound dressings will be optimized to fulfill the following characteristics:

- Protect the wound from physical damage and micro-organisms
- Be comfortable, compliant and durable
- Be non-toxic, non-adherent, and non-irritant
- Allow gaseous exchange
- Allow high humidity at the wound
- Be compatible with topical therapeutic agents
- Be able to allow maximum activity for the wound healing without retarding or inhibiting any stage of the process.

Wound Healing Stages



CO₂ assisted phase inversion



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[1] D.T. Woodley et al. Molecular therapy : the journal of the American Society of Gene Therapy, 2007, 15, 628.