

DEVELOPMENT OF CHITOSAN CONTAINING VEGETABLE OIL SCAFFOLDS BY 3D PRINTING AIMING CHRONIC EPITHELIAL WOUND REPAIR

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Introduction and objective: Wound healing can be disrupted, slowing down the healing process and thus resulting in chronic wounds. In the context of skin repair, chitosan is a promising natural polymer, with antimicrobial and antioxidant properties. Such materials can form hydrogels, being suitable for 3D printing process. Vegetable oils are in general composed of essential fatty acids, vitamins, and minerals that can contribute to wound healing. In this work *scaffolds* based on chitosan incorporated with different concentrations of vegetable oil were produced by 3D printing, aiming at the healing of chronic epithelial wounds.

Methodology Hydrogels were produced by varying the vegetable oil percentage in the chitosan matrix. They were used as ink for 3D printing aiming the production of scaffolds. The mechanical properties of these structures were studied through tensile behaviour of wet and dry scaffolds. Indirect cytotoxicity, adhesion, and proliferation assays up to 96hs were carried out using balb/c 3T3 cells to explore the biological properties of the material.

Results and discussion The printed scaffolds presented good shape fidelity when compared to the CAD models and displayed better results with the vegetable oil incorporation in the chitosan hydrogel. The tensile experiments showed that the dried scaffolds have higher mechanical properties and behave as soft materials in wet conditions. The *in vitro* toxicity assay results showed that the degradation products of the scaffolds were non-toxic, and increased cell viability in a dose/dependent manner. Vegetable oil increased cell adhesion of the chitosan scaffold, with better results at lower oil concentrations. The proliferation assay showed better results for chitosan containing vegetable oil in early stages. However, for 96hs, pure chitosan have better cell proliferation.

Conclusions: Scaffolds of chitosan containing vegetable oil have potential applications as wound dressings, acting in physical and microbiological protection and cell proliferation of the tissue. Other biological assays are indicated to confirm the possibility of applying these biomaterials in chronic wounds.

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