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3D printing and characterization of an alginate-gelatin hydrogel soaked in low molecular weight chitosan for application in burns treatment

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Burns are among the skin lesions that cause the most morbidity and weakness, leaving psychological, physical, and aesthetic sequelae. (1) They directly influence the quality of life of individuals affected by serious accidents, especially in emerging countries where awareness and information provided by public policies are limited, in addition to having a smaller structure for treatment. The use of dressings as a complementary treatment subsidizes the main treatments and has great potential in preventing complications in cases where burns profoundly affect a large-medium extension of the body.With the advancement of technology and the availability of materials, 3D printing has become a large-scale manufacturing process with great potential. It allows for the geometric, physical, and chemical modulation of materials of interest, particularly printed hydrogels that emerge as potential therapeutic products. (1-2) These products can be printed together with cell lines or printed as scaffolds for grafting on injured sites.The present project aims to synthesize, 3D print, and characterize gelatin-alginate formulations. (3) These formulations are subsequently soaked in low molecular weight chitosan and calcium chloride to construct the base of a 3D printed delivery system for application in the complementary treatment of burns. (1) Modifications were made to the printer's hardware to obtain temperature control that favors working with gelatin. The system achieved temperatures that oscillated in the range of 8-10 degrees Celsius, which was considered very satisfactory.By using 3D modeling software and notepads, it was possible to design and modulate parameters that control the deposition of filaments for different proportions of the hydrogel formulation. T-tests were carried out throughout the project to evaluate and optimize the formulations made. The tests demonstrated the ineffectiveness of pre-crosslinking when mixing alginate and gelatin. However, they also showed some conditions of interest for further characterizations with non-pre-crosslinked formulations that will be used again in more detailed tests with new proposals for formulations.

Palavras-chave: Custom delivery systems in 3D bio-printing. Alginate-gelatin printed grafts. Burns treatment.

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