# MANUFACTURE AND CHARACTERIZATION OF 3D HYBRID SCAFFOLDS FROM POLYCAPROLACTONE (PCL) AND HYDROGEL FOR BONE TISSUE ENGINEERING

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## SUMMARY

Bioprinting is a promising biofabrication process that can be applied to produce matrices to tissue engineering(1). Extrusion bioprinting has gained a lot of space due to its ease of processing and low cost, and is currently the most widely used technique(2). Within the context of biofabrication, bioinks are important and innovative components, as they are biomaterials carried with cells that will, after the bioprinting process, produce seeded scaffolds(3).However, hydrogels, which are the basis of bioinks, have poor mechanical properties and low printability(4). For the bioprinting of hard tissues, such as bone, it is necessary reinforce the bioinks, and one of the strategies is an association with thermoplastic frames(5).The main goal of this work was to produce hybrid scaffolds, composed by polycaprolactone (PCL) and chitosan/gelatin hydrogel, aiming its application for bone regeneration. The influences of speed and extrusion factor for printing hydrogels were analyzed and the best parameters for scaffolds' printing were defined. A PCL structure was produced at 77ºC (printing diameter of 0.3 mm, and 8.3 mm in length and width) was printed by Genesis II™ bioprinter, (3D Biotechnology Solutions, São Paulo). The program used for printing was Pronterface, from IMADE3D, and the piece was sliced by SLIC3R program. The hydrogel piece filled the PCL piece's

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pores and its concentration was 2.5% w/w chitosan and 5% w/w gelatin. Under these conditions, the produced scaffolds showed good printability and only partial in vitro degradation at the end of 4 weeks after immersion in artificial saliva, buffer solution and aqueous mediums. Fourier Transform Infrared Spectroscopy (FTIR) analysis proved chemical interaction between chitosan and gelatin to form the hydrogel. The material demonstrates hemostatic potential being able to absorve fluids and gradually release ions into the environment. In vitro biological tests using F-OST cells showed no citotoxicity and capacity to induce mineralization. It was possible to produce a PCL/chitosan-gelatin hybrid scaffold which demonstrates a good potential for bone regeneration and could be a cheaper alternative to the use of modified gelatins.

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