



Functionalization of osteoinductive scaffolds printed with hydroxyapatite substituted with different ions and corn starch hydrogels

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Bone defects caused by fractures and bone diseases that require replacement or filling generally use biomaterials as treatment. Studies based on functionalization with ionic components for bone regeneration are still scarce, which makes them interesting and innovative. There is a constant search for scaffolds that adapt to the body's functions. Starch has been shown to be a good candidate for the production of printed biomaterials, as it is biodegradable, biocompatible and has gelling power, which allows it to bring interesting rheological properties to this type of 3D printing process. In this sense, among potential additives, bioceramics are capable of mimicking bones, in addition to being associated with active properties in bone regulation. However, bioceramics such as hydroxyapatite (HAp) functionalized with ions have been a strong bet, as well as the cobalt ion (Co^{2+}), which has been associated with its potential ability to cooperate in bone regeneration, as it can act as hypoxia-inducible factors and accelerate bone repair. Thus, this work aimed to (i) synthesis via chemical route and characterization of cobalt-substituted hydroxyapatite with different degrees of substitution (xCoHAp, where $x = 0, 50$ and 100%), (ii) production and characterization of formulations based on bioceramics synthesized in starch hydrogels and (iii) production via 3D printing and characterization of bone scaffolds from formulations based on bioceramics synthesized in starch hydrogels. The synthesized bioceramics presented substitution with cobalt ions in HAp at different levels, evidenced by the results of XRD, FTIR and EDS mapping. Hydrogels have shown great potential to be a scaffold in the form of a 3D matrix due to their biological, mechanical and chemical properties, such as firmness, cohesion energy, storage modulus (G') and reduced biodegradability rate, indicating that they can be a promising biomaterial for bone tissue engineering and also to optimize printing properties.

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