ABSTRACT SUBMISSION

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A new formulation of porous injectable calcium phosphate cement foam for bone repair

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One of the challenges in bone tissue engineering with calcium phosphate cements is to create **macro porous**, **degradable**, **injectable** and **bioactive** materials[1,2]. In this approach, the challenge is to develop a foam of hydrogel/cement to allow the colonization by the cells for bone repair. For that, we are interesting in a formulation of calcium deficient hydroxyapatite (CDHA) and silanized hyaluronic acid and bovine serum albumin (Si-Hya Ac + BSA) or gelatine (gel) hydrogel, that is **biocompatible** and **biodegradable**[3]. The objective is to develop composite formulations with appropriate **mechanical properties**, **injectability** and **porosity** for bone regeneration. Each these materials were characterized. The injectable cement foams are studied regarding their porosity, phase identification and mechanical behaviour.

For the formulation of the cement, α-TCP and Na_2HPO_4 are mixed to form the cement's phase of CDHA. α-TCP is synthetized at high temperature (1365°C) followed by very fast tempering. α-TCP is characterized by X-ray diffraction. The hydrogel and the NaH_2PO_4 (with air) solutions are initially sealed in two commercial syringes, being ready for use. Directly after the mix, these two components (CDHA cement and Si-Hya Ac + BSA or Gel hydrogel) are mixed in the syringe and create the foam material.

The behaviour of the different composite formulation are compared by mechanical assays. For this, the strength compression and flexion are compared. Additionally, porosity with µCT are observed, and ionic interactions are investigated. Finally, the biocompatibility and the cytotoxicity of each the component and the different composite formulations are studied.

The present study opens a new route towards formulation of different and functional hierarchically porous cement using polymers as foaming agent. The next step will be to compare the biological behaviours of the different formulations with and without encapsulated cells. The goal is to maintain cells alive in the composite as long as possible to secrete bioactive factors for bone repair.

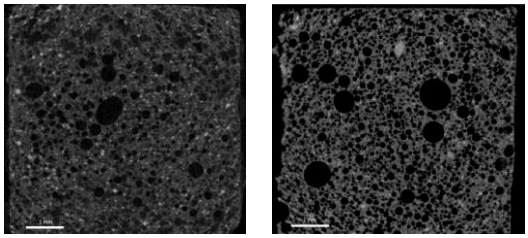

Fig 1: Respectively, µCT image of the CDHA/Gel and CDHA/Si-Hya Ac + BSA foam composites.

References : [1] J. Zhang *et al.*, *Acta Biomater.*, vol. 31, pp. 326 -338, 2016
[2] W. Liu *et al.*, *Acta Biomater.*, vol. 9, no. 3, pp. 5740 -5750, 2013
[3] A. Kovtun et al., Acta Biomaterialia 12 (2015) 242–249