Influence of topography of porous – Nurse´s A phase bioceramic on metabolic activity of adult human mesenchymal stem cells.

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Abstract

It is well known that Si-Ca-P bioceramics are promising bioactive materials for bone tissue engineering, particularly for bone repair [1]. Silicon incorporation to these ceramics may be fundamental to skeletal development stimulating mesenchymal stem cells proliferation and differentiation to osteoblasts [2,3].

An important characteristic of a bioceramic designed for bone reconstruction is its open porosity with a high area / volume ratio that facilitates the initial circulation of biological fluids, cell migration and vascular invasion after bone implantation [4,5].

In this work, we have processed a Si-Ca-P ceramic using a Q-switched Nd:YAG laser, obtaining biocompatible ceramics with 70 µm and 350 µm homogeneously distributed interconnected pores.

In vitro assays using *ah*MSCs showed that cells seeded onto the top of these scaffolds could proliferate, cross the small pores and enter into big pores. So, if we use these bioceramics *in vivo*, we could probably observe how the cells penetrate into the bioceramics through the pores, improving the cellular and vascular colonization of the biomaterial and allowing initial circulation of the body fluids from the first moment of implantation, increasing the bioceramic biodegradability.

Image

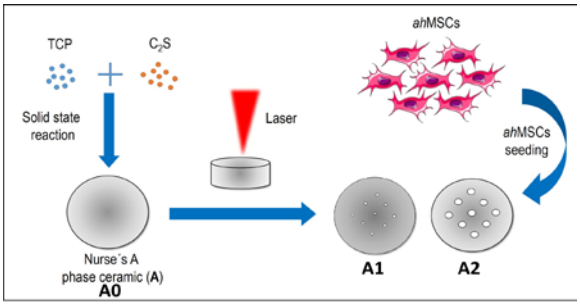


Figure 1. Synthesis of porous Nurse´s A phase and ahMSCs seeding

Recent Publications

1. El-Ghannam A. Bone reconstruction: from bioceramics to tissue engineering. Expert review of medical devices. 2005;2(1):87-101.

2. Carlisle EM. Silicon: a possible factor in bone calcification. Science. 1970;167(3916):279-80.

3. Schwarz K, Milne DB. Growth-promoting effects of silicon in rats. Nature. 1972;239(5371):333-4.

4. Hing K, Annaz B, Saeed S, Revell P, Buckland T. Microporosity enhances bioactivity of synthetic bone graft substitutes. Journal of Materials Science: Materials in Medicine. 2005;16(5):467-75.

5. Sanzana ES, Navarro M, Ginebra MP, Planell JA, Ojeda AC, Montecinos HA. Role of porosity and pore architecture in the in vivo bone regeneration capacity of biodegradable glass scaffolds. Journal of Biomedical Materials Research Part A. 2014;102(6):1767-73



Biography

Dr. Ruben Rabadan (PhD) is a post-doctoral researcher who has his expertise in Tissue Repair, and passion in improving the health by the study of Organ and Tisse Regeneration. In his short career, he has focused in bone, ligament and cartilage regeneration, and he has helped to develop scaffolds based on the C_2S-TCP *phase diagram* and combinating bioceramics with fibroin, specially testing their biocompatibility and osteointegration by in *vitro* and *in vivo* studies.

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Notes/Comments: Abstract for E-poster