BIOACTIVE CERAMICS FOR DENTISTRY

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Different types of ceramic scaffold materials are widely used in dentistry, oral surgery and implantology. The most often used are hydroxyapatite (HA) and β-tricalcium phosphate (ßTCP) bioactive modified scaffolds. The appropriate mechanical properties, capable of supporting cell attachment and proliferation are critical parameters at the designing of a scaffold. Moreover, porosity, the mechanical integrity and effect of surface morphology on cell adhesion and proliferation are important parameters that must be examined in constructing the scaffold. Aim of this study is to characterize silica based aerogel itself and blended form with biopolymer as a scaffold. The advantage of the blended form of aerogel is that hyaluronic acid is a part of the extracellular matrix and promote the bone healing. Modified aerogels with different HA/βTCP ratio were fabricated by sol-gel technology and supercritical drying in carbon dioxide at 80°C. *In vitro* study the cytotoxicity of modified aerogel was analysed based on Alamar Blue assay (Invitrogen, USA) by using malignant osteosarcoma cell line (SAOS-2, Rockville, MD, USA). The gene expression changes were measured with BMP-2, Runx2, TaqMan® assays (ABI, USA). *In vivo* study modified aerogels discs were implanted into the prepared rat calvaria defects to investigate the osteointegration around the inserted aerogels. The blended form scaffold consisted of biocompatible and biodegradable photopolymerisable modified hyaluronic acid biopolymer and powdered aerogel. This scaffold was characterized by swelling, compression strength (ISTRON 5544; USA) and cytotoxicity. Our measurements showed that aerogels and blended form are biocompatible and non-toxic for SAOS-2 cell type. The gene expression analysis showed that ßTCP and/or HA containing composites can trigger differentiation of SAOS-2 cells to osteoblasts. In vivo experiments showed early signs of osteointegration after 1 month intervention. These materials showed promising properties to be useful scaffolds for bone regeneration.

References

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