IJAE
Vol. 120, n. 1 (Supplement): 129, 2015
ITALIAN JOURNAL OF ANATOMY AND EMBRYOLOGY

3D polysaccharide based hydrogel for bone tissue engineering

Gabriella Teti[1], Giovanna Orsini[2], Antonio Mazzotti[3], Monica Mattioli Belmonte[4], Alessandra Ruggeri[1]

[1] Dipartimento di Scienze Biomediche e Neuromotorie, Università, Bologna, Italy - [2] Dipartimento Scienze cliniche stomatologiche, Università Politecnica Marche, Ancona - [3] Istituto Ortopedico Rizzoli, Università, Bologna - [4] Dipartimento Scienze cliniche molecolari, Università Politecnica Marche, Ancona

Hydrogels have attracted considerable attention in biomedical engineering applications due to their many favorable biomimetic properties. Hydrogels based on proteins or carbohydrates can also function as effective extracellular matrices to direct cellular behavior. Recently, polysaccharide based hydrogels have become particularly interesting as matrices for the repair and regeneration of a wide variety of tissues and organs. The incorporation of inorganic minerals as hydroxyapatite nanoparticles can modulate the performance of the hydrogel with potential applications for bone tissue engineering.

The aim of this study was to verify the biological potential of a new carboxymethyl cellulose—hydroxyapatite hybrid hydrogel in bone tissue regeneration. Mesenchymal stem cells were seeded on hydrogel scaffold, in presence and absence of hydroxyapatite, for 7, 14 and 21 days. Cell viability assay and morphological analysis were carried out to evaluate biocompatibility and cell adhesion of the materials. Real Time PCR for genes involved in tissue regeneration was carried out to assay the influence of the scaffold in cell differentiation.

Results showed a high cell viability and biocompatibility of the tested material, confirmed by morphological analysis. The evaluation of osteoblast markers demonstrated the osteogenic induction of the 3D material enriched with hydroxyapatite in the production of mineralized extracellular matrix compared to the carboxymethyl cellulose based material.

In conclusion, our data show that carboxymethyl cellulose—hydroxyapatite hybrid hydrogel may have great potential in bone tissue engineering applications.

Keywords

Carboxymethylcellulose; hydrogel; mesenchymal stem cells; osteogenic markers.