ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ
ΤΜΗΜΑ ΕΠΙΣΤΗΜΗΣ ΚΑΙ ΤΕΧΝΟΛΟΓΙΑΣ ΥΛΙΚΩΝ

ΠΑΡΟΥΣΙΑΣΗ ΜΕΤΑΠΤΥΧΙΑΚΟΥ ΔΙΠΛΩΜΑΤΟΣ ΕΙΔΙΚΕΥΣΗΣ

Τίτλος

«Characterization of the extracellular matrix produced by human bone marrow mesenchymal stem cells undergoing osteogenic differentiation in chitosan/gelatin scaffolds»

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ABSTRACT

In the present study we aim at extending our previous observations on the osteogenesis supporting capacity of 40:60% chitosan/gelatin (CS/Gel) scaffolds, by evaluating the composition of extracellular matrix (ECM) produced by human bone marrow mesenchymal stem cells (BM-MSCs) undergoing osteogenic differentiation on these scaffolds. BM-MSCs were characterized based on their morphologic/immunophenotypic characteristics and their osteogenic/adipogenic differentiation potential. BM-MSCs were cultured on the scaffolds or on tissue culture polystyrene (TCPS) controls and induced towards osteocytes. The scaffolds' osteogenic promoting capacity was demonstrated by the mRNA expression of the osteogenic markers RUNX2, ALP, OSC, DLX5.

Notably, ALP and OSC mRNA expression was higher in the scaffolds compared to TCPS. A PCR array was used to assess the mRNA expression of 29 bone ECM-associated genes. We demonstrate, for the first time, the differential expression of 28/29 genes within the CS/Gel scaffolds compared to TCPS. Genes encoded for collagens type I A1 and type V A1, ECM protease inhibitors and osteopontin, among others, were significantly downregulated in the scaffolds, whereas genes encoding for ECM proteases and vitronectin were upregulated. Immunofluorescence data for the detection of the bone ECM proteins collagen type I A1, and osteopontin were in line with the PCR array results. In conclusion, we have provided a comprehensive characterization of bone ECM in cultures of human BM-MSCs differentiated towards osteocytes in CS/Gel scaffolds. Our findings are anticipated to contribute to better understanding of the complex cell-scaffold interactions within the matrix microenvironment, and are of importance for bone tissue engineering applications.