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Combined delivery of BMP-6 and PDGF-BB from chitosan scaffolds for osteoblastic differentiation

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The aim of this study was to design a 3D-construct capable of delivering multiple growth factors in a controlled manner for bone tissue engineering applications. Platelet derived growth factors (PDGF-BB) and bone morphogenic protein-6 (BMP-6) were loaded in gelatin microparticles and poly (3-hydroxybutyric acid-co-3-hydroxyvaleric acid) (PHBV) sub-micron particles to acquire different release kinetics. Growth factor carrying particles were loaded in 3D chitosan scaffolds prepared by freeze-drying. Release kinetics of dual delivery was investigated *in-vitro* by Enzyme Linked Immunosorbent Assay (ELISA). The effect of single or dual delivery of PDGF-BB and BMP-6 on osteoblastic differentiation and proliferation was evaluated by using MC3T3-E1 pre-osteoblasts for 21 days. The viability of MC3T3-E1 cells was followed by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) at 1,3,5,7, 14 and 21st days of culture period. Cell morphology and mineral formation was detected by Scanning Electron Microscopy (SEM) and Energy-dispersive X-ray spectroscopy (EDX) analysis at the 4th, 7th, 14th days. Real Time Protein Chain Reaction (RT-PCR) was performed to clarify the osteogenic differentiation. For this purpose gene expressions of β -actin, RunX2, collagen type I (Col I), osteocalcin (OCN) and osteopontin (OPN) of the MC3T3-E1 pre-osteoblastic cell cultures were evaluated for 7,14 and 21st days of culture period. As a consequence of this study, PDGF-BB release is faster than BMP-6 release. The faster release of PDGF-BB from scaffolds resulted in an increased MC3T3-E1 cell population on chitosan scaffolds. According to the RT-PCR results, osteogenic markers of RunX2, Col I, OPN were higher on scaffolds loaded with growth factors either individually or in combination. Moreover, OCN expression and bone mineral formation were remarkable on scaffolds incorporating PDGF-BB and BMP-6 as a combination. This result was compatible with SEM and EDX analysis of chitosan scaffold that include both PDGF-BB and BMP-6.

Biography

Eda Göz has completed her PhD from Ankara University. She is a Research Assistant of Chemical Engineering department, Ankara University.

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