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Polycaprolactone-based scaffolds facilitates osteogenic differentiation of human adipose-derived stem cells in a co-culture system

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Abstract
(1) Background: Stem cells in combination with scaffolds and bioactive molecules have made significant contributions to the regeneration of damaged bone tissues. A co-culture system can be effective in enhancing the proliferation rate and osteogenic differentiation of the stem cells. Hence, the aim of this study was to investigate the osteogenic differentiation of human adipose derived stem cells when co-cultured with human osteoblasts and seeded on polycaprolactone (PCL):hydroxyapatite (HA) scaffold; (2) Methods: Human adipose-derived stem cells (ASC) and human osteoblasts (HOB) were seeded in three different ratios of 1:2, 1:2 and 2:1 in the PCL-HA scaffolds. The osteogenic differentiation ability was evaluated based on cell morphology, proliferation rate, alkaline phosphatase (ALP) activity, calcium deposition and osteogenic genes expression levels using quantitative RT-PCR; (3) Results: The co-cultured of ASC/HOB in ratio 2:1 seeded on the PCLHA scaffolds showed the most positive osteogenic differentiation as compared to other groups, which resulted in higher ALP activity, calcium deposition and osteogenic genes expression, particularly Runx, ALP and BSP. These genes indicate that the co-cultured ASC/HOB seeded on PCL-HA was at the early stage of osteogenic development; (4) Conclusions: The combination of co-culture system (ASC/HOB) and PCL-HA scaffolds promote osteogenic differentiation and early bone formation.

Author Keywords
Human adipose-derived stem cells; Osteogenic; Polycaprolactone

Index Keywords
Bone, Calcium, Cytology, Deposition, Genes, Hydroxyapatite, Phosphatases, Stem cells; Alkaline phosphatase activity, Bioactive molecules, Calcium deposition, Co-culture system, Human adipose derived stem cells, Osteogenic differentiation, Proliferation rate, Quantitative RT-PCR; Scaffolds (biology)

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