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Different sources of stem cells for skeletal tissue regeneration

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The wide variety of bone tissue engineering applications ranges from reconstruction of long bone defects in the femour, articular osteochondral defects to craniofacial reconstruction. Sources of cells in bone tissue engineering include Mesenchymal Stem Cells (MSCs). The most important supply of cells for bone repair seems to be bone itself. Bone and bone marrow (BM) could be therefore considered the main local source of skeletal stem cells/progenitors. More recently, periosteal progenitor cells (PCs), mesenchymal stem cells derived from amniotic fluid (AF-MSCs) and from skin (S-MSCs) have been suggested for bone tissue-engineering applications. In the present research the ability of stem cells isolated from bone marrow (BM-MSCs) and subchondral bone (B-MSCs), PCs, AF-MSCs and S-MSCs to differentiate in osteocytes and chondrocyte were evaluated.

Before differentiation, cell phenotype was assessed in agreement with the International Society for Cellular Therapy guidelines.Cell differentiation towards osteoblastic and chondroblastic phenotypes was performed in the appropriate medium and evaluated with alkaline phosphatase and von Kossa stainings for osteoblasts and Alcian Blue staining for chondroblasts

As expected, BM-MSCs and B-MSCs differentiate either in osteoblasts or in chondroblasts. Osteoblastic differentiation was observed also in AF-MSCs, S-MSCs and PCs.

Our results suggest that differently-derived adult stem cells could represent an interesting aid to produced engineered tissue for a rapid clinical use. Moreover, the use of different stem cell sources may identify explicit tissue engineering approaches: for instance, the use of bone derived progenitors cells (i.e. B-MSCs and PCs), whose harvesting is more invasive, may be restricted to strategies forecasting their recruitment in the lesion site, while S-MSC (most abundant) may be utilized in those tissue engineering applications in which a large cell amount is needed.

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Mesenchymal Stem Cells, Bone Tissue Engineering