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HOXA11 pre-selected human mesenchymal stem cells from different body parts for enhanced osteoblastogenesis

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In dental surgery new bone reconstructive therapies are of great interest. Bone grafts are usually provided from autologous, allogenic, or xenogenic sources that are either not available in sufficient amounts or carry the risk of immunogenic reactions. A promising new approach is the use of human mesenchymal stem cells from the patient in combination with scaffolds. We showed recently, that stem cells from the head region are pre-committed towards hard tissues and address the question, if there are cells from other body parts, that are easier to obtain and similar pre-committed. *HOX* genes are a highly conserved family of 39 transcription factors defining the limp development along the cranio-caudal axis and thus are potential biomarkers for the osteogenic potential of stem cells isolated from different body parts. Collagen scaffolds were tested for their successful support of attachment and growth of freshly isolated primary cells. Mesenchymal stem cells from neck, thigh, and belly were isolated from liposuction material and differentiated towards the osteogenic lineage. The *HOX* gene pattern was investigated before and after differentiation via gene array analysis and RT-PCR. The osteogenic differentiation was confirmed via Alizarin Red S staining. Interestingly one member of this gene family, namely *HOX*A11, is up-regulated during in vitro osteogenesis. In addition, mesenchymal stem cells from the belly region showed the highest basal expression of *HOX*A11 and the strongest staining with Alizarin Red S. One hurdle for the use of mesenchymal stem cells in regenerative dentistry is their low differentiation efficiency. Since liposuction material can be obtained from various body regions defining the most pre-committed stem cells for osteogenesis might improve their future use in bone regeneration by reducing unwanted side effects. For this *HOX*A11 can be a suitable marker gene. Collagen scaffolds with their good biocompatibility might serve as an intermediate to bridge the gap until the defect jawbone is reconstructed. The combination of *HOX*A11 preselected stem cells and collagen scaffolds might therefore be a promising alternative to current strategies in regenerative dentistry.

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