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Developmental Potential of Human Mesenchymal Stem Cells derived from Bone Marrow, Cord Blood and Fat Tissue

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Introduction:

Mesenchymal stem cells (MSC) are multipotent adult stem cells. They can be isolated from bone marrow (BM), fat tissue, cord blood (CB) and other tissues. Although these cells gain importance as potential sources for stem cell-based therapies, the developmental potential of MSCs from different origins and from different culture conditions are not well characterised. Therefore the BMBF-funded START-MSC (Standardization for Regenerative Therapy - Mesenchymal Stem Cell) consortium was established to develop standardised procedures for cell preparation and cell cultivation. Furthermore START-MSC aims to characterise the developmental potentials, marker profiles, proteins and signal transductions pathways in MSCs from different origins. Our aim in this consortium is the analysis of the *in vivo* developmental potential of MSCs by blastocyst injection.

Material and Methods:

Fat-MSC and CB-MSC were isolated by plastic adherence, BM-derived MSCs were FACS-sorted for the marker CD271. CD271 is considered a potential marker for BM-MSCs. To analyse the developmental potential of human MSCs (hMSC) from different origins (BM CD271+, CB, fat), we injected 5-10 hMSC of each type into murine embryonic day (E) 3.5 blastocysts and analysed the progeny of injected hMSCs in different tissues on embryonic day E16.5 by human-specific real-time PCR.

Results:

We were able to detect progeny of injected hMSCs in several embryonic tissues of E16.5 embryos. Donor positive tissues were detected after injection of all three hMSC types. Positive tissues showed low-level donor cell engraftment (between 2-20 human cells per 10.000 murine cells). Further we observe that CD271+ BM cells generated less frequent engraftment compared to hMSC derived from CB or fat tissue. The quantification of donor signals by real time PCR indicated that the injected cells underwent proliferation.

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Conclusion and Discussion:

All three MSC types that were analysed showed engraftment in developing murine embryos. So far we could not detect enhanced engraftment of distinct tissues. The injection of pre-selected CD271+ BM cells shows the least frequent donor positive tissues. To further address the question whether donor cells are functionally integrated into recipient tissues we are planning combined immunohistochemistry and *in situ* hybridisation analyses to characterize the phenotype of donor derived cells.