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Isolation, culture and functional characterization of endothelial cells trans-differentiated from mesenchymal cells isolated from human Wharton's jelly

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Mesenchymal stem cells (MSCs) are very attractive for cell therapy because of its high potential for differentiation, proliferation, plasticity and low immunogenicity. Despite of advances in tissue engineering, is still difficult to achieve vascularization of an injuried area. Therefore, the objective of this work is to obtain MSCs from Wharton's jelly umbilical cord and trans-differentiate them into the endothelial phenotype.

MSCs were isolated from human Wharton's jelly by digestion with collagenase and cultured in differentiation medium to adipocyte, osteocyte or endothelium. The cells were identified by morphological criteria and expression of endothelial (CD31, KDR, eNOS) and mesenchyman (CD73, CD90 and CD105) cell makers by real-time polymerase chain reaction and flow cytometry. The activity of nitric oxide synthase (eNOS) was demonstrated by conversion of L-[3H] arginine to L-[3H] citrulline. Our result show that MSCs fibroblastic appearance and adhered easily to the plastic plate. The oil red O and von Kossa staining was positive in mesenchymal cells differentiated into adipocytes and chondrocytes, respectively. MSCs had high expression of the CD73, CD90 and CD105 (mesenchymal markers) but low levels endothelial marker (Tie-2, KDR, eNOS). However, MSCs differentiated into endothelium expressed high levels of ICAM-1, Tie-2, Cav, KDR and eNOS ICAM-1 after 21 and 30 days. The activity of eNOS was significantly higher in cell culture 30 days compared with mesenchymal cells.

These results demonstrate that mesenchymal stem cells isolated from Wharton's jelly umbilical cord can be cultured in vitro and trans-differentiated into adult endothelial cells functionally competent.

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