A Novel Source for Mesenchymal Stromal Cells: the Wharton’s Jelly of the Umbilical Cord

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Introduction: Mesenchymal Stem Cells (MSCs) have been proposed as a potential therapeutic tool in some clinical settings [1]. MSCs are currently obtained from healthy donors, which is accompanied by risk and discomfort and therefore not considered to be ethical. A similar cell type can be cultured from the Wharton’s Jelly of the Umbilical Cord (UC) without any ethical constraints. In this study, we show a relatively simple, cheap and rapid procedure for the culture of the Umbilical Cord Cells (UCC). We characterized the UCC and compared them with bone marrow MSCs (BM-MSCs).

Objective: Characterization of UCC with respect to their 1) ability to differentiate into mature cell types, 2) antigen expression profile and 3) T-cell proliferation inhibition potential and comparison of these traits with BM-MSCs.

Methods: Umbilical cords were collected at the Rijnland Hospital (Leiden. The Netherlands) and the HUVA Hospital (Murcia. Spain). The cords were processed by the explant method and cells were analyzed by flow cytometry to confirm the mesenchymal stem cell phenotype. For studying differentiation capacity, MSCs were analyzed with respect to their ability to differentiate into adipocytes, chondrocytes, and osteoblasts. Cells were put in culture with a cell-specific differentiation medium. The presence of differentiated cells was demonstrated by cell-specific stains or calcium deposits. For studying inhibition of T cell proliferation, MSCs were mixed with peripheral blood mononuclear cells (PBMC) in different ratios and cultured with αCD3αCD28 beads for five days. Inhibition was calculated as the counts/minute (CPM, tritium incorporation) of the condition divided by the CPM of a control without MSCs.

Conclusions: The morphology and expression profiles of UCC and BM-MSCs were similar. Although several authors claim that UCC can differentiate into cells of all three germ layers, we found no evidence of this differentiation [2]. UCC and BM-MSC can inhibit T cell proliferation to a similar proportion and, this suggests that UCC are suitable candidates to replace BM-MSCs in immune related cell therapy. The absence of differentiation capacity could then be regarded as an advantage for clinical application such as immunotherapy.

References