

Multilineage differentiation potential of human amniotic fluid and umbilical cord blood-derived mesenchymal stem cells

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It is becoming increasingly evident that human amniotic fluid and umbilical cord blood (UCB) can serve as a reliable source of mesenchymal stem cells (MSC). However, attempts to isolate MSC from umbilical cord blood of full-term deliveries have previously either failed or been characterized by a low yield. In this study, mononuclear cells (MNC) were separated from amniotic fluid and UCB by using Ficoll plus and cultured in DMEM or MSCGM. We tried to improve the MSC yield from amniotic fluid and UCB using optimized isolation and culture conditions. amniotic fluid and UCB -derived clones were highly proliferative and immunophenotypically positive for CD13, CD29, CD44, CD54, CD73 (SH3), CD90, CD105 (SH2) and HLA class I, but negative for CD14, CD31, CD34, CD45 and HLA-DR. Incubation of these MSC with osteogenic agents resulted in development of osteocytes. Under proadipogenic conditions, several oil vacuoles appeared in the cells. Exposure of cells to basic fibroblast growth factor resulted in neural differentiation. Adipogenic, osteogenic and neurogenic differentiation demonstrated a multilineage capacity of the cells comparable with bone marrow derived MSC. By considering ease in collection, banking and availability, cord blood-MSC might offer an added therapeutic advantage compared to marrow. In addition, these multilineage cells unlike bone marrow cells, have a lower precursor frequency and a lower level of bone marrow antigen expression, and lack neural antigens. Altogether, the amniotic fluid and UCB derived multipotent cells are intriguing as a potential source of cells for cellular therapeutics for stromal, bone and neural repair.