P-73

Multilineage Potential of Porcine Mesenchymal Stem Cells Derived from Bone Marrow and Umbilical Cord Blood

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The multilineage potential of mesenchymal stem cells (MSCs) has been under intense scrutiny in recent years due to documented success in transplantation therapy. The aim of this study was to isolate porcine MSCs (pMSCs) from bone marrow and to functionally characterize their ability to differentiate into diverse lineages. Further, we explored the possibility of umbilical cord blood as an alternative source of multipotent MSCs. Isolated population of pMSCs from bone marrow were characterized by their growing fibroblast-like cell population with significant renewal capacity, cell-surface antigen profile ($CD13^{pos}$, $CD29^{pos}$, $CD44^{pos}$, $CD105^{pos}$, $CD45^{neg}$ and $CD133^{neg}$) and by their extensive consistent differentiation to multiple mesenchymal lineages under controlled *in vitro* conditions. Differentiation along osteogenic lineage was documented by the formation of a continuously interconnected network of alkaline phosphatase positive cells, deposition of calcium, and by expression of osteocalcin and collagen type I as marker genes. Adipocytes were identified by the accumulation of lipid vacuoles and the expression of adipocyte specific genes. Expression of collagen type II, aggrecan and the staining of proteoglycans indicated chondrogenic differentiation. pMSCs also exhibited their ability to synthesize hematopoietic cytokines and growth factors such as granulocyte colony-stimulating factor (G-CSF), leukemia inhibitory factor (LIF), and stem cell factor (SCF). Under similar induction conditions, pMSCs isolated from umbilical cord blood had the potential to

differentiate into osteocytic, adipocytic and chondrocytic lineages. In conclusion, we demonstrated the potential of pMSCs isolated from bone marrow for multilineage differentiation, which could facilitate future studies of stem cell biology and therapeutics. Additionally, pMSCs of umbilical cord blood origin can be readily expanded in culture and induced to differentiate into various mesenchymal cells.
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