The biological properties of porcine mesenchymal stromal/stem cells isolated from different tissue sources and their *in vitro* multi-lineage differentiation potential

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Mesenchymal stem cells (MSCs) have significant clinical importance due to their promising application in cell therapy for regenerative medicine and tissue engineering. The MSCs isolated from different tissue sources of porcine tend to show varied biological characteristics despite having propensity to differentiate into different lineages upon induction (specific cues). We have studied the biological characteristics and multi-lineage differentiation potential of MSCs isolated from the porcine bone marrow (BM-MSCs), adipose tissue (A-MSCs), dermal skin tissue (DS-MSCs), and endometrium (EMSCs). BM-MSCs showed higher self-renewal capacity with reduced proliferation rate. They also expressed higher OCT3/4 protein compare to other MSC types suggesting the retention of stronger stem cell-like capacity even after in vitro expansion. Further, BM-MSCs and A-MSCs are more potent immune modulators compared to DS-MSCs. The cell aging (IL6, c-Myc, TGFβ, p53 and p21) and apoptosis (Bak and Bcl2) related proteins showed a varied expression pattern among these tissue sources. All MSCs differentiated into osteocytes and adipocytes *in vitro* regardless of tissue source with varying differentiation capacity. A-MSCs displayed higher differentiation capacity to both osteocyte and adipocyte lineages compared to DS-MSCs. We have also analyzed the neuronal trans-differentiation potential of EMSCs. EMSCs exhibited distinctive dendritic morphology with axon projections and neuronal specific genes were positively expressed. Nevertheless, functional analysis of neuronal differentiated EMSCs displayed voltage-dependence and kinetics for transient outward K^+ currents (I_{to}), at holding potential of -80 mV, Na^+ currents and during current clamp, neuronal differentiated EMSCs were more negative than that of control EMSCs. Further, when MSCs were transplanted into immunodificient mice, there was no risk of teratoma was observed.

Key words: Biological properties, Multi-lineage differentiation potential, Mesenchymal stromal/stem cells, Different tissue sources

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