Isolation and characterization of mouse mesenchymal stem cells

S. Raeth¹, T. Hauk¹, G. Siegel², K. Pfizenmaier¹, A. Hausser¹

Abstract

Mesenchymal stem cells (MSC) are multipotent adult stem cells. Bone-marrow derived MSCs are able to differentiate at least into osteocytes, adipocytes and chondrocytes in vitro. Because of their multipotency and ability to migrate to sites of injury in animal models, MSC moved into the focus of regenerative medicine. The general properties of MSC are discussed controversially in literature. Therefore, a comprehensive understanding of signaling pathways involved in proliferation and differentiation is essential considering the potential use of MSC in therapy. Especially mouse MSC could be a versatile tool to investigate important factors and proteins involved in mesenchymal stem cell signaling as a variety of transgenic mouse models are available. In this study, mMSC were isolated according to Nadri and characterized with respect to proliferation and differentiation. Remarkably, cells isolated showed a long lag phase with no growth after the isolation.

Preliminary experiments suggest that oxidative stress could be involved in this quiescent phase after isolation. By characterizing different isolates from C57BL/6 mice, general characteristics concerning proliferation and differentiation were analyzed. The cell populations displayed a heterogeneous marker profile, though all isolates did not show the expression of hematopoietic markers (CD34, CD45). Surprisingly, cell isolates displayed an increased proliferation in later passages. The cell populations consisted of unipotent, bipotent and tripotent cells with the tripotent isolates being considered as mMSC according to Pittenger. The osteogenic differentiation of the cells was analyzed in more detail by measuring the level of mineralization at different time points. Taken together, the isolation of mesenchymal stromal cells from C57BL/6 mice results in a heterogeneous cell population consisting of various precursor cells.