# Isolation and characterization of multipotent mesenchymal stem cells from human scalp tissue

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## Abstract

Stem cells isolated from developing tissues can be differentiated into more than one specific cell type . The proportion of these multipotent stem cells diminishes with the maturation of the tissue. On the other hand, recent studies have shown that adult tissues contain residual tissue stem/progenitor cells capable of not only generating mature cells of their own tissue but also renewing other tissue cells. A growing body of evidence has also shown that the process of tissue repair is driven by these stem-like cells residing in different tissues. Among candidates for reparative cells are the stem cells from adult bone marrow referred to as either mesenchymal stem cells or marrow stromal cells (BM-MSCs). BM-MSCs are defined by their ability to differentiate into cells of osteogenic, chondrogenic, adipogenic, and, more or less, myogenic lineages. Besides bone marrow , the peripheral blood , the retina , the adipose tissue , and the central nervous system are known reservoirs for multipotent, mesenchymal stem cells (MSCs). The adherent, spreading morphology of MSCs is visibly distinct from hematopoietic stem cells. Our current interest is focused on identifying new sources of MSCs and characterizing their potentials for differentiating into nonmesenchymal tissues.

Recently, BM-MSCs were found to undergo neuronal differentiation when they were cocultured with brain tissue in the absence of hematopoietic stem cells . The study implied that a population of cells with neuroectodermal potential can be derived from marrow stroma, the mesodermal mesenchyme origin. Successively, several groups have reported that circulating blood is a reservoir of multipotent MSCs that can be directed into adipogenic, osteogenic, myogenic, neurogenic, hepatogenic or epithelial, endothelial, hepatogenic lineages .

In vitro characterization and maintenance of tissue stem/ progenitor cells is critical to the assessment of their potential for clinical applications. Murine skin-derived progenitors (mSKPs) obtained during developmental stages showed osteogenic, adipogenic, smooth muscle, and neuronal differentiation potentials , suggesting that they could be exploited as an alternative source for treating mesenchymal and neurodegenerative disorders. Here we describe that the human scalp tissue contains stem/progenitor cells with mesenchymal and neurogenic differentiation

potentials. We isolated the scalp-derived adherent cells (hSCPs) by both medium-selective (ms-hSCPs) and clongenic (c-hSCPs) cultures, characterized their growth kinetics, mesenchymal differentiation potentials, and expression of cell markers, and concluded their characteristics as neurogenic mesenchymal stem/progenitor cells.