

Evaluation of neural markers expression in human mesenchymal stem cells after mesengenic differentiation

Dana Foudah, Arianna Scuteri, Juliana Redondo, Giovanni Tredici, Mariarosaria Miloso

Dipartimento di Neuroscienze e Tecnologie Biomediche, Università di Milano Bicocca, via Cadore 48, 20900 Monza (MB), Italy

Introduction. Mesenchymal Stem Cells (MSCs) are adult multipotent cells able to differentiate in mesengenic (osteogenic, adipogenic, chondrogenic) and non mesengenic lineages (e.g. neural) under appropriate culture conditions. MSCs represent a very promising therapeutic approach in different settings particularly for tissue repair and regeneration. The knowledge of human MSCs (hMSCs) biological properties is very important to optimize their clinical application.

In view of MSCs application in neurodegenerative diseases, the neuronal differentiation potential of hMSCs has been also explored. Our preliminary data demonstrated that the neuronal markers beta III tubulin and NeuN were spontaneously expressed by a high percentage of undifferentiated hMSCs independently from serum presence and number of culture passages. The expression of neural markers by MSCs in absence of any differentiative agents is considered as a demonstration of MSC neural predisposition. The aim of this work was to evaluate if these markers, known to be neuronal ones, continued to be expressed also in hMSCs differentiated towards mesengenic lineages.

Methods. hMSCs were obtained after patient consensus, from iliac crest bone marrow. In according to the Mesenchymal and Tissue Stem Cell Committee of the International Society for Cellular Therapy, the isolated hMSCs were plastic-adherent, capable of extensive proliferation when maintained in standard culture conditions, lacked of hematopoietic markers expression and presented specific surface antigens. hMSCs were differentiated toward osteogenic, adipogenic and chondrogenic lineages using specific in vitro protocols. The expression of the neuronal markers beta III tubulin and NeuN were evaluated by immunofluorescence experiments at different time points depending on the differentiation protocol used. hMSCs cultured in absence of any differentiative agent represented controls.

Results. In our experiments the most of hMSCs differentiated in osteogenic and adipogenic lineages expressed the neuronal markers beta III tubulin and NeuN. Unlike, chondrogenic differentiated hMSCs didn't express these markers.

Conclusions. The finding that hMSCs differentiated into adipogenic and osteogenic lineages express neuronal markers such as beta III tubulin and NeuN raises doubts about the reliability of these markers as indicators of neuronal differentiation and suggests that their expression could be an intrinsic property of a wide range of cellular types. Further studies are necessary to understand the specific biological role of beta III tubulin and NeuN in hMSCs differentiated towards mesengenic lineages.

Keywords: human mesenchymal stem cells, neural markers, mesengenic differentiation