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RESEARCH ARTICLE

Differentiation potential of menstrual blood- versus bone marrow-stem cells into glial-like cells

Fereshteh Azedi[1], Somaieh Kazemnejad[2]*, Amir Hassan Zarnani[3,4], Gila Behzadi[1], Mohammad Vasei[5], Manijeh Khanmohammadi[2], Sayeh Khanjani[2], Haleh Edalatkhah[2] and Niknam Lakpour[2]

1 Department of Physiology, Faculty of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran
2 Reproductive Biotechnology Research Centre, Avicenna Research Institute, ACECR, Tehran, Iran
3 Nanobiotechnology Research Centre, Avicenna Research Institute, ACECR, Tehran, Iran
4 Immunology Research Centre, Iran University of Medical Sciences, Tehran, Iran
5 Department of Pathology, Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran

Abstract

Menstrual blood is easily accessible, renewable, and inexpensive source of stem cells that have been interested for cell therapy of neurodegenerative diseases. In this study, we showed conversion of menstrual blood stem cells (MenSCs) into clonogenic neurosphere- like cells (NSCs), which can be differentiated into glial-like cells. Moreover, differentiation potential of MenSCs into glial lineage was compared with bone marrow stem cells (BMSCs). Differentiation potential of individual converted NSCs derived from MenSCs or BMSCs into glial-like cells was investigated using immunofluorescence staining and real-time polymerase chain reaction.The fibroblastic morphology of both MenSCs and BMSCs was turned into NSCs shape during first step of differentiation. NSCs derived from both BMSCs and MenSCs expressed higher levels of Olig-2 and Nestin markers compared to undifferentiated cells. The expression levels of myelin basic protein (MBP) mRNA up regulated only in BMSCs-NSCs no in MenSCs-NSCs. However, outgrowth of individual NSCs derived from both MenSCs and BMSCs into glial-like cells led to significant up regulation of glial fibrillary acidic protein,Olig-2 and MBP at mRNA and protein level accompanied with down regulation of Nestin protein.This is the first study demonstrating that MenSCs can be converted to NSCs with differentiation ability into glial-like cells. Accumulative data show different expression pattern of glial markers in differentiated MenSCs compared to BMSCs. The comparable differentiation potential, more accessibility and no invasive technique for sample collection of MenSCs in comparison with BMSCs introduce MenSCs as an apt, consistent and safe alternative to BMSCs for cell therapy of neurodegenerative diseases.

Keywords: bone marrow; differentiation; glial; menstrual blood; neurosphere; stem cell

Introduction

Cell-based strategies for treating nervous system disorders with adult stem cells have created the hope that they may be used in therapy of human injury or disease. Despite intense research to translate these studies from the bench to bedside, critical problems such as low availability, invasive methods for sample collection and low proliferation capacity of well-known adult stem cell sources, including bone marrow and adipose tissue compared with embryonic stem cells limit the applicability of these cells for clinical use (Henningson et al., 2003; Edwards, 2004).

Menstrual blood has now been identified as an easily accessible and recycled stem cell source with some advantages (Czyz et al., 2003; Zhang et al., 2009; Rodrigues et al., 2011a; Lin et al., 2011; Rodrigues et al., 2012a; Allickson and Xiang, 2012): (1) the specimen is obtained by a non-invasive, safe and painless procedure; (2) the use of menstrual blood-derived stem cells (MenSCs) has fewer ethical problems compared with ESCs; (3) the limitations, such as tumor formation, karyotypic abnormalities during cell culture, and immune rejection of consequent allogenic transplantation of MenSCs are restricted; (4) the proliferation rate of MenSCs is much higher than umbilical cord- and bone marrow-derived mesenchymal stem cells (BMSCs); and (5) multipotency of these cells has been established with evidence of their transdifferentiation ability into different lineages, such as osteoblasts (Darzi et al., 2012; Karadas

Corresponding author: e-mail: kazemnejad_s@yahoo.com, s.kazemnejad@avicenna.ac.ir