THE THERAPEUTIC PROPERTIES OF HUMAN MESENCHYMAL STEM CELLS

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Adult mesenchymal stem / stromal cell (MSCs) are defined as multipotent cells which can differentiate into mesenchymal and non-mesenchymal lineages. Although extensive investigations on MSCs have been performed during the last decade, knowledge about these cells remains incomplete. Numerous subpopulations of cells with more or less MSC-like properties are grouped under the roof of MSCs increasing the complexity of the field. Therefore, comprehensive characterization of these cells is one major goal of today MSCs research.

MSCs have been isolated from various post-natal organs and tissues, including placenta, umbilical cord blood, bone marrow, adipose tissue and others in various species, especially humans. Researchers are now exploring the use of MSCs in preclinical and clinical studies for cell therapy of tissue injury regeneration, hematopoiesis and immune mediated diseases.

MSCs are excellent candidates for cell therapy because human MSC are easily accessible, the isolation of MSCs is straightforward and the cells can expand to clinical scales in relatively short periods of time. MSCs can also be cryo-preserved with minimal loss of potency and stored for future usage. Human clinical trials with MSCs thus far have shown no adverse reactions and therefore, MSCs are considered safe for cell therapy. The typical surface antigen pattern of cultured, no stimulated MSCs comprises CD73+, CD90+, CD105+ and CD14-, CD34-, CD45, CD19- and HLA-DR-.

After autologous and allogeneic stem cell transplantation dysfunction of hematopoiesis is a common phenomenon caused by multiple factors, this prolonged pancytopenia in cases non-responding to hematopoietic growth factors is a major life threatening condition.

The PLX cells are mesenchymal-like adherent stromal cells derived from full term placenta. The cells are expanded in a bioreactor system, which provides a three dimensional microenvironment that enables full control over the manufacturing process, large-scale growth of these cells and batch to batch consistency. Recently we treated three patients (two allogeneic and one autologous) how suffered from severe and long standing pancytopenia with associated complications on a compassionated basis with intra-muscular (IM) injections of PLX for the enhancement of their hematopoiesis. No local or systemic side effects were observed. All patients responded after the treatment with improvement of tri-linage hematopoiesis and impressive clinical improvement that enable discharge from hospitalization.

MSCs posses the potential for multi linage differentiation. This ability was used successfully for the first to correct ineffective hematopoiesis. Future clinical trials are needed for further investigation of the potential of MSCs in the treatment of chemo/radio therapy related bone marrow failure, autoimmune diseases and regenerative medicine.