Stem cell

see also Stem cell therapy.

Stem cells are characterized by their capability to differentiate into multiple cell types via exogenous stimuli from their environment.

Stem cells have been considered as possible therapeutic vehicles for different health related problems such as cardiovascular and neurodegenerative diseases and cancer. Secreted molecules are key mediators in cell-cell interactions and influence the cross talk with the surrounding tissues. There is strong evidence supporting that crucial cellular functions such as proliferation, differentiation, communication and migration are strictly regulated from the cell secretome. The investigation of stem cell secretome is accumulating continuously increasing interest given the potential use of these cells in regenerative medicine.

Stem cells are undifferentiated biological cells that can differentiate into specialized cells and can divide (through mitosis) to produce more stem cells. They are found in multicellular organisms. In mammals, there are two broad types of stem cells: embryonic stem cells, which are isolated from the inner cell mass of blastocysts, and adult stem cells, which are found in various tissues. In adult organisms, stem cells and progenitor cells act as a repair system for the body, replenishing adult tissues. In a developing embryo, stem cells can differentiate into all the specialized cells—ectoderm, endoderm and mesoderm (see pluripotent stem cells)—but also maintain the normal turnover of regenerative organs, such as blood, skin, or intestinal tissues.

Stem cell theory

Stem cell theory

Types

Adipose-derived stem cell

Mesenchymal stem cell

Neural stem cell

Cancer stem cell

Glioblastoma stem cell

Glioma stem cell

Human-induced pluripotent stem cell

—-

Sources

Accumulating evidence has demonstrated that menstrual blood stands as a viable source of stem cells. Menstrual blood-derived stem cells (MenSCs) are morphologically and functionally similar to cells directly extracted from the endometrium, and present dual expression of mesenchymal and embryonic cell markers, thus becoming interesting tools for regenerative medicine. Functional reports show higher proliferative and self-renewal capacities than bone marrow-derived stem cells, as well as successful differentiation into hepatocyte-like cells, glial-like cells, endometrial stroma-like cells, among others. Moreover, menstrual blood stem cells may be used with increased efficiency in reprogramming techniques for induced Pluripotent Stem cell (iPS) generation. Experimental studies have shown successful treatment of stroke, colitis, limb ischemia, coronary disease, Duchenne's muscular atrophy and streptozotocin-induced type 1 diabetes animal models with MenSCs. As we envision an off-the-shelf product for cell therapy, cryopreserved MenSCs appear as a feasible clinical product. Clinical applications, although still very limited, have great potential and ongoing studies should be disclosed in the near future [1].

Transplantation

Stem cell transplantation.

1)
Rodrigues MC, Lippert T, Nguyen H, Kaelber S, Sanberg PR, Borlongan CV. Menstrual Blood-Derived Stem Cells: In Vitro and In Vivo Characterization of Functional Effects. Adv Exp Med Biol. 2016;951:111-121. PubMed PMID: 27837558.