

## Stem cell therapy.

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### Editorial

What are stem cells? Stem cells are no differentiated cells that have the ability of proliferation, regeneration, conversion to differentiated cells and tissue production. Regeneration means that these cells have the ability of asymmetric division which one of the resulting cells remains as stem cell while another cell, which is called daughter cell, becomes one cell of germ layer. Stem cells may remain inactive for a long time till they enter cell division again [1,2].

For the first time in 1981, researchers could isolate stem cells from mouse embryos. More accurate studies on the biology of mouse stem cells led to discovery of methods for separation of stem cells from the human embryo in 1998 [3-5]. Stem cells are divided into two groups: embryonic and adult stem cells. Embryonic stem cells are derived from zygote cell which is fertilized in vitro and usually is 4-5-day embryo that is in the form of a hollow ball called blastocyst. Blastocyst is composed of three parts: the trophoblast layer that is surrounding blastocyst, a hollow cavity inside the blastocyst and inner cell mass that changes to embryo. Since zygote cells can differentiate into placenta and fetal cells, sometimes they are considered as the only true totipotent stem cells. Because the inner cell mass of the blastocyst does not have the ability to differentiate into placenta cells, it is called the pluripotent cell. Non-differentiated cells other than embryonic stem cells can be found in differentiated cells of specific tissues after birth. These cells are called adult or non-embryonic stem cells but more accurate word for them is "somatic stem cells" because these cells also exist in children and umbilical cord. They are divided into two main categories: hematopoietic stem cells that can differentiate into blood cells and mesenchymal stem cells that are less differentiated. Nose, muscle, liver, skin, brain, retina and limbus of the eye are the other sources of adult stem cells. One of the most important advantages of adult stem cells over embryonic stem cells is because of the fact that they can be obtained without the need for destruction of embryo [6,7].

The pluripotent stem cell differentiates into the multipotent cell of 3 different germ layers (ectoderm, mesoderm and endoderm layer). The multipotent cell differentiates into unipotent cell of a specific cell lineage within its germ layer [8]. If differentiation process is successful, the resulting cells will be called as progenitor cells or stem cell-like cells that have the capability of regeneration [6]. Stem cell therapy has been evaluated in various blood diseases (such as lymphoblastic leukemia, myeloid leukemia, thalassemia, multiple myeloma, cell cycle anemia).

Stem cell therapy has been also evaluated in treatment of Parkinson's disease [9], Amyotrophic lateral sclerosis

[10], Alzheimer [11], Stroke [12], Spinal Cord Injury [13], Multiple Sclerosis [14], Radiation Induced Intestinal Injury [15], Inflammatory Bowel Disease [16], Liver Disease [17], Duchenne Muscular Dystrophy [18], Diabetes [19], Heart Disease [20], Bone Disease [21], Renal Disease [22], Chronic Wounds [23], Graft-Versus-Host Disease [24], Sepsis [25] and Respiratory diseases [26].

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