JNPE, June 2016, Volume 2, Issue 2, pp. 31 – 34 ISSN No. 2395-1974

Review Article

Stem Cells

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Abstract

Stem cells are the cells that develop into the specific cells that made up into the different kind of tissues in the human body. They have the ability to renew by themselves with the help of mitotic cell division and can differentiating into a different type of specialized cell. They are essential to the cell growth and development, cell maintenance, and repair of body tissues like brains, bones, muscles, nerves, blood, skin, and other organs. Stem cells are found in all human beings, from the early stage of development to the end of human life. The Stem cells are cells with have the potentiality to develop into much different kind of cells in the human body. They serve as a repair system for the human body**.**

Keywords: mitotic cell division, stem cells, specialized cells

Introduction to Stem Cells

The Stem cells are special biological cells that can changes into other kind of cells and can divide and produce more number of the same kind of stem cells. They are identified in all multicellular organisms.[1]

The stem cell have two properties as

1. ***Self-replication:*** it is the ability of the stem cells that can go through the no of cycles of cell division when maintaining the undifferentiated state.

2.Potency: It is the ability of the stem cells to change into the specialized uniform cell types. This requires that the stem cells can be have either totipotent or pluripotent type.

It is to be able to rise to any mature cell types, and the multipotent or unipotent progenitor cells are referred to as stem cells[1]. The stem cell function is regulated in a manner of feedback mechanism.

The Pluripotent and embryonic stem cells develop as the inner cell mass cells within a blastocyst. These stem cells can any kind kind of tissue in human body, except as in placenta. The stem cells from early stage of the embryo, known as the morula. They are totipotent in nature and able to become or develop to the all the tissues in the body and the extraembryonic placenta[2].

Different types of Stem Cells

Embryonic Stem Cells

The Embryonic stem (ES) cells are the cells of the inner cell mass of a blastocyst, an early-stage embryo. The Human embryos develop to the blastocyst stage at 4–5 days of post fertilization, at this time they consist of 50–150 cells. The Embryonic stem (ES) cells are the pluripotent type cells and change during development of the three primary germ layers: as **ectoderm layer, endoderm and mesoderm layer.**

They can develop into more number of stem cells more than 200 cell types of the adult body when given as sufficient and necessary stimulation for a certain cell type but they do not contribute to the extra-embryonic membranes or the placental celll

FETAL STEM CELLS

They are the primitive type stem cells and located in the organs of fetuses are known as the fetal stem cells.

There are two types of fetal stem cells:

- The Fetal stem cells come from the tissue of the fetus and are generally collected after occurrence of the abortion. These kind of stem cells are not immortal but have a high level of cell division and are multi potent type cells.
- The Extra embryonic fetal stem cells comes from the extra embryonic membranes, and are generally not identified from the ` adult stem cells. These stem cells collected after the birth and they are not immortal but have a high level of cell division, and are pluri potent type cells[4].

Amniotic Stem Cells

- They are the Multi potent stem cells are found in amniotic fluid. The amniotic stem cells are usually collected from the amniotic sac by amniocentesis procedure which can perform without harming the embryos.
- The Human amniotic fluid cells are used in a diagnostic tool purpose and for the prenatal diagnosis of fetal genetic anomalies. Research suggests that they can also collect for a therapeutic potential for treating human diseases, as different populations of fetal-derived stem cells are isolated from amniotic fluid[5].

Epithelial Stem Cells

- The epidermis of the skin contains layers of cells called keratinocytes. Only the basal layer, next to the dermis, contains cells that divide as the number of stem cells
- The keratinocytes slowly move outward through the epidermis as they mature, and they eventually die and are sloughed off at the surface of the skin.
- The epithelium of the small intestine forms projections called villi, which are interspersed with small pits called crypts.
- The Cells are continuously develop in the crypts and migrate onto the villi, and are frequently shed into the lumen of the intestine.
- The cells are migrate and they differentiate into the different cell types of the intestinal epithelium[6].

Hematopoietic Stem Cells

- The Bone marrow contains the cells called hematopoietic stem cells, which are generate to all the cell types of the blood and the immune system.
- The Hematopoietic stem cells are also identified in small numbers in peripheral blood and in larger numbers in umbilical cord blood.
- In bone marrow, hematopoietic stem cells are anchored to osteoblasts of the trabecular bone and to blood vessels.
- They generate progeny that can become lymphocytes, granulocytes, red blood cells, and certain other cell types, depending on the balance of growth factors in their immediate environment[7].

The Neural Stem Cells

- Research identified that there are also stem cells in the brain.
- In mammals very few new neurons are formed after birth, but some neurons in the olfactory bulbs and in the hippocampus are continually being formed.
- These neurons comes from the neural stem cells, This type of stem cell is being studied for use in cell therapy to treat Parkinson disease and other forms of neurodegeneration or traumatic damage to the central nervous system.

The Dental Pulp Stem Cells

- The Dental pulp stem cells are present in the dental pulp area, they are the soft living tissue within the teeth.
- They are multipotent cells, so they have the potential to differentiate into a variety of cell types.
- The Other sources of dental stem cells are the dental follicles and they developed in periodontal ligament.

Advantages

- ✓ The Stem cell treatments may lower symptoms of the disease conditions that is being treated with stem cells.

- ✓ The reducing of the symptoms may allow patients to reduce the drug intake of the disease conditions.
- ✓ The Stem cell treatment may also provide knowledge for society to further stem cell understanding and future treatments.

Disadvantages

- ➢ The Stem cell treatments may require immune suppression because of a requirement for radiation before the organ transplantation to remove the person's previous cells, or because the patient's immune system may target the stem cells.
- ➢ The One approach to avoid the second possibility is to use stem cells from the same patient who is being treated.
- ➢ The Pluripotency cells in certain stem cells could also make it difficult to obtain a specific cell type.
- ➢ It is also difficult to obtain the exact cell type needed, because not all cells in a population differentiate uniformly.
- ➢ The Undifferentiated stem cells can create tissues other than desired types.
- ➢ The Some stem cells can form tumors after transplantation;
- ➢ The Pluri potency is linked to tumor formation especially in embryonic stem cells, fetal proper stem cells, and induced pluri potent stem cells.
- ➢ Fetal proper stem cells form tumors despite multi potency[8].

Donating or Harvesting Stem Cells

The human beings can donate and store stem cells to help their relations, or possibly for their own use in the future purpose.

Sources of stem cell donations:

- ***The Bone marrow***: These cells are collected under a general anesthetic procedure and usually from the hip or pelvic bone. The technicians will isolate the stem cells from the bone marrow for storage or donation and to help the needy one.
- ***The Peripheral stem cells:*** A person receives several injections that cause their bone marrow to release stem cells into the blood after that blood is removed from the body and the machine separates out the stem cells, and doctors' return the blood to the human body.
- ***The Umbilical cord blood***: this type Stem cells can be collected from the umbilical cord after delivery of the baby, with no harm to the baby and some people donate the cord blood, and others store it.
- This method of collection of stem cells can be high expensive, but the advantages for future needs[9] .

Treatment

- By using stem cell management we can treat different type of Diseases and conditions where stem cell treatment is being investigated .

Conclusion

Due to advancing health problems the people should aware regarding stem cell management techniques and how to banking and accessing the stem cells for future generation.

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