

DEFINATION & CHARACTERSTICS OF STEM CELL

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Stem cells are defined as cells that have clonogenic and self-renewing capabilities and differentiate into multiple cell lineages. Stem cells are found in all of us, from the early stages of human development to the end of life. Stem cells are basic cells of all multicellular organisms having the potency to differentiate into wide range of adult cells.

Stem cells are unspecialized cells that develop into the specialized cells that make up the different types of tissue in the human body. They are characterized by the ability to renew themselves through mitotic cell division and differentiating into a diverse range of specialized cell types. They are vital to the development, growth, maintenance, and repair of our brains, bones, muscles, nerves, blood, skin, and other organs .Stem cells are found in all of us, from the early stages of human development to the end of life. Stem cell research holds tremendous promise for the development of novel therapies for many serious diseases and injuries. While stem cellbased treatments have been established as a clinical standard of care for some conditions, such as hematopoietic stem cell transplants for leukemia and epithelial stem cell-based treatments for burns and corneal disorders, the scope of potential stem cell-based

therapies has expanded in recent years due to advances in stem cell research. It has been only recently that scientists have understood stem cells well enough to consider the possibilities of growing them outside the body for long periods of time.

CHARACTERISTICS

1. They are unspecialized.
2. They are capable of continuous self renewal.
3. They can give rise to specialized cell types.
4. Stem cells can divide either symmetrically (allowing the increase of stem cell number) or asymmetrically. Asymmetric divisions keep the number of stem cells unaltered and are responsible for the generation of cells with different properties.

[5] These cells can either multiply (progenitors or transit amplifying cells) or be committed to terminal differentiation. Progenitors and transit amplifying cells have a limited lifespan and therefore can only reconstitute a tissue for a short period of time when transplanted. In contrast, stem cells are self-renewing and thus can generate any tissue for a lifetime. This is a key property for a successful therapy and use in Regenerative medicine.

[6] Fig. 01 shows the process of stem cell division and differentiation where A is the Stem cell, B is the Progenitor cell and C is the Differentiated cell. First symmetric division gives rise to two stem cells,

second asymmetric division forms one stem and one progenitor cell, third progenitor division gives rise to progenitor cells while the fourth is the terminal differentiation.

Process of Stem Cell Division

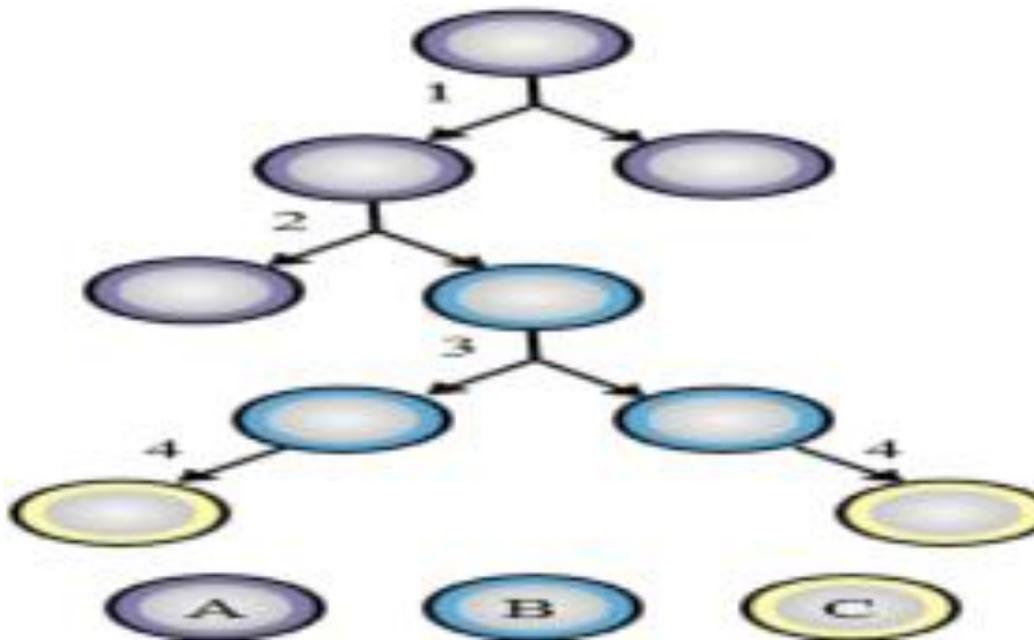


Fig. 01 : (A: Stem cell; B: Progenitor cell; C: Differentiated cell
.1:Symmetric division-give rise to two stem cells ; 2:Asymmetric division- forms one stem and one progenitor cell ; 3:Progenitor division: gives rise to progenitor cells ; 4:Terminal differentiation)

5. Adult stem cells are believed to reside in a specific area of each tissue, i.e., a “stem cell niche”. Many types of adult stem cells reside in several mesenchymal tissues, and these cells are collectively referred to as mesenchymal stem cells or multipotent mesenchymal stromal cells (MSCs).