STEM CELLS AND THEIR TYPES

INTRODUCTION

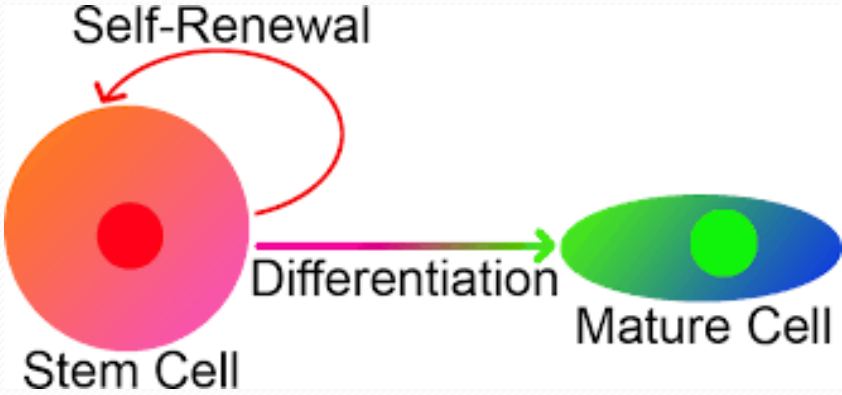
- Stem cells are undifferentiated cells found in the human body that has the potential to develop into many different cell types that carry out different functions.
- Most cells in the human body are differentiated , that means they are built to function in a particular organ system and carry out a specific function.
- A red blood cell for example is designed to carry oxygen , while a white blood cell is designed to fight off disease.
- These differentiated cells result from the process of cell division , a process that begins with undifferentiated stem cells.

CHRACTERISTIC OF STEM CELLS

1 Self- renewal

2 Differentiation

First , they are unspecialized cells that renew themselves for long periods through cell division. For example, when bodies need more white blood cells to fight off an infection , our blood stem cells self-renew to make more blood stem cells that can then differentiate into specialized white blood cells.



- The second is the stem cells can give rise to specialized cells .
- When unspecialized stem cells give rise to specialized cells , the process is called differentiation.
- For example a blood stem cell is considered a stem cells because it has the ability to differentiate into all the specialized cell types of the blood cell lineage including red blood cells , white blood cells and platelets.

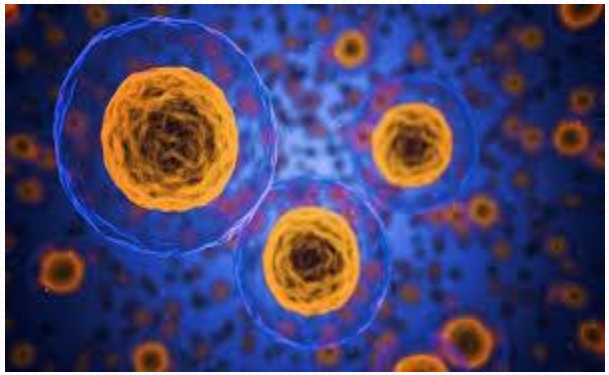
TYPES OF STEM CELLS

- ON THE BASIS OF THEIR SOURCE -Embryonic stem cells derived from blastocyst and Adult stem cells which are found in adult tissue.

- ON THE BASIS OF THEIR POTENCY- Totipotent , Pleuripotent , Multipotent , Oligipotent and Unipotent.

EMBRYONIC STEM CELLS

- These cells are also known as early stem cells.
- Embryonic stem cells are derived from embryos at a devlopmental stage before the time of implantation would normally occur in the uterus.
- Embryonic stem cells can give rise to cells from all three embryonic germ layers eg ectoderm , mesoderm , endoderm ,even after being grown in a culture for a long time.



ADULT STEM CELLS

- An adult stem cell is an undifferentiated cells found among differntiated cells in a tissue or organ , can renew itself and can differentiate to yield the major specialized cell types of the tissue or the organ.
- The primary roles of adult stem cells in the living organism are to maintain and repair the tissue in which they are formed.
- Hematopoietic stem cells give rise to all type of blood cells(red blood cells , B lymphocytes ,T lymphocytes , natural killer cells , neutrophils , basophils , eosinophils , monocytes , macrophages and platlets)

TOTIPOTENT STEM CELLS

They are produced from the fusion of an egg and a sperm cells . Cell produced by the first few divisons of the fertilized egg are also totipotent.

They can give rise to all cell types of an organism , including extra embryonic cells.

An example of totipotent stem cell is the fetilized egg of mammalian embryo .

PLEURIPOTENT STEM CELLS

- They are descendents of totipotent cells and can differentiates into cells drived from three germ layers.
- Pleuripotent stem cells have the potential to differntiate into all cells of the embryo proper , but not cells of extraembryonic support tissue.
- During embryonic devlopment pleuripotent stem cells form the inner cell mass of the blastocyst. When inner cells mass are removed from the blastocyst and cultured in a dish , these cells can continously divide and still maintain their potential to differntiates into all cell types of the body

MULTIPOTENT STEM CELLS

These stem cells can self renew and differentiate into a specific range of cell types.

Example-Mesenchymal stem cells can differntiate into osteoblasts (type of bone cells), myocytes (muscle cells) , adipocytes (fat cells) and chondrocytes(cartilage cells).

OLIGOPOTENT STEM CELLS

- They can only self-renew and differentiate into closely related cell types.
- Example- Hematopoietic stem cells(a blood stem cells can differentiate into all cells of the blood system including the oxygen carrying red blood cells , the white blood cells of the immune system and platelets but not cells of nervous system)

UNIPOTENT STEM CELLS

- They can produce only one cell type but have the property of self renewal which distinguishes them from non stem cells .

- Example-cardiac stem cells , muscle stem cells.

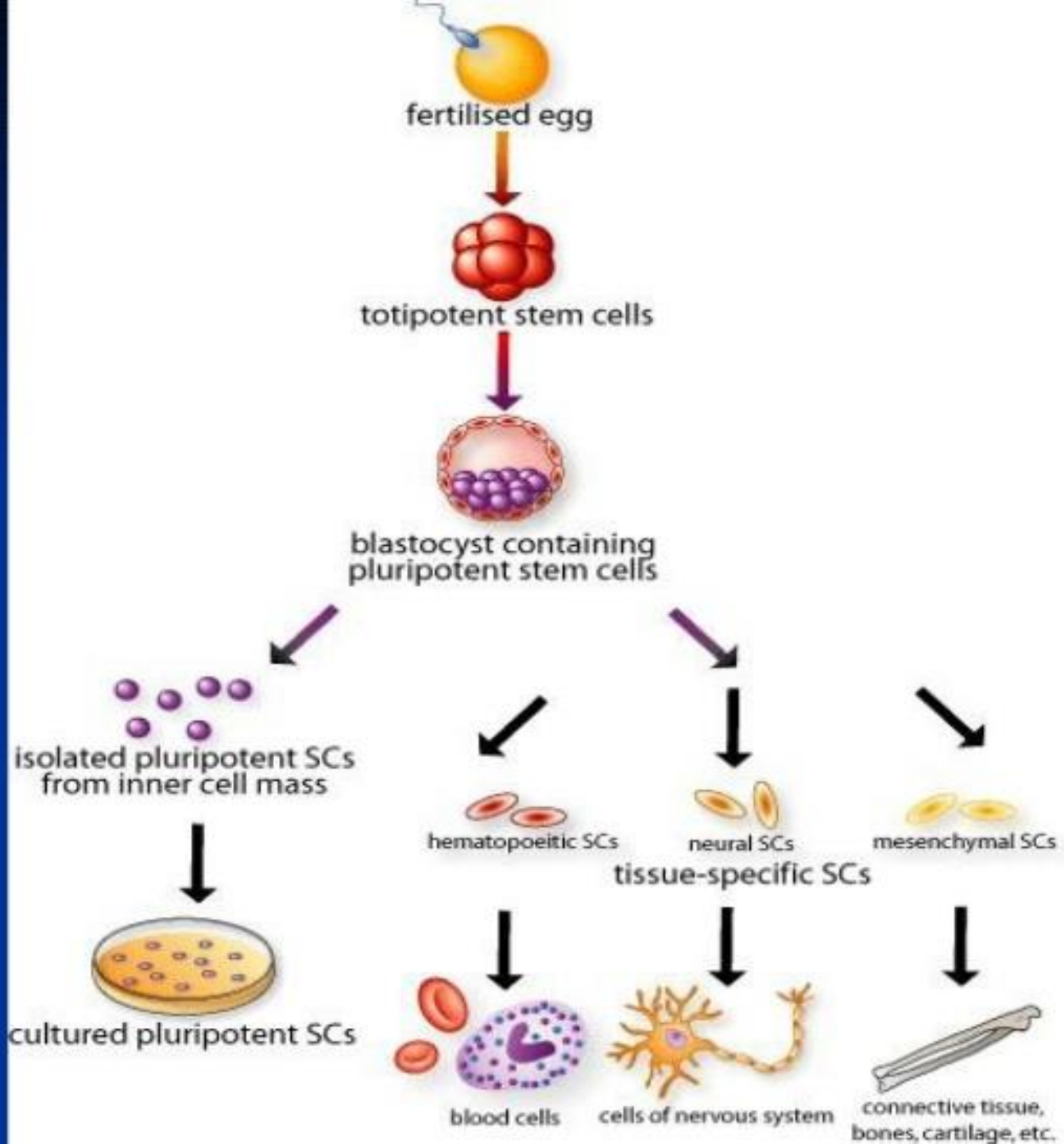
Embryonic Stem cells

Totipotent

Pluripotent

Multipotent

Unipotent



THANK YOU