

1.Somatic/Germline Stem cells

Stem Cells

Unspecialised cells that:

1. Reproduce themselves to produce more stem cells and remain undifferentiated.
2. Differentiate into specialised cells.

Somatic cells

Cells in the body that are not involved in reproduction (e.g. muscle, skin, bone, blood etc).

They have two sets of chromosomes (**diploid** cells).

Somatic stem cells divide by mitosis to form more somatic cells.

Germline cells

Haploid gametes (sperm and ova) & stem cells that divide to form gametes.

Germline stem cells can divide by:

1. MITOSIS

To produce more germline stem cell to maintain the diploid chromosome number.

Diploid cells have 23 pairs of homologous chromosomes (46 single chromosomes).

2. MEIOSIS

To produce haploid gametes. The nucleus undergoes two divisions.

First division: separates homologous chromosomes (diploid to two haploid cells).

Second division: separates chromatids to produce more haploid gametes.

Haploid gametes contain 23 single chromosomes.

1. Stem Cells

Cell differentiation

The process by which a cell expresses certain genes to produce specific proteins characteristic for that type of cell.

This allows a cell to carry out specialised functions. This saves ATP/resources.

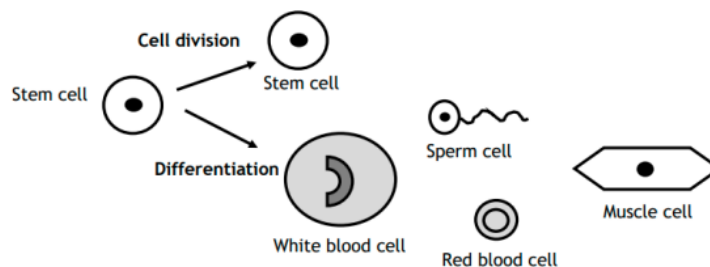
Types of Stem Cells

1. Embryonic Stem Cells

Cells in the very early embryo can differentiate into all the cell types that make up the individual

All the genes in embryonic stem cells can be switched on so these cells can differentiate into any type of cell aka pluripotent.

Pluripotent Embryonic Stem Cells



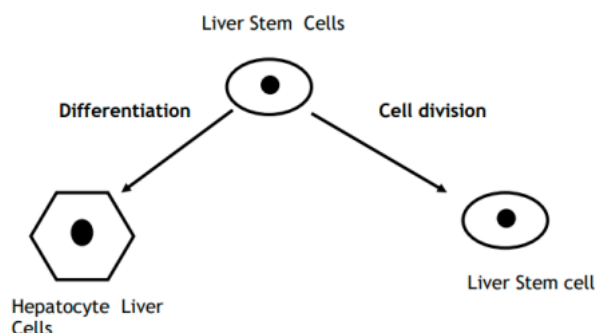
2. Tissue stem cells

Involved in the growth, repair and renewal of the cells found in one tissue and so are called multipotent.

Example 1: Blood stem cells in bone marrow can give rise to ONLY a few types of blood cells.

Example 2: Liver Stem Cells produce only 1 type (liver hepatocytes)

Multipotent Liver Stem Cells



1. Therapeutic/Research uses & Cancer Cells

Research Uses of Stem Cells

1. Provide information of cell growth/cell differentiation
2. Model cells for studying how diseases develop.
3. Model cells for drug testing

Therapeutic Uses of Stem Cells

Involve the repair of damaged/ diseased organ or tissues.

1. Corneal Repair
2. Regeneration of damaged skin

Ethics surrounding Embryonic Stem Cell

Embryonic stem cells can self renew under right conditions in the lab and be used as a potential therapeutic use of stem cells.

Advantage

Offer effective treatment for disease/injury.

Disadvantage

Involves destruction of the embryo.

Cancer Cells

Divide excessively as they fail to respond to **regulatory signals**.

This results in a mass of abnormal cells called a tumour.

If tumour cells fail to attach to each other they can **spread throughout the body** causing a secondary tumour.

Tumour forms (mass of abnormal cells)

