Unit 1 DNA & the Genome

Key Area 4 : Cellular Differentiation

Cellular Differentiation is the process by which a cell **expresses certain genes** to produce **PROTEINS** characteristic for that type of cell. This allows a cell to carry out specialised functions.

STEM CELLS

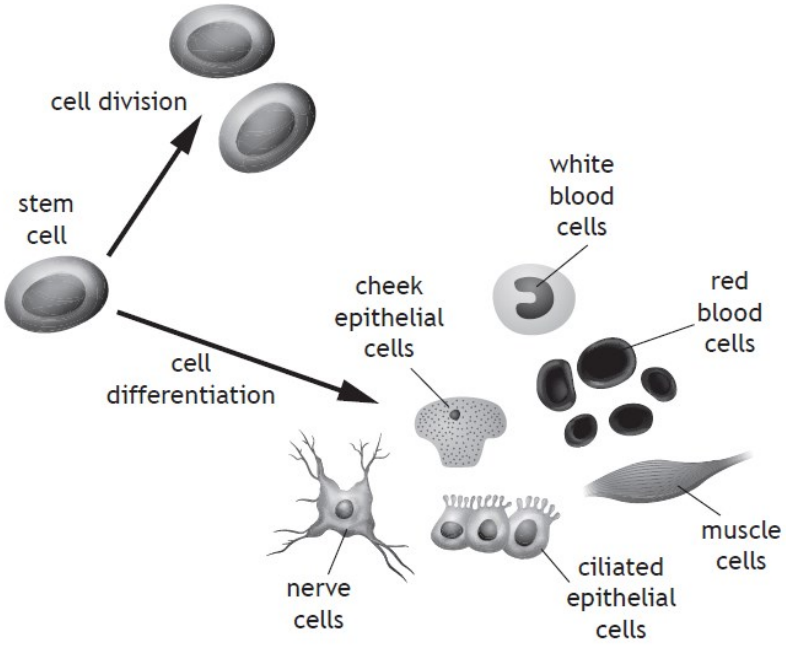
Stem cells are **UNSPECIALISED CELLS** in animals that can **divide (SELF-RENEW)** and/or **Differentiate.**

There are 2 Types of Stem Cells : **Embryonic and Tissue**

EMBRYONIC STEM CELLS

EMBRYONIC stems cells can differentiate into **ALL THE CELL TYPES** that make up the organism and so are **PLURIPOTENT.**

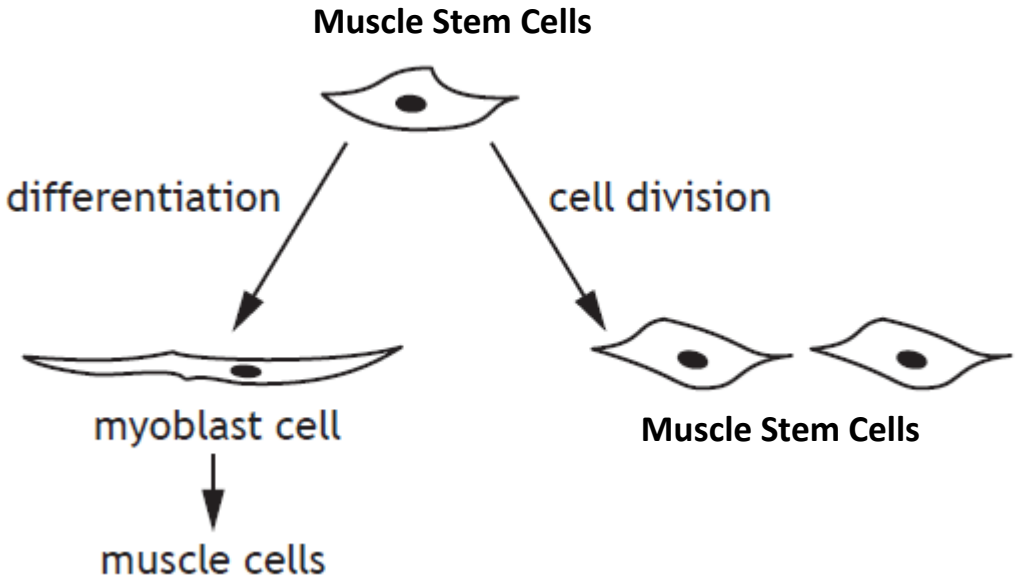
Example



All the genes in embryonic stem cells can be **switched on** so these cells can differentiate into **ANY TYPE OF CELL.**

TISSUE STEM CELLS

TISSUE stem cells are involved in the **GROWTH, REPAIR** and **RENEWAL** of the cells found in that tissue. They are **MULTIPOTENT** because they can differentiate into all of the types of cell found in a particular tissue type.



THERAPEUTIC AND RESEARCH USES OF STEM CELLS

Therapeutic uses of stem cells involve the **repair of damaged or diseased organs or tissues**.

Stem cells from the embryo can self-renew, under the right conditions in the lab.

Examples :

Stem cells can be used to repair damaged CORNEA in the eye.

Stem cells can be used to regenerate SKIN tissue for BURNS VICTIMS.

Research uses of stem cells involves them being used as **model cells** to **study how diseases develop** or being used for **drug testing**.

Stem cell research provides information on how **cell processes** such as **cell growth**, **differentiation** and **gene regulation** work.

ETHICAL ISSUES

Use of EMBRYONIC stem cells can offer effective treatments for disease and injury, however, it involves **destruction of embryos** and therefore the **destruction of a potential life**.

MERISTEMS

Meristems are regions of **unspecialised cells in plants** that can **divide (self-renew) and/or differentiate.**

Apical meristems are found in the **Root Tip & Shoot Tip.** These give rise to increase in length/height.

Lateral meristems, also known as **Cambium,** are found in vascular bundles between the Xylem & Phloem**.** These give rise to **Thickening** of the plant.