Chapter 8 - Cell Diversity

Learning objectives

- To define the term 'tissue' and give examples of two plant tissues and two animal tissues
- To explain tissue culture and state two ways in which it can be used
- To define the term 'organ' and give an example of one plant organ and one animal organ
- To define the term 'organ system' and give examples of two organ systems in animals.

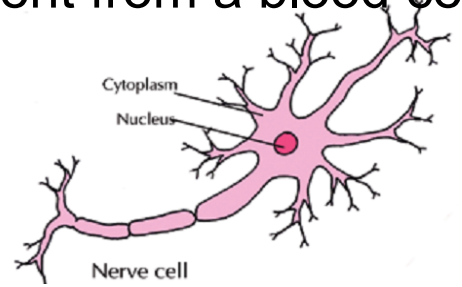
Future?

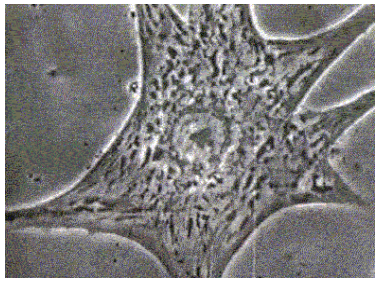
Chapter 8 - Cell Diversity

Cells, Tissues, Organs and Systems

Cells have different shapes because they have different jobs to do.
A nerve cell is very different from a blood cell for example.


Red blood cell





A **tissue** is a group of similar cells with the same function. e.g. muscle.

An **organ** is a group of different tissues working together, e.g. the heart.

A **system** is a group of organs working together, e.g. the circulatory system.

Cells → Tissues → Organs → System → Organism

Plant Tissues

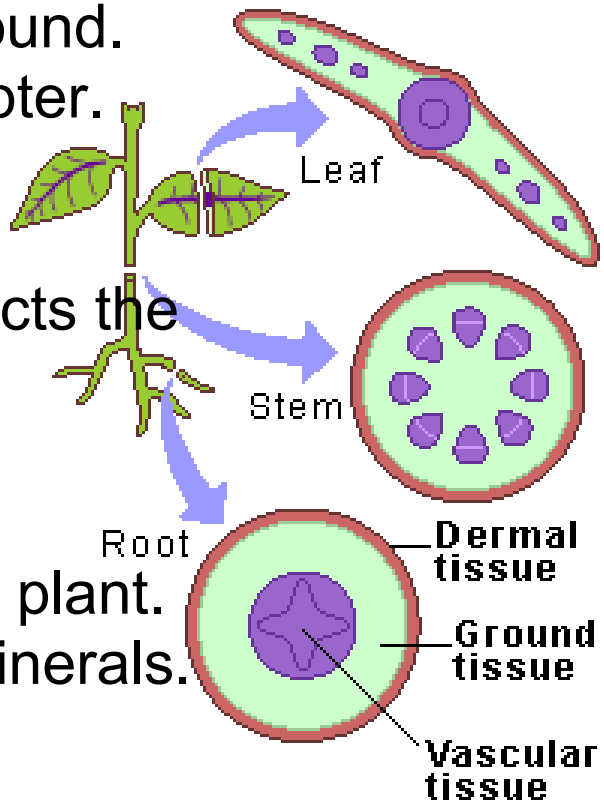
There are 4 main types of plant tissue.
Dermal, Vascular, Meristematic and Ground.
We need to know two types for this chapter.

Dermal tissue

A layer of cells that surrounds and protects the plant, e.g. epidermis

Vascular tissue

This transports materials throughout the plant.
Xylem transports water and dissolved minerals.
Phloem transports food.



Transport in Plants

Xylem - carries water and dissolved minerals from root to leaf.

Xylem is made of 'straws' that can let water move through them. The water moves in a stream from the roots, up through the plant into the leaves and out of tiny holes under the leaves called 'stomata'.
This movement of water is called the '**transpiration stream**'.

Transpiration - is the loss of water vapour from the surface of a plant.

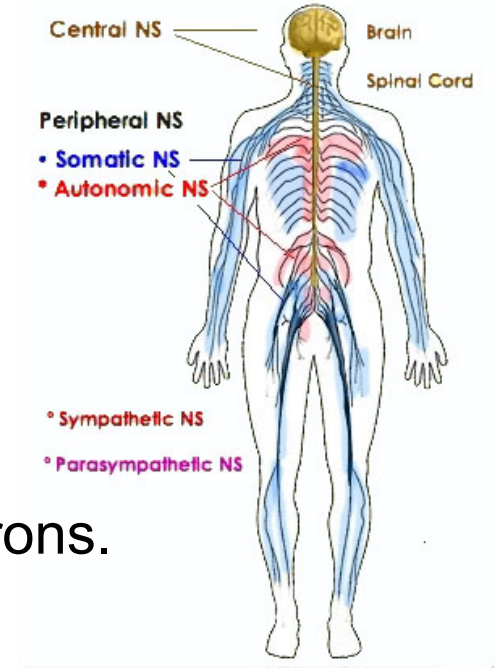
Phloem - carries food from the leaves to all other parts of the plant.

Animal Tissues

There are 4 main types of animal tissue.
Epithelial, Connective, Muscular and Nervous Tissue.
We need to know two types for this chapter.

Connective tissue

Cells are spread out in a matrix (glue) by the connective tissue. Examples of tissues are cartilage, bone, blood and adipose tissue.



Nervous tissue

This tissue is made of nerve cells called neurons. These carry messages to and from the brain and spinal cord.

Tissue Culture

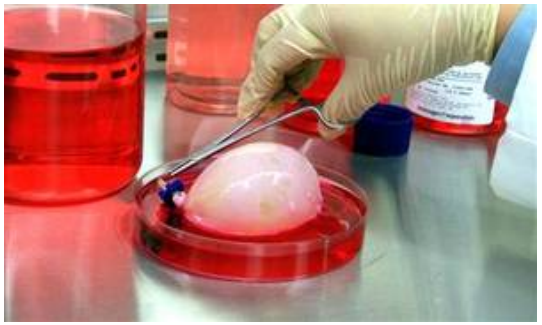
This is the growth of tissues on an artificial medium outside an organism.

The growth of cells/tissues outside the organism is called **in-vitro** growth.

Steps

A sample of tissue is removed from a plant or animal.
The tissue is grown in glassware or a bioreactor with suitable food (nutrient medium).
Wastes are removed and other conditions are carefully controlled.

What other factors would have to be controlled?

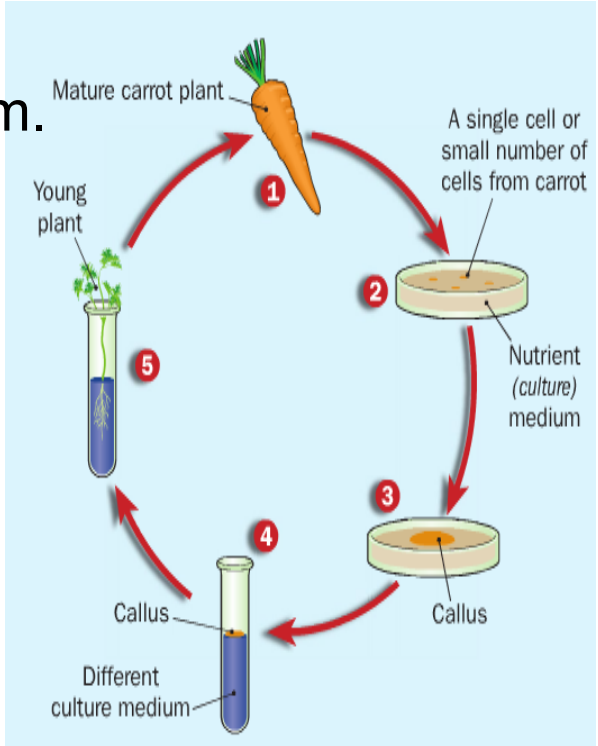


Applications of tissue culture

Plant Breeding

Micropropagation is the growth of large numbers of plants from very small pieces of tissue or cells.

1. The cells are taken from the carrot.
2. The cells are grown on a suitable medium.
3. A 'callus' of cells grows.
4. The callus is put in a different medium.
5. The callus grows into a young plant.
6. The young carrot plant can be put in soil.

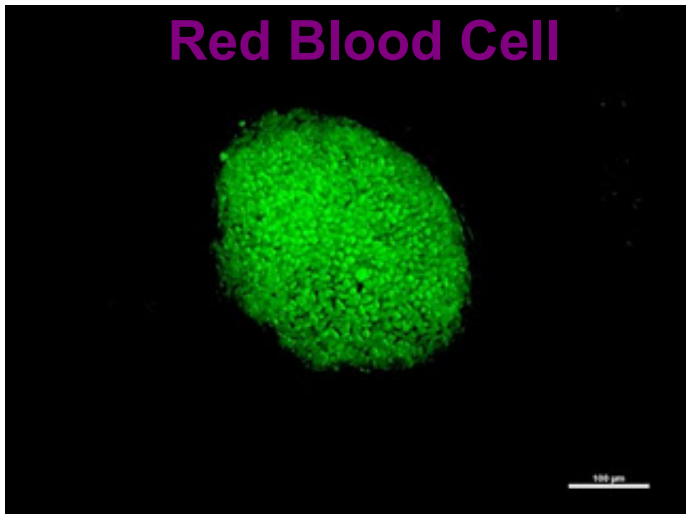


Benefits

A large number of plants can be grown.
All will be genetically identical (clones).
Cheap way to grow a product.

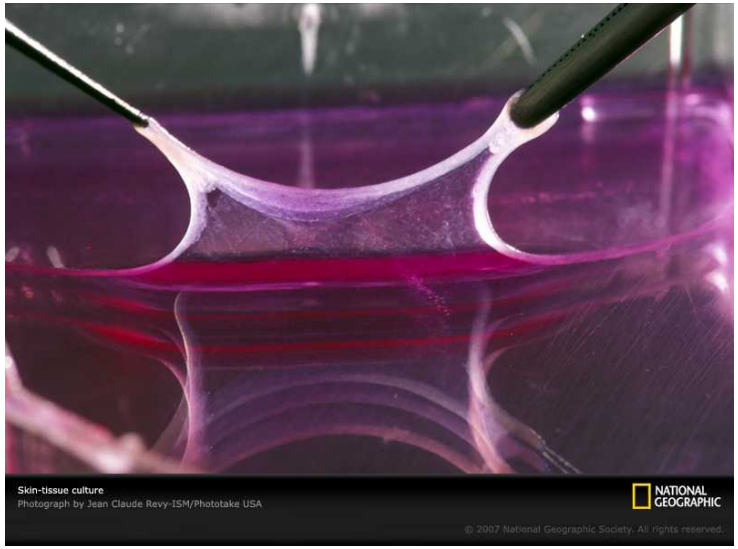
Cancer Research

Antibodies are proteins that attach to an antigen.
Our immune system makes antibodies that find and attach to antigens
Antigens are labels on the outside of cancer cells.
It is now possible to produce antibodies in the lab that will attach to cancer cells.
These are called Monoclonal antibodies or MAB's.
These can be genetically altered to change colour or glow when they find a cancer cell.



Skin Grafts

Tissue culture can be used to grow new skin.
We take a sample of someone's skin and then we grow the cells in a petri dish with the correct nutrients.
When the skin grows bigger we can give it to the person and graft it on over a scar or damaged skin.
Their body won't reject it as it is their own skin.



Organs

An organ is a structure composed of a number of tissues that work together to carry out one or more functions

Plant Organ - A leaf

1. Dermal tissue is found in epidermis
2. Vascular tissue is found as xylem and phloem
3. Ground tissue is the other cell types.

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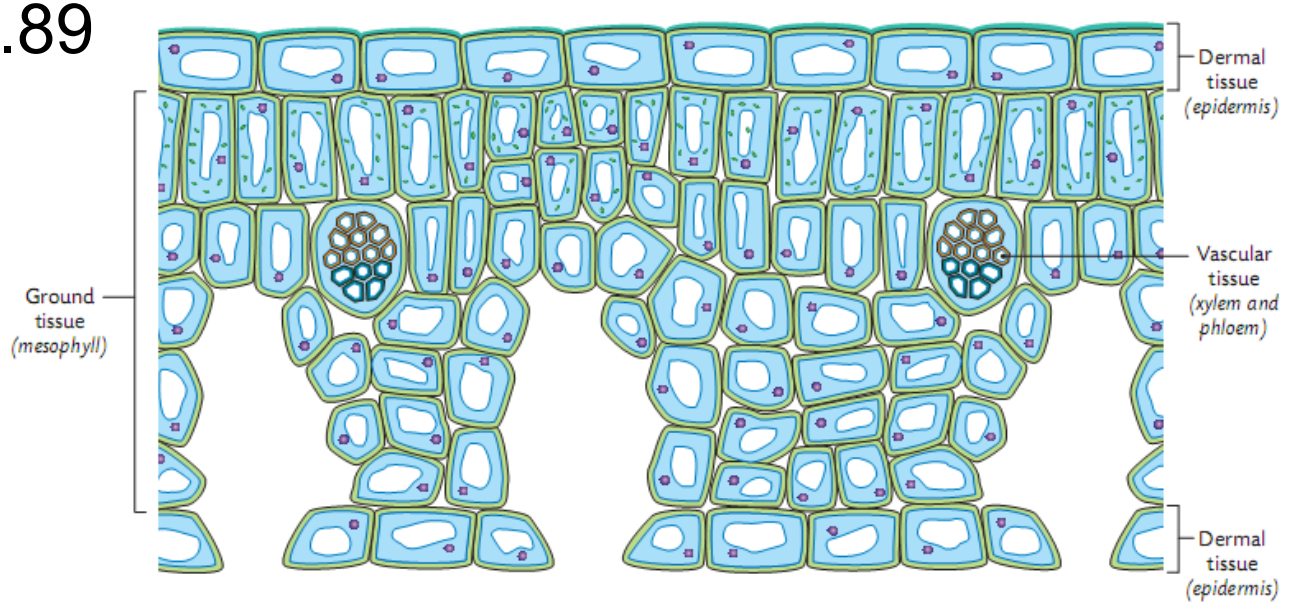
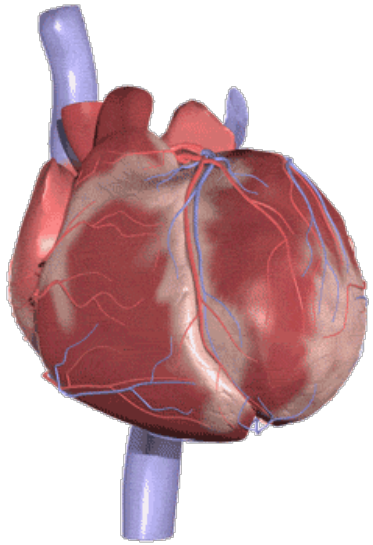


Animal Organ - A heart

The Heart is an animal organ and pumps blood.
It has 4 types of tissue,



1. **The walls are made of cardiac** (muscle) tissue.
2. There is a protective membrane made of epithelial tissue.
3. Blood and cartilage are present, these are connective tissue.
4. The heartbeat is controlled by nervous tissue.

An **organ system** is made of a number of organs working together.
e.g. Digestive System - stomach, liver, pancreas, etc.