Basrah University
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Human Biology

Cells: The Basic Units of Life

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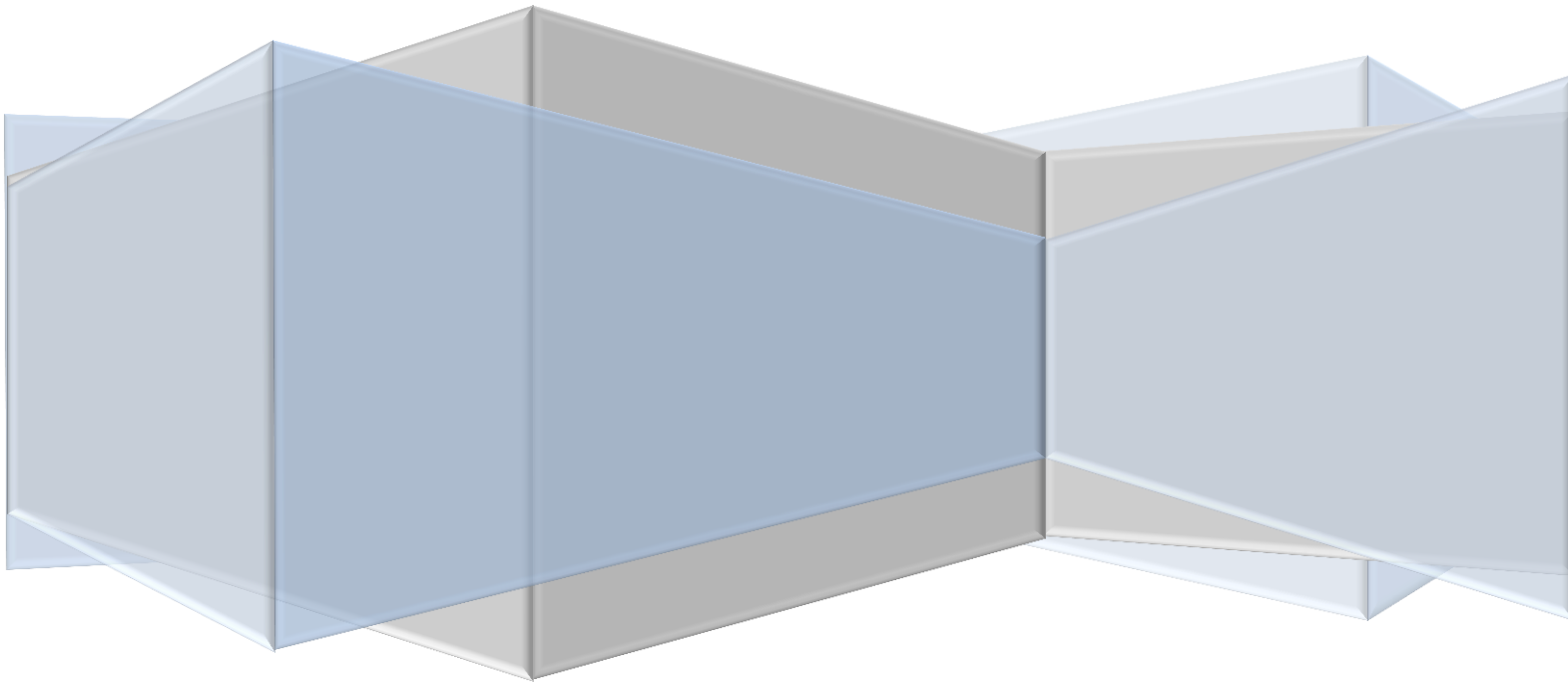

Cells: The Basic Units of Life

All organisms are composed of one (e.g. bacteria) or more cells (e.g. human body contains about a trillion cells).

Cells are the basic structural and functional unit of life. The study of cells is called **cytology**.

Cell theory

Cell theory consists of three principles:

- ✓ All living things are made up of cells.
- ✓ Cells are the structural and functional unit of an organism.
- ✓ All cells come from pre-existing cells through cell division.

Types of cells

All living cells can be divided into two groups:

1- Prokaryotic (also spelled procaryotic): They have their hereditary material in the form of a single long strand of **DNA**, no separate nucleus, fewer organelles in the cytoplasm and a cell wall like plant e.g. bacteria.

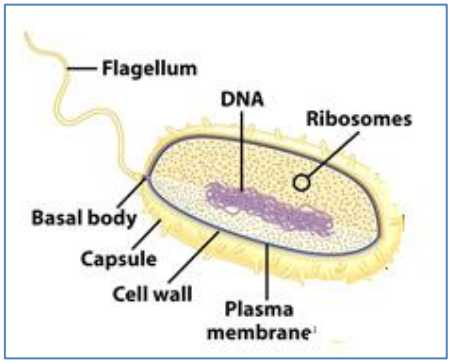

Figure 1: Main parts of prokaryotic cell

2- Eukaryotic (also spelled eucaryotic): They have the hereditary material in the form of chromosomes, a nucleus surrounded by a nuclear membrane and many organelles in the cytoplasm e.g. animals, plants and fungi.

Plants and animals

All animals and plants are made of cells. Animal cells and plant cells have features in common, such as a nucleus, cytoplasm, cell membrane, mitochondria and ribosomes. Plant cells differ from animals in the following:-

- ✓ **Cell wall:** The defensive walls of the plant, they are made of polysaccharide called cellulose. Animal cells do not have a cell wall.
- ✓ **Vacuole:** Animal cells have one or more small vacuoles whereas plant cells have one large central vacuole that can take up to 90% of cell volume. In plant cells, the function of vacuoles is to store water and maintain turgidity of the cell. Vacuoles in animal cells store water, ions and waste.
- ✓ **Chloroplasts:** They are present in plant cells; these are packages of green pigment **chlorophyll** that is used to capture the light energy in the process of **photosynthesis**. Plants are able to take in simple chemicals (water and salts from the soil and carbon dioxide from the air) and use them to synthesize complex molecules. Plants are therefore **autotrophs** (they can produce their own food from the substances available in their surroundings). Animals take in complex chemicals and break them down into simpler substances that can then be used by the body, this process called digestion animals are therefore **heterotrophs**.

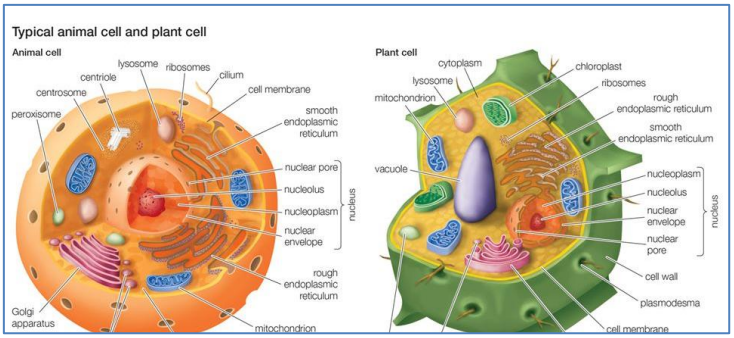

Figure 2: Plant and animal cells

Cell shapes and sizes

There are various shapes of cells. For example, it can be a cube like cell, cubical cells which is seen in cubical epithelium tissue, another shape is long column like, the goblet cell. Nerve cells have long projections that help them carry electrical messages to other

cells. Smooth muscle cells have spindle shape and skeletal muscle cells have rectangular shape.

- ✓ As the shapes are variable, sizes are also variable. Some large cells e.g. an egg such as frogspawn can be seen with the unaided eye. Most cells though are much smaller and so we need a microscope to be able to examine them. **Light microscope** allows us to see objects as small as 200 nanometres (nm). In order to see the parts of cell that are smaller than this we need to use an **electron microscopes**. This type of microscope is big, expensive and uses beams of electrons instead of light and it allows us to observe objects that are only 0.2 nm.

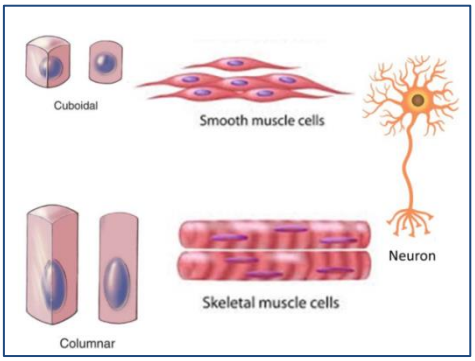

Figure 3: cell shapes