Topic: Eukaryotic Cell

B.Sc. Botany Hons. III

Paper: V Group: A

Dr. Sanjeev Kumar Vidyarthi

Department of Botany

Dr. L.K.V.D. College, Tajpur, Samastipur

L.N. Mithila University, Darbhanga

All other organisms, including fungi, plants, and animals, are composed of eukaryotic cells and belong to the domain Eukarya. Eukaryotic cells are more structurally complex than prokaryotic cells, having internal, membrane-bound organelles and a distinct nucleus that physically separates the genetic material of the cell from the all of the other parts of the cell.

Based on genetic analysis, the Archaea and Eukarya are more closely related to each other than they are to the Bacteria, suggesting that eukaryotic cells may have arisen from a single ancestral archaean cell.

. Eukarya includes the traditional kingdoms Plantae, Animalia, Fungi, and Protista. Protists include a diverse assemblage of single-celled eukaryotic organisms including algae, amoebas, and paramecia. Because algae are photosynthetic, they have often been included in the study of plants, although they are not members of the plant kingdom.

Fungi include such organisms as smuts, rusts, molds, and mushrooms. Fungal cells have external cell walls and because of this have often been included in the study

of plants.

However, fungal cell walls have a completely different structure and composition from those of plant cell walls, and fungi lack plastids and photosynthetic pigments. Fungi represent a unique evolutionary line. They too, however, tend to be studied in botany courses, even though they are not plants.

Eukaryotic cells are surrounded by a cell membrane, or plasma membrane, that is composed of a lipid structure in which other molecules, such as proteins and carbohydrates, are embedded. The cell membrane serves as a semipermeable, or selective, barrier between the cell and its environment.

Some small, uncharged molecules can freely cross the cell membrane; others must be transported across the membrane before they can enter the cell. The cell membrane serves to protect the cell and to receive signals from the environment and other cells that help to direct cell activities.

In addition to the cell membrane, plant cells also have external cell walls. The presence of the external cell wall is one of the major characteristics that distinguishes plants cells from animal cells.

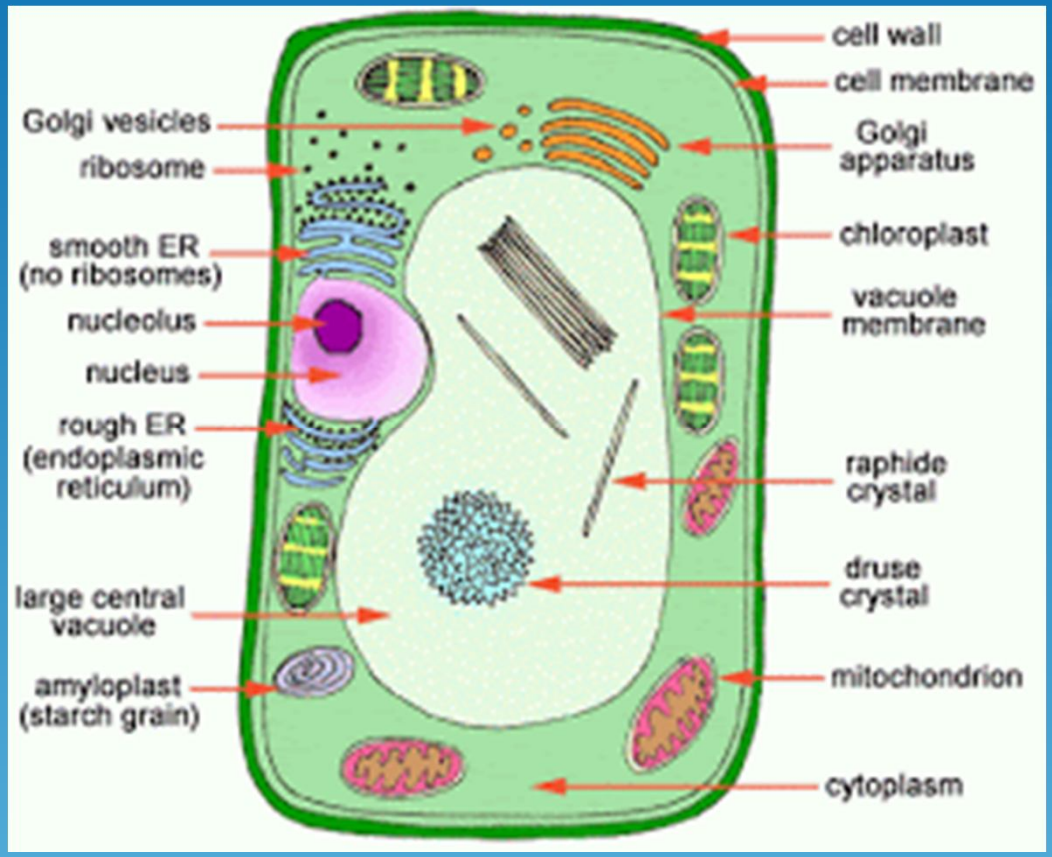

Fig. Eukaryotic cell

The cell wall limits the size of the internal protoplast (the internal cytoplasm and nucleus) and prevents the plasma membrane from breaking when the protoplast enlarges following the uptake of water by the cell.

Cell walls are not merely static support structures, however. They contain enzymes that are important in bringing essential molecules into the cell and in secreting molecules. They may also play important roles in the defence of the plant against bacterial and fungal pathogens.

Eukaryotic cells also have a prominent, membrane-bound organelle called the nucleus. The nucleus contains the genetic information of the cell that directs the cellular activity. A double membrane called the nuclear envelope surrounds the nucleus.

Inside the nucleus, deoxyribonucleic acid (DNA) is transcribed to make molecules of ribonucleic acid (RNA), copies of the genetic information that can be delivered to the cytoplasm, where the RNA molecules serve to direct the manufacture of proteins.

DNA in the eukaryotic nucleus exists as linear molecules that are associated with many proteins, and the DNA is packaged into a highly organized chromosomal

structure by proteins called histones.

In addition to the nucleus, eukaryotic cells contain a number of internal membrane-bound organelles that help the cell carry out the functions necessary for life.

The types of organelles found inside a eukaryotic cell reflect the function of that cell and the processes that it must carry out. Some of these organelles, such as mitochondria and chloroplasts, are important in capturing and releasing energy for cell function

. Some, like the Golgi complex and the endoplasmic reticulum (ER), are involved in the manufacture, processing, and transport of proteins and other molecules within the cell. Others, such as peroxisomes, are involved in detoxifying chemicals and breaking down molecules.

The cell cytoskeleton is a highly dynamic structure that provides support and motility to cells as well as providing some of the apparatus that is used in the transduction of signals from the cell membrane to the nucleus.

In plant cells, cytoskeletal elements form tracks for the movement of internal cellular organelles, such as the cytoplasmic streaming of chloroplasts, which can be observed.

By light microscopy.

Work of the cytoskeleton is also necessary for the opening and closing of the stomata in plant leaves. The cytoskeleton consists of a variety of filament like proteins as well as proteins that serve as anchor points for filaments.

Continued in next lecture of Eukaryotic cell