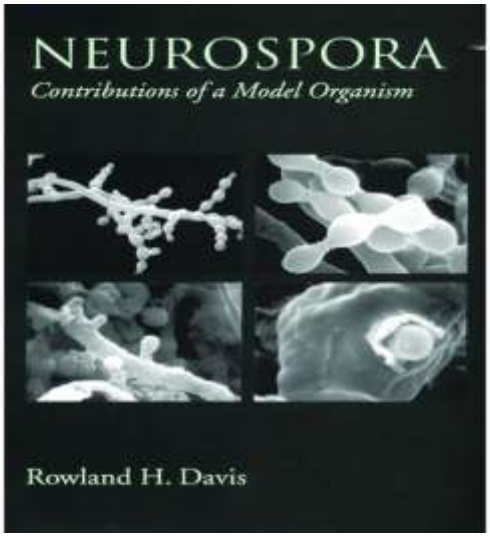
Fungi genetics:

Why do we study fungal genetics? Many fungi are excellent target to study genetics, and genetics plays an important role in various fields of fundamental and applied mycology. can consider some aspects of the biology of fungi that are essential for understanding genetic features and processes. In addition, various aspects of fungal genetics are reviewed in order to elucidate how they play a role in fundamental biology, biotechnology, plant pathology, and other fields of applied biology.

Fungi genetics: is the study of the mechanisms of Heritability information in fungi. Yeasts and filamentous fungi are extensively used as model organisms for eukaryotic genetic research, including cell cycle regulation, chromatin structure, genetic recombination and gene regulation.

Fungi used as model organisms for eukaryotic genetic research:

Fungi used as model organisms are widely because, in general, they are less expensive to maintain under laboratory conditions than are members of the two other higher eukaryotic kingdoms, the animals and plants. Ascomycetes have been the most popular fungi with geneticists and molecular developmental biologists, beginning with Neurospora and recently with Saccharomyces and Aspergillus.



Fungal Cell contents:

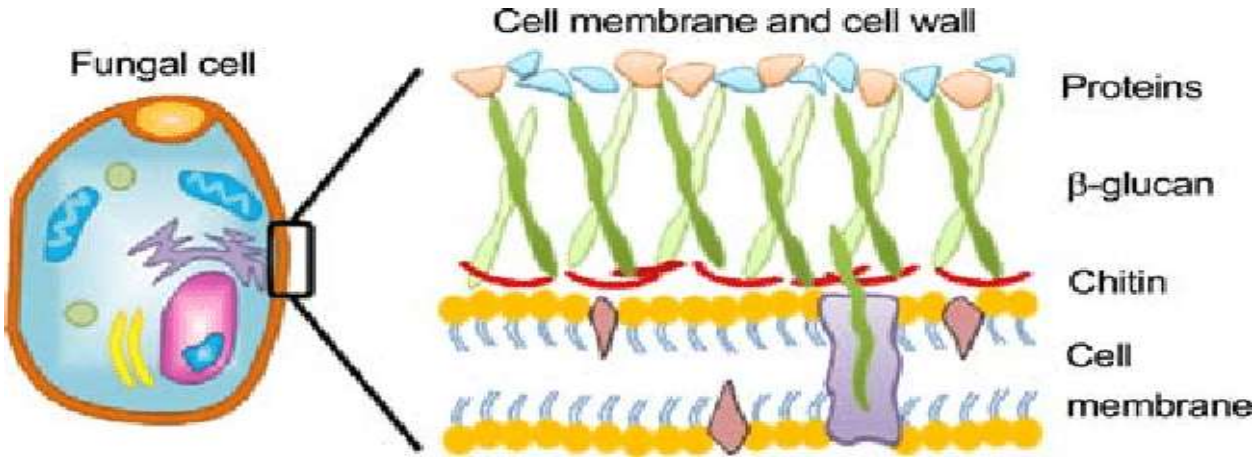
a- The Cell Wall:

Except slime molds (Myxomycetes), the fungal cell consists of a rigid cell wall and cell organelles. However, composition of cell wall of different fungal groups differs. Chemical analysis of cell wall reveals that it contains 80-90% polysaccharides, and remaining proteins and lipids.

Chitin (a polymer of N-acetyl glucosamine), cellulose (a polymer of D-glucose) or other glucans are present in cell walls in the form of fibrils forming layers. In most of the fungi the cell wall lacks cellulose (except Oomycetes) usually chitin and cellulose are found together e.g. Ceratocystis and Rhizidiomyces contain a form of chitin called fungus cellulose. It is similar to the chitin of insects. Structural formulae of repeating units of cellulose and chitin are given.

b- Plasma Membrane (Cell Membrane):

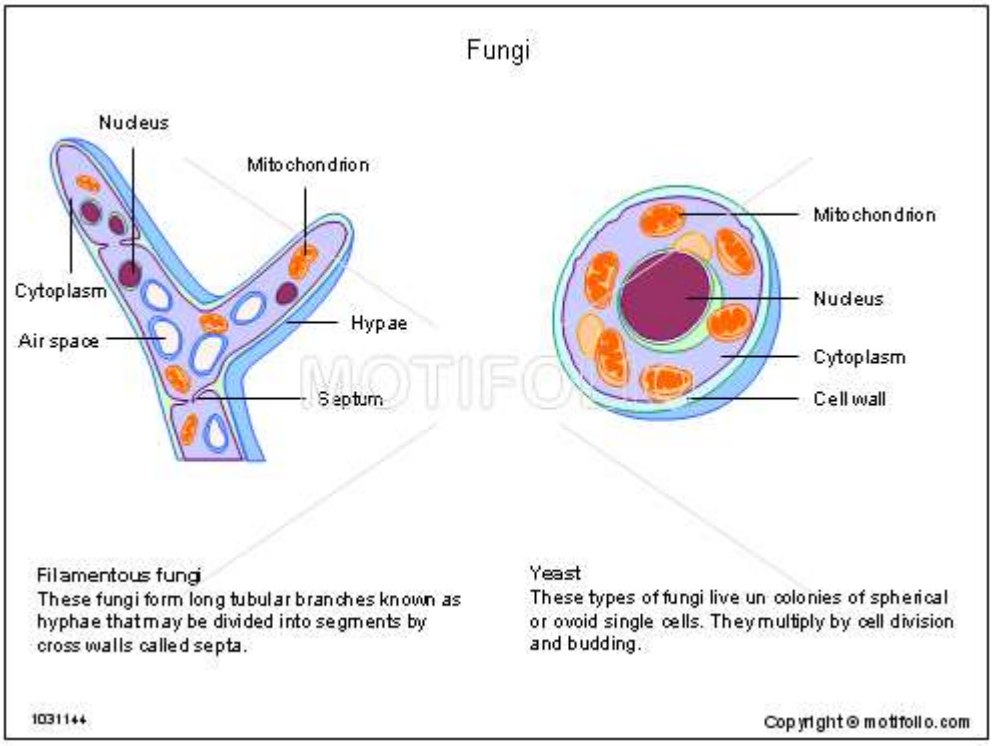
In fungi too the cell wall is followed by plasma membrane that encloses the cytoplasm. It is semipermeable and, in structure and function, it is similar to that of prokaryotes. However, specialized organelles have been reported at the surface of plasma membrane in the region where the fusion of secretory vesicles of cytoplasm occurs. The plasma lemma invaginates and forms a pouch like structure enclosing the granular or vesicular materials.



c- Cytoplasm:

Cytoplasm is colorless in which sap-filled vacuoles are found. Except chloroplasts many of the familiar organelles and inclusions, characteristic of eukaryotes, are found in fungal cytoplasm.

The cytoplasmic inclusions are dead, non-functional, and unimportant for fungal survival for example stored food (glycogen and oil drops), pigments and the secretory granules. The cell organelles are endoplasmic reticulum, mitochondria, ribosomes, golgi bodies and vacuoles, Lomasomes are also present between plasma membrane and cell wall.



The organelles are described below:

❖ Endoplasmic Reticulum:

Presence of endoplasmic reticulum in fungal cytoplasm is observed through electron microscope. It is made up of a system of microtubules beset with small granules. In most of the fungi it is highly vesicular. It is loose and irregular as compared with cells of green plants. In multinucleate hyphae the nuclei may be connected by endoplasmic reticulum.

❖ Mitochondria:

Numerous small and spherical to elongated bodies known as mitochondria are dispersed in cytoplasm. Mitochondria are covered by an outer double membrane; the inner infoldings form parallel flat plates of irregular tubules called cristae. There is no difference between mitochondria of fungi and green plants.

Generally, these are called the power house of the cell.

❖ Golgi Apparatus:

Except in Oomycetes (e.g. Pythium) and non-fungal eukaryotic cells, Golgi apparatus is of rare occurrence in fungal cells. In Oomycetes and non-fungal eukaryotes, Golgi apparatus consists of stacks of folded membranes functioning in secretion. In the cells of Saccharomyces a Golgi apparatus consisting of three flattened sacs can be observed.

❖ Vacuoles:

Vacuoles are found in the old cells of hyphae. The end of hyphal tip of young hyphae lacks vacuole. With the age, the vacuoles coalesce. Vacuoles are surrounded by a membrane known as tonoplast.

❖ Nucleus:

The cytoplasm contains one, two or more globose or spherical nuclei of about 1-3 p.m diameter. A nucleus consists of a bilayered porous nuclear envelope that encloses the chromosomes and nucleolus. The chromosome consists of DNA and a few basic proteins called histones. The DNA material remains in changing stage with cell growth. The nuclear pores permit to interchange the materials between the cytoplasm and nucleus.

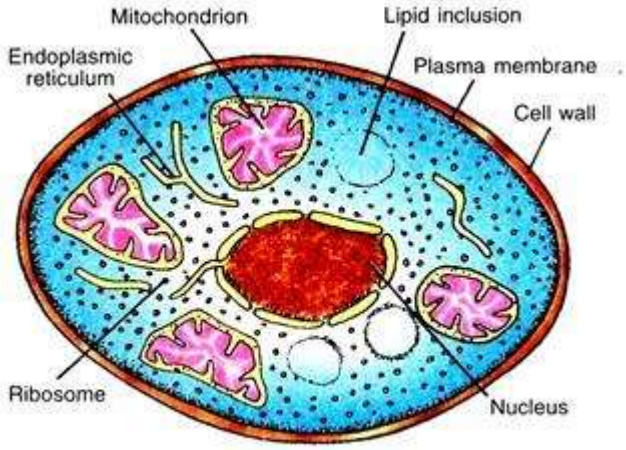


Fig. 1.8. *Fungi*. Fine structure of **Torula Yeast** cell based on an electron micrograph.