

Cell Structure

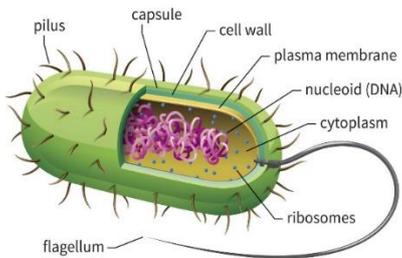
A. DEFINITION

The cell is the basic structural, functional, and biological unit of all known organisms. Cells are the smallest units of life, and hence are often referred to as the "building blocks of life". The study of cells is called cell biology, cellular biology, or cytology.

B. CELL TYPE

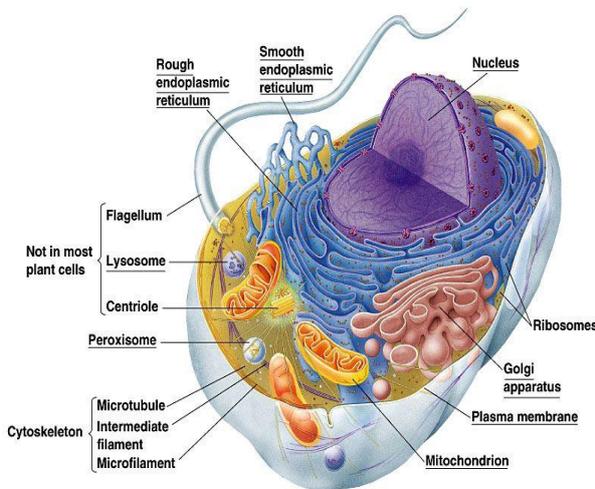
Prokaryotic cells

Prokaryotes include bacteria and archaea, two of the three domains of life. Prokaryotic cells were the first form of life on Earth, characterized by having vital biological processes including cell signalling. They are simpler and smaller than eukaryotic cells, and lack a nucleus, and other membrane-bound organelles. Most prokaryotes are the smallest of all organisms ranging from 0.5 to 2.0 μm in diameter.



Eucaryotic cells

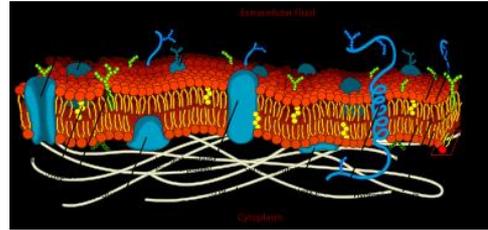
Plants, animals, fungi, slime moulds, protozoa, and algae are all eukaryotic. These cells are about fifteen times wider than a typical prokaryote and can be as much as a thousand times greater in volume.



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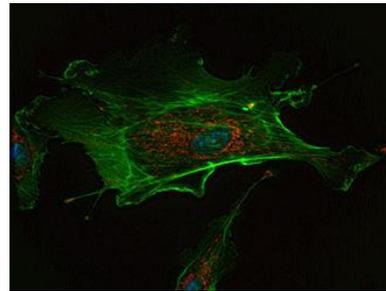
C. SUBCELLULAR COMPONENTS

Membrane



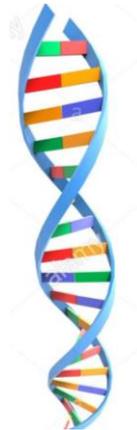
The cell membrane, or plasma membrane, is a biological membrane that surrounds the cytoplasm of a cell.

Cytoskeleto



The cytoskeleton acts to organize and maintain the cell's shape; anchors organelles in place; helps during endocytosis, the uptake of external materials by a cell, and cytokinesis, the separation of daughter cells after cell division; and moves parts of the cell in processes of growth and mobility.

Generic Material



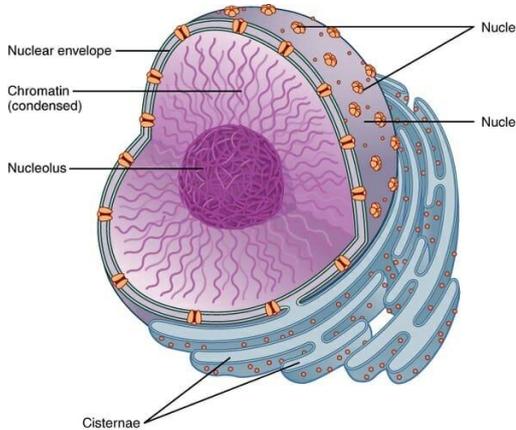
Two different kinds of genetic material exist: deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).

Organelles

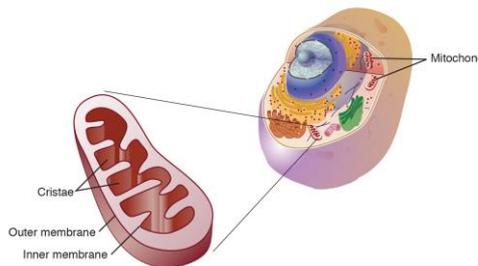
Organelles are parts of the cell which are adapted and/or specialized for carrying out one or more vital functions, analogous to the organs of the human body (such as the heart, lung, and kidney, with each organ performing a different function).

What do eucaryotic cells have but don't have in procaryotic cells?

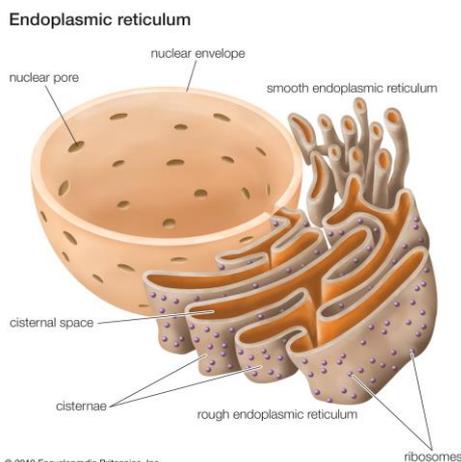
- Cell nucleus: A cell's information center, the cell nucleus is the most conspicuous organelle found in a eukaryotic cell. It houses the cell's chromosomes and is the place where almost all DNA replication and RNA synthesis (transcription) occur.



- Mitochondria and chloroplasts: generate energy for the cell. Mitochondria are self-replicating organelles that occur in various numbers, shapes, and sizes in the cytoplasm of all eukaryotic cells.

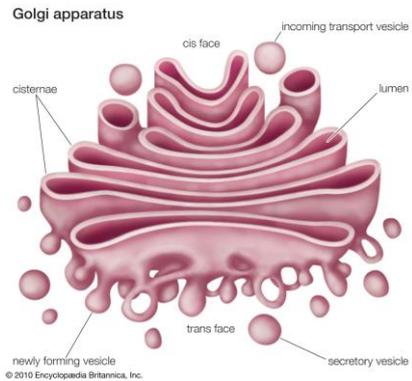


- Endoplasmic reticulum: The endoplasmic reticulum (ER) is a transport network for molecules targeted for certain modifications and specific destinations, as compared to molecules that float freely in the cytoplasm.



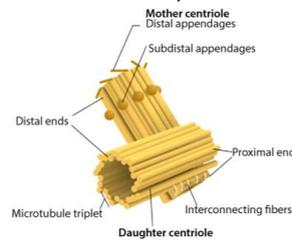
- Golgi apparatus: The primary function of the Golgi apparatus is to process and package the

macromolecules such as proteins and lipids that are synthesized by the cell.



- Lysosomes and peroxisomes: Lysosomes contain digestive enzymes (acid hydrolases). Peroxisomes have enzymes that rid the cell of toxic peroxides.

- Centrosome: the cytoskeleton organiser



- Vacuoles: Vacuoles sequester waste products and in plant cells store water.

What do prokaryotic and eukaryotic cells have?

- Ribosomes: The ribosome is a large complex of RNA and protein molecules.

D. STRUCTURES OUTSIDE THE CELL MEMBRANE

- Cell wall

The cell wall acts to protect the cell mechanically and chemically from its environment and is an additional layer of protection to the cell membrane.

What do prokaryotic cells have but don't have in eukaryotic cells?

- Capsule

A gelatinous capsule is present in some bacteria outside the cell membrane and cell wall.

- Flagella

Flagella are organelles for cellular mobility.

- Fimbriae

A fimbria (plural fimbriae also known as a pilus, plural pili) is a short, thin, hair-like filament found on the surface of bacteria.

E. CELLULAR PROCESSES

■ Replication

Cell division involves a single cell (called a mother cell) dividing into two daughter cells. This leads to growth in multicellular organisms (the growth of tissue) and to procreation (vegetative reproduction) in unicellular organisms.

■ DNA repair

In general, cells of all organisms contain enzyme systems that scan their DNA for damages and carry out repair processes when damages are detected. These include:

- nucleotide excision repair,
- DNA mismatch repair,
- non-homologous end joining of double-strand breaks,
- recombinational repair
- light-dependent repair (photoreactivation).

■ Growth and metabolism

Cell metabolism is the process by which individual cells process nutrient molecules. Metabolism has two distinct divisions: catabolism and anabolism.

■ Protein synthesis

This process involves the formation of new protein molecules from amino acid building blocks based on information encoded in DNA/RNA. Protein synthesis generally consists of two major steps: transcription and translation.

- Transcription is the process where genetic information in DNA is used to produce a complementary RNA strand.

■ Motility

Unicellular organisms can move in order to find food or escape predators. Common mechanisms of motion include flagella and cilia.

In multicellular organisms, cells can move during processes such as wound healing, the immune response and cancer metastasis. For example, in wound healing in animals, white blood cells move to the wound site to kill the microorganisms that cause infection. Cell motility involves many receptors, crosslinking, bundling, binding, adhesion, motor and other proteins.

EXERCISE

1. Ribosomes exist as separate subunits that bind together during protein synthesis. What do these subunits consist of?
 - a. Protein & mRNA.
 - b. mRNA & tRNA.
 - c. rRNA & protein.
 - d. rRNA & tRNA.

Answer: C. rRNA & protein.

2. What is the function of the nucleolus?
 - a. The formation and breakdown of the nuclear envelope.
 - b. The formation of rough endoplasmic reticulum.
 - c. The synthesis of ribosomal proteins
 - d. The synthesis of rRNA.

Answer: D. The synthesis of rRNA.

3. Which part of the cell is often continuous with the rough endoplasmic reticulum?
 - a. Cell surface membrane.
 - b. Golgi apparatus.
 - c. Mitochondrion.
 - d. Nuclear envelope.

Answer: D. Nuclear envelope.