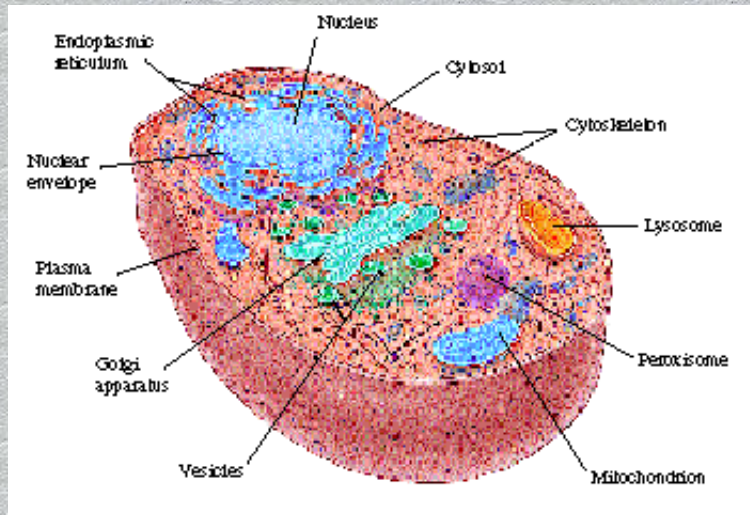


Eukaryotes

The Basic Structure Of A Prokaryote

Eukaryotes include fungi, animals, and plants as well as some unicellular organisms. Eukarotic cells at 10 microns in diameter are about 10 times the size of a Prokaryote and can be as much as 1000 times greater in volume than the Prokaryote. Obviously, the Prokaryote is much more complex, requiring sophisticated internal structures for rapid transportation of chemicals and communication within the cell. In consummation of such, the Eukaryotes developed several superior structures which provide the primary basis by which to distinguish them from ancestral prokaryotes. These structures are depicted below in a composite cell, and include: **Organelles, Nucleus with its nuclear membrane, Golgi apparatus, Mitochondria / Chloroplasts, and Cytoskeleton.**



Organelles

Organelles are independent, distinct, membrane-bounded structures or compartments within a eukaryotic cell which perform specific tasks for the overall success and well being of the cell. The specific functions of organelles *vary widely* and typically depend on their proximity within the cell as well as their physical characteristics. For example, specialized digestive organelles called **lysosomes** perform the digestive functions in many Eukaryotes. The absence of organelles greatly inhibited the Prokaryote's ability to evolve into more complex cells. While evolution did attempt avoid organelles with alternative solutions, such as colonial environments where the metabolic specialties of one species could benefit others, organelles proved to be the most effective solution.

Nucleus

The nucleus was, for years, the criteria required for an organism to be a eukaryote. Much like the brain of humans, the nucleus represents the "control center" for the cell and includes 95% of its DNA. Due to the complexity involved, eukaryotes typically contain a great deal more DNA than do prokaryotes. In fact, Prokaryotes usually contain only one circular molecule of DNA, which represents its genetic material, or **genome**, while Eukaryotes' genome is structured into a number of linear chromosomes. The **nuclear envelope**, a two-layered membrane, represents the outer limits of the nucleus.

Endoplasmic Reticulum and Golgi Apparatus

The endoplasmic reticulum extends away from the nuclear envelope through a network of tubules. This organelle performs complex tasks involved with synthesis of RNA into proteins, which are eventually extricated from the cell entirely or are distributed to specific places within the cell.

Also associated with many species are membranous sacs known as the **Golgi apparatus**, which reside near the nucleus and endoplasmic reticulum. The Golgi apparatus interfaces with a network of vesicles, to transport contents to and from the Golgi apparatus. As the contents pass through the organelle, any appropriate chemical alterations are performed. The contents may then be transported inside or outside the cell, as deemed necessary.

Mitochondria and Chloroplasts

Mitochondria and chloroplasts make possible the energy transduction of their respective cells. **Mitochondria** metabolizes carbohydrates, fatty acids, and amino acids into oxidative energy required to sustain the eukaryotic cell. **Chloroplasts** use light energy to convert carbon dioxide and water into carbohydrates through a process known as **photosynthesis**. Chloroplasts are found primarily in algae and plants.

Cytoskeleton

The cytoskeleton consists of a web or mesh of protein fibers that pervade throughout the cell forming the cell shape and support, managing intracellular traffic, and cell locomotion. The cell materials flow within paths defined by membrane walls and tabules, and traffic from one organelle to another is highly regulated. The three types of protein filaments found in the cytoskeleton include the *actin filaments*, *microtubules*, and *intermediate filaments*, all of which perform a variety of specific cell processes and functions.

General Characteristics

The oldest known eukaryotic fossil is 1.5 billion years old, and evolution of prokaryotic cells preceded that of eukaryotic cells by 2 billion years. Eukaryotes reproduce on the basis of **sexual** reproduction as opposed to asexual, meaning genetic variations can be transferred to the cell's offspring. Since more genetic combinations were possible after the primitive Eukaryotes evolved, the evolution of multi-cellular animals became more plausible.

