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Key Resemblance among Prokaryotes and Eukaryotes

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Editorial

Description

A living thing can be composed of either one cell or many cells. The basic unit of all Cells lead a single presence; others live in communities; some have defined, geometric shapes; others have flexible boundaries; some swim, some crawl, and some are sedentary; many are green (some are even red, blue, or purple); others have no obvious coloration. Given these differences, it is perhaps surprising that there are only two types of cell. Bacterial cells that are said to be prokaryotic (Greek for "before nucleus") because they have very little visible internal organization so that, for instance, the genetic material is free within the cell. They are also small, the vast majority being 1–2 µm in length. The cells of all other organisms, from protists to mammals to fungi to plants, are eukaryotic (Greek for "with a nucleus"). These are generally larger (5–100 µm, although some eukaryotic cells are large enough to be seen with the naked eye) and structurally more complex.

Although the basic structure of all eukaryotic cells is constructed from membranes, organelles, and the cytosol, each type of cell exhibits a distinctive design defined by the shape of the cell and the location of its organelles. The structural basis of the unique design of each cell type lies in the cytoskeleton, a dense network of three classes of protein filaments that permeate the cytosol and mechanically support cellular membranes. Cytoskeletal proteins are among the most abundant proteins in a cell, and the enormous surface area of the cytoskeleton constitutes a scaffold to which particular sets of proteins and membranes are bound. The basic structure of bio membranes. The lipid components of membranes not only affect their shape and function but also play important roles in anchoring proteins to the membrane, modifying membrane protein activities, and transducing signals to the cytoplasm. We then consider the general structure of membrane proteins and how they can relate to different membranes. The unique function of each membrane is determined largely by the complement of proteins within and adjacent to it.

Prokaryotes, which represent the simplest and smallest cells, about 1–2 m in length, are surrounded by a plasma membrane but contain no internal membrane limited sub compartments. Although DNA is concentrated in the center of these unicellular organisms, most enzymes and metabolites are thought to diffuse freely within the single internal aqueous compartment. Certain metabolic reactions, including protein synthesis and anaerobic glycolysis, take place there; others, such as the replication of DNA and the production of ATP, take place at the plasma membrane. In the larger cells of eukaryotes, however, the rates of chemical reactions would be limited by the diffusion of small molecules if a cell were not partitioned into smaller sub compartments termed organelles. Each organelle is surrounded by one or more bio membranes, and each type of organelle contains a unique complement of proteins some embedded in its membrane(s), others in its aqueous interior space, or lumen. These proteins enable each organelle to carry out its characteristic cellular functions. The cytoplasm is the part of the cell outside the largest organelle, the nucleus. The cytosol, the aqueous part of the cytoplasm outside all of the organelles, also contains its own distinctive proteins.