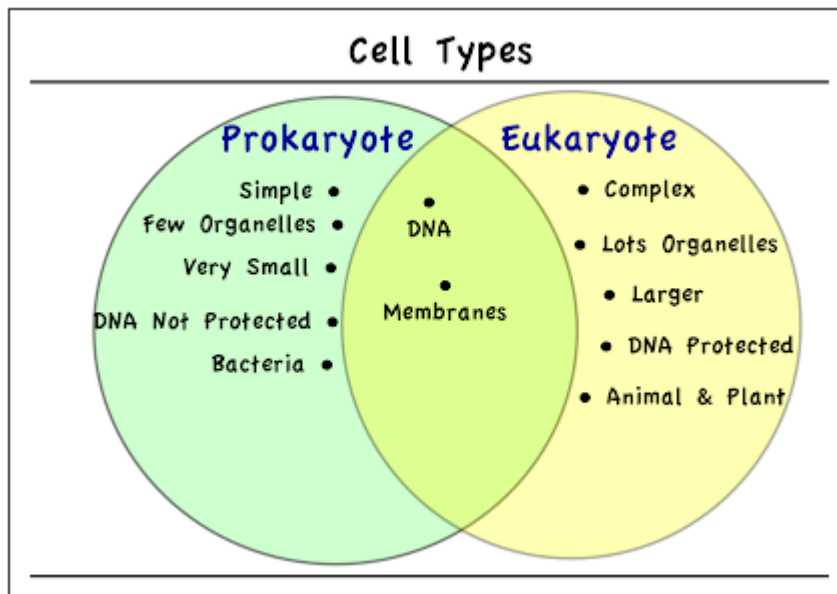


Eukaryotic and Prokaryotic Cells: Similarities and Differences



Eukaryotic cells contain membrane-bound organelles, including a nucleus. **Eukaryotes** can be single-celled or multi-celled, such as you, me, plants, fungi, and insects. Bacteria are an example of **prokaryotes**. **Prokaryotic cells** do not contain a nucleus or any other membrane-bound organelle.

The distinction between **prokaryotes** and **eukaryotes** is considered to be the most important distinction among groups of organisms. Eukaryotic cells contain membrane-bound organelles, such as the nucleus, while prokaryotic cells do not. Differences in cellular structure of prokaryotes and eukaryotes include the presence of mitochondria and chloroplasts, the cell wall, and the structure of chromosomal DNA.

The difference between the structure of prokaryotes and eukaryotes is so great that it is considered to be the most important distinction among groups of organisms.

- The most fundamental difference is that eukaryotes do have "true" nuclei containing their DNA, whereas the genetic material in prokaryotes is not membrane-bound.

- In eukaryotes, the mitochondria and chloroplasts perform various metabolic processes and are believed to have been derived from endosymbiotic bacteria. In prokaryotes similar processes occur across the cell membrane; endosymbionts are extremely rare.
- The cell walls of prokaryotes are generally formed of a different molecule (peptidoglycan) to those of eukaryotes (many eukaryotes do not have a cell wall at all).
- Prokaryotes are usually much smaller than eukaryotic cells.
- Prokaryotes also differ from eukaryotes in that they contain only a single loop of stable chromosomal DNA stored in an area named the nucleoid, while eukaryote DNA is found on tightly bound and organized chromosomes. Although some eukaryotes have satellite DNA structures called plasmids, these are generally regarded as a prokaryote feature and many important genes in prokaryotes are stored on plasmids.
- Prokaryotes have a larger surface area to volume ratio giving them a higher metabolic rate, a higher growth rate and consequently a shorter generation time compared to Eukaryotes.
- Genes
 - Prokaryotes also differ from eukaryotes in the structure, packing, density, and arrangement of their genes on the chromosome. Prokaryotes have incredibly compact genomes compared to eukaryotes, mostly because prokaryote genes lack introns and large non-coding regions between each gene.
 - Whereas nearly 95% of the human genome does not code for proteins or RNA or includes a gene promoter, nearly all of the prokaryote genome codes or controls something.
 - Prokaryote genes are also expressed in groups, known as operons, instead of individually, as in eukaryotes.
 - In a prokaryote cell, all genes in an operon (three in the case of the famous lac operon) are transcribed on the same piece of RNA and then made into separate proteins, whereas if these genes were

native to eukaryotes, they each would have their own promoter and be transcribed on their own strand of mRNA. This lesser degree of control over gene expression contributes to the simplicity of the prokaryotes as compared to the eukaryotes.