Describe the similarities and differences between the eukaryotic and prokaryotic cell (Autosaved).docx

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Describe the similarities and differences between the eukaryotic and prokaryotic cell.

Prokaryotes were the first organisms on earth, then more complicated organisms; eukaryotic cells came into being through evolution. http://www.diffen.com/difference/Eukaryotic_Cell_vs_Prokaryotic_CellThere are similar and different properties between eukaryotic and prokaryotic cells, due to their evolutionary relationship. For example, prokaryotes and eukaryotes share common features, such as, plasma membrane, cytoplasm, DNA and ribosomes, which are the foundation of all cell structures suggesting their importance in all cellular life.
I'm going to compare the different properties of prokaryotes and eukaryotes, looking at the differences and similarities in structure and functioning.

First I'm going to look at the basic similarities and differences. They both contain a plasma membrane, cytoplasm, DNA and ribosomes. The plasma membrane is a lipid bilayer consisting of phospholipids and proteins that acts as selective barrier for molecules coming into and out of the cell for both prokaryotes and eukaryotes. Another similarity between prokaryotes and eukaryotes is that they both contain genetic material in the form of DNA as the basis for genes that regulate cell function and encode the information which is passed onto progeny. They also both contain ribosomes that help synthesise proteins. However, there are differences in the structure of ribosomes in eukaryotes compared to prokaryotes, where eukaryotic ribosomes have 80S ribosomes which are larger than prokaryotic ribosomes which are 70S. Eukaryotic ribosomes are also more complex than prokaryotic ribosomes as they are made of five kinds of ribosomal RNA and about eighty kinds of proteins, whereas prokaryotic ribosomes are composed of only three kinds of rRNA and about fifty kinds of protein. Both eukaryotes and prokaryotes contain a cytoplasm with a similar composition as well,
https://www.sciencetopia.net/biology/similarities-prokaryotic-eukaryotic-cells where eukaryotic cytoplasm is everything between the plasma membrane and nuclear envelope and In prokaryotes it encompasses everything within the plasma membrane.
http://www.news-medical.net/life-sciences/Eukaryotic-and-Prokaryotic-Cells-Similarities-and-Differences.aspx.
Added to that they both have a cystol that is a major component of the cytoplasm in both prokaryotes and eukaryotes which is a solution that contains numerous ions, molecules and organelles. Therefore, it is also the site of many metabolic reactions, such as protein synthesis. They both also have a cytoskeleton which is a multicomponent system of microtubules, actin filaments and intermediate filaments which is required for maintaining cell shape, providing internal organization and mechanical support and is also very important in movement and cell division.
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The clear identifiable difference between prokaryotes and eukaryotes is that eukaryotes contain a nucleus containing the DNA and membrane bound organelles, whereas prokaryotes have free moving DNA in the cytoplasm (nucleoid) and no membrane bound organelles.
This effects both the overall metabolism inside the cell and the way protein synthesis takes place (transcription, translation).
The membrane bound organelles therefore that are present in eukaryotes but not not prokaryotes are, mitochondria, chloroplasts, lysosomes, perixosomes, golgi apparatus, endoplasic reticulum
This is a key difference because it allows a high level of intracellular division of labor and contributes to the greater complexity that eukaryotic cells have. Confining certain cellular process to a smaller area also increases the efficiency of functions by improving communication and movement within the cell.
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The other differences include the size, reproductive process, presence of cell wall. Eukaryotic cells are normally larger (10 – 100um) than prokaryotic cells (1 – 10um) and Eukaryotes are often multicellular whereas prokaryotes are unicellular. There are however some exceptions as unicellular eukaryotes include amoebas, paramecium, yeast which are single celled
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However prokaryotes have a larger surface area to volume ratio giving them a higher metabolic rate, higher growth rate and therefore a shorter generation time compared to eukaryotes
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Most eukaryotes undergo sexual reproduction whilst prokaryotes reproduce asexually. Sexual reproduction in eukaryotes results in offspring with genetic material which is a mixture of the parents' genome and during this process, genetic variation is generated via sexual recombination.
On the other hand, a prokaryote will reproduce clones of itself via binary fission and relies more on horizontal genetic transfer for variation. This occurs by mitosis for eukaryotic cells and binary fission for prokaryotic cells. Eukaryotic cells undergo mitosis then cytokinesis. This involves numerous stages; the nuclear membrane disintegrates then the chromosomes are sorted and separated to ensure that each daughter cell receives two sets (a diploid number) of chromosomes. Following this, the cytoplasm divides to form two genetically identical daughter cells i.e. cytokinesis.
In contrast, prokaryotes undergo a simpler process of binary fission. This is faster than mitosis and involves DNA (nucleoid) replication, chromosomal segregation, and ultimately cell separation into two daughter cells genetically identical to the parent cell. Unlike mitosis, this process does not involve the nuclear envelope and centromere and spindle formation
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Cell wall is the extra rigid outermost covering of the cell which prevents cell dehydration and provides typical shape to the cell. Such protective layer is present in all prokaryotic cells and eukaryotic plant cells.
https://www.sciencetopia.net/biology/similarities-prokaryotic-eukaryotic-cells.
Prokaryotes cell wall are formed differently, with prokaryotes having a more chemically complexed cell wall with molecule peptidoglycan to those of eukaryotes and many eukaryotes do not have a cell wall at all, only plant cells and fungi, where plants have cellulose cell wall and fingi with pectin cell wall
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The DNA within prokaryotes and eukaryotes however has a lot of differences. Eukaryotic DNA is linear and complexed with packaging proteins called "histones," before organization into a number of chromosomes. Prokaryotic DNA is circular and is neither associated with histones nor organized into chromosomes. A prokaryotic cell is simpler and requires far fewer genes to function than the eukaryotic cell. Therefore, it contains only one circular DNA molecule and various smaller DNA circlets (plasmids).
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Eukaryotic chromosomes are condensed in a membrane bound nucleus via histones whereas prokaryotes are condensed in nucleoid via DNA supercoiling and binding of various architectural proteins. In eukaryotes transcription occurs in nucleus and translation occurs in cytoplasm whereas because prokaryotes can interact with cytoplasm, transcription, and translation occur simultaneously. Most eukaryotes contain two copies of each gene (they are diploid) whereas most prokaryotes contain only once copy of each gene (they are haploid)
Some eukaryotic genomes are organized into operons but most are not. Nonessential prokaryotic genes are commonly encoded on extrachromosomal plasmids whereas in eukaryotes extrachromosomal plasmids are not commonly present in eukaryotes
Prokaryotic genomes are efficient and compact containing little repetitive DNA whereas eukaryotes contain large amounts of non-coding and repetitive DNA
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To sum up prokaryotes and eukaryotes have many fundamental similarities as they share evolutionary relationship, so these similarities show they are important for all cellular life to survive. The differences however show the differences in prokaryotes and eukaryotes in their ability to survive, since eukaryotes evolved from prokaryotes and have multicellular potential, so the fundamental differences are in metabolism (division of labor) which relates to the membrane bound organelles and overall protein synthesis which relates to DNA stored within nucleus

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