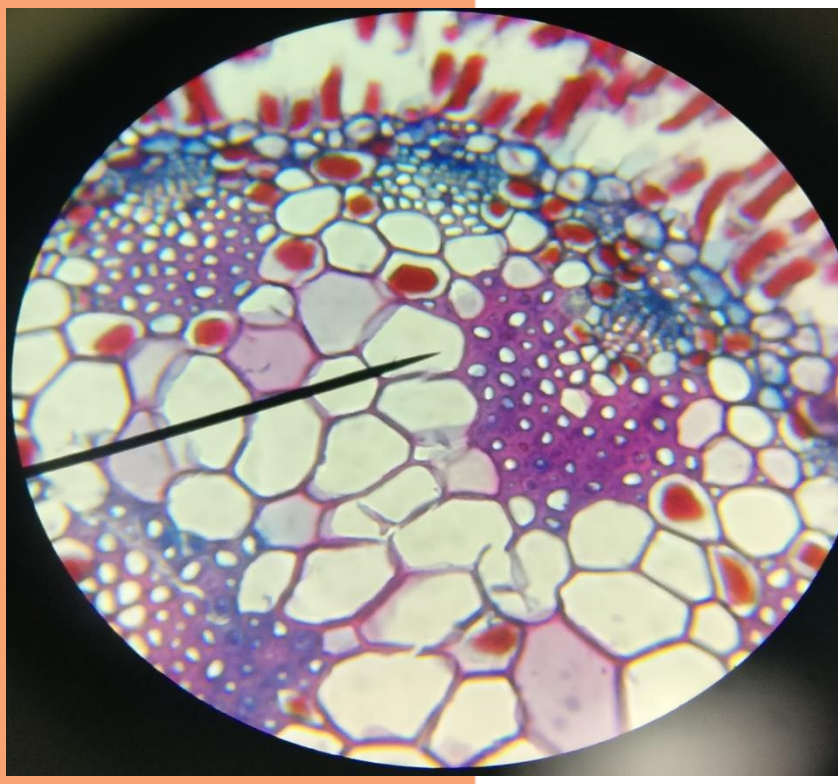
Cell Biology



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Introduction

The human body is made up of billions of tiny living cells. We could weigh ourselves and what is contained within our body, while they would be the same chemically, biologically they are completely different (BBC4, 2009). Although there are different types of cell, there are 2 most known, these are Animal and Plant Cells. These cells have got another name, and that is the Eukaryotic Cell. These eukaryotic cells are multicellular. Bacteria cells are known as Prokaryotic cells, which are unicellular. Yeast cells are different again, it is a unicellular fungus, it is unique because of this, and it contains a nucleus, through a process called budding, the yeast cell reproduces asexually creating identical cells (Fosbery, p. 102).

Structure of the Eukaryotic Cell

Most cells are small structures, they range from 0.01 to 0.15mm in diameter, and so far, research has only considered the features that are visible under a light microscope. Under the low power of the light microscope, only 100 times magnification is achieved, rising to 400 times or just above at high power, this does depend on the lenses used. Looking closer was achieved using Electron microscopy, this magnifies in the thousands. It revealed the fine structure also known as the ultrastructure, of the cell. Using the Electron microscopy method, it was also found that the Nucleus has a double membrane, which came to be called the nuclear envelope, the cytoplasm appears as a complex system of membranous sacs, this would be called the Endoplasmic reticulum (ER). The mitochondria, ribosomes and Golgi apparatus are smaller structures and are found within the Cytoplasm. These structures contained within the cell are referred to as Organelles. (John Adds, 1996, p. 2).

Key Organelles of a Eukaryotic Cell

Some organelles are found in all Eukaryotic cells, these have key roles to contribute to the cell, including such as making energy and synthesising proteins. Including the below there is also the cell membrane, however further detail about this can be found further in this report.

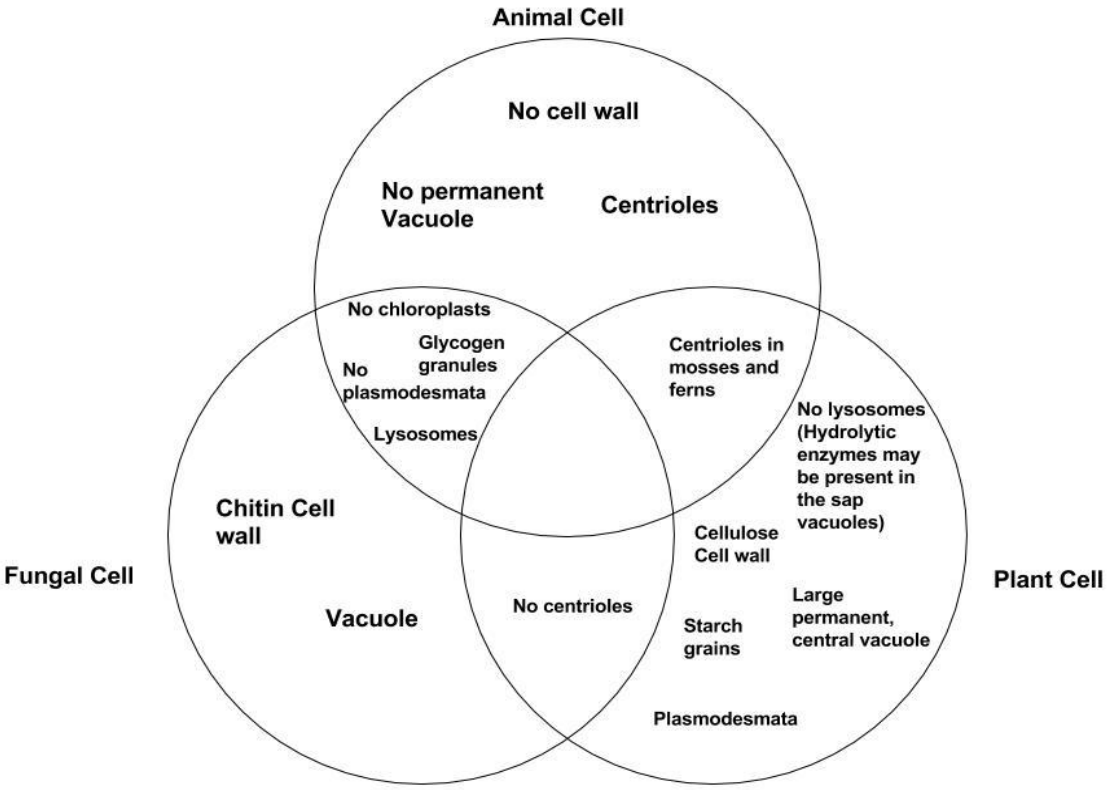
These are:

Organelle	Description	Function
The Nucleus	A large organelle surrounded by a Nuclear envelope (double membrane), which contains many pores. The nucleus also contains chromatin and a structure called the nucleolus.	The nucleus controls the cell's activities by controlling the transcription of DNA. DNA contains the instructions to make proteins. The pores allow substances to move between the nucleus and the cytoplasm.
Rough Endoplasmic Reticulum	A system of membranes enclosing a fluid filled space which surface is covered with Ribosomes.	The RER Folds and processes proteins that have been made at the ribosomes.
Smooth Endoplasmic Reticulum	Like the RER, only no Ribosomes.	It synthesises and processes lipids.
Golgi Apparatus	A group of fluid-filled, membrane bound, flattened sacs. Vesicles are often seen at the edges of the sacs.	Processes and packages new lipids and proteins, it also makes lysosomes.
Ribosomes	A very small organelle that either floats free in the cytoplasm or is attached to the RER. Made up of proteins and RNA, it's not surrounded by a membrane.	Proteins are made in Ribosomes.
Mitochondrion	Usually oval shaped, they have a double membrane. The inner one is folded to four structures called cristae. Inside is the matrix, which contains enzymes involved in respiration.	The site of aerobic respiration, where ATP is produced. They're found in large numbers in cells that are very active and require a lot of energy.

Self created (Anderson et al, 2015, p. 58)

Comparison of Eukaryotic Cells

There are 3 different types of Eukaryotic cells, these are Animal, Plant, and Fungal. They each contain the Key organelles as described above, however each have differences to each.

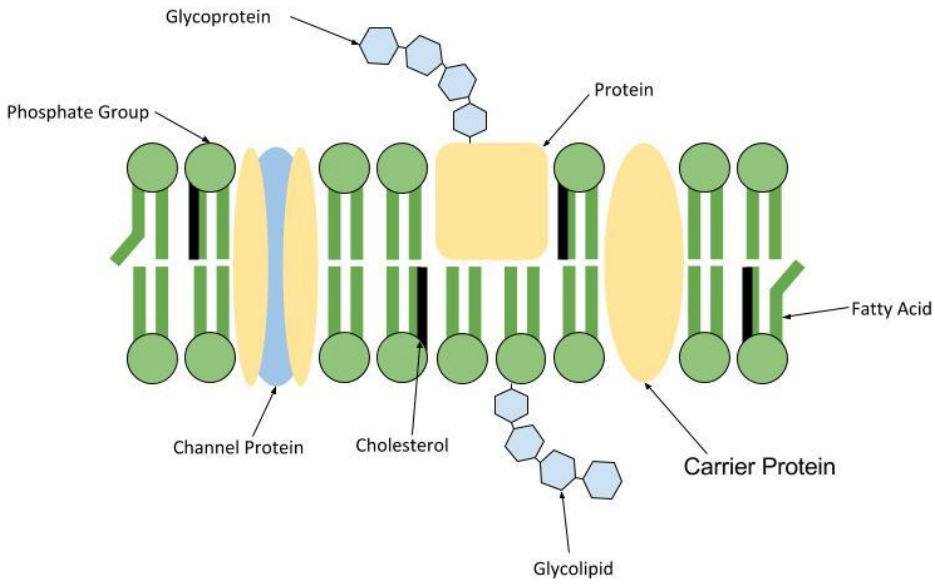


Self created (Campton, 2016, p. 36)

The Venn-Diagram above shows the comparison of the three types of cells. The cell types that have the most similarities are the fungal and animal cells, the least amount of similarities to the others are Plant cells. Although there are partial similarities with plant and Fungal cells, they are not the same. For example, the Vacuole is present in both, however there is a larger permanent one in the Plant cell.

Structure and function of the Cell Membrane

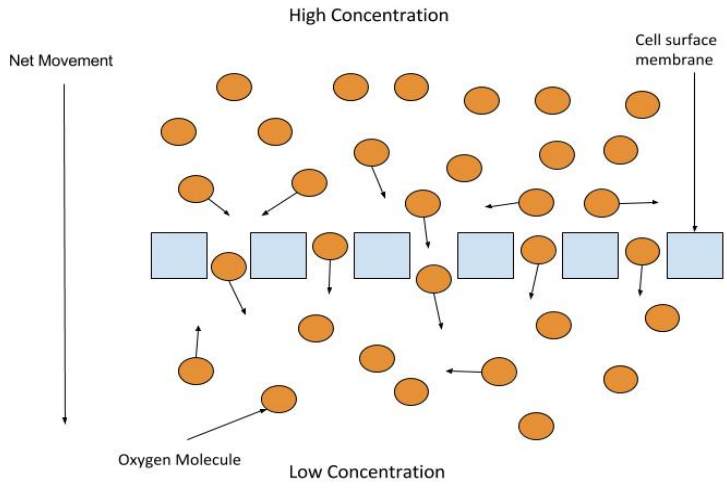
The structure of the Cell Membrane comes in one main fashion. This is the Phospholipid Bilayer formed from the Hydrophobic tails and the Hydrophilic heads. The tails, made up of fatty acids, face inwards away from aqueous environment, and the phosphate heads face toward the Cytoplasm of the cell, or the extracellular fluid on the outside of the cell. Proteins are also present in the cell membrane, these hold a responsibility towards the transportation of substances across the membrane. These proteins, sometimes carrier proteins, float in the bilayer (intrinsic proteins) or are attached to the membrane surface (extrinsic proteins). Since the Phospholipids are constantly moving the proteins are scattered among them, this structure is called the fluid-mosaic model. While all Cell membranes have a phospholipid bilayer, they don't all have the same number or type of proteins. This is because the cell membranes function is to facilitate the molecules that enter and leave the cell, this is with the use of proteins (Campton, 2016, p. 40).



Self created (Anderson et al, 2015, p. 30), (Adds et al. 1996, p. 4)

Transportation of Substances

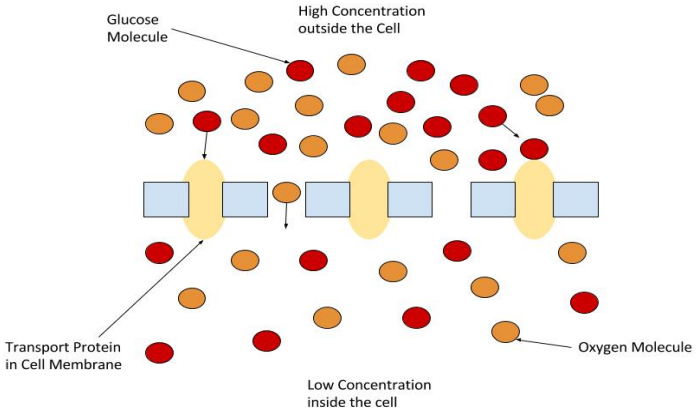
Since the cell-surface membrane acts as a barrier between cytoplasm and the extracellular fluid there are various processes used to transport the needed particles across.



Diffusion is where the smallest molecules such as gases, like oxygen and carbon dioxide passes through the lipid bilayer. This is where the particles are moving down the concentration gradient, so the cell doesn't need to provide energy for it. (Campton, 2016, p. 42)

Self created (Adds, J. et al, 1996, p. 13)

Facilitated diffusion is the diffusion of larger substances such as glucose or amino acids through the membrane. This is through macromolecules like channel proteins. Since these are polarised they cannot move through the phospholipid bilayer. Each channel protein is shaped for a specific type of substance, for example there is a Glucose protein which is only able to transport glucose atoms through the cell membrane, and cannot transport any other. (Campton, 2016, p. 42)



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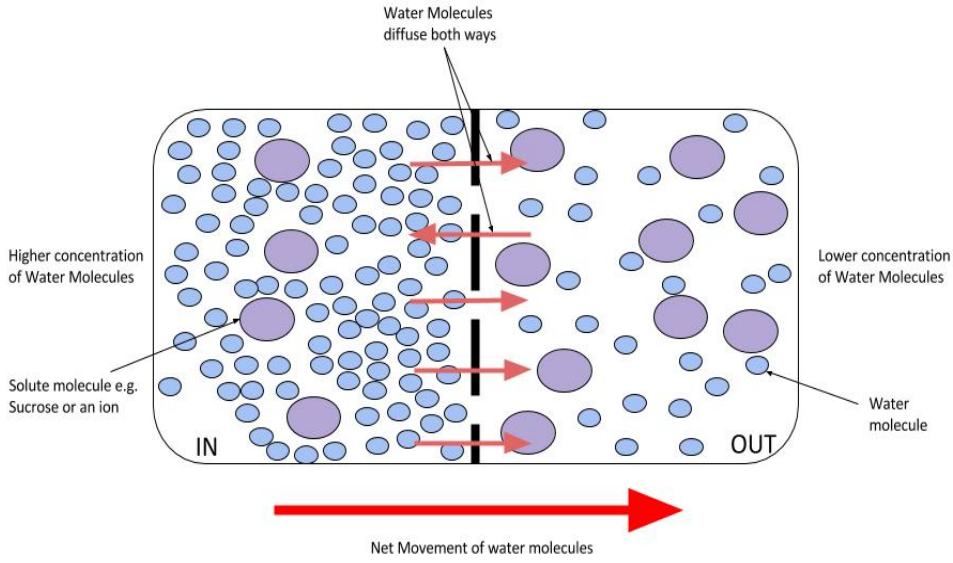
Osmosis is the diffusion of water through the partially permeable cell membrane. The water molecules move from a high concentration to a low concentration down the concentration gradient, so the cell doesn't need to supply any energy for it (Anderson, S., et al 2015, p. 9).



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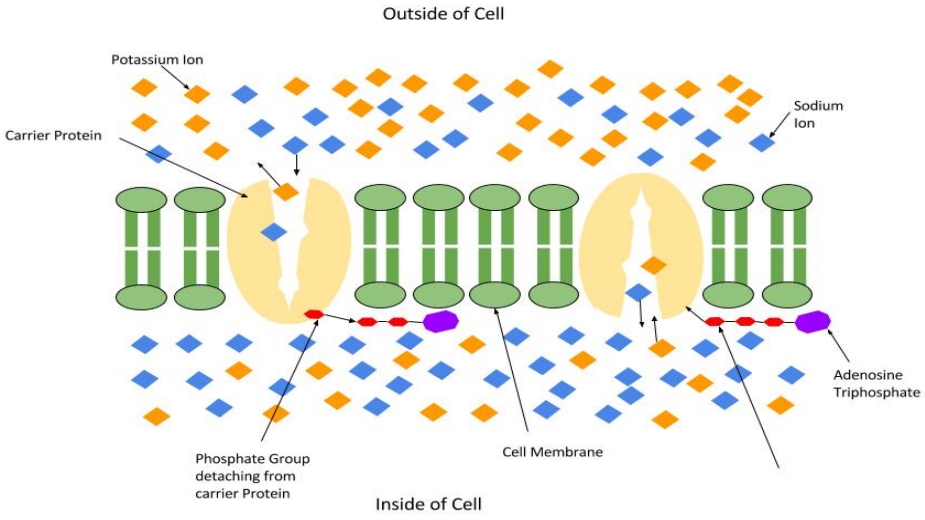
Active transport is the process where an atom goes against the concentration gradient, because it needs energy to do this the cell needs to provide energy for it. The cell does this by using the metabolic energy gained from ATP (Adenosine triphosphate). The most common active transport is the use of protein pumps, one of the best examples of this is the sodium-potassium pump. The protein pumps sodium atoms against the concentration gradient with ATP, and pumps potassium atoms with the gradient out of the cell (John Adds, 1996, p. 16)



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Substance Transportation and the Membrane Structure

The membrane structure and the transportation are very much related. If it weren't for the channel and pump proteins, the cell wouldn't be able to receive larger molecules such as water and glucose. This could mean that the cell wouldn't have enough nutrients and wouldn't be able to survive. Where the phospholipid bilayer has hydrophobic tails, the water molecules wouldn't be able to make it through, as they would stay in the middle of the membrane.

Summary

To summarise, the Cell is a very complex biological organism which may never be fully understood. There are many layers and organelles from the cell membrane to the central nucleolus. This and many more processes that keep the cell and ourselves functioning correctly.

References

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