

EUKARYOTES

- Eukaryote cells have some similarities with prokaryote cells, however they have many differences. Eukaryote cells are defined as cells containing a nucleus, organelles (other intracellular components surrounded by a membrane). For example mitochondria and chloroplasts are organelles. Plant cells are eukaryote cells; they have nuclei, mitochondria and chloroplasts. Though prokaryotes lack nucleus and other organelles, they still have some similarities.



- All prokaryote and eukaryote cells have **cell membrane** consisting of bilayer of phospholipids. Integral membrane proteins are found within this bilayer structure. Cell membranes are described as semipermeable. Only very small molecules and molecules without charge (some gases like oxygen, carbon dioxide, nitrogen, water and some other molecules) can pass freely. Big molecules and ions can not enter the cell membrane without their specific integral membrane proteins.



Integral membrane proteins facing the inner and outer parts of the cell are slightly protruded. They are also called transmembrane proteins. Some integral membrane proteins carry the nutrients in to the cell from the outside and some of them carry the metabolism products or waste products outside the cell. Some other integral membrane proteins function as the receptors of external communication signals.



Some cell membrane proteins perceive the environmental information. Receptors are found in their membranes and when these receptors bind to the chemical messenger molecule, the signal is perceived. The signal that is perceived at the surface is transmitted to towards the cytoplasm and responses form. These receptors enable cells to perceive their chemical environments and react accordingly.



- While these carrier proteins enable passing of molecules and information that is appropriate to be inside the cell, they limit passing of unnecessary and harmful substances.
- eg. Root cells of plants use ion channels to get minerals. Some of these channels are specialized in phosphate uptake. Phosphate is found within the structure of phospholipids, ATP and DNA. Nitrate and ammonium (ions that plants use for the production of amino acids and proteins) are taken inside the cell with ion carrying proteins that are found in the membranes of root cells.



- **Osmosis** results from the semipermeable property of the cell membrane. Cell wall is developed by nearly all prokaryotes, most of the Protista, fungi and plants as an evolutionary response. Cell wall is a limiting structure against expansion of the cell volume. Animal cells do not require cell wall against bursting of the cell since the salt concentration of the body fluids that the cells are found within is the same with the salt concentration of the cell itself. Thus salt is important in the diet of animals.



- Sportsmen and sportswomen drink special drinks enhanced with soluble substances to compensate for the fluid that they lose by sweating. And seriously dehydrated patients are given salt and sugar instead of pure water due to this phenomenon.



- Normally hypertonic solutions like salty water damage plants cells. If pot flowers are given salt water, they get damaged. In animal cells, ion channels are present to prevent the accumulation of excess ions in cytoplasm (absent in plant cells).
- Some plants may adapt to salty environment (e.g. deserts, salty swamps). These plants are termed as halophytes (salt loving plants).



- Halophytes have developed some adaptation mechanisms to avoid osmosis damage to the cell. Most of these cells accumulate inorganic salts like NaCl in their vacuoles and organic solutes in their cytoplasm. By this way, plants try to balance the concentration of solutes inside and outside the cell. Some other halophytes empty the excessive salts to the outside.



- **Endocytosis and exocytosis** are methods of substance transfer via cell membrane. Cells use other methods to take in or empty the substances that can not pass through the carrier proteins that are found in their membranes. Transfer of these big substances are performed by endocytosis and exocytosis. However prokaryotes do not perform endocytosis and exocytosis.



- Substances that would be expelled from the cell via exocytosis are primarily packaged in vesicles that have the structure of a phospholipid membrane. These balloon like vesicles move towards the cell membrane, and when they reach the cell membrane they fuse with the membrane and the substances that they contain are disposed of.



- Endocytosis starts with the accumulation of particles or other materials that are found outside the cell with a pocket formed by the cell membrane. The membrane turns into a vesicle with the gathering of the pocket opening. Then the vesicle detaches from the cell membrane and becomes a free vesicle within the cytoplasm.

