the Cell Membrane

The cell membrane, also known as the plasma membrane, is a double layer of lipids and proteins that surrounds a cell. It separates the cytoplasm (the contents of the cell) from the external environment. It is a feature of all cells, both prokaryotic and eukaryotic.

Function of the Cell Membrane

Isolate cells contents from outside environment.

Regulate exchange of substances between inside and outside of cell.

Communicate with other cells.

It is a selectively permeable barrier, meaning it allows some substances to cross, but not others. The cell membrane only allows certain molecules to enter or exit.

Structure of the Cell Membrane

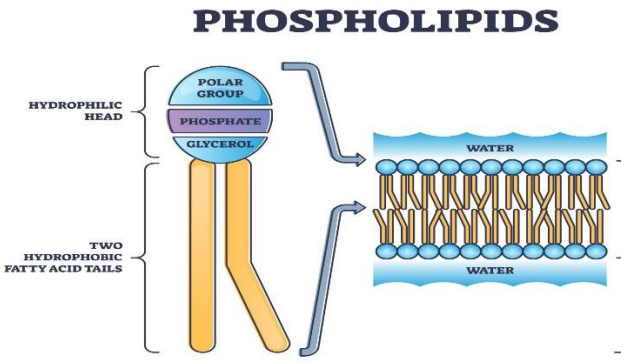
The cell membrane is primarily composed of a mix of proteins and lipids, while lipids help to give membranes their flexibility, proteins monitor and maintain the cell's chemical climate and assist in the transfer of molecules across the membrane.

Cell Membrane Lipids

Phospholipids

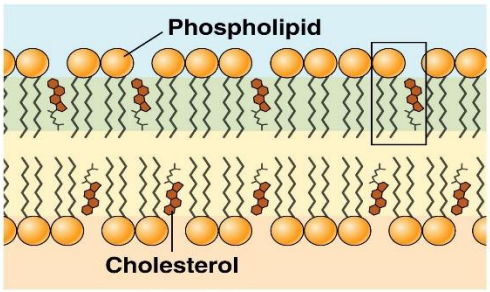
Phospholipids are a major component of cell membranes. Phospholipids form a lipid bilayer in which their hydrophilic (attracted to water) head areas spontaneously arrange to face the aqueous cytosol and the extracellular fluid, while their hydrophobic (repelled by water) tail areas face away from the

cytosol and extracellular fluid. The lipid bilayer is semi-permeable, allowing only certain molecules to diffuse across the membrane.



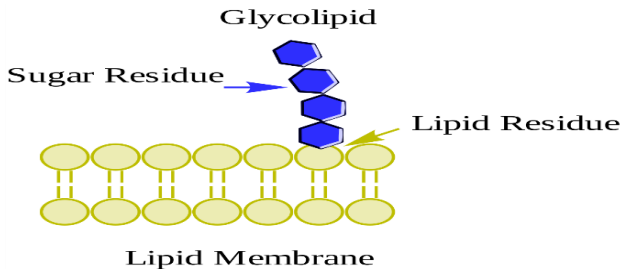
Cholesterol

Cholesterol is another lipid component of animal cell membranes. Cholesterol molecules are selectively dispersed between membrane phospholipids. This helps to keep cell membranes from becoming stiff by preventing phospholipids from being too closely packed together.



Glycolipids

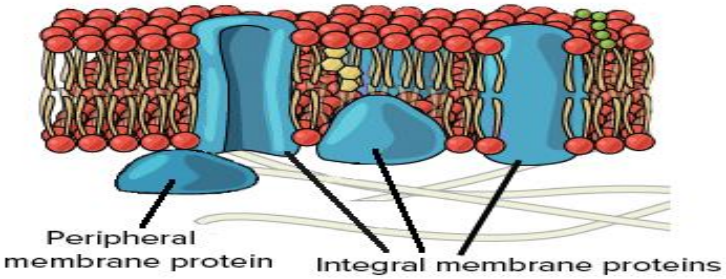
are located on cell membrane surfaces and have a carbohydrate sugar chain attached to them. They help the cell to recognize other cells of the body.



Cell Membrane Proteins

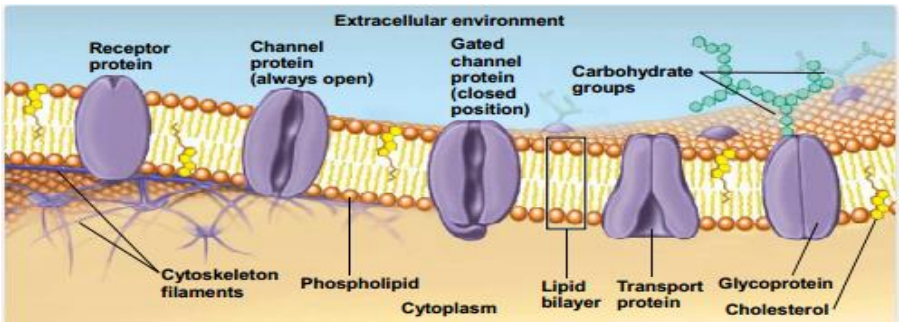
The cell membrane contains two types of associated proteins.

1. Peripheral membrane proteins are exterior to and connected to the membrane by interactions with other proteins.
2. Integral membrane proteins are inserted into the membrane and exposed to aqueous environment on both sides of the membrane and used to transport molecules across membrane.



Cell membrane proteins have a number of different functions.

1. Structural proteins help to give the cell support and shape.
2. receptor proteins help cells communicate with their external environment through the use of hormones, neurotransmitters, and other signaling molecules.
3. Transport proteins, such as globular proteins, transport molecules across cell membranes through facilitated diffusion.
4. Glycoproteins have a carbohydrate chain attached to them. They are embedded in the cell membrane and help in cell to cell communications and molecule transport across the membrane.

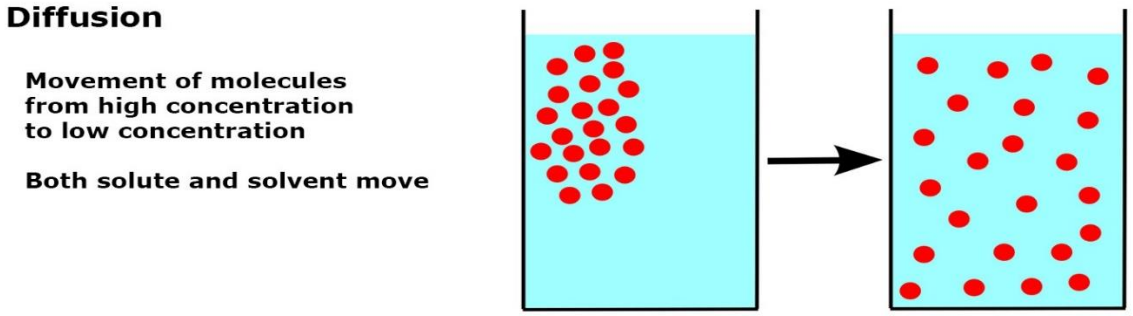


Movement through the Plasma Membrane

In order for the cell cytoplasm to communicate with the external environment, materials must be able to move through the plasma membrane. This movement occurs through several mechanisms.

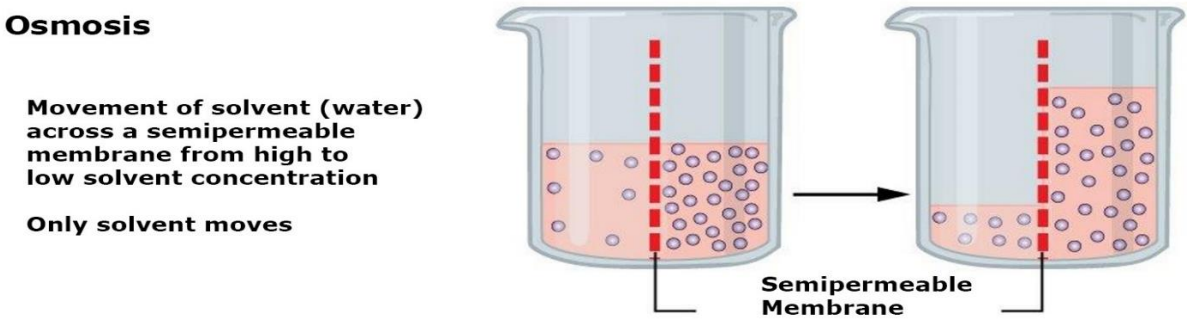
Diffusion

Diffusion is the movement of molecules from high concentration to low concentration (both solute and solvent move).



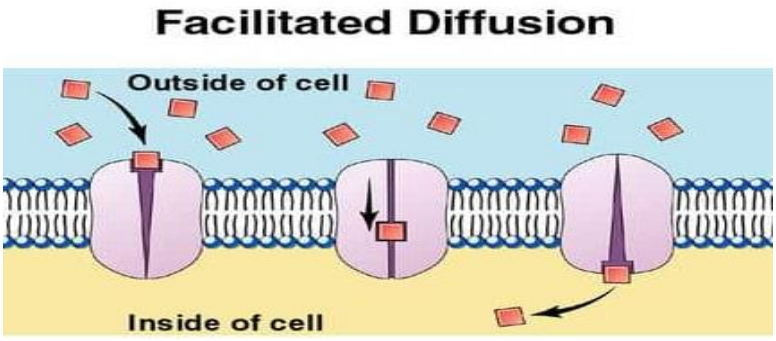
Osmosis

Osmosis is the movement of water from a region of higher concentration to one of lower concentration. Osmosis occurs across a membrane that is semipermeable. A semipermeable membrane lets only certain molecules pass through while keeping other molecules out. Osmosis is really a type of diffusion involving only water molecules.



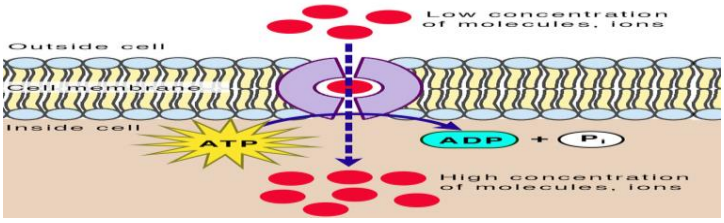
Facilitated diffusion

A third mechanism for movement across the plasma membrane is facilitated diffusion. Certain proteins in the membrane assist facilitated diffusion by permitting only certain molecules to pass across the membrane. The proteins encourage movement in the direction that diffusion would normally take place, from a region with a higher concentration of molecules to a region of lower concentration.



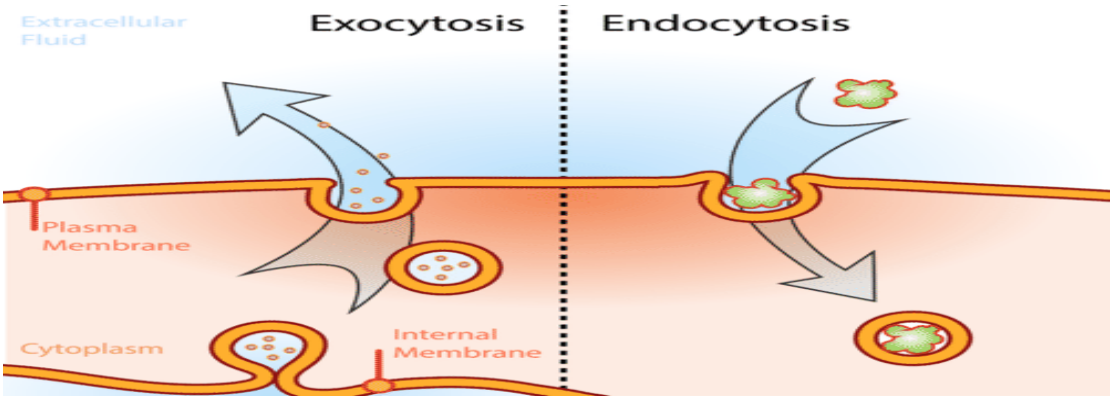
Active transport

A fourth method for movement across the membrane is active transport. When active transport is taking place, a protein moves a certain material across the membrane from a region of lower concentration to a region of higher concentration. Because this movement is happening against the concentration gradient, the cell must expend energy that is usually derived from a substance called adenosine triphosphate, or ATP



Endocytosis and exocytosis

The final mechanism for movement across the plasma membrane into the cell is endocytosis, a process in which a small patch of plasma membrane encloses particles or tiny volumes of fluid that are at or near the cell surface. The membrane enclosure then sinks into the cytoplasm and pinches off from the membrane, forming a vesicle that moves into the cytoplasm. When the vesicle contains solid particulate matter, the process is called phagocytosis. When the vesicle contains droplets of fluid, the process is called pinocytosis. Along with the other mechanisms for transport across the plasma membrane, endocytosis ensures that the internal cellular environment will be able to exchange materials with the external environment and that the cell will continue to thrive and function. Exocytosis is the reverse of endocytosis, where internally produced substances are enclosed in vesicles and fuse with the cell membrane, releasing the contents to the exterior of the cell.



Animal Tissues, Organs and Organ Systems

Cells are organized into tissues which are grouped together to form organs. A collection of organs work together in an organ system which carry out a particular function.

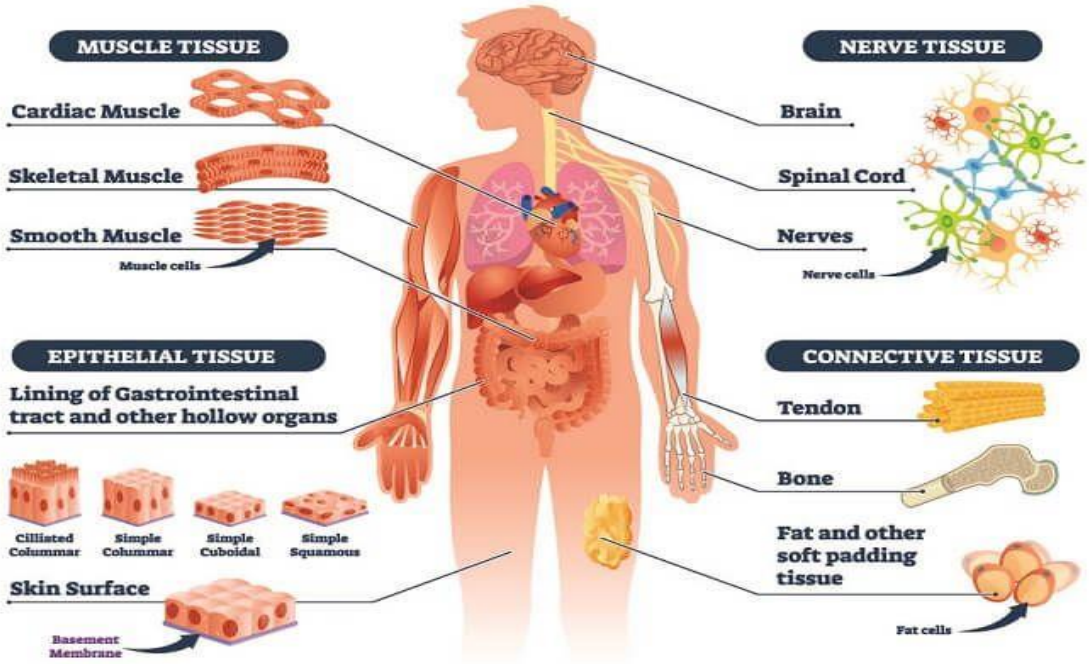
The Tissues

Our bodies have trillions of cells and those cells are organized into other structures. A group of cells that work together to perform a specific function is called a tissue. In animals, some types of tissues can be considered simple if they are made up of only one layer of cells or can be considered compound if they are composed of more than one layer.

A tissue is a group of specialized cells that work together to carry out specific functions.

There are 4 main types of tissues in the human body:

1. Epithelial tissue: Lining tissue made up of single or multiple layers of cells that cover the external surface of the body and line the internal surfaces (e.g., the digestive tract).
2. Connective tissue: Connective tissue composed of cells suspended in a matrix that supports, protects, binds, or otherwise connects other structures.
3. Muscular tissue: Motor tissue made up of cells that cause movement of body parts by shortening, or contracting, and relaxing.
4. Nervous tissue: Communicative tissue composed of cells (neurons) that send and receive electrical impulses and cells that support them.

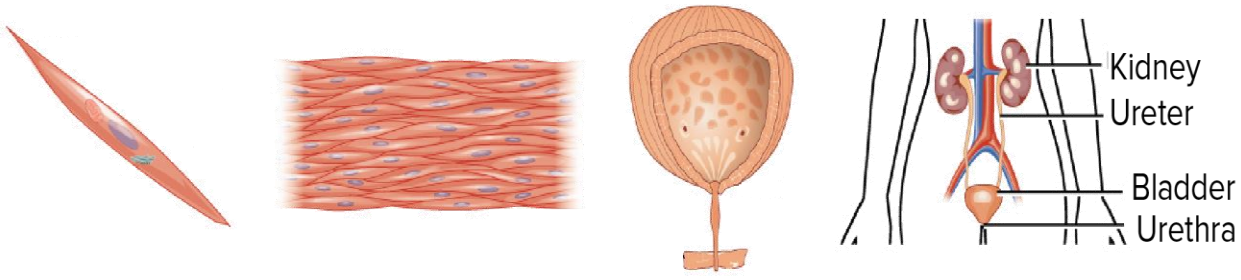


The organs

An organ is a collection of tissues joined in a structural unit to serve a common function Examples of organs include the heart, the lungs, the liver, kidneys, the intestines and the stomach.

The organ system

An organ system is a biological system consisting of a group of organs that work together to perform one or more functions, examples of organ systems include the respiratory system, circulatory system, reproductive system and digestive system



Muscle cell Muscle tissue Organ (bladder) Organ system