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Human Physiology:

Physiology is the scientific study of an organism's vital functions, including growth and development, the absorption and processing of nutrients, the synthesis and distribution of proteins and other organic molecules, and the functioning of different tissues, organs, and other anatomic structures.

The word physiology was come from the Ancient Greek (physiología, "natural philosophy"). Human Physiology is the science deal with the normal functions in living systems. Human physiology is the study of functions of the human body such as:

*__Cell physiology__, which study of the functions of cells.
__*Special physiology__, which study of the functions of specific organs. For example, study of kidney function.

__*Systemic physiology__, which study the function of cardiovascular physiology etc.

__*Pathophysiology,__ study of the effects of diseases on organ or system functions.

There are hundreds of trillions (10^{14}) of cells in our bodies and most humans cells are between 1 and 100 micrometers , which constitute about 200 distinct types of cells. Cells with similar properties aggregate to form tissue, (i.e. muscle tissue, nerve tissue). Different tissues combine to form organs (i.e.

brain, heart, and kidney). Organs are linked together to form systems. (i.e. cardiovascular system).

Cell physiology:

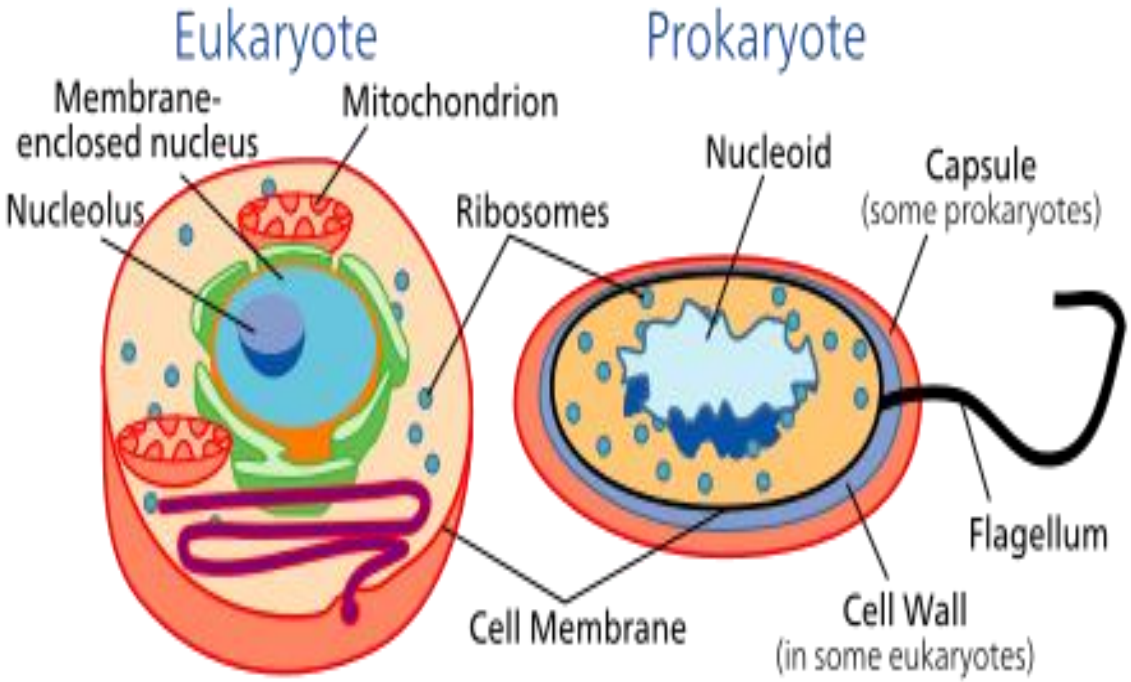
The term "physiology" refers to all the normal functions that take place in a living organism. Cell biology is a scientific discipline that studies cells – their physiological properties, such as life cycle, division and death..etc.

Cell is the smallest unit of life that is classified as a living thing, and is often called the "building blocks of life". It consists of a protoplasm enclosed within a membrane, which contains many biomolecules such as proteins and nucleic acids. Organisms can be classified as unicellular (consisting of a single cell; including most bacteria) or multicellular (including animals). All organisms are composed of one or more cells, vital functions of an organism occur within cells, and all cells contain the hereditary information necessary for regulating cell functions and for transmitting information to the next generation of cells. There are two types of cells:

Eukaryotes: are organisms whose cells have a nucleus enclosed within a nuclear envelope. They represent a tiny minority of the number of organisms, which contain a nucleus; they can be either single-celled or part of multicellular organisms. Eukaryotic cells are about fifteen times wider than a typical prokaryote and can be as much as a thousand times greater in

volume, like animals. It contain membrane-bound organelles such as mitochondria and the Golgi apparatus, and some cells contain chloroplasts.

Prokaryotes: is a unicellular organism that lacks a membrane-bound nucleus, mitochondria, or any other membrane-bound organelle, like Bacteria. Prokaryotes reproduce without fusion of gametes. They are the first form of life on Earth. They are simpler and smaller than eukaryotic cells.



The cells of eukaryotes and prokaryotes

Cell Membrane:

The cell membrane (also known as the plasma membrane or cytoplasmic membrane) is a biological membrane that separates

the interior of all cells from the outside environment and protect the cell from its surroundings.

The membrane is selectively permeable and able to regulate what enters and exits the cell, thus facilitating the transport of materials needed for survival. The movement of substances across the membrane can be either "**passive**", occurring without the input of cellular energy, or **Active**, requiring the cell to expend energy in transporting it. Cell membrane are involve in variety of cellular processes such as cell adhesion and ion conductivity of cell.

Function of cell membrane includes:

1- Supporting and retaining the cytoplasm.
2- Being a selective barrier: Some molecules can cross the membrane without assistance, most cannot.
3- Transport: The proteins in the membrane making contact with both, the outside environment and the cytoplasm.
4- Recognition: The cells identify other cells and microorganisms through its membrane.

Transport through cell membrane: In cellular biology, transport through membrane refers to the collection of mechanisms that regulate the passage of solutes such as ions and small molecules through biological membranes, every cell membrane has two primary building blocks, include protein (about 60% of the membrane) and lipids (about 40% of the membrane). The regulation of passage through the membrane is

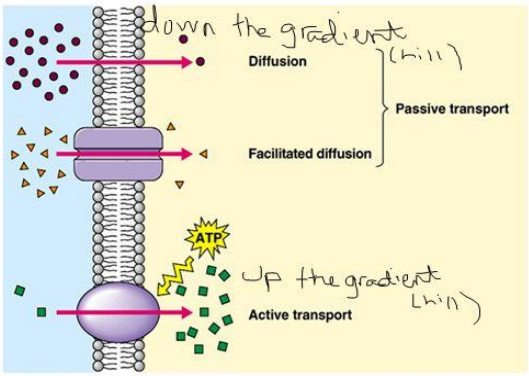
due to selective membrane permeability. In other words, they can be permeable to certain substances but not to others.

Cell membrane transport

- There are 2 types of cell membrane transport:

– **Passive Transport**
  - Things flow from High to low concentration
  - DOES NOT USE ATP (energy)

– **Active Transport**
  - Things flow from Low to high concentration
  - USE ATP (energy)



Transport types:

1- Passive transport is a spontaneous phenomenon that things flow from high to low concentration and does not use ATP energy. The rate of passive transport depends on the permeability of the cell membrane, which, in turn, depends on the organization and characteristics of the membrane lipids and proteins. The four main kinds of passive transport are simple diffusion, facilitated diffusion, filtration, and/or osmosis.

2- Active transport is the movement of molecules across a membrane from a region of lower concentration to a region of higher concentration. It is requires cellular energy to achieve this movement. An example of active transport in human physiology is the uptake of glucose in the intestines. There are two types of active transport. Primary active transport that uses adenosine triphosphate (ATP) and secondary active transport that uses an electrochemical gradient.