

Introduction to cell physiology

Human Physiology

The science of human physiology attempts to explain the specific characteristics and mechanisms of the human body that make it a living being.

Cell physiology

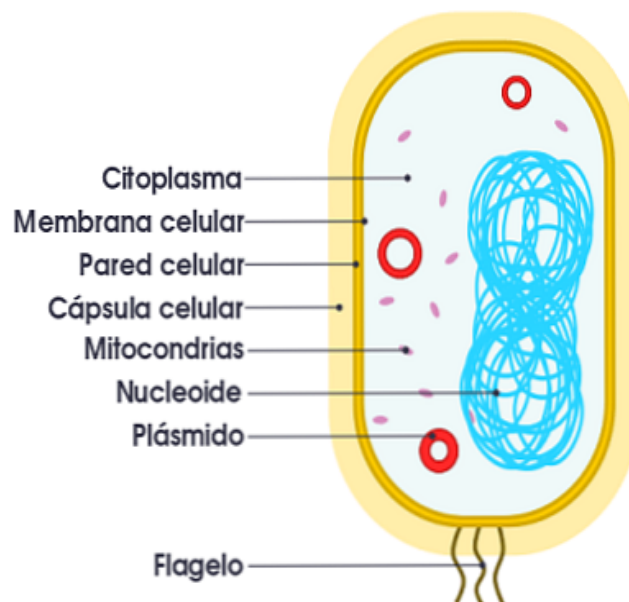
is the study of the activities that take place in a cell to keep it alive. It is a branch of biology that focuses on the normal functions of living organisms. Animal cells, plant cells, and microorganism cells show similarities in their functions even though they vary in structure. There are two types of cells: prokaryotes and eukaryotes

General characteristics

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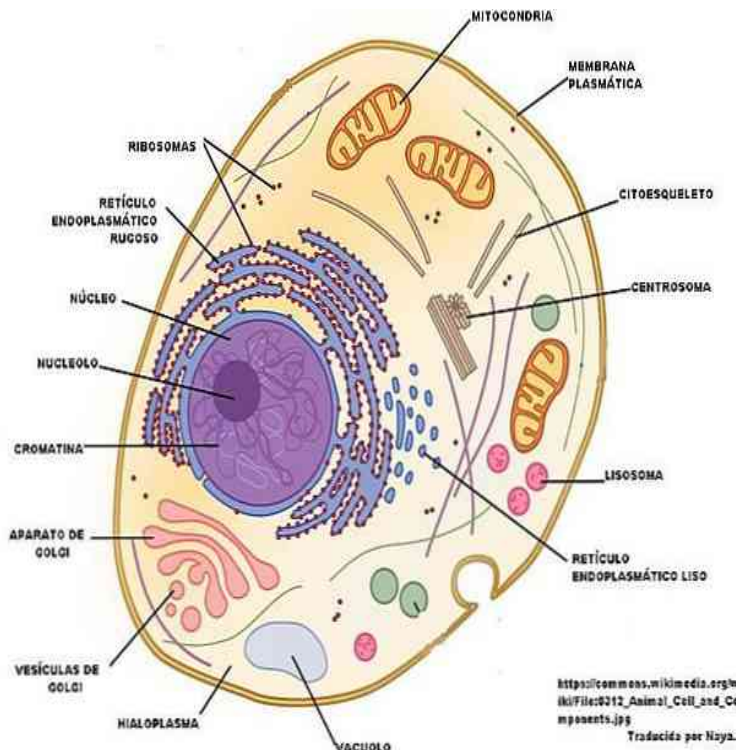
1- Prokaryotes

Prokaryotes have DNA located in an area called the nucleoid, which is not separated from other parts of the cell by a membrane. Prokaryotes have fewer organelles than eukaryotes. Both have plasma membranes and ribosomes (structures that synthesize proteins[clarification needed] and float free in cytoplasm). Two unique characteristics of prokaryotes are fimbriae (finger-like projections on the surface of a cell) and flagella (threadlike structures that



2- Eukaryotes

Eukaryotes have a nucleus where DNA is contained. They are usually larger than prokaryotes and contain many more organelles. The feature of a eukaryote that distinguishes it from a prokaryote, contains a nuclear envelope, nucleolus and chromatin. In cytoplasm,



Levels of Organization of the human body

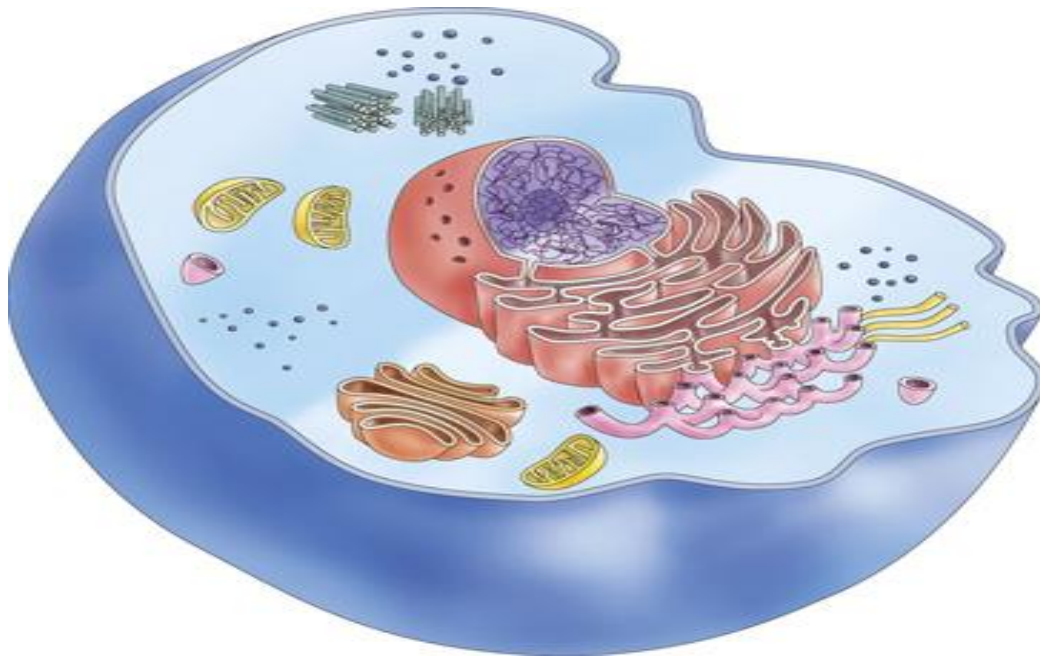
Chemicals → Cellular → Tissue → Organ → System → Organisms

Chemical level :- At this level, atoms, tiny building blocks of matter, combine to form molecules.

Cells:- is the smallest unit that is capable of performing life functions..

Cells are the Living Units of the Body:

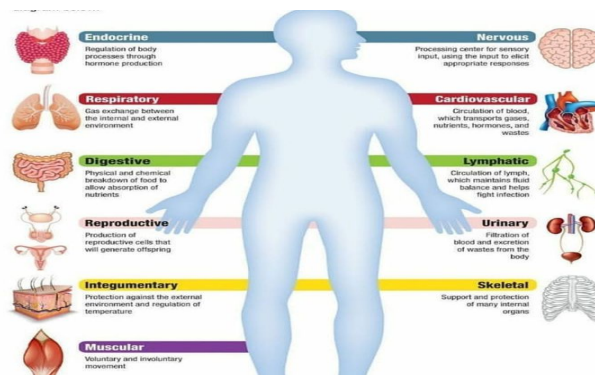
The basic living unit of the body is the cell. Each organ is an aggregate of many different cells held together by intercellular supporting structures.



Tissues:- it is groups of similar cells that have a common function.

Organ is:- a structure composed of two or more tissue types that performs aspecific function for the body.

Organ system is:- a group of organs that work together to accomplish acommon purpose.



- Integumentary System
- Skeletal System
- Muscular System
- Nervous System
- Endocrine System
- Cardiovascular System
- Lymphatic System
- Respiratory System
- Digestive System
- Urinary/excretory system
- Reproductive system

Organism:- it is the highest level of organization, it includes 11 organsystem.

The basic principles of physiology on which the activity of an organism depends:

Extracellular fluid—the “internal environment”

- ❖ About 60 percent of the adult human body is fluid, mainly a water solution of ions and other substances.
- ❖ Fluid is inside the cells and is called intracellular fluid.
- ❖ Fluid outside the cells and is called extracellular fluid.
- ❖ This extracellular fluid is in constant motion throughout the body. It is transported rapidly in the circulating blood and then mixed between the blood and the tissue fluids by diffusion through the capillary walls.
- ❖ In the extracellular fluid are the ions and nutrients needed by the cells to maintain life.
- ❖ Cells are capable of living and performing their special functions as long as the proper concentrations of oxygen, glucose, different ions, amino acids, fatty substances, and other constituents are available in this internal environment.
- ❖ The intracellular fluid differs significantly from the

extracellular fluid;

❖ The extracellular fluid contains large amounts of sodium, chloride, and bicarbonate ions plus nutrients for the cells, such as oxygen, glucose, fatty acids, and amino acids. It also contains carbon dioxide that is being transported from the cells to the lungs to be excreted, plus other cellular waste products that are being transported to the kidneys for excretion. While the fluid inside the cell contains large amounts of potassium, magnesium and phosphate ions instead of the ions found in the extracellular fluid.

* Special mechanisms of ion transport across cell membranes maintain ion concentration differences between extracellular fluids and intracellular fluids.

Homeostasis

Homeostasis in a general sense refers to stability and balance. It is the body's attempt to maintain a constant internal environment. Maintaining a stable internal environment requires constant monitoring and adjustments as conditions change. This adjusting of physiological systems within the body is called homeostatic regulation.

Homeostatic regulation involves three parts or mechanisms:

1) **the receptor:** The receptor receives information that something in the environment is changing.

2) **the control center:** integration center receives and processes information from the receptor.

3) **the effector:** the effector responds to the commands of the control center by either opposing or enhancing the stimulus.

For example:

o in regulating body temperature there are temperature receptors in the skin, which communicate information to the

brain, which is the control center, and the effector is our blood vessels and sweat glands.

Negative feedback: a reaction in which the system responds in such a way as to reverse the direction of change.

Example of Negative feedback

- ❖ when the concentration of carbon dioxide in the human body increases, the lungs are signaled to increase their activity and expel more carbon dioxide.
 - ❖ Thermoregulation is another example of negative feedback, when body temperature rises (or falls), receptors in the skin and the hypothalamus sense a change, triggering a command from the brain, this command in turn effects the correct response. in this case the temperature of body is lowering.**Positive feedback:** a response is to amplify the change in the variable.
- o This has a destabilizing effect, so does not result in homeostasis.
 - o Positive feedback is less common in naturally occurring systems than negativefeedback, but it has its applications.
 - o (parturition) are other types of positive feedback.
 - o Positive Feedback it also can be harmful at times.

- **Metabolism**

The living organism obtains the energy necessary for its growth, the restoration of its organs and the completion of its vital activities from food.

The energy is released through complex chemical reactions through which large molecules are broken down into simple molecules or oxidized into water and carbon dioxide. This process of catabolism is called catabolism.

He himself builds complex materials from simple materials called the process of anabolism, and the end result of the processes of building and demolition is called metabolism.