

# INTRODUCTION TO PHYSIOLOGY



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# Physiology

Physiology (from the Greek *physis* = nature; *logos* = study) is the study of biological function—of how the body works, from molecular mechanisms within cells to the actions of tissues, organs, and systems, and how the organism performs particular tasks essential for life.

An example:

1. The study of the mechanical, physical, and biological mechanisms that underpin bodily functions is known as human physiology.
2. About 60% of the human body is made up of fluid, and two thirds of that fluid is intracellularly stored in cells.
  - Potassium, magnesium, and phosphate ions are abundant in intracellular fluid.
  - makes about one-third of the fluid outside of cells Extracellular fluid.
  - Extracellular fluid also contains significant concentrations of sodium, chloride, and bicarbonate ions. In addition to oxygen, glucose, fatty acids, and amino acids.

# Relation to Physiology

## **Anatomy**

These Greek words are derived from ana which means "up"; and tomos which means, "to cut".

Together this gives "a cutting up" In general, anatomy is considered the “Study or knowledge of the structure (form) and function of the human body“. Anatomy and physiology are connected to each other and thus it is important to identify and incorporate the way these two are related.

## **Relation to Physiology:**

Anatomy describes the form, location, and structure of organs, while physiology explains how those organs function. They are closely related: You cannot fully understand how something works (physiology) without knowing what it looks like and where it is (anatomy)

# Level of organization in living organisms

- 1- Cell: The cell is the basic unit of structure and function of living organisms.
- 2- Tissue: A tissue is a group of similar cells that performs a specialized function (epithelia, connective, muscle and nervous).
- 3- Organ: An organ is a structure consisting of a group of tissues that perform a specialized function (skin, heart, brain, etc...).
- 4- System: A system is a group of organs that act together to perform a specialized function. ( cardiovascular system, respiratory system, urinary system, digestive system, nervous system, endocrine system, etc...)
- 5- Human body: A living organism is the most complex level of organization. It consists of all the systems.

# Human physiology types:

The study of human physiology can be categorized into the following sorts of bodily functions.

1. Cell physiology

The study of how cells work.

2. Special physiology

This is the study of how particular organs work. Ex, the study of kidney function.

- 3- Systemic physiology

It covers every facet of how the body's systems work, including respiratory, digestive and cardiovascular physiology.

4. Pathophysiology

It is the study of how diseases affect the way organs or systems work.

# Homeostasis and feedback control

- The regulatory mechanisms of the body can understand terms of a single shared function:

that

- of maintaining constancy of the internal environment. The internal environment is known

as

- homeostasis, maintained by negative feedback loops.

# Negative Feedback Loops

When a particular measurement of the internal environment, such as a blood measurement deviates significantly from the normal range of values, it can be concluded that homeostasis is not being maintained and that the person is sick. In order for internal constancy to be maintained, changes in the body must stimulate sensors that can send information to an integrating center. This allows the integrating center to detect changes from a set point; there is a set point for body temperature, blood glucose concentration. The integrating center is often a particular region of the brain or spinal cord, but it can also be a group of cells in an endocrine gland. A number of different sensors may send information to a particular integrating center, which can then integrate this information and direct the responses of effectors —generally muscles or glands.

A sensor detects a rise in some factor of the internal environment ( $\uparrow X$ ). This information is

send to an integrating center, which causes an effector to produce a change (1) in the opposite

direction ( $\downarrow X$ ). The initial deviation is thus reversed (2), completing a negative feedback loop. A sensor detects a fall in some factor of the internal environment ( $\downarrow X$ ).

### **Antagonistic Effectors**

Control by antagonistic effectors is sometimes described as

“push-pull”, where the increasing activity of one effector is accompanied by decreasing activity of an antagonistic effector.

# Positive Feedback

- By negative feedback loops, maintain constancy of the internal environment. The opposite
- occurs during positive feedback—in this case, the action of effectors amplifies those changes
- that stimulated the effectors. Blood clotting, for example, occurs as a result of a sequential
- activation of clotting factors; the activation of one clotting factor results in activation of many
- in a positive feedback cascade. In this way, a single change is amplified to produce a blood
- clot. Formation of the clot, however, can prevent further loss of blood, and thus represents the
- completion of a negative feedback loop that restores homeostasis.