
SECTION ONE

ENDOCRINE SYSTEM OVERVIEW

The endocrine system is a network of glands and organs located throughout the body. It is similar to the nervous system in that it plays a vital role in controlling and regulating many of the body's functions.

However, while the nervous system uses nerve impulses and neurotransmitters for communication, the endocrine system uses chemical messengers called hormones.

Keep reading to discover more about the endocrine system, what it does and the hormones it produces.

What Does the Endocrine System Perform?

The endocrine system is responsible for regulating a range of bodily functions through hormone release.

Hormones are secreted by the glands of the endocrine system and travel through the bloodstream to various organs and tissues in the body. The hormones then inform the organs and tissues of what to do or how to function.

Examples of bodily functions that are controlled by the endocrine system include the following:

- Metabolism
- Growth and development

- Sexual function and reproduction
- Heart rate
- Blood pressure
- Appetite
- Sleeping and waking cycles
- Body temperature

What Is a Gland?

The gland is an organ that creates and releases substances that the body needs to function. There are two types of glands:

1. Endocrine glands, which release hormones directly into the bloodstream.
2. Exocrine glands, such as lymph nodes and sweat glands, which are not part of the endocrine system.

Regional Control

Autocrine control: Autocrine control also participates in the self-regulation of the cell, but it is accompanied by the secretion of signalling molecules. After release, the signalling molecule binds to a receptor on the same secretory cell and induces alterations in its activity.

Juxtacrine control: signalling compound is not secreted, but is transported through the pores of gap junctions – thus reaching the neighbouring cells and affecting those cells.

Paracrine control: A signalling compound is released by the cells of a certain organ or tissue and affects the adjacent cells of the same organ. It is the most common type of local control. Signalling compounds with predominant paracrine effects are often called paracrine factors or histo-hormones. Transduction of signals by neurotransmitters is one example of specialised paracrine signalling.

Endocrine (hormonal) control: Hormones are secreted by the endocrine gland and endocrine or effector cells and enter the bloodstream, acting on all body structures that possess the appropriate

receptor. The effects of a hormone depend on the type of receptor and the responsive tissue.

Intercellular Communication Systems

Neuroendocrine control: A neurohormone is secreted by axon terminals and enters the bloodstream via the capillary plexus. Other events are similar to those involved in endocrine regulation.

Neurocrine control: The nervous system can be considered a system with a paracrine way of regulation because the neurotransmitters act within a restricted spatial range on the nearby elements through specialised receptors. Distant action is achieved by the length of the axon and the number of synaptic switches.

Description and Functions of Hormones

Definition: Hormone is a regulatory messenger molecule that is produced and released by specialised glands or cells in the endocrine system. Hormones travel through the bloodstream to target cells or organs in various parts of the body, where they exert specific effects on physiological processes and help maintain homeostasis. These effects include the regulation of growth and development, metabolism, immune function, mood and reproductive processes.

Hormones play a crucial role in coordinating and controlling various bodily functions, ensuring that different systems work harmoniously. The endocrine system, consisting of glands such as the pituitary, thyroid, adrenal and pancreas, is responsible for producing and releasing hormones. Hormones interact with specific receptors on target cells, triggering a cascade of events that ultimately leads to the desired physiological response.

There are various hormones, including peptides, steroids and amino acid derivatives, each with unique structures and functions. Examples of hormones include insulin, cortisol, oestrogen, testosterone, adrenaline and thyroid hormones. The precise regulation of hormone levels

is essential for maintaining optimal health and ensuring the proper functioning of the body's physiological processes.

Hormones help to regulate:

- Chemical composition and volume of the internal environment (interstitial fluid)
- Metabolism and energy balance
- Contraction of smooth and cardiac muscle fibres
- Glandular secretions
- Some immune system activities, e.g.:
 - control of growth and development
 - regulates the operation of reproductive systems
 - helps establish circadian rhythms

Hormone Activity

- Hormones affect only specific target cells that have receptors to recognise (bind) a given hormone.
- The number of hormone receptors may decrease or increase.
- Circulating hormones enter the bloodstream, while local hormones (without first entering the bloodstream) are called paracrine (acting locally on neighbouring cells) and autocrine (acting locally on the same cell that secretes them).

Mechanisms of Hormones

- Lipid-soluble steroid hormones and thyroid hormones affect cell function by altering gene expression → (Lipid-soluble hormones bind to receptors inside target cells.)
- Water-soluble hormones alter cell function by activating plasma membrane receptors, which elicit production of a second messenger that activates various enzymes inside the cell → (Water-soluble hormones bind to receptors embedded in the plasma membranes of target cells.)