

Endocrine System

The endocrine system

Is a control system of ductless glands that secrete hormones within specific organs . Hormones act as "messengers," and are carried by the bloodstream to different cells in the body, which interpret these messages and act on them.

It seems like a far-fetched notion or idea that a small chemical can enter the bloodstream and cause an action at a distant location in the body. Yet this occurs in our bodies' everyday of our lives. The ability to maintain homeostasis and respond to stimuli is largely due to hormones secreted within the body. Without hormones, you could not grow, maintain a constant temperature, produce offspring, or perform the basic actions and functions that are essential for life.

The endocrine system provides an electrochemical connection from the hypothalamus of the brain to all the organs that control the body metabolism, growth and development, and reproduction.

There are two types of hormones secreted in the endocrine system: Steroidal and non-steroidal, (or protein based) Hormones.

Increases in hormone activity decrease the production of that hormone.

Types of Glands

Exocrine Glands

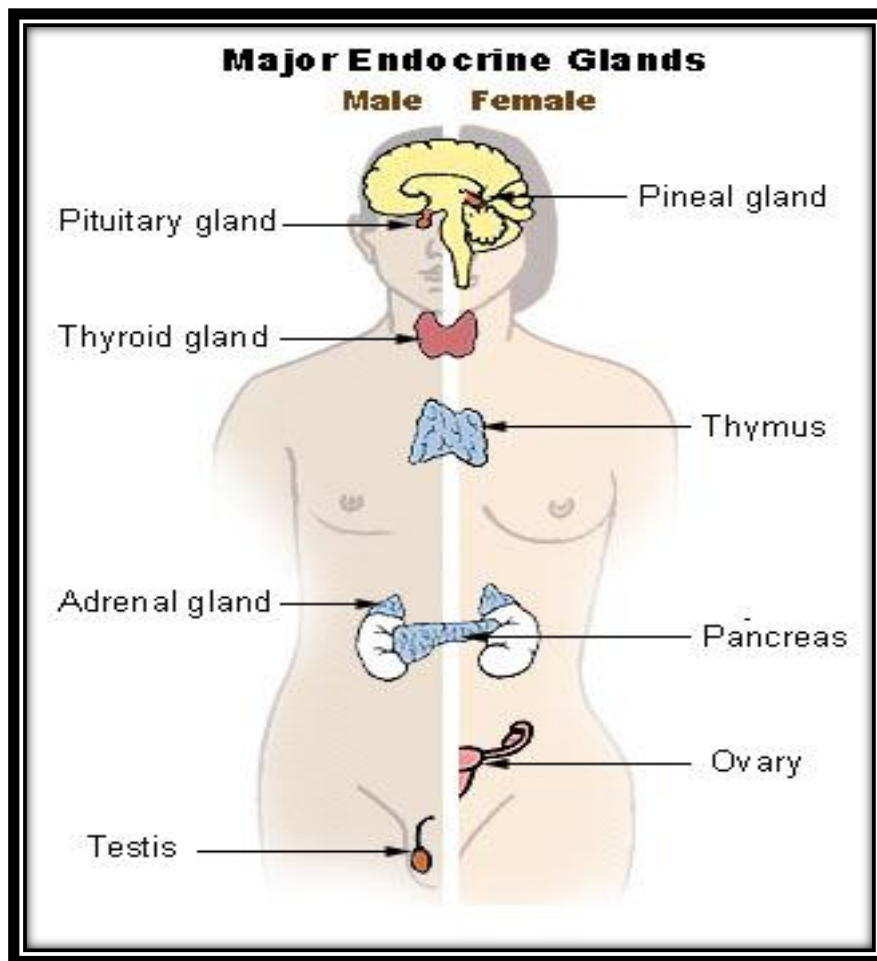
Are those which release their cellular secretions through a duct which empties to the outside or into the lumen (empty internal space) of an organ . These include certain sweat glands, salivary glands, and mammary glands. They are not considered a part of the endocrine system.

Endocrine Glands

Are those glands which have no duct and release their secretions directly into the intercellular fluid or into the blood . The collection of endocrine glands makes up the endocrine system.

The major endocrine glands:

1. Pineal gland
2. Pituitary gland
3. Thyroid gland
4. Thymus
5. Adrenal gland
6. Pancreas
7. Ovary
8. Testis



Hormones and Types

hormone is a type of chemical signal. They are a means of communication between cells.

The endocrine system produces hormones that are instrumental in maintaining homeostasis and regulating reproduction and development. A hormone is a chemical messenger produced by a cell that effects specific change in the cellular activity of other cells (target cells). Unlike exocrine glands (which produce substances such as saliva, milk, stomach acid and digestive enzymes), endocrine

glands do not secrete substances into ducts (tubes). Instead, endocrine glands secrete their hormones directly into the surrounding extra cellular space. The hormones then diffuse into nearby capillaries and are transported throughout the body in the blood.

The endocrine and nervous systems often work toward the same goal. Both influence other cells with chemicals (hormones and neurotransmitters). However, they attain their goals differently. Neurotransmitters act immediately (within milliseconds) on adjacent muscle, gland, or other nervous cells, and their effect is short-lived. In contrast, hormones take longer to produce their intended effect (seconds to days), may affect any cell, nearby or distant, and produce effects that last as long as they remain in the blood, which could be up to several hours.

Hormones can be chemically classified into four groups:

- 1. Amino acid-derived:** Hormones that are modified amino acids.
- 2. Polypeptide and proteins:** Hormones that are chains of amino acids of less than or more than about 100 amino acids, respectively. Some protein hormones are actually glycoproteins, containing glucose or other carbohydrate groups.
- 3. Steroids:** Hormones that are lipids synthesized from cholesterol. Steroids are characterized by four interlocking carbohydrate rings.
- 4. Eicosanoids:** Are lipids synthesized from the fatty acid chains of phospholipids found in plasma membrane. Hormones circulating in the blood diffuse into the interstitial fluids surrounding the cell. Cells with specific receptors for a hormone respond with an action that is appropriate for the cell. Because of the specificity of hormone and target cell, the effects produced by a single hormone may vary among different kinds of target cells.

Hormones activate target cells by one of two methods, depending upon the chemical nature of the hormone.

- **Lipid-soluble** hormones (steroid hormones and hormones of the thyroid gland) diffuse through the cell membranes of target cells. The lipid-soluble hormone then binds to a receptor protein that, in turn, activates a DNA segment that turns on specific genes. The proteins produced as result of the transcription of the genes and subsequent translation of mRNA act as enzymes that regulate specific physiological cell activity.

- **Water-soluble** hormones (polypeptide, protein, and most amino acid hormones) bind to a receptor protein on the plasma membrane of the cell.

Endocrine glands release hormones in response to one or more of the following stimuli:

1. Hormones from other endocrine glands.
2. Chemical characteristics of the blood (other than hormones).
3. Neural stimulation.