

F. Endocrine System

Definition

What is your chemical system?

You have two major systems for sending signals to the body's muscles, glands, and organs. We have already discussed the nervous system, which uses neurons, nerves, and neurotransmitters to send information throughout the body. The second major system for sending information is called the endocrine system.

The **endocrine system** is made up of numerous glands that are located throughout the body. These glands secrete various chemicals, called **hormones**, which affect organs, muscles, and other glands in the body.

The location and function of some of the endocrine system's glands are shown in the figure below.

Control Center

In many ways, the **hypothalamus**, which is located in the lower middle part of the brain, controls much of the endocrine system by regulating the pituitary gland, which is located directly below and outside the brain. The hypothalamus is often called the control center of the endocrine system.

The drawing on the left shows that the hypothalamus is connected to the pituitary gland.



Other Glands

We'll describe some of the endocrine system's major glands as well as their dysfunctions.

The **pituitary gland**, a key component of the endocrine system, hangs directly below the hypothalamus, to which it is connected by a narrow stalk. The pituitary gland is divided into anterior (front) and posterior (back) sections.

Posterior pituitary. The rear portion of the pituitary regulates water and salt balance.

Dysfunction: Lack of hormones causes a less common form of diabetes.

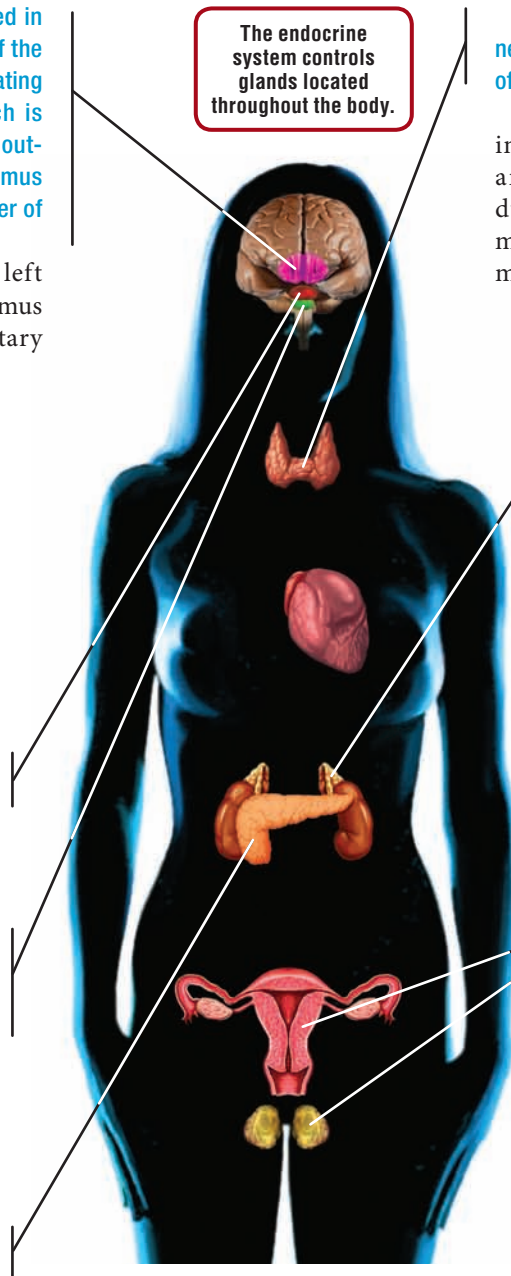
Anterior pituitary. The front part of the pituitary regulates growth through secretion of growth hormone and produces hormones that control the adrenal cortex, pancreas, thyroid, and gonads.

Dysfunction: Too little growth hormone produces dwarfism; too much causes gigantism. Other problems in the pituitary cause problems in the glands it regulates.

Pancreas. This organ regulates the level of sugar in the bloodstream by secreting insulin.

Dysfunction: Lack of insulin results in the more common form of diabetes, while too much causes hypoglycemia (low blood sugar).

The endocrine system controls glands located throughout the body.



Thyroid. This gland, which is located in the neck, regulates metabolism through the secretion of hormones.

Dysfunction: Hormone deficiency during development leads to stunted growth and mental retardation. Undersecretion during adulthood leads to reduction in motivation. Oversecretion results in high metabolism, weight loss, and nervousness.

Adrenal glands. The adrenal cortex (outside part) secretes hormones that regulate sugar and salt balances and help the body resist stress; they are also responsible for growth of pubic hair, a secondary sexual characteristic. The adrenal medulla (inside part) secretes two hormones that arouse the body to deal with stress and emergencies: epinephrine (adrenaline) and norepinephrine (noradrenaline).

Dysfunction: With a lack of cortical hormones, the body's responses are unable to cope with stress.

Gonads. In females, the ovaries produce hormones that regulate sexual development, ovulation, and growth of sex organs. In males, the testes produce hormones that regulate sexual development, production of sperm, and growth of sex organs.

Dysfunction: Lack of sex hormones during puberty results in lack of secondary sexual characteristics (facial and body hair, muscles in males, breasts in females).

Up to this point, we have examined many of the structures and functions that make up the incredible nervous and endocrine systems. After the Concept Review, we'll discuss a question that students often ask: Do the brains of males differ from those of females?