

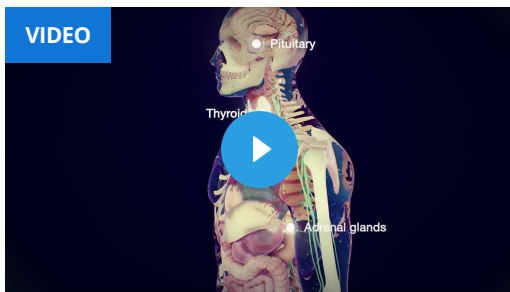
Endocrine Function

By **John E. Morley**, MB, BCh, Saint Louis University School of Medicine

Last full review/revision Apr 2019 | Content last modified Apr 2019

The main function of [endocrine glands](#) is to secrete hormones directly into the bloodstream. Hormones are chemical substances that affect the activity of another part of the body (target site). In essence, hormones serve as messengers, controlling and coordinating activities throughout the body. (See also [Endocrine Glands](#).) Upon reaching a target site, a hormone binds to a receptor, much like a key fits into a lock. Once the hormone locks into its receptor, it transmits a message that causes the target site to take a specific action. Hormone receptors may be within the nucleus or on the surface of the cell.

Hormones



Ultimately, hormones control the function of entire organs, affecting such diverse processes as growth and development, reproduction, and sexual characteristics. Hormones also influence the way the body uses and stores energy and control the volume of fluid and the levels of salts and sugar (glucose) in the blood. Very small amounts of hormones can trigger very large responses in the body.

Although hormones circulate throughout the body, each type of hormone influences only certain organs and tissues. Some hormones affect only one or two organs, whereas others have influence throughout the body. For example, thyroid-stimulating hormone, produced in the [pituitary gland](#), affects only the thyroid gland. In contrast, thyroid hormone, produced in the [thyroid gland](#), affects cells throughout the body and is involved in such important functions as regulating growth of cells, controlling the heart rate, and affecting the speed at which calories are burned. Insulin, secreted by the islet cells of the pancreas, affects the processing (metabolism) of glucose, protein, and fat throughout the body.

Most hormones are derived from [proteins](#). Others are steroids, which are fatty substances derived from cholesterol.

Major Hormones

Where Hormone Is Produced	Hormone	Function
Adipose (fat) tissue	Leptin	Controls appetite
	Resistin	Blocks the effects of insulin on muscle
Adrenal glands	Aldosterone	Helps regulate salt and water balance by causing the kidneys to retain salt and water and excrete potassium
	Cortisol	Has widespread effects throughout the body
		Especially has anti-inflammatory action
		Maintains blood sugar level, blood pressure, and muscle strength
		Helps control salt and water balance
Digestive tract	Dehydroepiandrosterone (DHEA)	Has effects on bone, mood, and the immune system
	Epinephrine and norepinephrine	Stimulate the heart, lungs, blood vessels, and nervous system
	Cholecystokinin	Controls gallbladder contractions that cause bile to enter the intestine
	Ghrelin	Stimulates release of digestive enzymes from the pancreas
		Controls growth hormone release from the pituitary gland
Hypothalamus	Glucagon-like peptide	Causes sensation of hunger
	Corticotropin-releasing hormone	Increases insulin release from the pancreas
	Gonadotropin-releasing hormone	Stimulates release of adrenocorticotrophic hormone
	Growth hormone-releasing hormone	Stimulates release of luteinizing hormone and follicle-stimulating hormone
	Somatostatin	Stimulates release of growth hormone
Kidneys	Thyrotropin-releasing hormone	Inhibits release of growth hormone, thyroid-stimulating hormone, and insulin
	Erythropoietin	Stimulates the release of thyroid-stimulating hormone and prolactin
	Renin	Stimulates red blood cell production
Ovaries	Estrogen	Controls blood pressure
	Progesterone	Controls the development of female sex characteristics and the reproductive system
Pancreas	Glucagon	Prepares the lining of the uterus for implantation of a fertilized egg and readies the mammary glands to secrete milk
	Insulin	Raises the blood sugar level
		Lowens the blood sugar level
Parathyroid glands	Parathyroid hormone	Affects the processing (metabolism) of sugar, protein, and fat throughout the body
Pituitary gland	Corticotropin (also called adrenocorticotrophic hormone [ACTH])	Controls bone formation and the excretion of calcium and phosphorus
	Growth hormone	Controls the production and secretion of hormones by the adrenal glands
	Luteinizing hormone and follicle-stimulating hormone	Controls growth and development
		Promotes protein production
		Control reproductive functions, including the production of sperm and semen in men and egg maturation and menstrual cycles in women
		Control male and female sexual characteristics (including hair distribution, muscle formation, skin texture and thickness, voice, and perhaps even personality traits)

Where Hormone Is Produced	Hormone	Function
	Oxytocin	Causes muscles of the uterus to contract during childbirth and after delivery and stimulates contractions of milk ducts in the breast, which move milk to the nipple
	Prolactin	Starts and maintains milk production in the ductal glands of the breast (mammary glands)
	Thyroid-stimulating hormone	Stimulates the production and secretion of hormones by the thyroid gland
	Vasopressin (antidiuretic hormone)	Causes kidneys to retain water and, along with aldosterone, helps control blood pressure
Placenta	Chorionic gonadotropin	Stimulates ovaries to continue to release progesterone during early pregnancy
	Estrogen and progesterone	Keep uterus receptive to fetus and placenta during pregnancy
Testes	Testosterone	Controls the development of male sex characteristics and the reproductive system
Thyroid gland	Calcitonin	Tends to decrease blood calcium levels and helps regulate calcium balance
	Thyroid hormones	Regulate the rate at which the body functions (metabolic rate)

Endocrine Controls

To control endocrine functions, the secretion of each hormone must be regulated within precise limits. The body is normally able to sense whether more or less of a given hormone is needed.

Many [endocrine glands](#) are controlled by the interplay of hormonal signals between the hypothalamus, located in the brain, and the pituitary gland, which sits at the base of the brain. This interplay is referred to as the hypothalamic-pituitary axis. The hypothalamus secretes several hormones that control the pituitary gland.

The [pituitary gland](#), sometimes called the master gland, in turn controls the functions of many other endocrine glands. The pituitary controls the rate at which it secretes hormones through a feedback loop in which the blood levels of other endocrine hormones signal the pituitary to slow down or speed up. So, for example, the pituitary gland senses when blood levels of thyroid hormone are low and releases thyroid stimulating hormone, which tells the thyroid gland to make more hormones. If the level gets too high, the pituitary senses that and decreases the amount of thyroid stimulating hormone, which then decreases the amount of thyroid hormone produced. This back-and-forth adjustment (feedback) keeps hormone levels in proper balance.

Many other factors can control endocrine function. For example, a baby sucking on its mother's nipple stimulates her pituitary gland to secrete prolactin and oxytocin, hormones that stimulate breast milk production and flow. Rising blood sugar levels stimulate the islet cells of the pancreas to produce insulin. Part of the nervous system stimulates the adrenal gland to produce epinephrine.



© 2020 Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Kenilworth, NJ, USA)