

CHEMICAL MESSENGERS



Learn how hormones help your brain and body communicate

What are hormones?

A **hormone** is a chemical substance produced in one part of your body that travels to other parts of your body via your bloodstream to control and regulate cells, organs and behaviour.

Hormones are one way your body sends messages to itself. They are part of the **endocrine system**, which is composed of a network of **glands** that produce and release hormones.

The endocrine system is made up of many important glands, such as the pituitary gland, thyroid and pancreas. The hypothalamus is a part of your brain that connects the endocrine and nervous systems. It also controls the release of hormones secreted from the pituitary gland. The pituitary gland produces many hormones that subsequently control other endocrine glands.

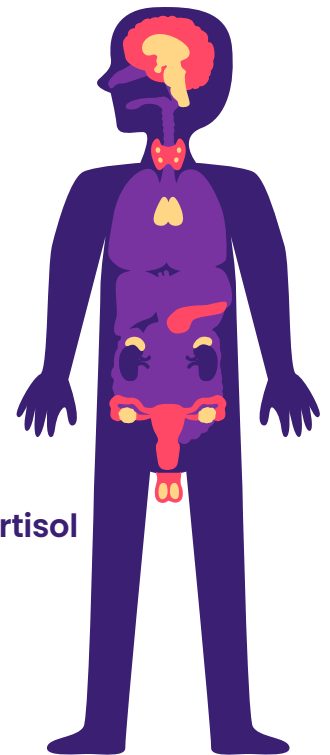
Hormones have many important functions, from helping the body metabolize food (breaking it down into energy), to controlling the body's response to stress, to enabling reproduction and beyond. Each hormone has a very important role to play in keeping the body running.

QUIZ 1

Can you match these common glands to the hormones they produce? Write down your answers on a piece of paper.

1. Pituitary Gland
2. Thymus
3. Thyroid
4. Adrenal Glands
5. Pancreas
6. Pineal Gland
7. Ovaries
8. Testes

- a. Insulin
- b. Estrogen
- c. Epinephrine and Cortisol
- d. Growth Hormone
- e. Testosterone
- f. Melatonin
- g. Thyroxine
- h. Thymosin



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How do hormones work?

Hormone receptors are essential to sending signals from hormone molecules to your cells. These receptors are made of proteins, and they can be found both inside and on the surface of your cells. Each hormone has its own special type of receptor that perfectly fits the hormone's shape, much like two puzzle pieces or a key in a lock.

You can think of a hormone receptor as an on-off switch for cellular activity in your body. Each receptor takes a message from the hormone molecule and transmits that message inside a cell, causing a change to occur.

QUIZ 2

Can you match the hormone to its main function(s)? Don't forget to write down your answers!

1. Insulin
 2. Estrogen
 3. Epinephrine and Cortisol
 4. Growth Hormone
 5. Testosterone
 6. Melatonin
 7. Thyroxine
 8. Thymosin
-
- a. Maintains balanced immune system
 - b. Induces breast development, controls menstrual cycle, affects reproductive development
 - c. Increases muscle mass, induces hair growth, affects reproductive development
 - d. Controls sleep-wake cycle
 - e. Affects metabolism, digestion, bone health, heart function and brain development
 - f. Affects growth
 - g. Increases heart rate and increases stress response
 - h. Regulates blood sugar



What is hormone therapy?

Sometimes, a person's body can produce too much or not enough of a certain hormone. **Hormone therapy** can be used to supplement, replace or block a certain hormone. Just as there are many different hormones, there are several types of hormone therapy.

One example is insulin therapy, an effective treatment for some types of diabetes. Insulin is a hormone produced by the pancreas; it allows your cells to absorb glucose and convert it to energy. Diabetes occurs when a person's body either does not produce enough insulin (known as type 1 diabetes) or cannot efficiently use the insulin it does produce (type 2 diabetes).

Hormone therapy can also involve taking medications to block certain hormones, like estrogen or testosterone. Some hormone-blocking medications work by interfering with the production of these hormones. Other medications prevent estrogen and testosterone from binding to their receptors. These medications can be used to treat polycystic ovary syndrome (PCOS), endometriosis, infertility, symptoms of menopause, certain types of hormone-sensitive cancers and more.

Another common use for both supplementary and hormone-blocking medications is gender-affirming hormone therapy. An individual may choose to undergo this type of therapy to change their body's secondary sexual characteristics to align with their gender identity or expression. Secondary sexual characteristics include facial and body hair, increased muscle mass and voice deepening, as well as breasts and body fat distribution, among others.



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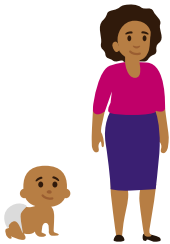
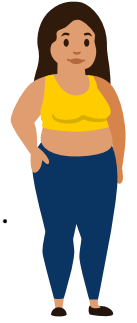
Hormones and Their Functions

Cortisol is mainly produced by the adrenal glands. It helps your body's different systems respond to stress by preparing them for a "fight or flight" situation. Cortisol is often called the "stress hormone."



Epinephrine is mainly produced by the adrenal glands. It helps your body respond to perceived threats, mainly by increasing heart rate and blood flow. Another name for epinephrine is adrenaline.

Estrogen is mainly produced by the ovaries. It contributes to reproductive development, pregnancy and secondary sexual characteristics, such as breast development. Estrogen also affects cholesterol, bone density and brain health. In people of all sexes, the adrenal glands also produce small amounts of estrogen.



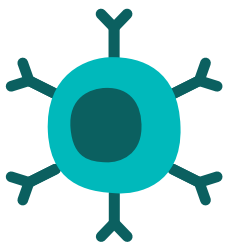
Growth hormone is produced by the pituitary gland. In children and adolescents, it promotes growth and development. In adults, this hormone helps maintain body structure and metabolism.

Insulin is produced by the pancreas. It regulates blood sugar by allowing cells to convert glucose into energy. All people with type 1 diabetes and some people with type 2 diabetes must take insulin to survive.



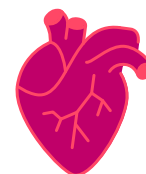
Melatonin is produced by the pineal gland, which is located in the brain. This hormone helps your body maintain a consistent sleep-wake cycle. Melatonin production can be affected by outside factors, including exposure to light, which can then impact your sleep.

Testosterone is mainly produced by the testes. It contributes to reproductive development, including growth of the penis and testes. Testosterone produces secondary sexual characteristics, such as increased muscle mass. It also affects body fat and bone health. In people of all sexes, the adrenal glands produce small amounts of testosterone.



Thymosin is produced mainly by the thymus. It helps your body maintain a balanced immune system by stimulating the development of T-cells, which are special white blood cells that work to keep you healthy. The thymus produces all of your T-cells by the time you reach puberty. Then, the gland starts to shrink and is replaced by fat.

Thyroxine is produced by the thyroid. It affects your metabolism, digestion, heart function, bone health and brain development.



Quiz 1 Answer Key : 1(d), 2(h), 3(g), 4(c), 5(a), 6(f), 7(b), 8(e)

Quiz 2 Answer Key: 1(h), 2(b), 3(g), 4(f), 5(c), 6(d), 7(e), 8(a)



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