

Endocrine System and Hormone Notes

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Animals have two very different systems for communication inside the body, the nervous system and the endocrine system.

The nervous system: consists of the brain, spinal cord, sensory and motor neurones. It carries electrical impulses at high speed along the neurones until they reach the target organ or tissue.

The endocrine system: consists of all the hormone producing glands in the body and the hormones that they produce.

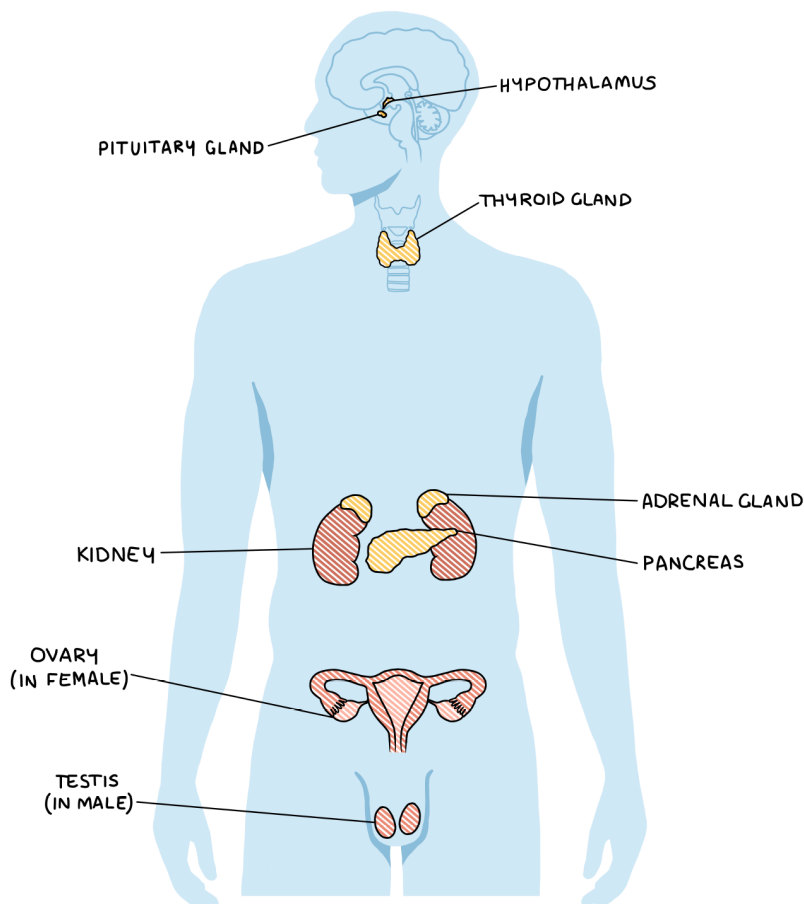
A hormone: is a chemical messenger that is produced in one organ and has an effect in a different part of the body. Hormones can have long lasting effects on the body. Hormones are carried by the bloodstream.

Nervous System versus Endocrine System

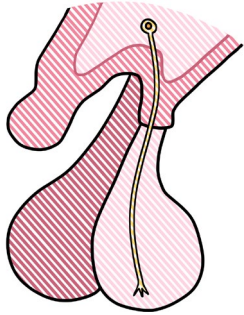
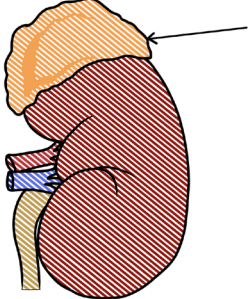
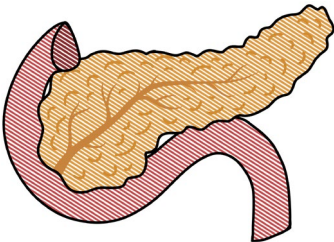
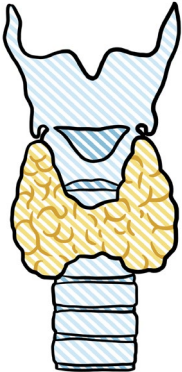
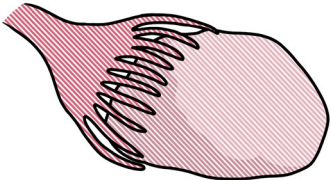
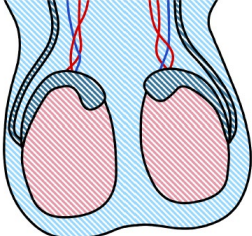
	Nervous System	Endocrine System
Signal being sent	electrical impulse	hormone
Transmitted by	neurones	the bloodstream
Effector	muscles or glands	target cells in particular tissues
Type of response	muscle contraction or secretion	chemical change
Speed of response	very rapid	slower
Duration of response	short (until nerve impulses stop)	long (until hormone is broken down)

The Endocrine System

The figure below shows the endocrine system of a human.



Let's have a look at each gland, the hormone it produces, and what that hormone does 😊

Gland	Diagram	Hormone(s)	What it does
Pituitary gland (Master gland)		Antidiuretic hormone (ADH) Follicle stimulating hormone (FSH) Luteinising hormone (LH) Thyroid-stimulating hormone (TSH)	Changes the permeability of the kidney nephron. Causes the development of a follicle in an ovary. Causes ovulation. Causes the thyroid gland to produce thyroxine.
Adrenal gland		Adrenaline	It raises the blood glucose level. It also increases metabolic activities. Prepares the body for the ' <u>fight or flight</u> ' response.
Pancreas		Insulin Glucagon	Causes the cells of the liver and muscles to convert excess glucose into glycogen. Causes the cells of the liver to convert glycogen into glucose and release it into the blood.
Thyroid		Thyroxine	Stimulates and maintains metabolic activity.
Ovary		Oestrogen Progesterone	Oestrogen causes the development of secondary sexual characteristics in females. Causes the endometrium (lining of the uterus) to thicken and repair/buildup. Maintains the uterus lining.
Testes (plural) Testis (singular)		Testosterone	Testosterone causes male secondary sexual characteristics. Like facial hair, a deeper voice, and increased muscle mass during puberty. It is also key in sperm production.

Thyroxine & Adrenaline

Questions on Thyroxine and adrenaline are regularly asked in the GCSE exam (mostly on Thyroxine though). So, what do we need to know? Check out the following 😊

Thyroxine	
What is it?	A <u>hormone</u> , a chemical messenger of the body.
What does it do?	Stimulates and maintains <u>metabolic activity</u> . Metabolic activity is the rate at which your body converts food into energy.
Where is it produced?	In <u>the thyroid gland</u> .
Is there another hormone involved in making thyroxine?	Yes, there are two 😊 The Hypothalamus produces Thyrotropin releasing hormone (TRH) . TRH causes the Pituitary gland to produce Thyroid stimulating hormone (TSH) . TSH travels from the pituitary gland to the thyroid gland via the bloodstream. At the thyroid gland TSH causes the production of more thyroxine.
How is its production controlled?	Thyroxine production is controlled by a negative feedback mechanism. 1. Low thyroxine levels in the bloodstream are detected by the hypothalamus. 2. The hypothalamus releases Thyrotropin releasing hormone (TRH) in to the bloodstream. 3. TRH causes the pituitary gland to release Thyroid stimulating hormone (TSH) into the bloodstream. 4. TSH causes the thyroid gland to release more thyroxine. When the thyroxine level in the blood returns to normal, the hypothalamus detects the change. 1. This inhibits the production of TRH by the hypothalamus. 2. This in turn inhibits the production of TSH from the pituitary gland, so normal levels of thyroxine are maintained in the blood. The figure below sums up the process 😊 <pre> graph TD Hypo[Hypothalamus] -- TRH --> Pit[Pituitary gland] Pit -- TSH --> Thy[Thyroid gland] Thy -- Thyroxine --> Blood[] Blood -- "Negative feedback" --> Pit Blood -- "Negative feedback" --> Hypo </pre>

Adrenaline	
What is it?	A <u>hormone</u> , a chemical messenger of the body.
What does it do?	It increases heart rate and blood pressure. It increases blood flow to the muscles (by dilating blood vessels). It also raises blood glucose levels by causing the liver to break down glycogen into glucose.
Why do I need it?	Adrenaline allows the body to prepare for action in situations where a quick response may be essential such as a fight or the need to run away from something.
Where is it produced?	The adrenal gland, found on top of the kidney.