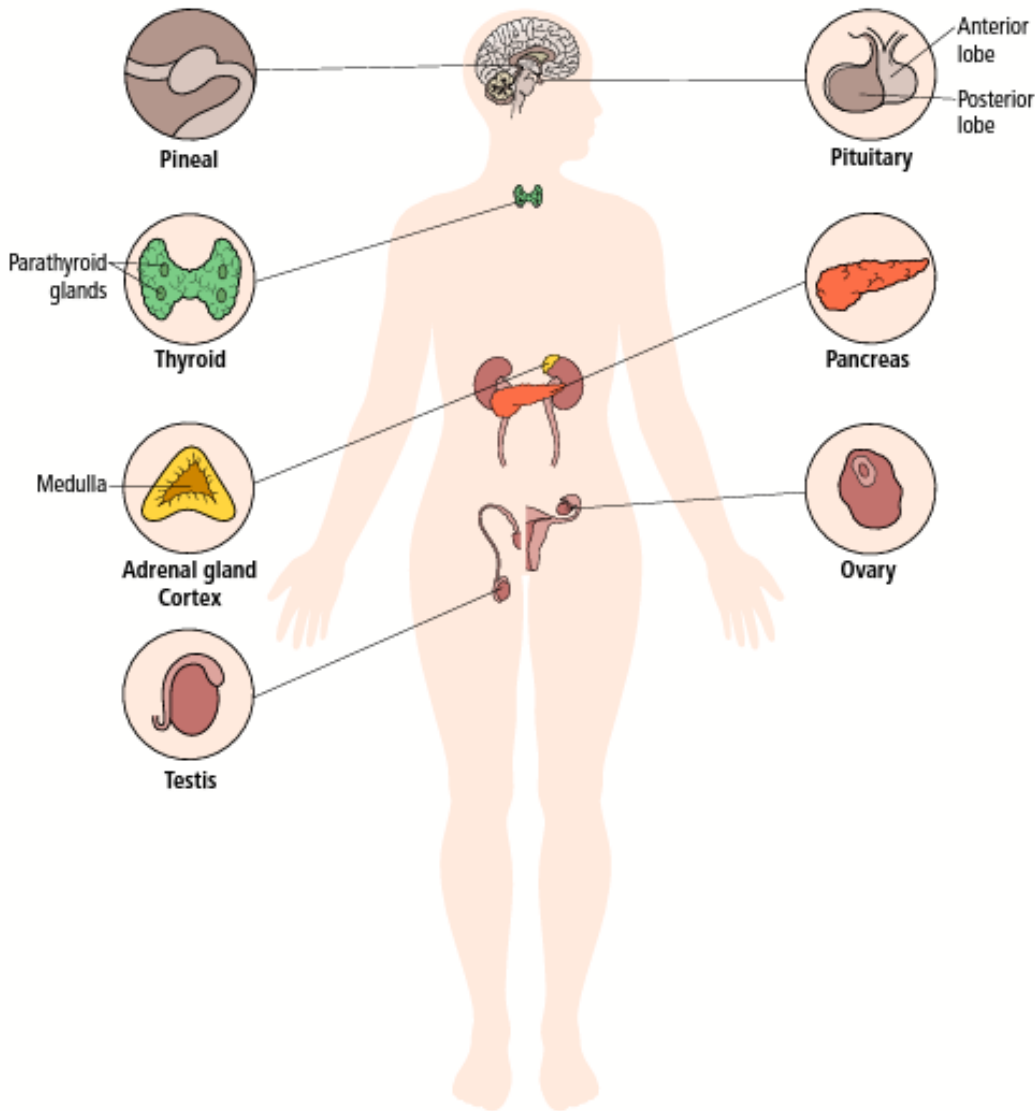


Endocrine system

The endocrine system is a message-relaying system and works with the nervous system to control the functions of the body. Unlike the nervous system there are no structures along which these messages are carried and instead the messages are carried in the blood circulatory system. The messages concerned are chemical messages called hormones and are produced by ductless glands called endocrine glands. The messages are deposited directly into the blood for transportation.



Hormones control the following functions of the body:

- emotions
- appetite
- sexual activity
- metabolism
- water balance.

The main glands that make up the endocrine system are:

- pituitary (anterior and posterior)
- pineal
- thyroid
- parathyroids
- thymus
- adrenals
- pancreas (Islets of Langerhan)
- gonads (ovaries and testes).

△ Position of the endocrine glands

Glands of the endocrine system and the hormones they produce

Endocrine gland	Hormone secreted	Target site for the hormone	Function of the hormone
<p>Hypothalamus:</p> <ul style="list-style-type: none"> ● Found in the brain ● Often called the 'master' gland ● Forms an attachment with the pituitary gland allowing two-way communication to take place between the endocrine and nervous systems 			<p>Detects the level of hormones in the blood and secretes hormones into the pituitary glands</p>
<p>Anterior pituitary:</p> <ul style="list-style-type: none"> ● Is about the size of a pea ● Situated at the base of the brain behind the nose ● Linked to the hypothalamus ● Its hormones control the other endocrine glands 	Thyroid stimulating hormone (TSH)	Thyroid	Regulates the body's metabolism
	Adrenocorticotrophic hormone (ACTH)	Suprarenal glands	Stimulates the adrenal cortex to produce hormones such as cortisol
	Somatotrophic or growth hormone	Bones and other hard tissue	Increases rate of growth in adolescents and maintains size in adults
	Follicle stimulating hormone (FSH)	Sex organs	Increases production of oestrogen and the maturation of ovarian follicles as part of the menstrual cycle in women and stimulates sperm production in men
	Luteinising hormone (LH)	Sex organs	Prepares breasts for lactation during pregnancy and the production of progesterone in women and testosterone in men
	Lactogenic hormone (prolactin or PRL)	Mammary glands	Stimulates the production of milk
Posterior pituitary	Antidiuretic hormone (vasopressin or ADH)	Kidneys and arteries	Decreases urine production
	Oxytocin	Uterus and breasts	Stimulates labour and ejects milk from the breast
Pineal	Melatonin	Brain	Regulates the body clock
<p>Thyroid:</p> <ul style="list-style-type: none"> ● Consists of two lobes which take the shape of a butterfly ● Situated just below the larynx and in front of the trachea in the neck 	Thyroxine	Throughout the body	Controls basal metabolic rate
	Calcitonin	Bones and kidneys	Regulates calcium levels in the blood

Endocrine gland	Hormone secreted	Target site for the hormone	Function of the hormone
Parathyroids: <ul style="list-style-type: none"> ● Four parathyroid glands arranged in pairs ● Each pair is embedded on the back of the lobes of the thyroid gland 	Parathormone (PTH)	Bones	Regulates calcium and phosphorus levels; increases blood calcium levels and activates vitamin D
Adrenals: <ul style="list-style-type: none"> ● Situated on top of each kidney ● Each gland is composed of an outer cortex and inner medulla 	Mineralocorticoids, e.g. aldosterone	Kidneys	Regulates the mineral content of body fluids, salt and water balance and therefore blood pressure
	Glucocorticoids e.g. cortisol	Liver	Regulates metabolism of carbohydrates in response to stress
	Sex hormones (oestrogen and androgens)	Reproductive organs	Development and functioning of the sex glands and gives rise to the secondary sexual characteristics associated with puberty
	Adrenaline	Several target organs including muscles, eyes, skin, digestive system, etc.	Controls the 'fight or flight' mechanism
	Noradrenalin	Blood vessels	Causes blood vessels to constrict and so responsible for an increase in blood pressure
Pancreas: Elongated flat organ Situated within the abdomen	Insulin	Blood sugar	Controls the metabolism of carbohydrates and lowers blood sugar levels
	Glucagon	Blood sugar	
	Somatostatin	Several organs	Controls the levels of other hormones such as growth hormone and insulin
Note: The pancreas also has a digestive function to secrete pancreatic juice for the digestion of proteins.			
Ovaries	Oestrogen	Female reproductive organs and breasts	Responsible for the secondary sexual characteristics of girls during puberty; regulates the menstrual cycle
	Progesterone	Female reproductive organs and breasts	Active during pregnancy, the development of the placenta and the preparation of the breasts for lactation
Testes	Androgens	Male reproductive organs	Development of the secondary sexual characteristics of boys: development of the genitalia, male hair growth patterns, increase in muscle bulk and deepening of the voice
	Testosterone	Male reproductive organs	Promotes the development of the sperm in the testes

Disorders of the endocrine system

Disease/disorder	Cause	Description
Goitre	Inflammation of the thyroid gland	Swelling of the thyroid gland resulting in swelling of the neck and voice box
Hyperthyroidism: Graves' disease	Hyper (excessive) secretion of thyroxine	Symptoms are weight loss, insomnia, hyperactivity, palpitations and increased blood pressure, bulging eyes, muscle weakness and moist, warm skin
Hypothyroidism: Cretinism	Hypo (inadequate) secretion of thyroxine in children	Small stature but with fat deposits and impaired mental ability
Myxoedema	Hypo secretion of thyroxine in adults	Lethargy, slow metabolism, slow mental and physical activity, brittle hair and nails, dry and coarse skin
Polycystic ovaries	Hyper secretion of testosterone and other male sex hormones	Cysts on the ovaries that cause menstruation to cease, hair growth in a male pattern, development of obesity
Cushing's syndrome	Hyper secretion of glucocorticoids	Weight gain, excess growth of facial and body hair, raised blood pressure and bone softening
Addison's disease	Hyper secretion of adrenocorticosteroids	Loss of appetite and weight loss, low blood sugar and blood pressure, tiredness and muscle weakness
Acromegaly	Hyper secretion of growth hormone in adults	Thickening of the bones, most apparent in the face, hands and feet
Dwarfism	Hypo secretion of growth hormone	Stunted growth
Gigantism	Hyper secretion of growth hormone in children	Rapid growth with abnormally large hands and feet with coarse features
Diabetes mellitus	Deficiency or absence of insulin	Increased thirst and urine output, weight loss
Diabetes insipidus	Lack of the vasopressin hormone	Dehydration, increased thirst and urine output
Amenorrhoea	Hormonal disturbances associated with the hypothalamus or the pituitary glands; a symptom of anorexia	Absence of menstrual cycle and no periods
Gynaecomastia	Hyper secretion of oestrogen and progesterone in males	Development of large breasts in males and muscle atrophy
Hirsutism	Over-production of androgens in women	Hair growth in a male sexual pattern
Seasonal Affective Disorder (SAD)	Hypo secretion of melatonin	Depression, slow mental and physical activity, excessive sleeping and overeating
Virilism	Hyper secretion of testosterone in women	Masculinisation occurs, e.g. deepening of the voice