AL MUSTAQBAL UNIVERSITY

College of Pharmacy / First Stage

(L9) Endocrine System Terminology

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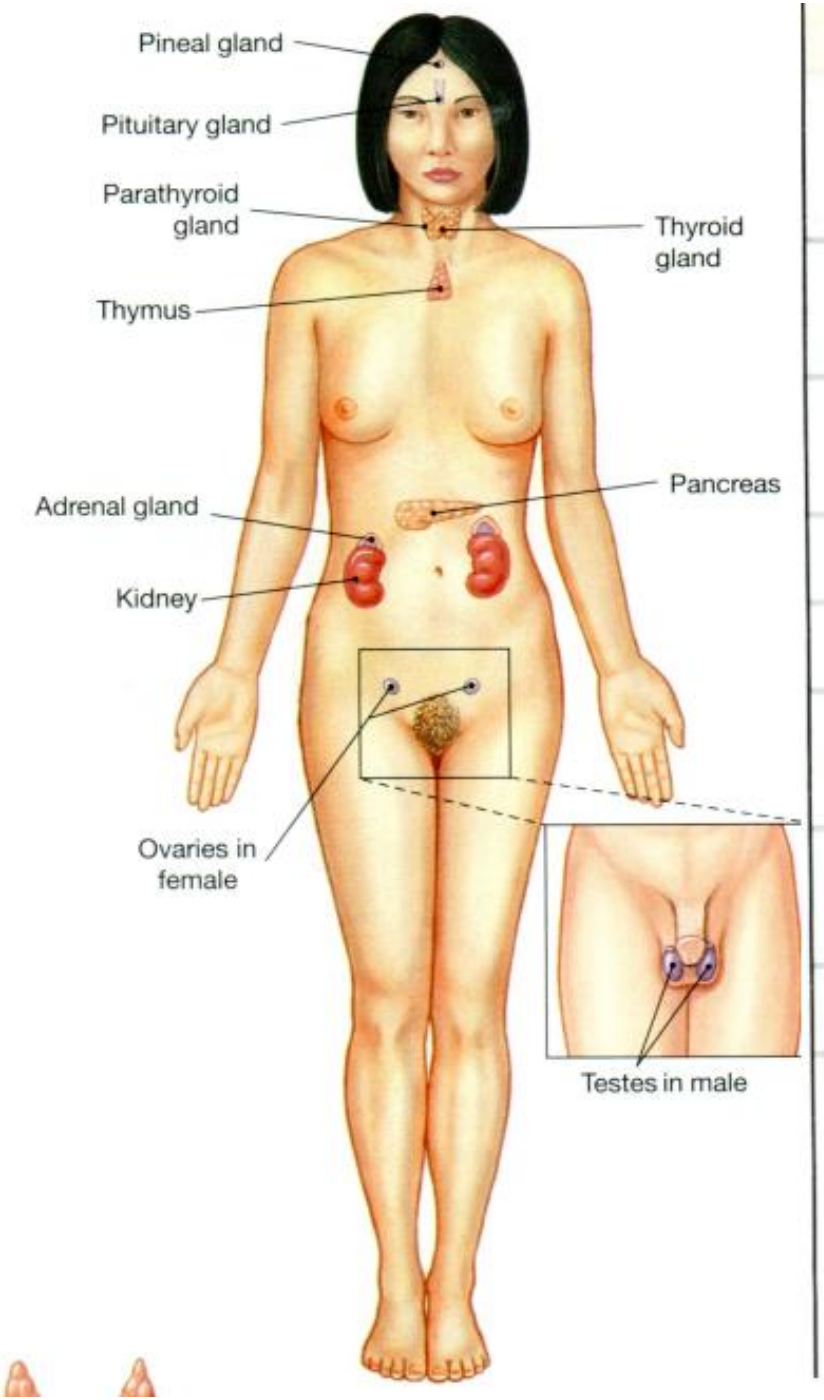
THE ENDOCRINE SYSTEM

Although often overshadowed by the brain and nerves, the Endocrine system is also involved in the information business. Hormones carry essential messages that have far-reaching effects. They control body processes at every level, from energy uptake of a single cell to the whole body's rate of growth and development.

There are 50 of hormones, which are the body's chemical messengers and they are made by 12 different Endocrine glands. These glands have no ducts but secrete their hormones directly into the blood, by which means they reach every cell in the body.

Hormones affect certain target tissues or organs and regulate their activities.
The Endocrine system sends hormones through the Circulatory system to control and coordinate body functions in much the same way as the nervous system uses tiny electrical signals.



Organ/Component	Primary Functions
Pineal Gland	May control timing of reproduction and set day-night rhythms
Pituitary Gland	Controls other endocrine glands; regulates growth and fluid balance
Thyroid Gland	Controls tissue metabolic rate; regulates calcium levels
Parathyroid Glands	Regulate calcium levels (with thyroid)
Thymus	Controls maturation of lymphocytes
Adrenal Glands	Adjust water balance, tissue metabolism, cardiovascular and respiratory activity
Kidneys	Control red blood cell production and assist in calcium regulation
Pancreas	Regulates blood glucose levels
Gonads	
Testes	Support male sexual characteristics and reproductive functions *(see part k)*
Ovaries	Support female sexual characteristics and reproductive functions *(see part l)*

The Endocrine system and the Nervous system work together to integrate in the brain and complement each other, but they tend to work at different speeds.

Nerves respond within split-seconds but their action soon fades.

Some hormones have longer lasting effects and act over hours, weeks, and years.

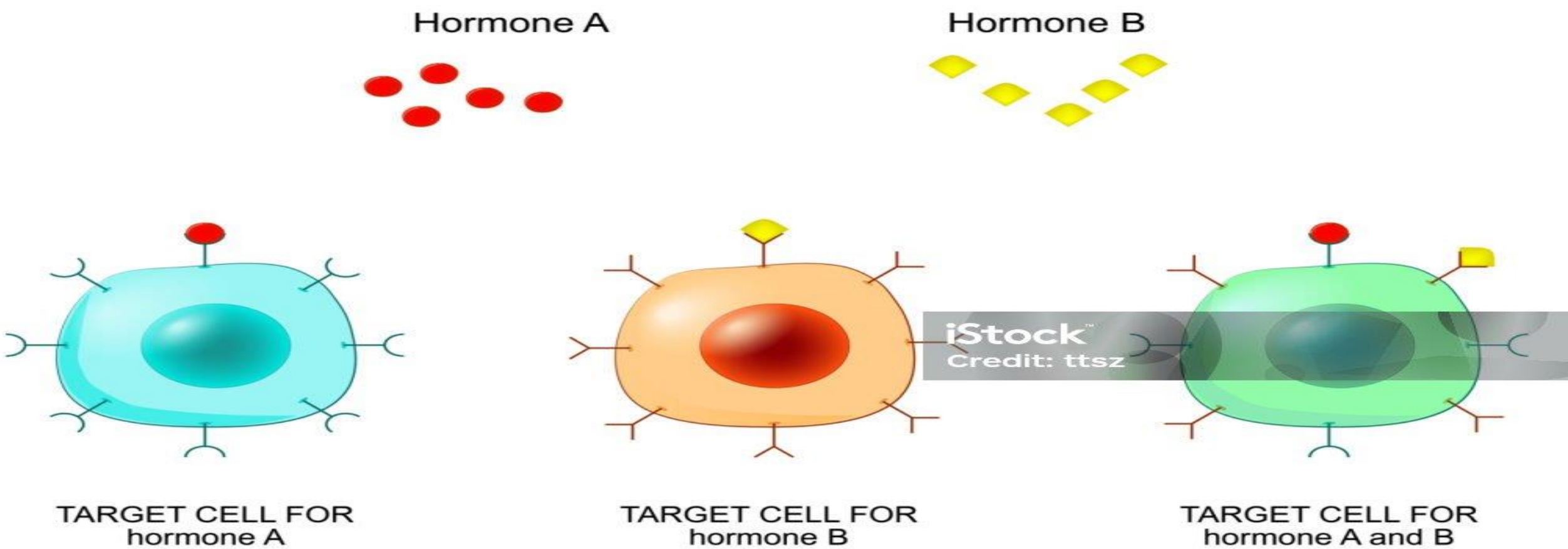
Hormones regulate processes such as:

- The breakdown of chemical substances in metabolism of what we eat and drink
- Fluid balance and urine production
- The body's growth and development
- Sexual reproduction.

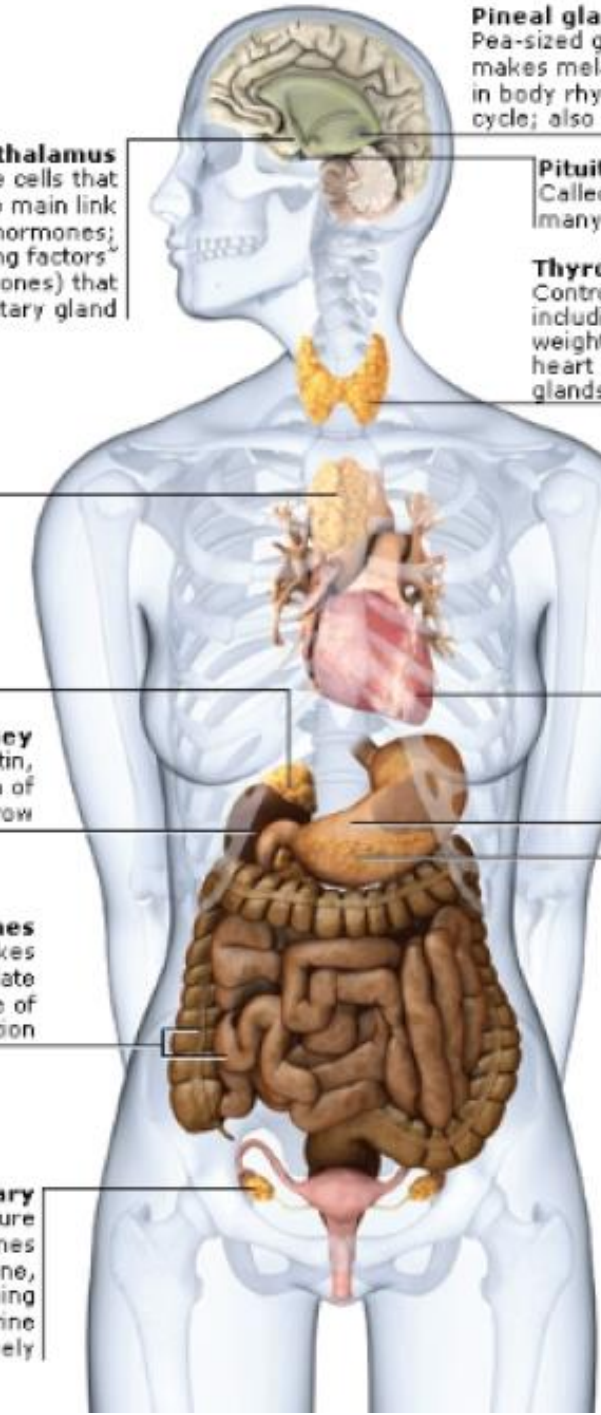
Comparison of nervous and hormonal control systems

Feature	Nervous	Hormonal (endocrine)
Made up of	Neurones	Secretory cells
Form of transmission	Electrical impulses	Chemical (hormones0
Transmission pathway	Nerves fibres (axons and dendrons)	Blood plasma
Speed of transmission	Fast	Slow
Duration of effect	Short term	Long term
Response	Localised	Widespread (although there may be a specific target organ)

Hormones and target cells



THE 12 PARTS OF THE ENDOCRINE SYSTEM



Pineal gland (pineal body)
Pea-sized gland in middle of brain; makes melatonin, a hormone important in body rhythms such as the sleep–wake cycle; also influences sexual development

Hypothalamus
Cluster of nerve cells that serves as the main link between nerves and hormones; produces "releasing factors" (regulatory hormones) that travel to pituitary gland

Pituitary gland
Called the "master gland"; controls many other endocrine glands

Thyroid gland
Controls rate of metabolism, including maintenance of body weight, rate of energy use, and heart rate; unlike other endocrine glands, it can store its hormones

Thymus gland
Produces three hormones involved in development of white blood cells called T-cells, which function in the immune system

Adrenal gland
Cortex (outer layer) manufactures steroid hormones that regulate metabolism of glucose, sodium, and potassium, and maintain fluid balance; medulla (inner layer) produces adrenaline

Heart
Produces a hormone called atriopeptin (atrial natriuretic factor, ANF, or atrial natriuretic peptide, ANP); atriopeptin reduces blood volume and pressure and helps to regulate fluid balance

Kidney
Secretes erythropoietin, which stimulates production of red blood cells in bone marrow

Stomach
Makes hormones that stimulate production or release of enzymes that aid digestion

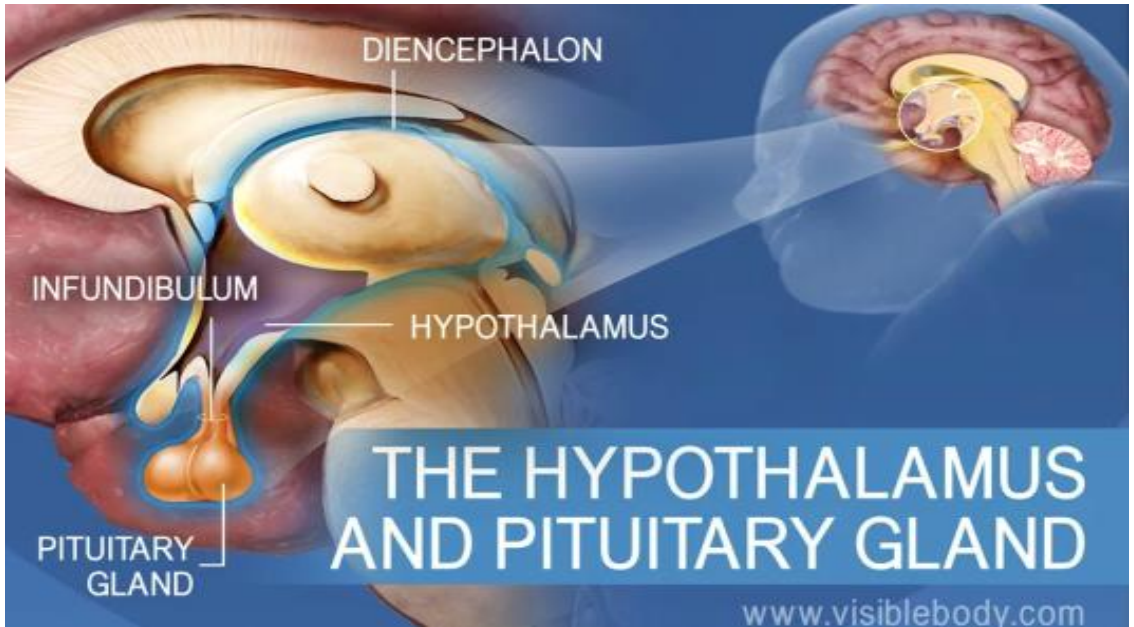
Pancreas
Bears clusters of cells, known as islets of Langerhans, which produce two hormones, insulin and glucagon, that respectively lower and raise blood glucose levels as part of the body's energy control mechanism

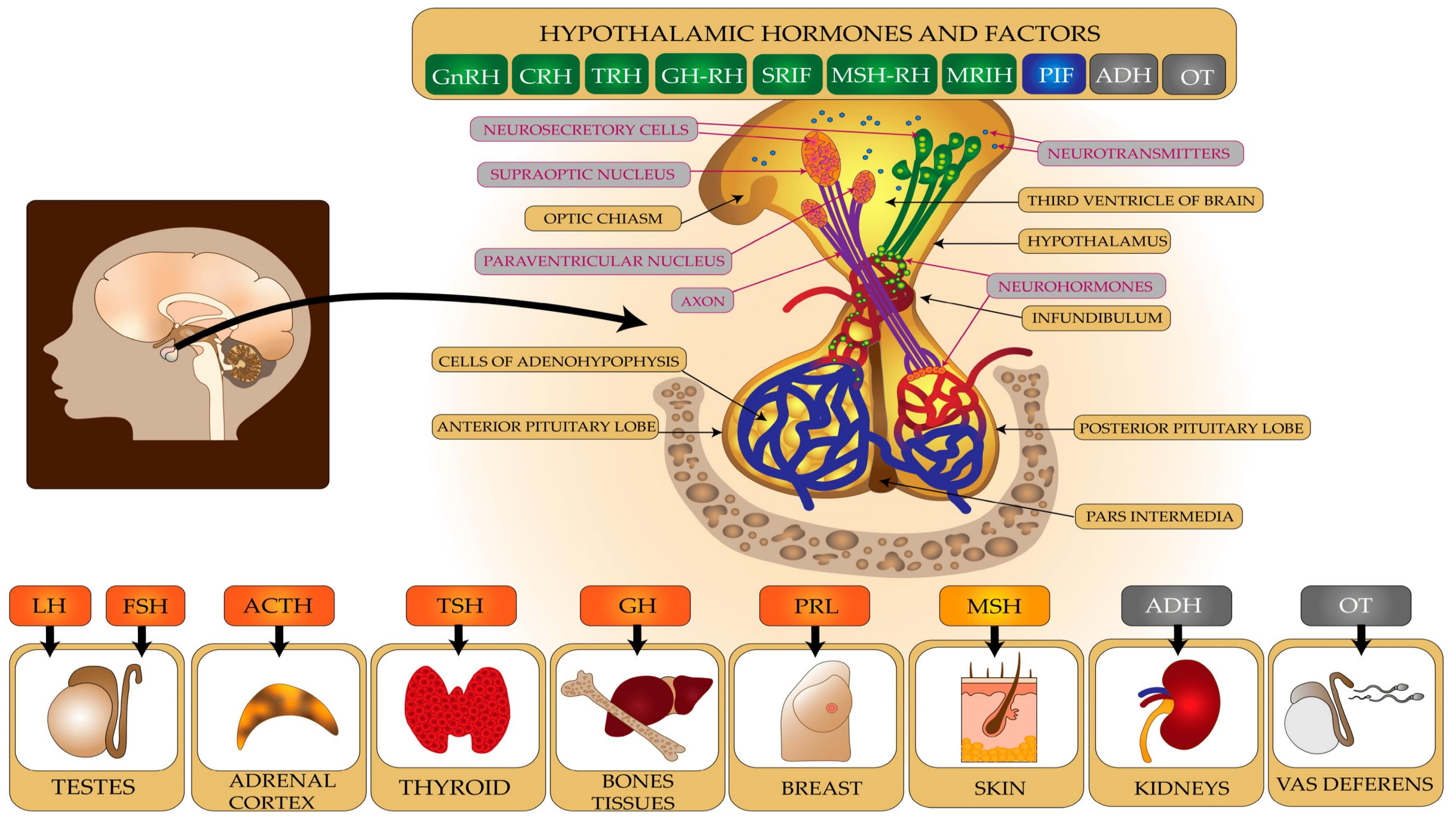
Intestines
Like stomach, makes hormones that stimulate production or release of enzymes that aid digestion

Ovary
The two ovaries manufacture the female sex hormones oestrogen and progesterone, which stimulate egg ripening and thickening of the uterine wall respectively

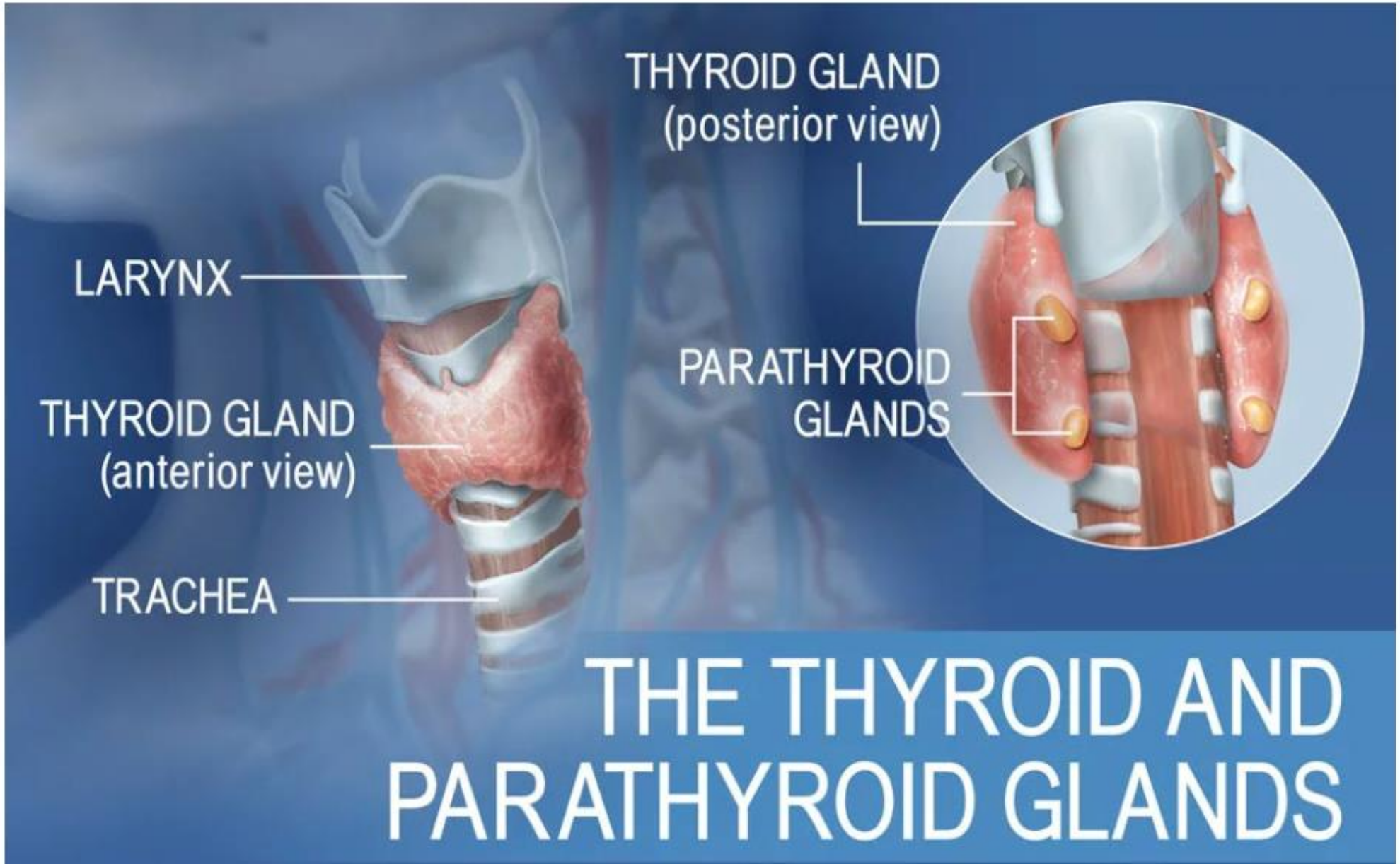
The hypothalamus and the pituitary gland are part of the diencephalon region of the brain.
The hypothalamus connects the nervous system to the endocrine system.
It receives and processes signals from other brain regions and pathways and translates them into **hormones**, the chemical messengers of the endocrine system.

These hormones flow to the pituitary gland, which is connected to the hypothalamus by the **infundibulum**. Some hormones are stored in the pituitary stores for later release; others spur it to secrete its own hormones. The hormones released by the pituitary gland and the hypothalamus control the other endocrine glands and regulate all major internal functions.




HYPOTHALAMIC HORMONES AND FACTORS
GnRH
CRH
TRH
GH-RH
SRIF
MSH-RH
MRIH
PIF
ADH
OT
NEUROSECRETORY CELLS
SUPRAOPTIC NUCLEUS
OPTIC CHIASM
PARAVENTRICULAR NUCLEUS
AXON
NEUROTRANSMITTERS
THIRD VENTRICLE OF BRAIN
HYPOTHALAMUS
NEUROHORMONES
INFUNDIBULUM
CELLS OF ADENOHYPOPHYSIS
ANTERIOR PITUITARY LOBE
POSTERIOR PITUITARY LOBE
PARS INTERMEDIA
LH
FSH
ACTH
TSH
GH
PRL
MSH
ADH
OT
TESTES
ADRENAL CORTEX
THYROID
BONES TISSUES
BREAST
SKIN
KIDNEYS
VAS DEFERENS

THE THYROID AND PARATHYROID GLANDS INCREASE METABOLISM AND REGULATE CALCIUM LEVELS

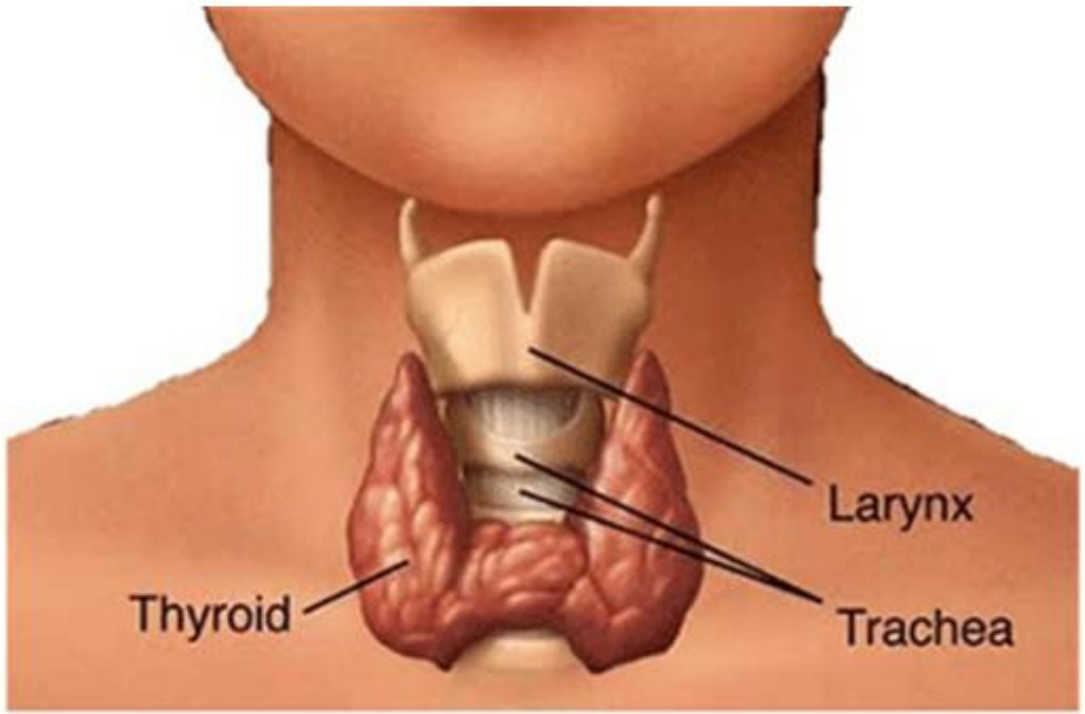


THYROID GLAND

The thyroid gland sits in the throat region, just below the larynx, served by large arteries with many branches and a dense network of capillaries.

The hormones it secretes, travel in the bloodstream throughout the body to:

- **Increase metabolism**
- **Regulate glucose use**
- **Protein synthesis**
- **Nervous system development**.
- **It also releases Calcitonin, which helps maintain blood calcium homeostasis by causing calcium to be removed from the blood and deposited into bones when blood (calcium) levels are too high.**



Parathyroid Glands

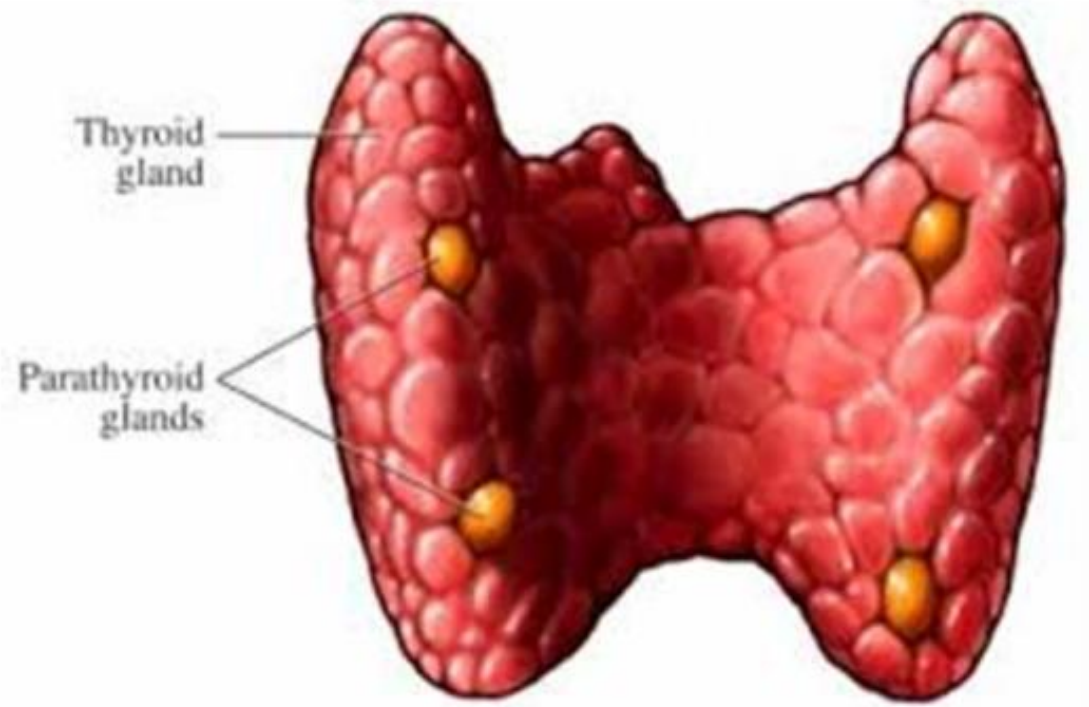
On the posterior (back) surface of the thyroid sit much smaller, separate glands: the **parathyroids.**

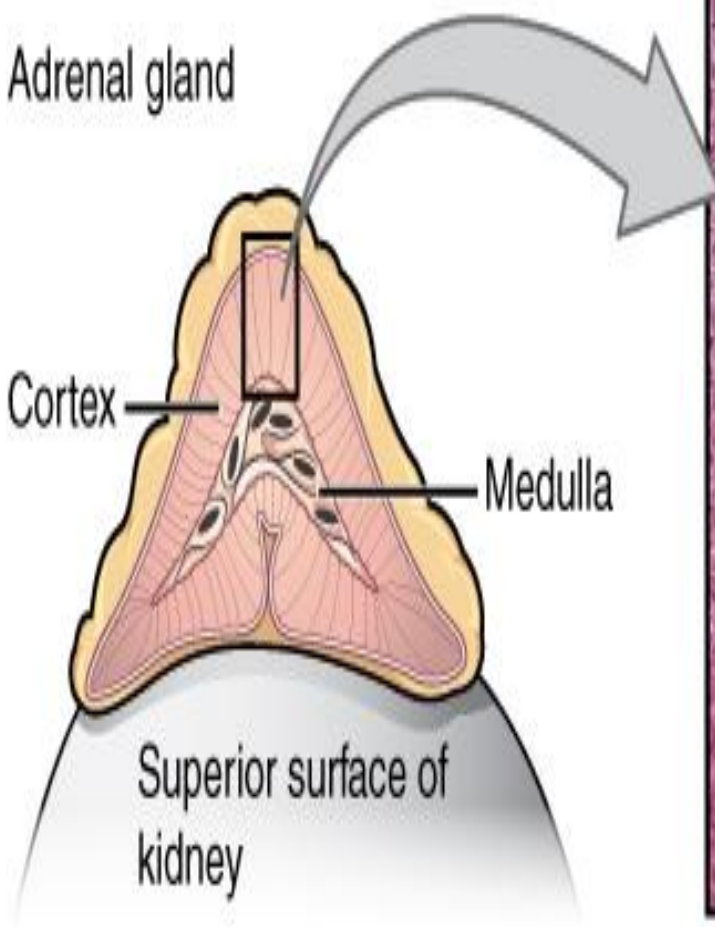
Typically there are four parathyroid glands, a superior and inferior pair on the left and right sides of the thyroid.

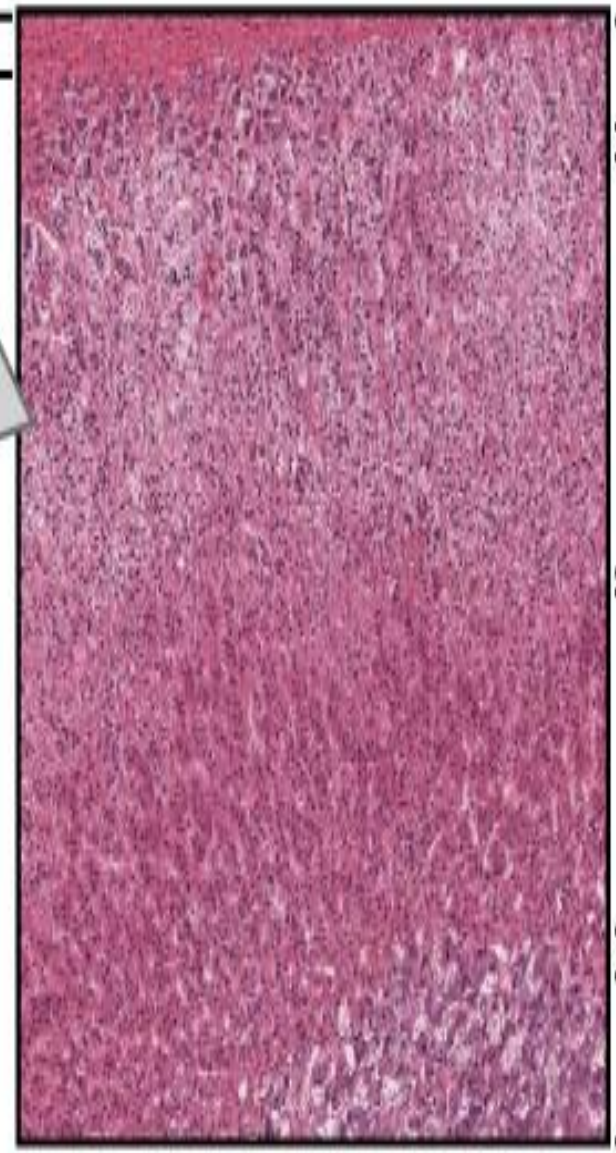
They secrete parathyroid hormone (PTH), which stimulates bones to release calcium into the blood when blood (calcium) levels are low.

PTH also causes the kidneys to reduce calcium secretion into urine to further elevate calcium levels in the blood.

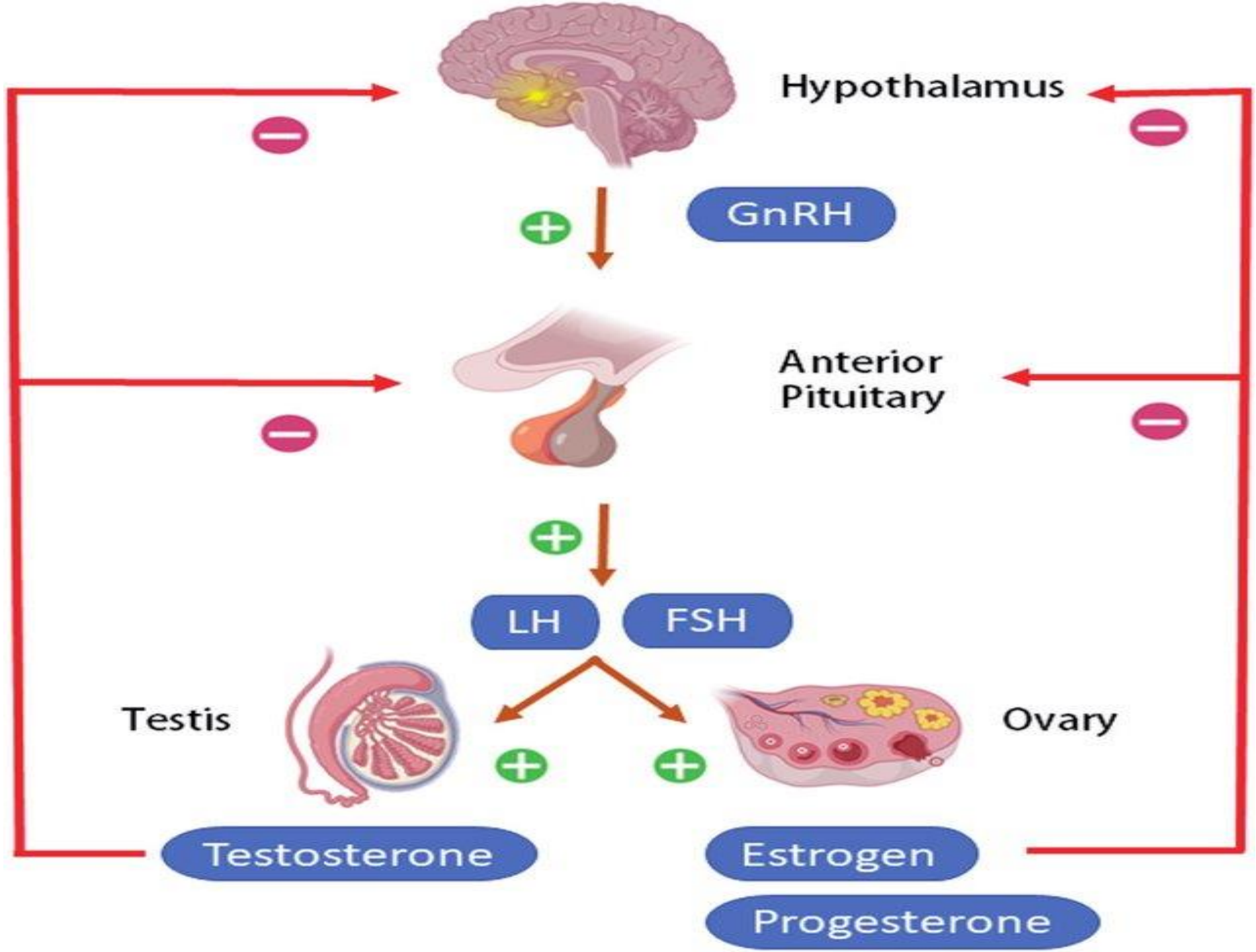
Together, calcitonin and PTH act in complementary ways to maintain blood calcium homeostasis, which is one of the most tightly controlled physiological parameters in the body.

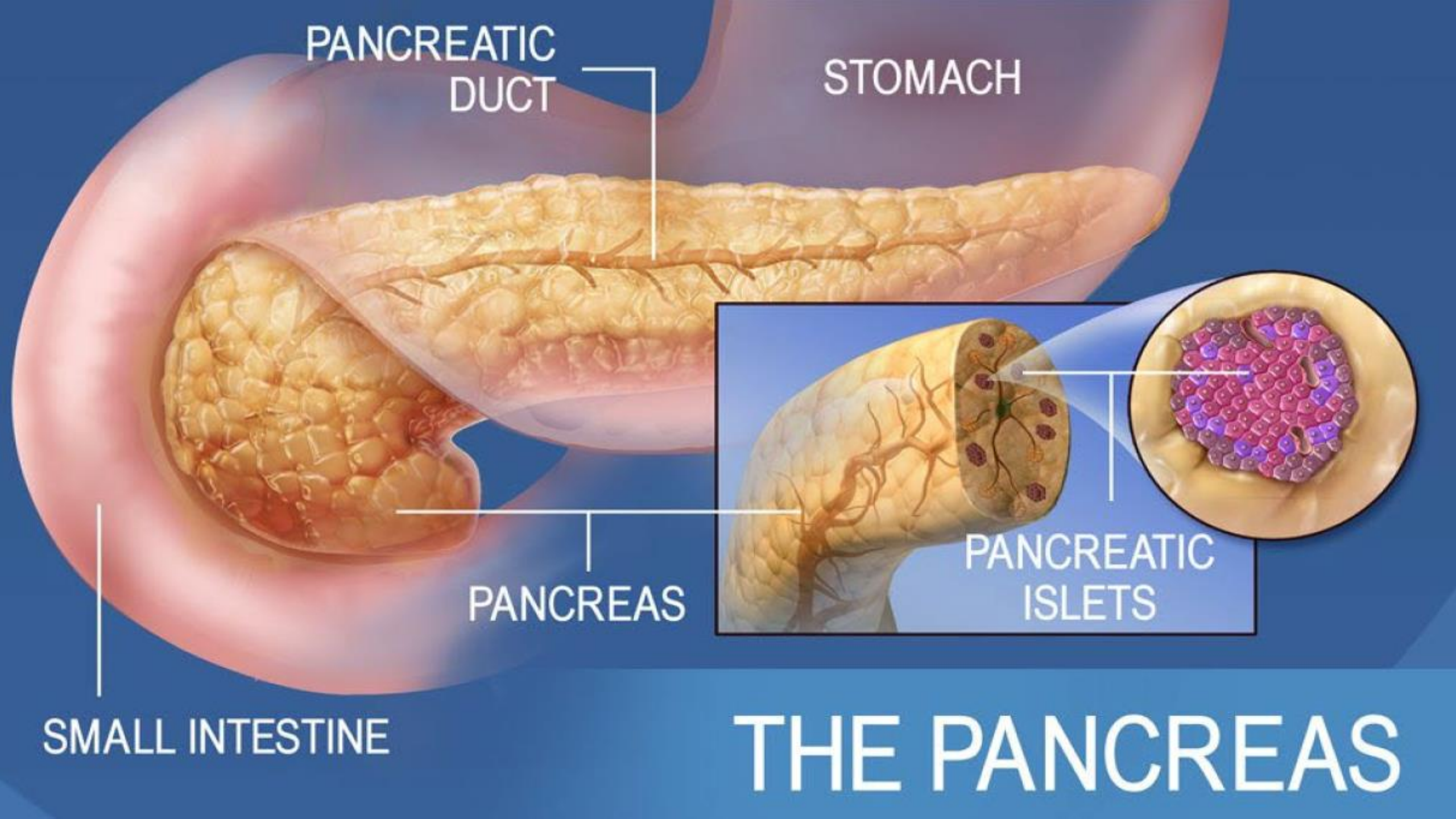






Tissue area	Hormones released	Examples
Zona glomerulosa (adrenal cortex)	Mineralcorticoids (regulate mineral balance)	Aldosterone
Zona fasciculata (adrenal cortex)	Glucocorticoids (regulate glucose metabolism)	Cortisol Corticosterone Cortisone
Zona reticularis (adrenal cortex)	Androgens (stimulate masculinization)	Dehydroepian-drosterone
Adrenal medulla	Stress hormones (stimulate sympathetic ANS)	Epinephrine Norepinephrine


Hypothalamus
GnRH
Anterior Pituitary
LH
FSH
Testis
Ovary
Testosterone
Estrogen
Progesterone


PANCREATIC DUCT
STOMACH
PANCREAS
PANCREATIC ISLETS
SMALL INTESTINE
THE PANCREAS

PANCREAS – A DUAL-PURPOSE GLAND

It is also a part of the digestive system.

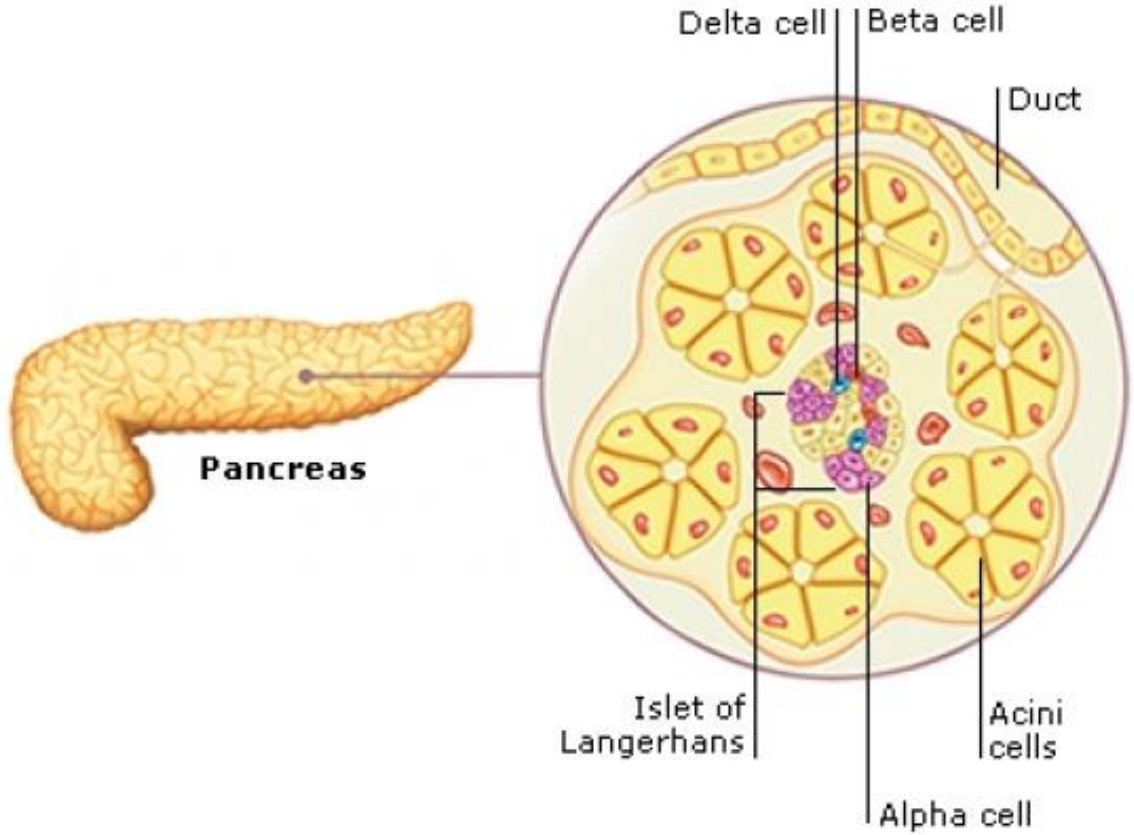
It excretes pancreatic juice into the small intestine via the pancreatic duct.

Scattered within the pancreas there are also tiny cell clusters called pancreatic islets (or islets of Langerhans) that release hormones into the bloodstream.

These islets make up less than 2% of pancreatic tissue, but their specialized cells regulate blood glucose levels (or blood sugar).

When blood sugar is low, alpha cells in the islets release glucagon. Glucagon spurs the liver to break down glycogen and release more glucose into the blood.

When blood sugar is high, beta cells in the islets release insulin, which increases glucose reuptake.



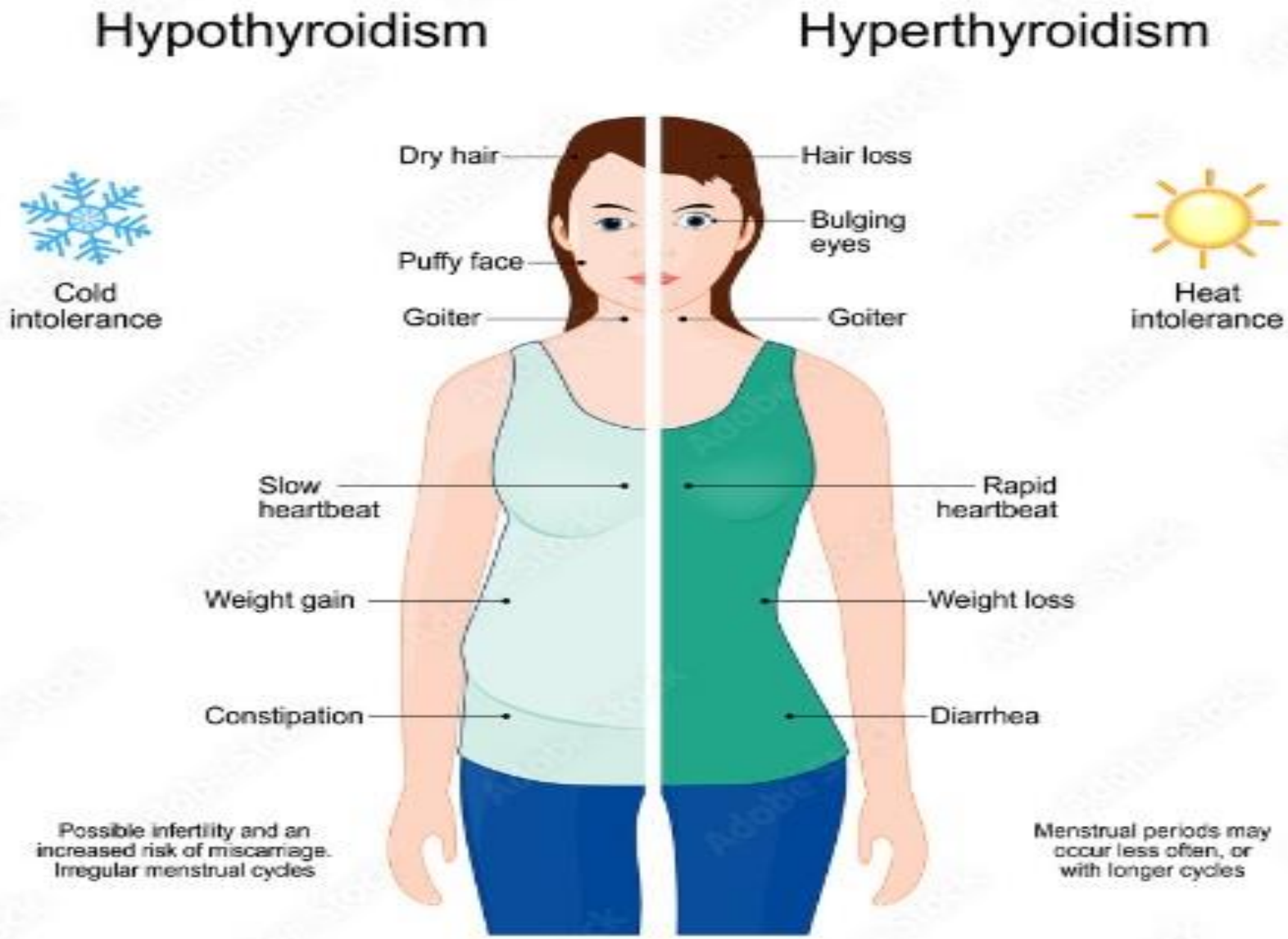
The Pancreas Regulates Blood Sugar

Surrounded by enzyme-producing acini cells, the tiny pancreatic islets contain three types of cells: alpha, beta, and delta. The secretions of the latter help regulate insulin and glucagon production.

Dwarfism, Gigantism, and Acromegaly

Growth Hormone Disorders

Disorder of the thyroid gland

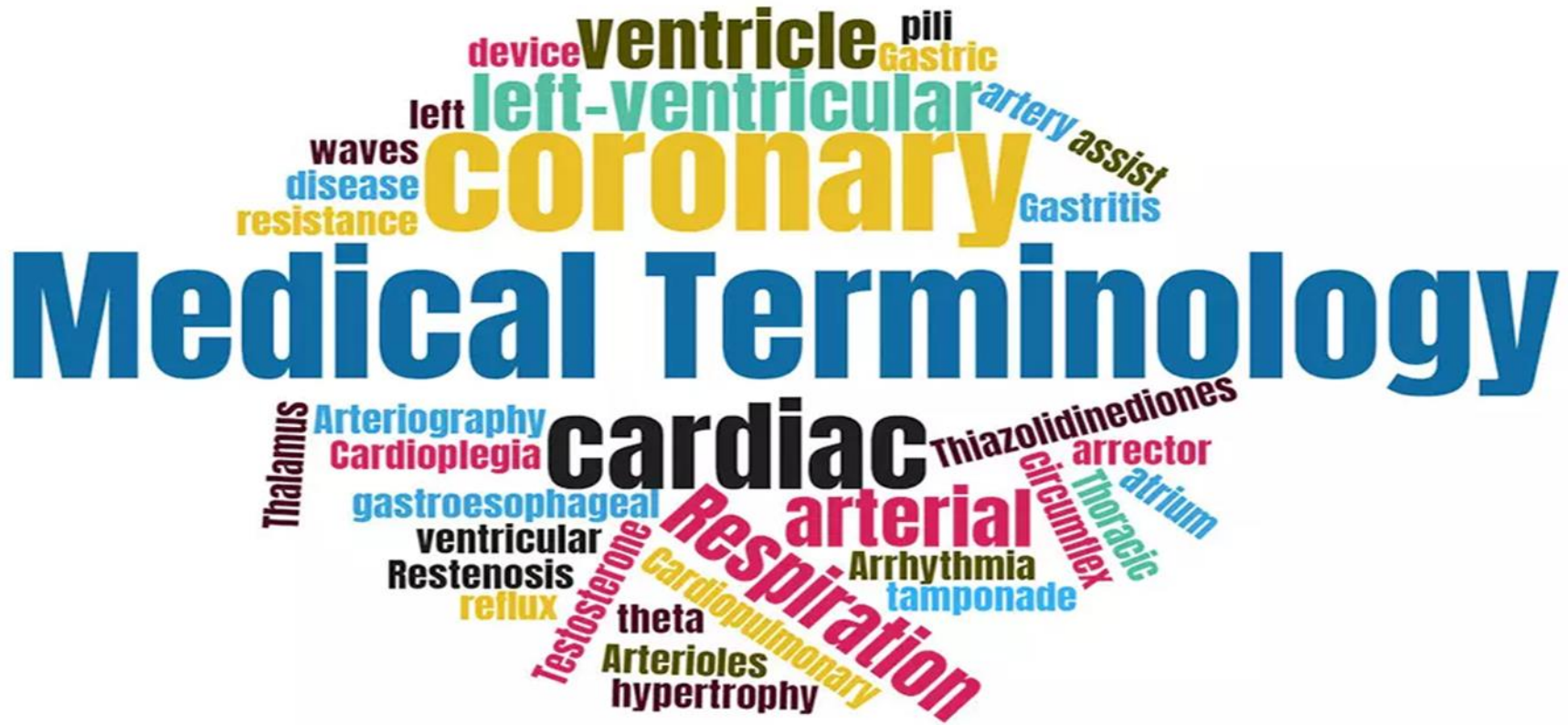


component	*meaning*	*example*
A-, AN-	without, lack	muscular atrophy = 'wasting away' of muscles
ADEN-	gland	adenoma = tumour with gland like structure
END-, Endo-	within	endocrine = secreting within
EXO-	away from	exocrine = secreting outwardly or away from
GLYCO-, GLUCO-	sugar, sweet	hyperglycaemia = excessive blood sugar levels
PARA-	near, beside	parathyroid = beside the thyroid
POLY-	much, many	polyadenitis = inflamation of many glands
-CRINE	to secrete	endocrine = endo (within) crine (secrete)
-TROPHY	growth	hypertrophy = excessive growth of an organ or part
-MEGALY	enlargement	hepatomegaly = enlarged liver with hepatitis

component	*meaning*	*example*
hypo-	below, under, deficient	Hypothyroidism :underactive thyroid gland
hyper-	above, excessive	Hyperglycemia refers to elevated levels of glucose (sugar) in the blood
dips/o	thirst	Polydipsia is excessive thirst
Phag/o	eating or swallowing	Polyphagia is excessive eating
natr/o	sodium	Hyponatremia is a condition marked by low levels of sodium in the blood.
kal/i	potassium	Hypokalemia is a low levels of potassium in the blood.
calc/i	calcium	Hypercalcemia is elevated levels of calcium in the blood
acr/o	extremities, height	Acromegaly: enlargement of extremities such as hands, feet, and facial features
adren/o	adrenal glands	Adrenocorticotropic: substances that stimulate the adrenal cortex
endocrin/o	endocrine	Endocrinology is the study of endocrine glands, hormones

COMBINING FORM	MEANING	EXAMPLE OF USE IN MEDICAL TERMS
adren/o	adrenal gland	adrenopathy
adrenal/o	adrenal gland	adrenalectomy
hypophys/o	pituitary gland	hypophysectomy
oophor/o	ovary	oophorectomy
ovari/o	ovary	ovarian
orch/o	testis	orchitis
orchi/o	testis	orchioplasty
orchid/o	testis	orchidotomy
pancreat/o	pancreas	pancreatitis
parathyroid/o	parathyroid gland	parathyroidectomy
pituitary/o	pituitary gland	hyperpituitarism
thyroid/o	thyroid gland	Thyroidotomy, Thyroidectomy

THANK YOU!


device
ventricle
pili
Gastric
left
left-ventricular
artery
assist
waves
coronary
disease
resistance
Gastritis
Medical Terminology
Thalamus
Arteriography
Cardioplegia
cardiac
Thiazolidinediones
arrector
atrium
Thoracic
circumflex
gastroesophageal
arterial
ventricular
Restenosis
Respiration
Arrhythmia
tamponade
reflux
Testosterone
cardiopulmonary
theta
Arterioles
hypertrophy