

Mr. E Science

The Endocrine System

Human anatomy and chemical communication

Glands, hormones, and homeostasis

Life Science

Major endocrine glands

Brain: hypothalamus, pituitary, pineal

Neck: thyroid and parathyroids

Chest: thymus

Abdomen: adrenal glands and pancreas

Pelvis: ovaries or testes

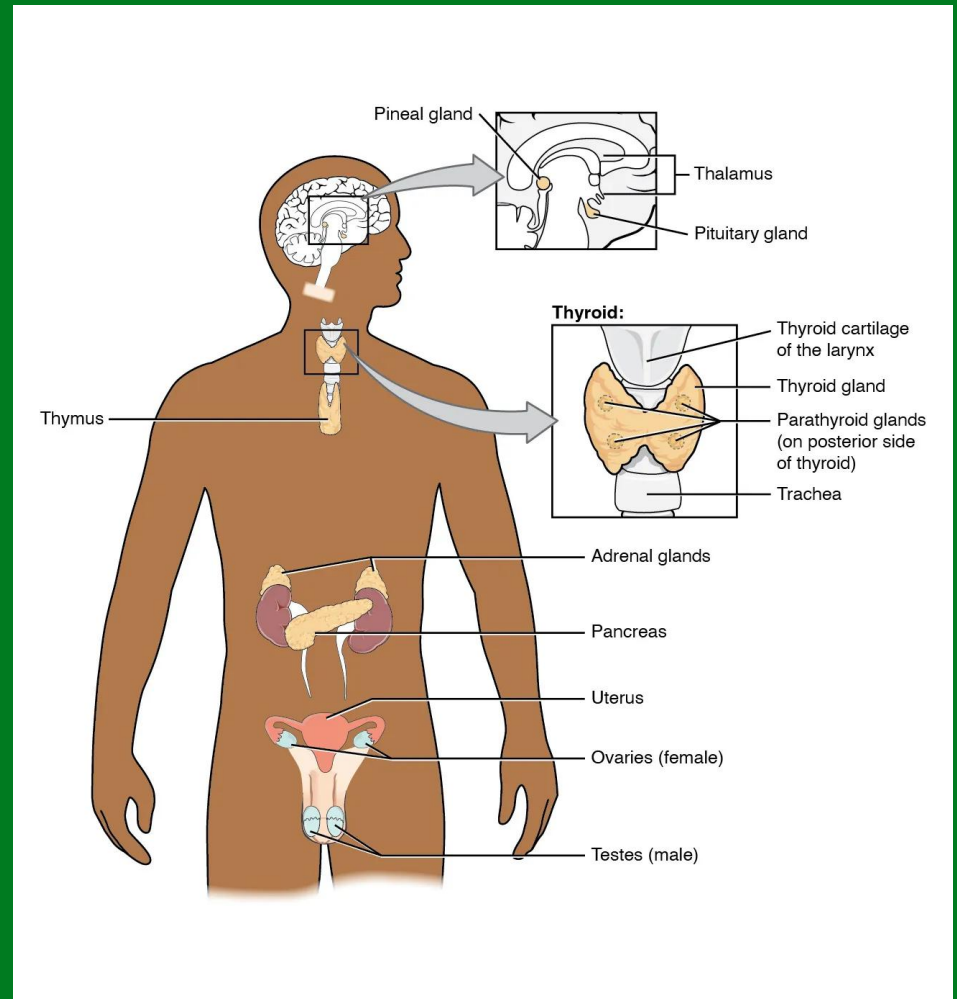


Diagram: OpenStax, Anatomy & Physiology (2013), CC BY 4.0

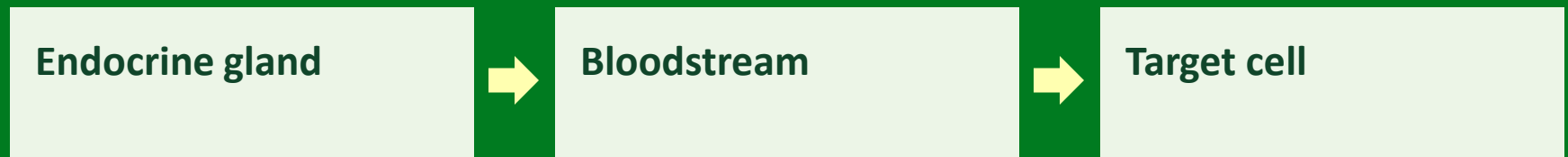
Hormones and target cells

An endocrine gland releases hormones into the blood.

A hormone is a chemical messenger.

Only cells with the matching receptor respond.

A target cell changes its activity when it receives the signal.

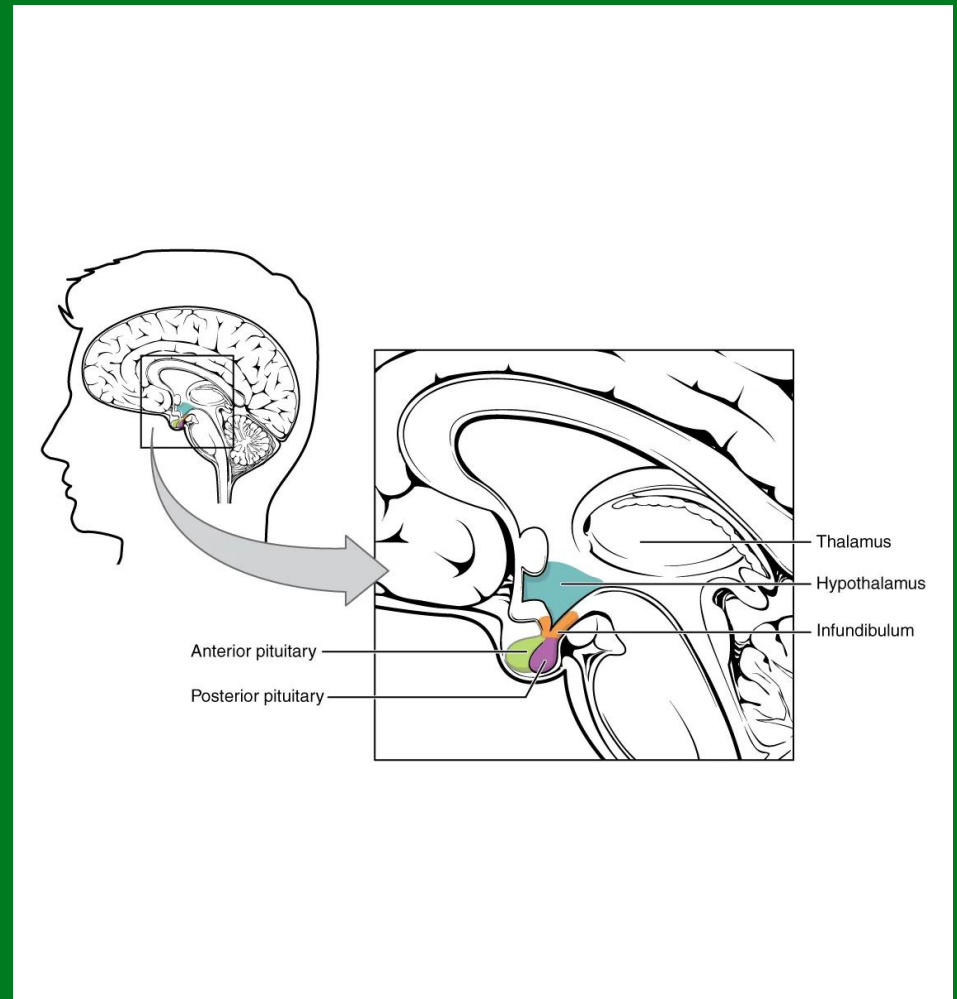


The hypothalamus and pituitary

The hypothalamus links nervous and endocrine control.

The pituitary hangs below it at the base of the brain.

Its anterior and posterior lobes have different roles.



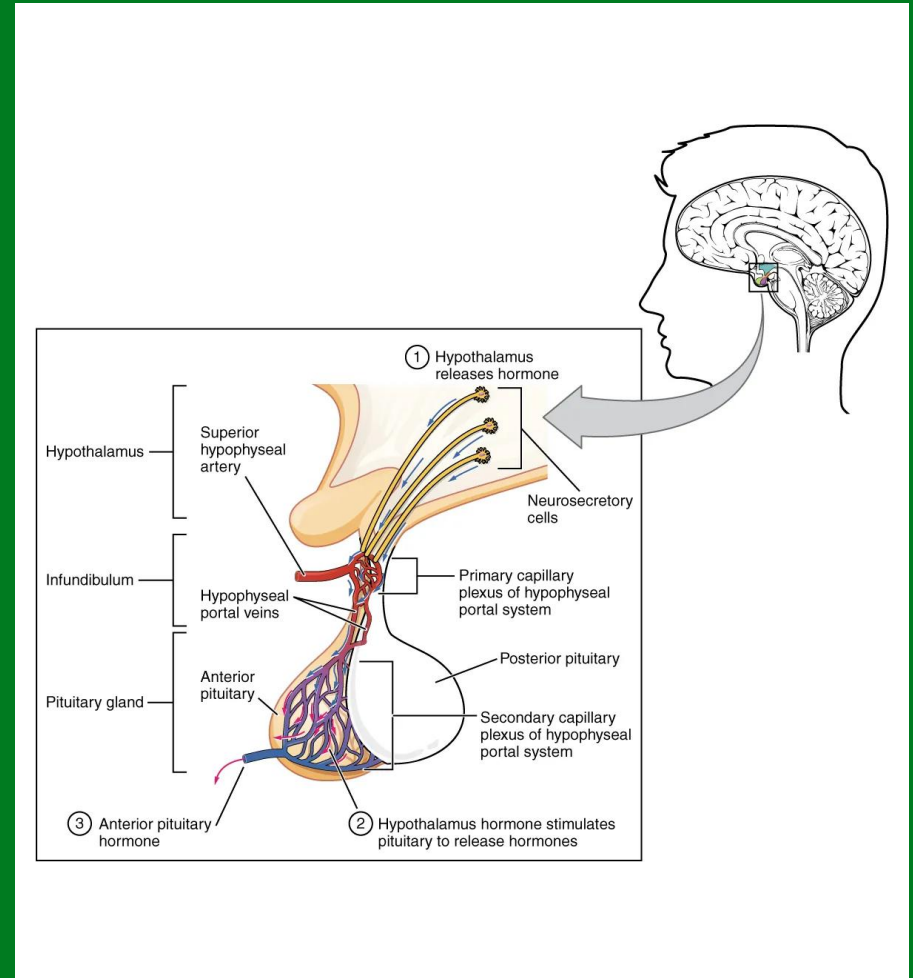
Anterior pituitary hormones

Growth hormone (GH): supports growth of bones and other tissues.

Thyroid-stimulating hormone (TSH): stimulates the thyroid.

Adrenocorticotrophic hormone (ACTH): stimulates the adrenal cortex.

Prolactin: supports milk production in mammary glands.



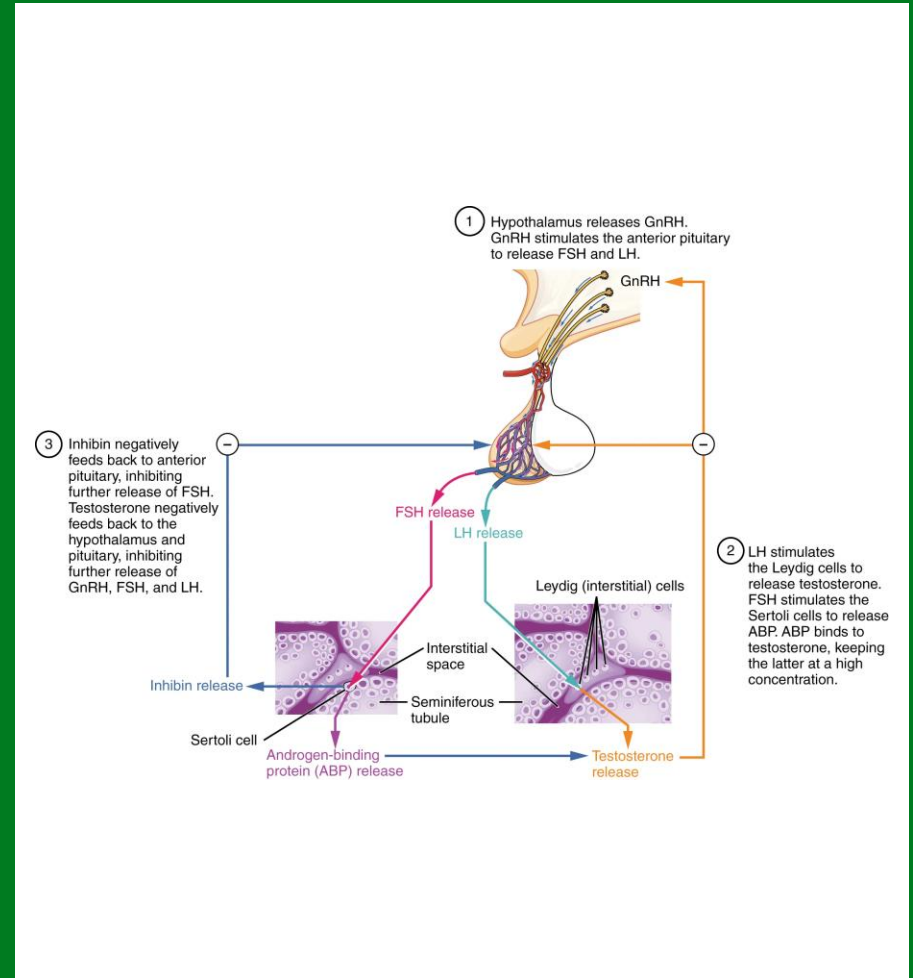
Pituitary signals to the gonads

Follicle-stimulating hormone (FSH) and luteinizing hormone (LH) act on the gonads.

FSH supports ovarian follicles and sperm production.

LH supports ovulation and hormone production.

Gonads are the ovaries and testes.



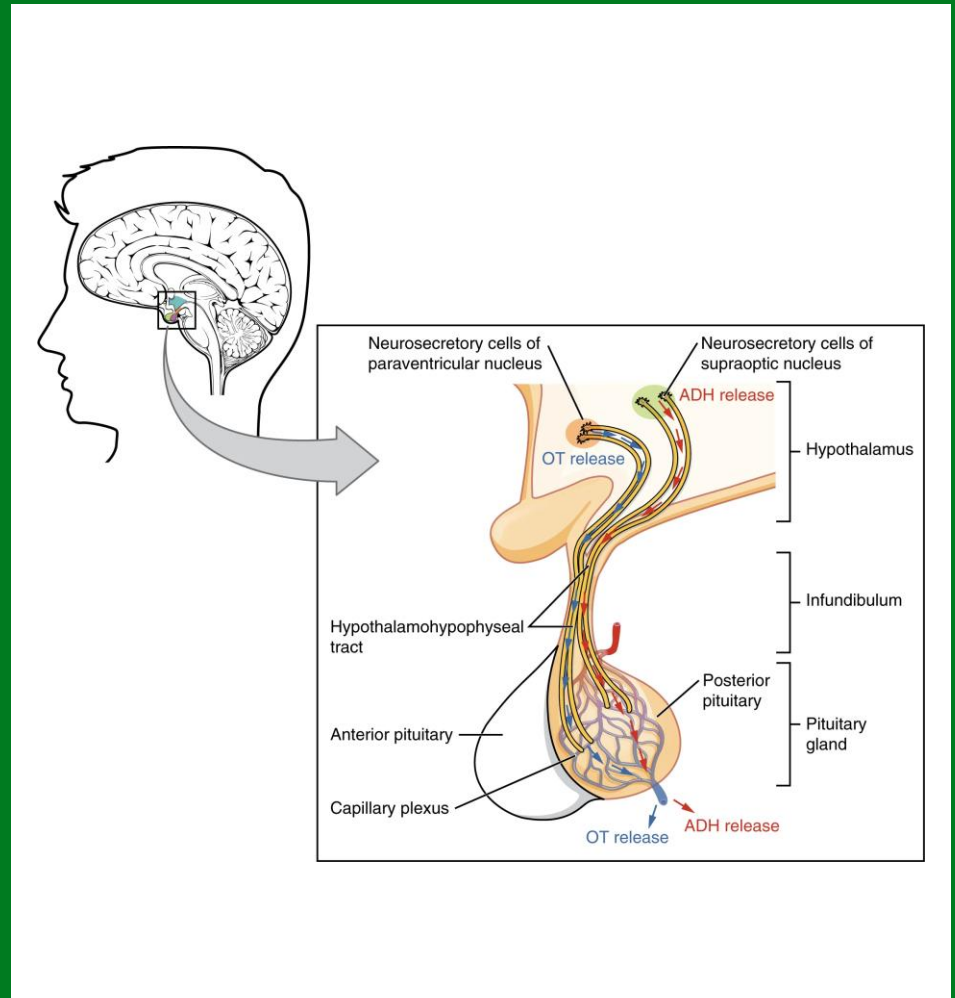
The posterior pituitary

Antidiuretic hormone (ADH) and oxytocin are made in the hypothalamus.

The posterior pituitary stores and releases them.

ADH helps the kidneys conserve water.

Oxytocin acts on uterine muscle and milk release.



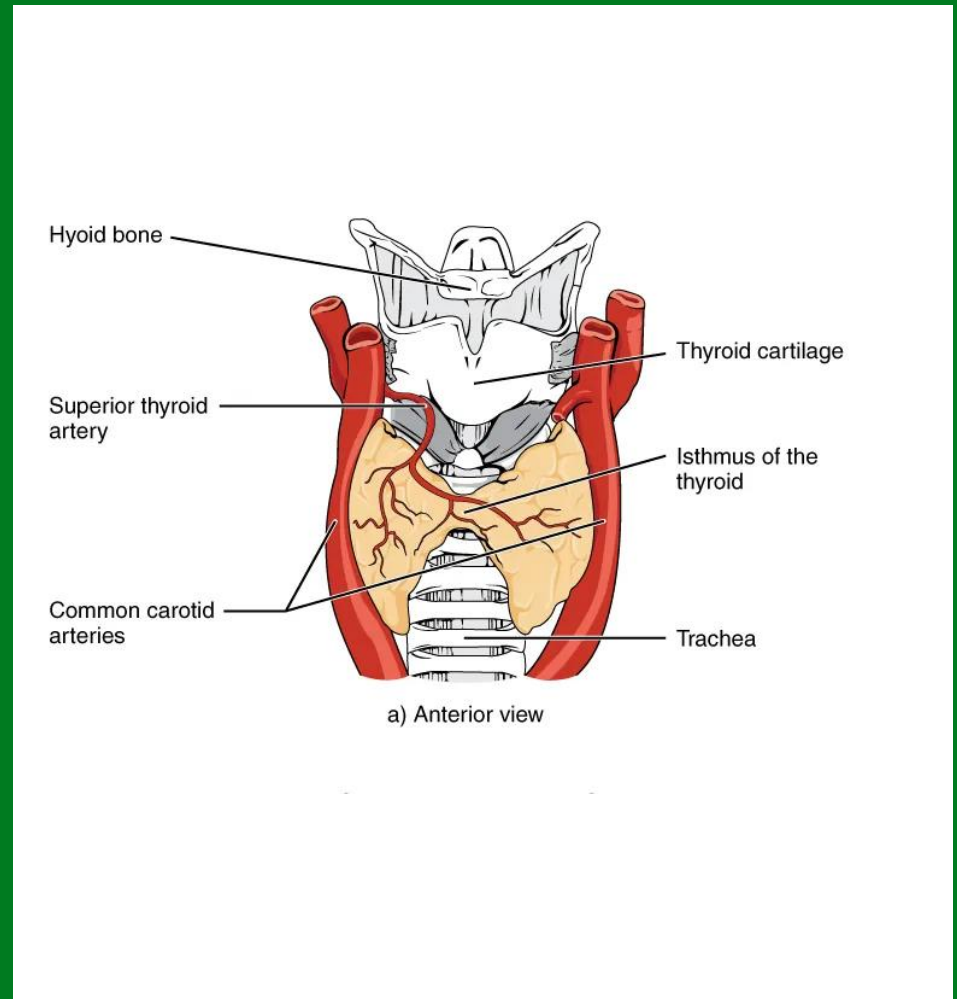
The thyroid gland

Two lobes lie at the front of the neck, beside the trachea.

Thyroxine (T4) helps regulate the body's metabolic rate.

Thyroid hormones support normal growth and development.

Calcitonin can lower blood calcium.



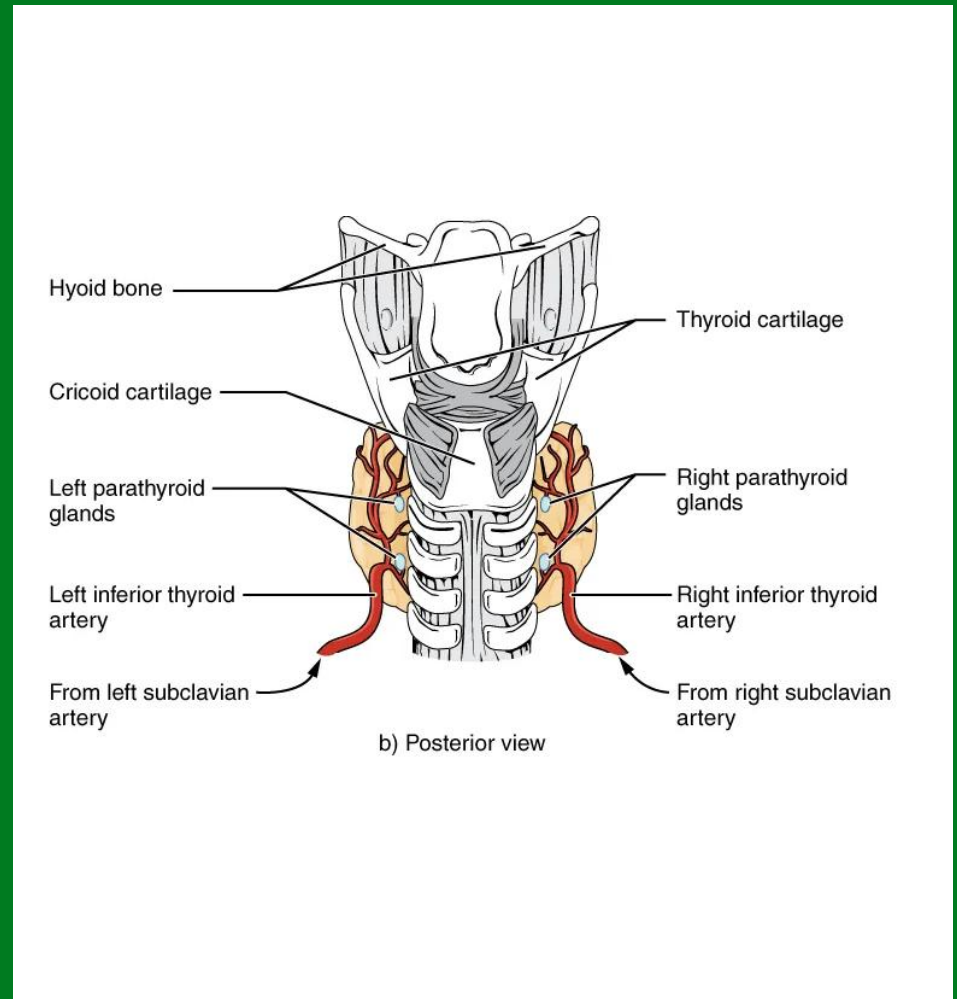
The parathyroid glands

Usually four small glands lie on the back of the thyroid.

Parathyroid hormone is called PTH or parathormone.

PTH raises blood calcium when it is too low.

Calcium supports bones, nerves, and muscle function.

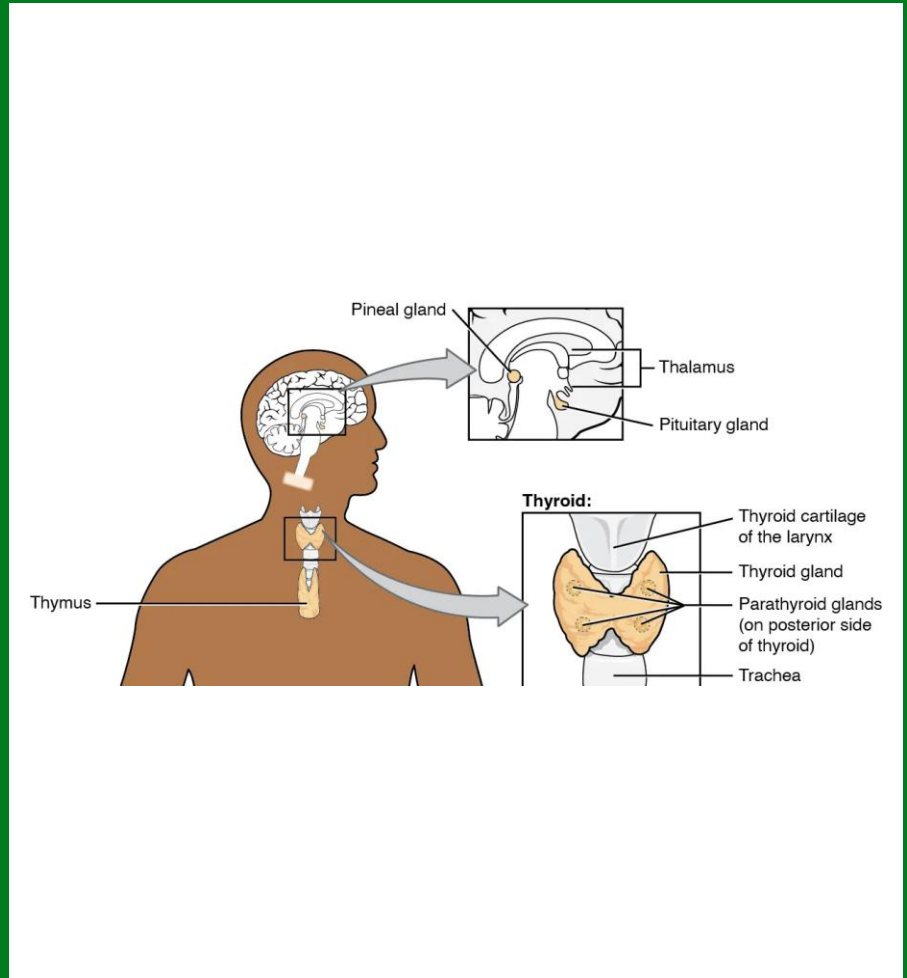


Pineal gland and thymus

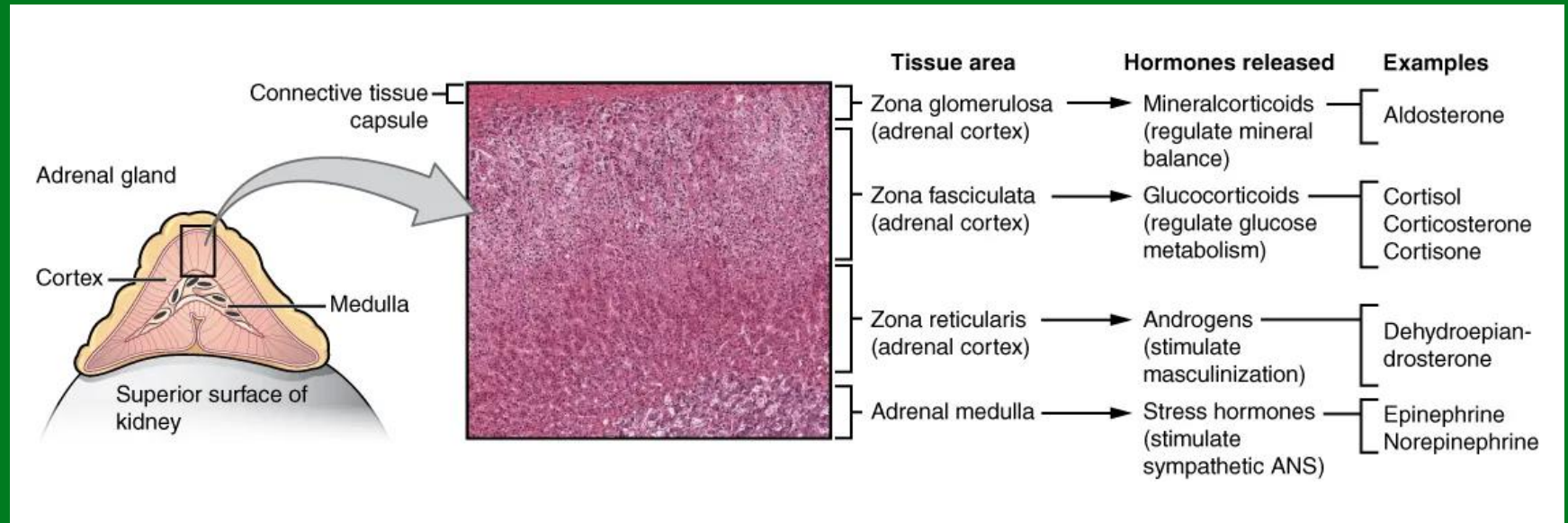
Pineal gland: a small gland in the brain. Melatonin helps time daily sleep and wake rhythms.

Thymus: behind the breastbone. Hormones called thymosins help T cells develop.

The thymus is especially active during childhood.



The adrenal glands



One adrenal gland sits above each kidney.

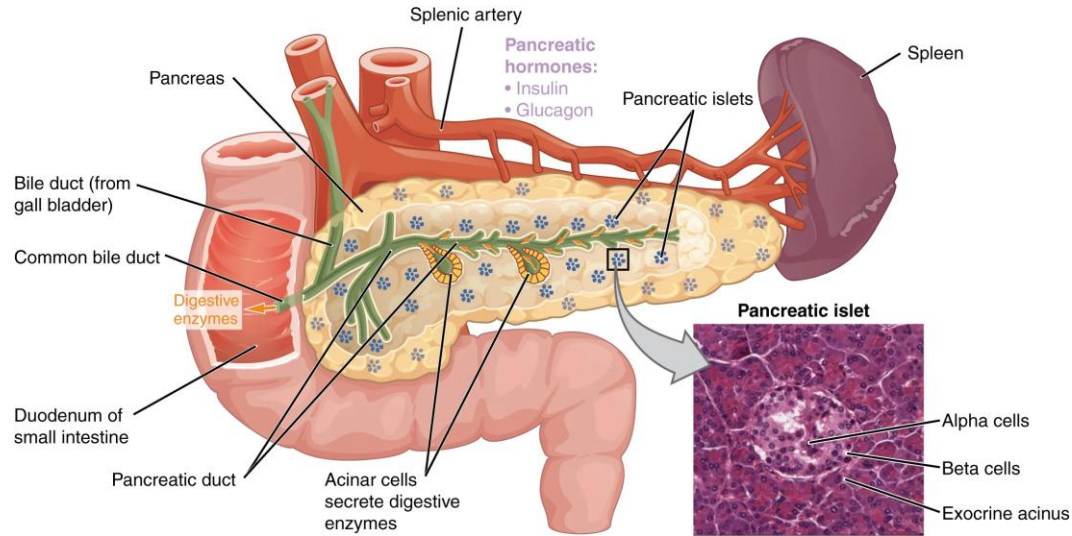
Outer cortex: cortisol helps the body respond to stress.

Aldosterone helps kidneys retain sodium and remove potassium.

Inner medulla: adrenaline (epinephrine) supports a rapid alert response.

Diagram: OpenStax, Anatomy & Physiology (2013), CC BY 4.0

The endocrine pancreas



The pancreas lies behind the stomach.

Clusters called pancreatic islets contain endocrine cells.

Beta cells release insulin. Alpha cells release glucagon.

Other pancreatic cells make digestive secretions.

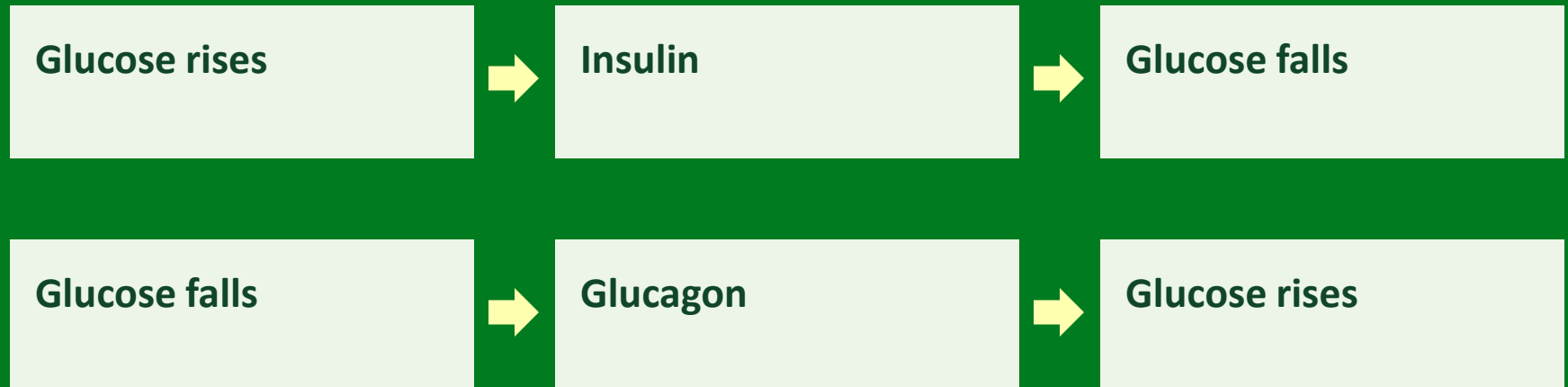
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Insulin and glucagon

After a meal, insulin helps lower blood glucose.

Between meals, glucagon helps raise blood glucose.

The liver stores glucose as glycogen and can release glucose again.



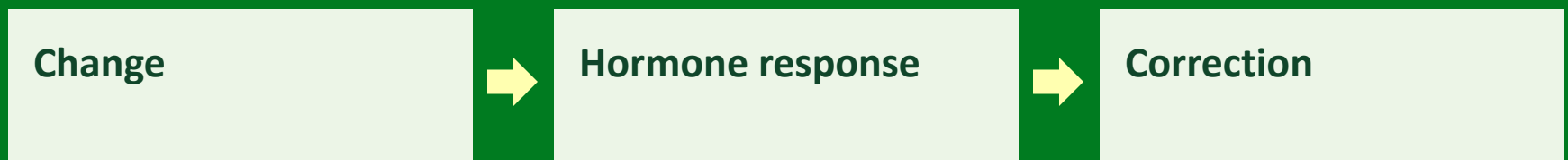
Negative feedback

A change triggers a hormone response.

The response moves the body toward its normal range.

As the change is corrected, the hormone signal decreases.

Example: falling glucose reduces the stimulus for insulin release.



Correction reduces the original stimulus.

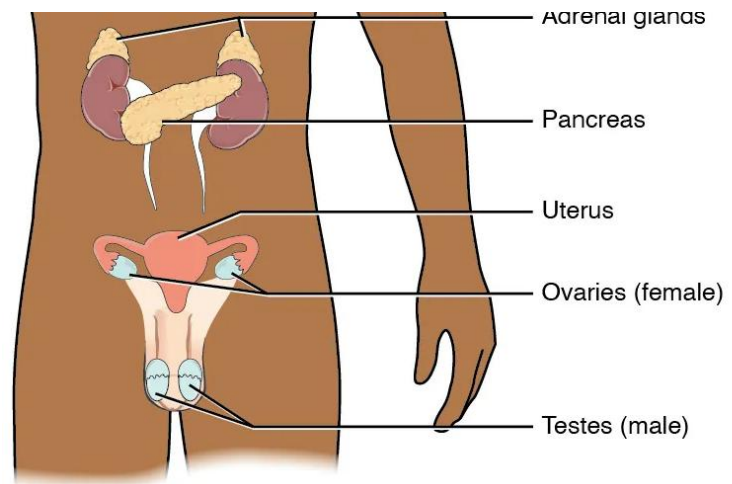
The ovaries and testes

Ovaries produce estrogens and progesterone.

Testes produce testosterone.

These hormones support development and reproductive organ function.

The same organs also produce reproductive cells.



Gland and hormone review

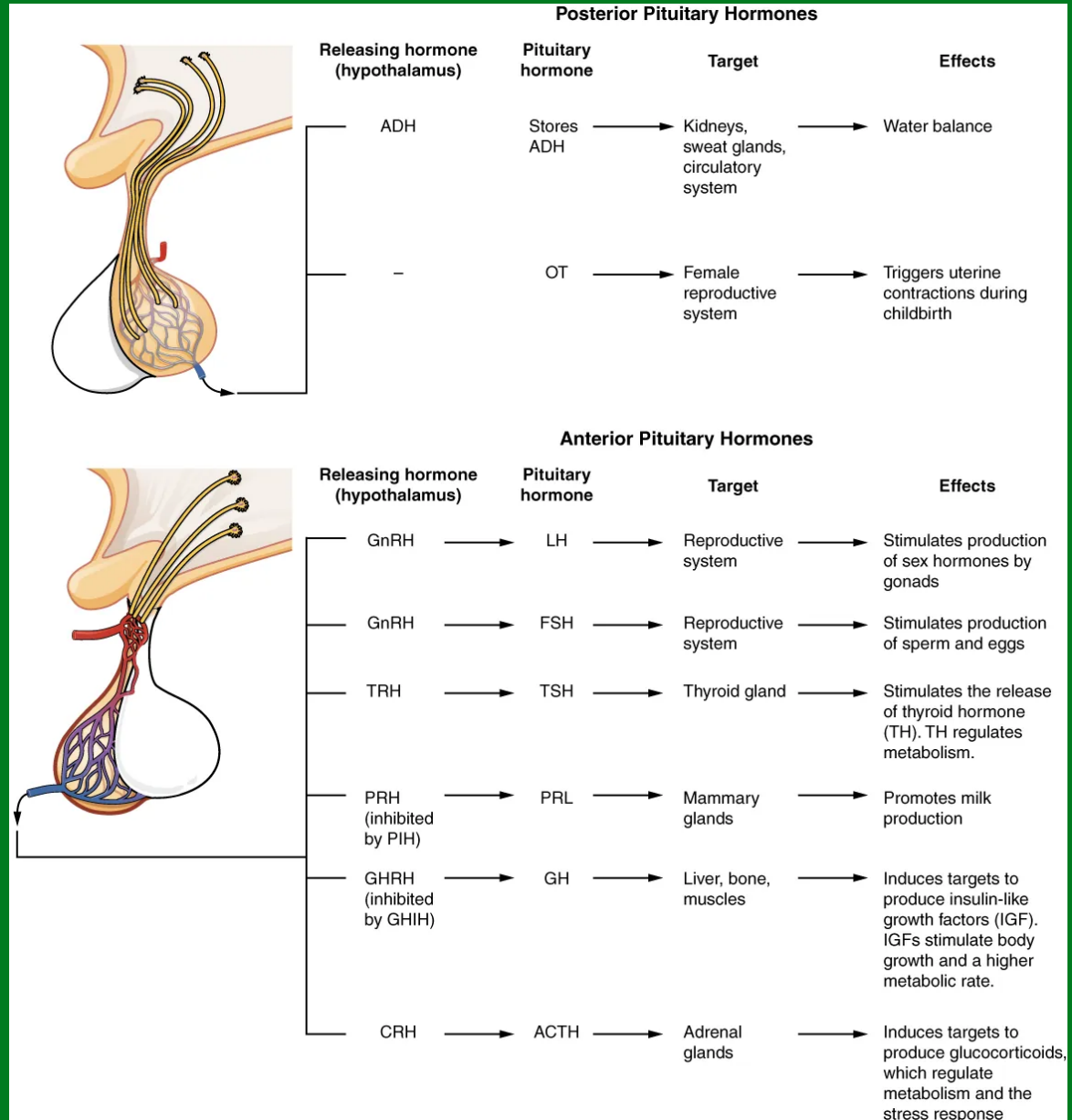
Pituitary: GH, TSH, ACTH, FSH, LH, prolactin

Posterior pituitary releases: ADH and oxytocin

Thyroid: thyroxine and calcitonin

Parathyroids: PTH

Adrenals: adrenaline, cortisol, aldosterone



Endocrine review

Which gland lies above each kidney?

Which hormone helps lower blood glucose?

Where are the parathyroid glands?

How does a target cell recognize a hormone?

Why does negative feedback reduce a hormone signal?

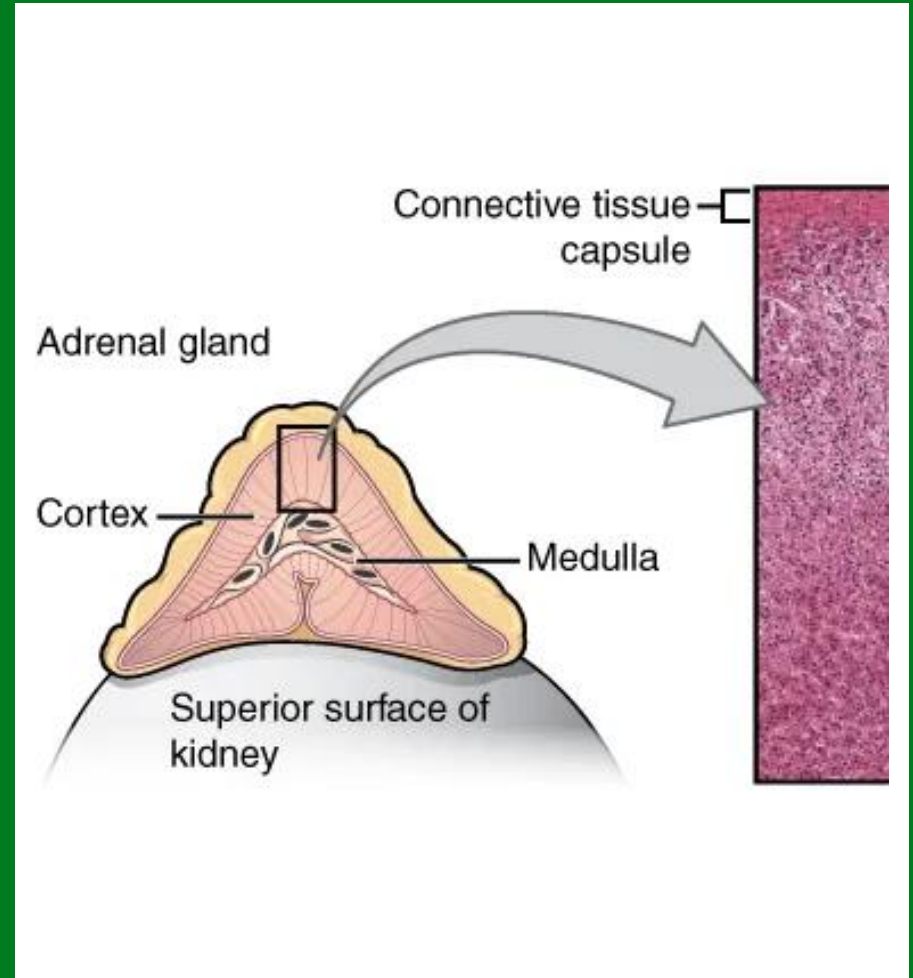


Diagram: OpenStax, Anatomy & Physiology (2013), CC BY 4.0

References and image credits

Scope: life_ws_38.pdf, pages 1, 2, and 4.

Anatomy diagrams: OpenStax, Anatomy & Physiology, first edition, Chapter 17.

Detailed source URLs appear in the speaker notes.

Diagram detail panels retain the labels from their source figures.