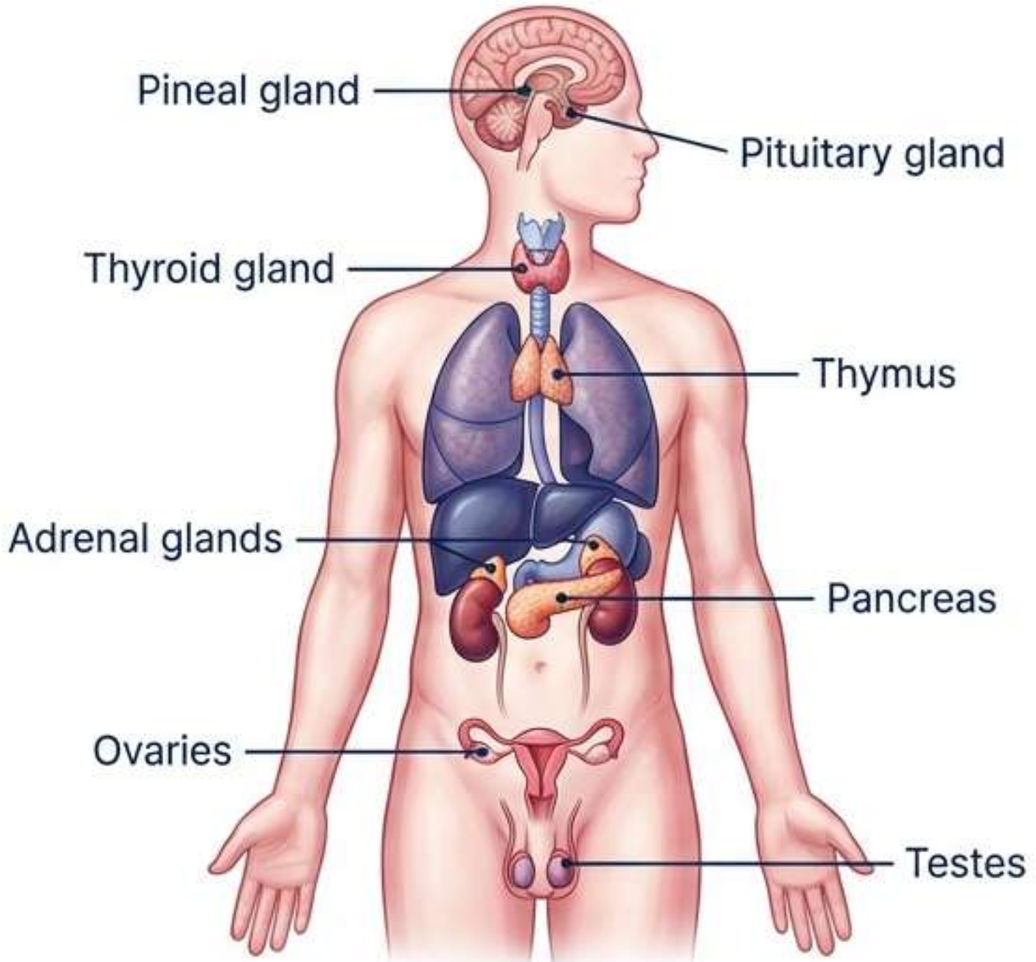
THE ENDOCRINE SYSTEM

SYSTEME ENDOCRINIEN



Comprehensive Study Guide & Exam Preparation Source

INTRODUCTION & DEFINITIONS

The Endocrine System: Made up of endocrine glands (organs or clusters of cells) specialized in **hormone synthesis**.

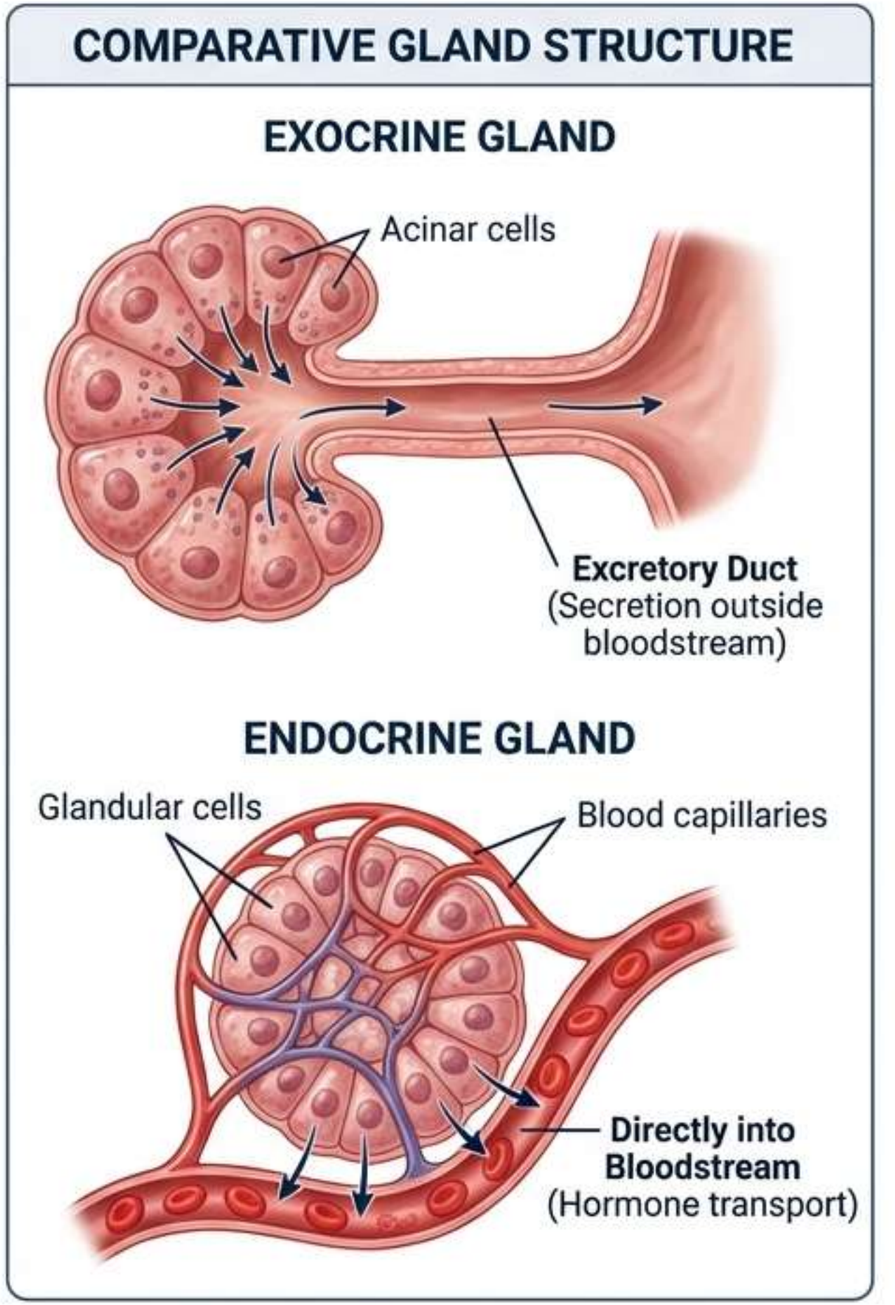
Hormone: A chemical messenger released into the extracellular medium and transported by the blood. **Acts on specific receptors** of target cells at a distance. [Ref: Q9, Q13]

Roles:

- Communication systems within the body. [Ref: Q13]
- Maintaining internal balance.
- Acts on the functioning or development of other organs. [Ref: Q9]

Types of Glands

1. **Endocrine Glands:** Secrete hormones and release them **directly into the bloodstream**. [Ref: Q1, Q8, Q13]
2. **Exocrine Glands:** Release secretions **outside the bloodstream** (into an organ or outside the body) via an **excretory duct**. [Ref: Q1, Q2, Q13]
3. **Mixed or Amphicrine Glands:** When secretion is dual: exocrine and endocrine (e.g., Pancreas [Ref: Q2]).

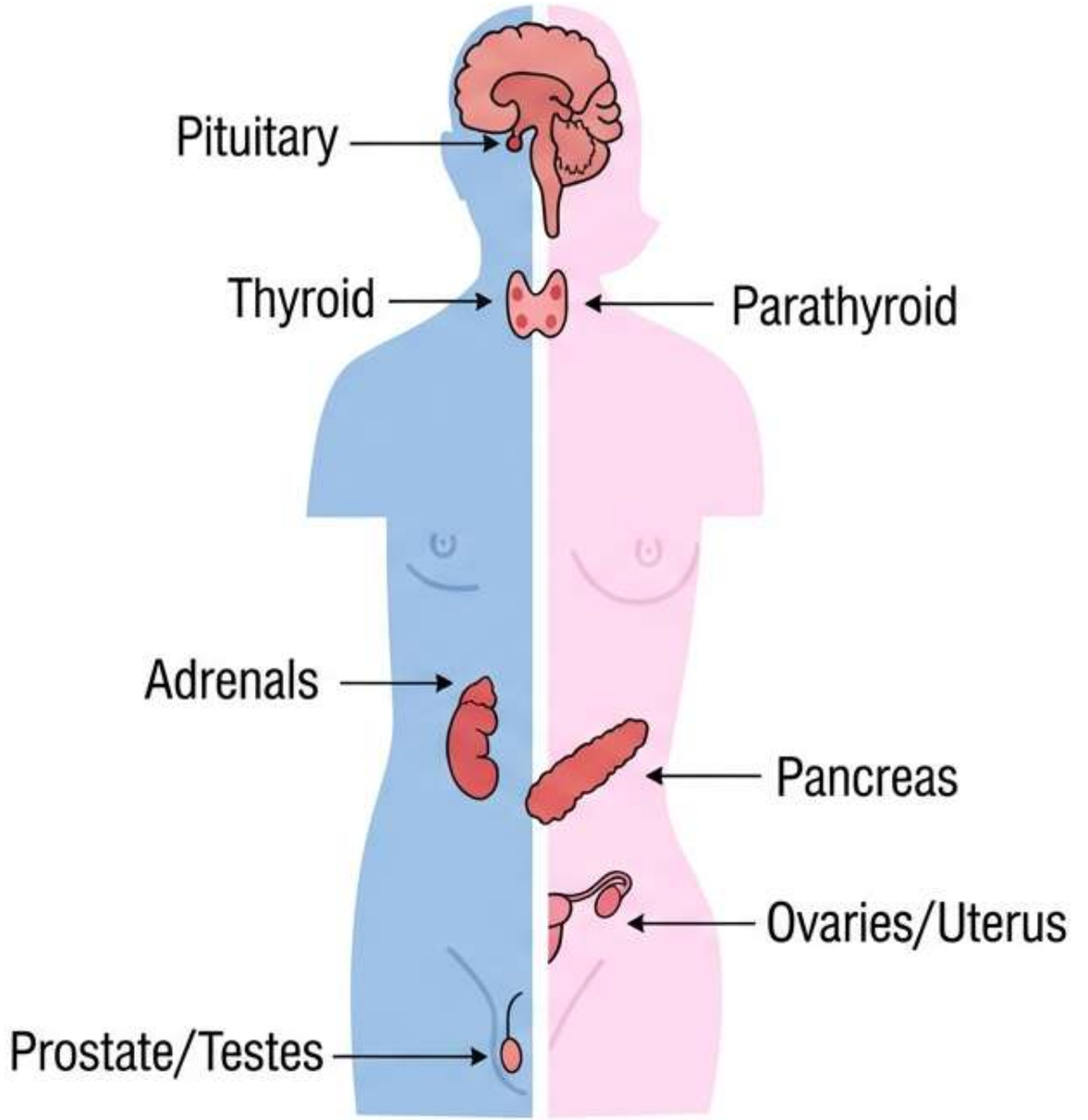


GLAND LOCATIONS

LOCALISATION DES GLANDES

Location of endocrine glands in the body:

1. **In the brain:** Hypothalamus, Pituitary, Pineal. [Ref: Q4])
2. **In the neck:** Thyroid, Parathyroids. [Ref: Q8, Q12])
3. **In the abdominal cavity:** Adrenals, Pancreas.
4. **In the pelvis:** Ovaries (Women).
5. **In the scrotum:** Testicles (Men). [Ref: Q7])



THE HYPOTHALAMUS

L'HYPOTHALAMUS

Anatomy

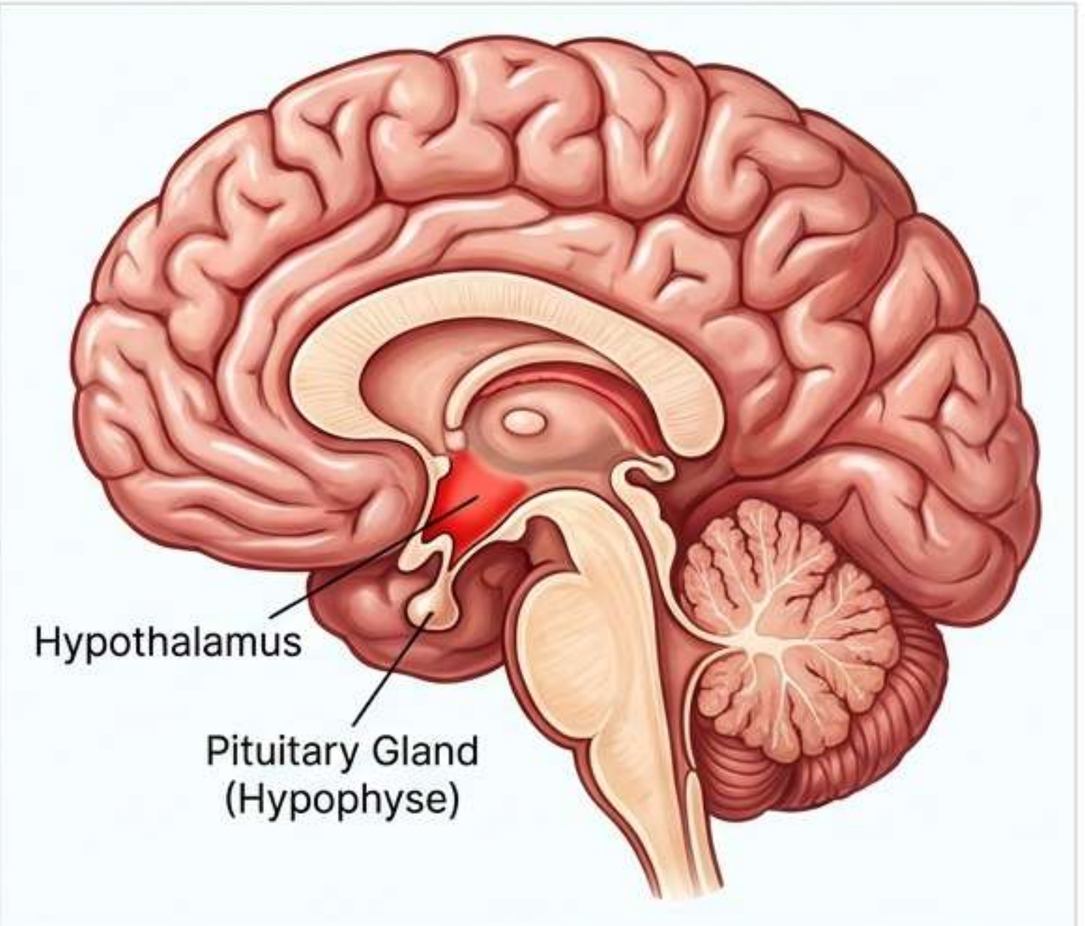
- Part of the central nervous system (Located in the brain). [Ref: Q4]
- **Location:** Located above the pituitary gland. [Ref: Q4, Q10, Q14]

Functions

- Acts as a link between the autonomic nervous system and the endocrine system.
- Participates in the regulation of major bodily functions: Hunger, Thirst, Sleep, Thermoregulation

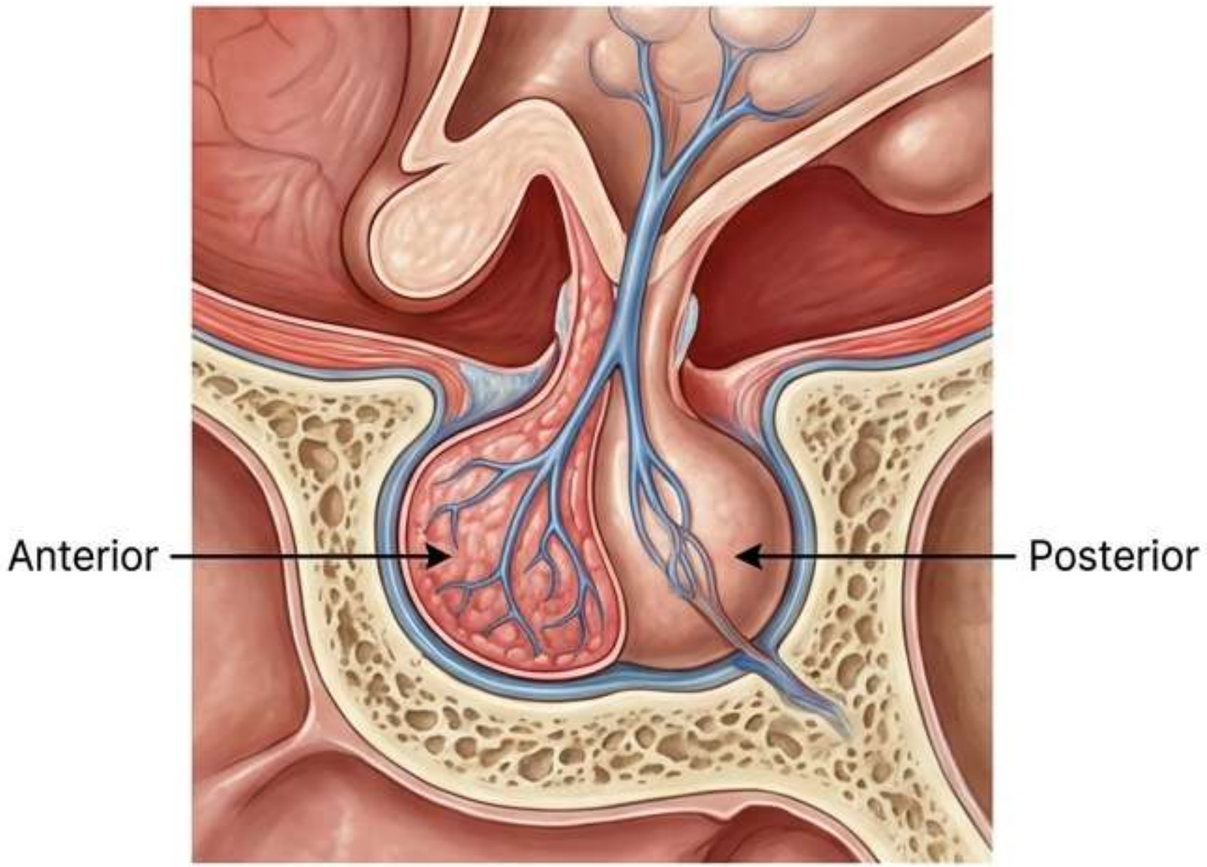
Hormonal Control

- Secretes hormones that control all pituitary secretions (inhibiting or stimulating them). [Ref: Q10]
- Together with the pituitary gland, it forms the **hypothalamic-pituitary axis**.



THE PITUITARY GLAND (HYPOPHYSIS)

L'HYPOPHYSE



Physical Characteristics

- **Height:** 5 mm
- **Width:** 15 mm
- **Thickness:** 10 mm
- **Weight:** 0.60g

Anatomy

- Contained in a bony cavity called the **sella turcica**. [Ref: Q4, Q12]
- The sella turcica is **hollowed out in the sphenoid bone**. [Ref: Q4]
- **Lobes**: Divided into **two lobes**: [Ref: Q14]
    1. **Anterior**: Adenohypophysis.
    2. **Posterior**: Neurohypophysis.

Function

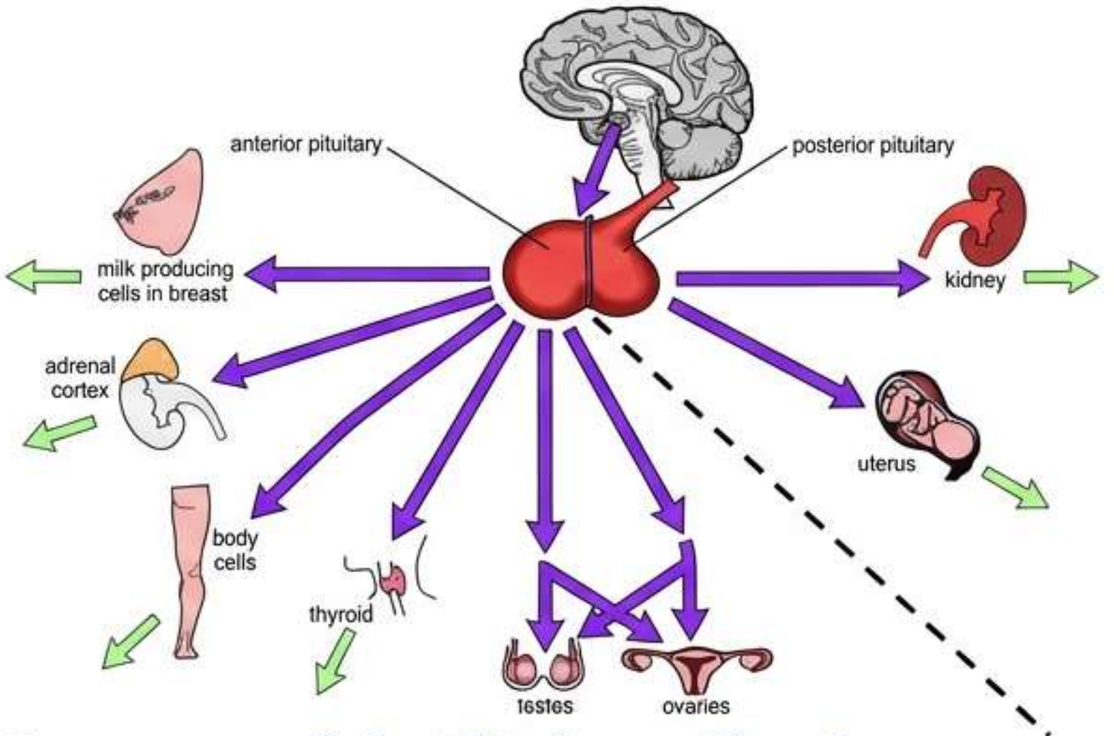
It regulates the other endocrine glands.

SECRETIONS OF THE AXIS

SÉCRÉTIONS DE L'AXE HYPOTHALAMO-HYPOPHYSAIRE

Hormones of the Hypothalamus

- **Dopamine**
- **TRH:** Stimulates thyrotropin.
- **GH-RH (Somatocrinin):** Enables release of STH (Growth Hormone).
- **GH-RIH (Somatostatin):** Inhibits STH.
- **GnRH:** Responsible for synthesis/secretion of FSH and LH.
- **CRH:** Promotes corticotropin.
- **PRH:** Prolactin-releasing hormone.
- **Oxytocin** and **Vasopressin** (produced here). [Ref: Q4 Explanation]



Hormones of the Pituitary Gland

Anterior Pituitary Secretes:

- **FSH, LH** (act on gonads).
- **TSH** (acts on thyroid).
- **ACTH** (acts on adrenal).
- **STH** (Growth Hormone), **Prolactin, MSH.**

Posterior Pituitary Secretes:

- **Antidiuretic hormone (ADH).** [Ref: Q4]
- **Oxytocin.**

THE PINEAL GLAND (EPIPHYSIS)

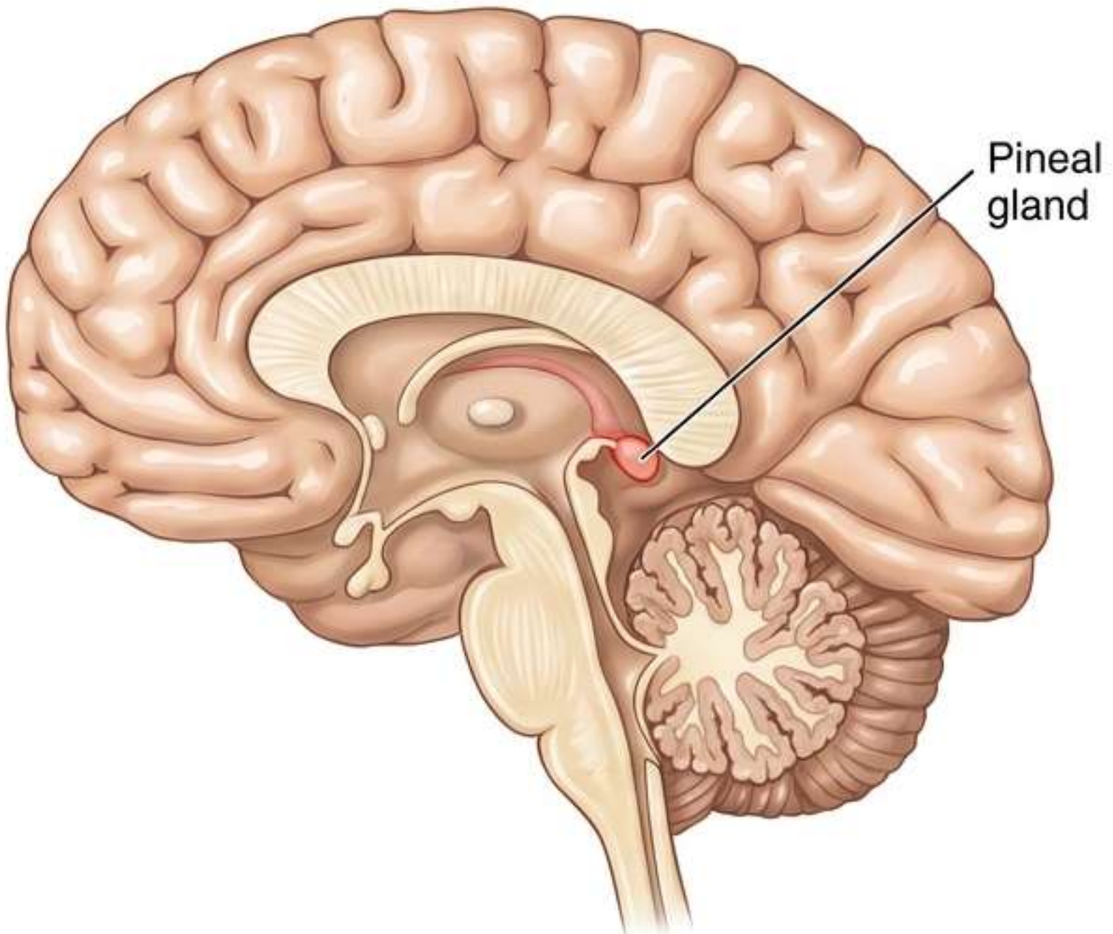
LA GLANDE PINÉALE OU ÉPIPHYSE

Anatomy

- Small, unpaired gland.
- Located in the brain.

Function

- It is an endocrine gland that secretes **Melatonin**.
- It is involved in regulating the **sleep/wake cycle**.



THYROID GLAND ANATOMY

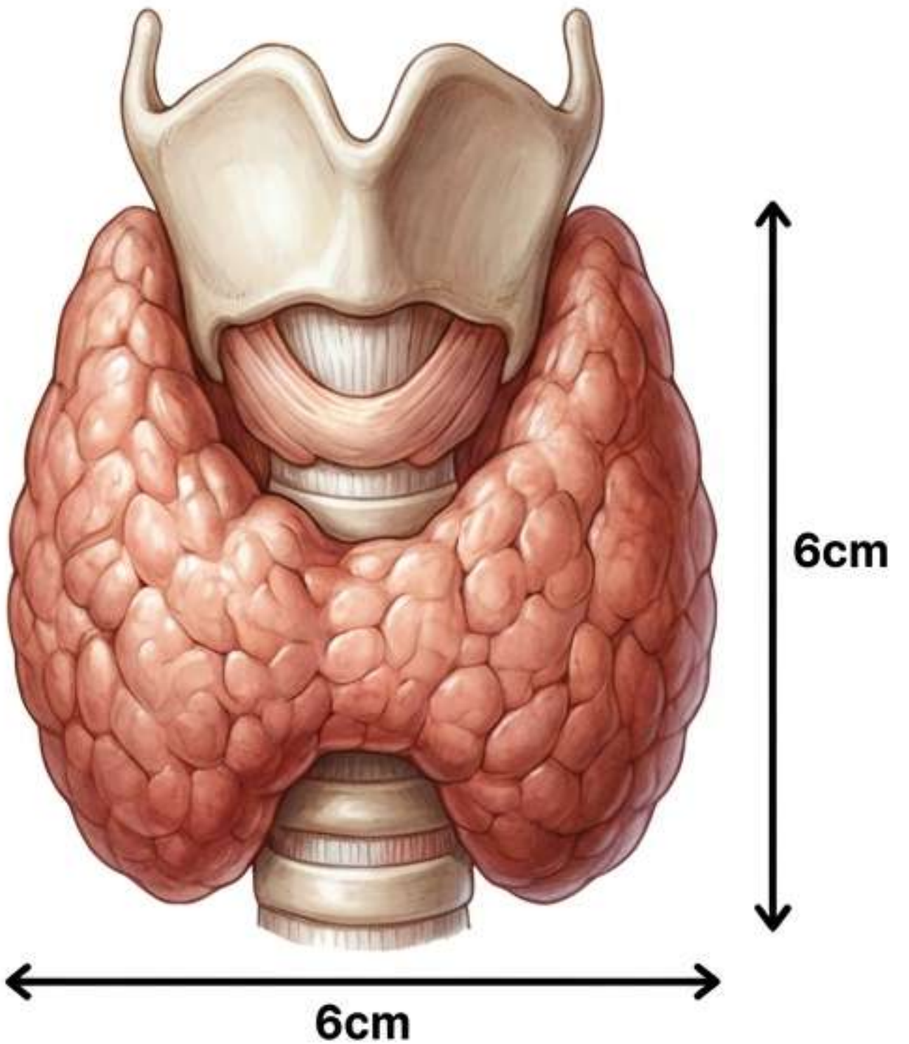
LA GLANDE THYROÏDE

Location & Shape

- Large gland located at the **front of the neck.** [Ref: Q8, Q13, Q15]
- **Shaped like an H surrounding the trachea.** [Ref: Q3]
- **Formed of two lobes, joined by an isthmus.** [Ref: Q3]
- The isthmus is pressed against the 2nd and 3rd tracheal rings.
- **Concave in the back, surrounding larynx and trachea.** [Ref: Q3, Q15]

Dimensions & Appearance

- **Lateral Lobes:** Shaped like a rounded pyramid.
- **Height: 6 cm** (from thyroid cartilage to 6th tracheal ring).
- **Weight:** Approximately **30 g** in adults.
- **Texture:** Reddish-brown, fairly soft consistency.
- **Structure:** Surrounded by a capsule.



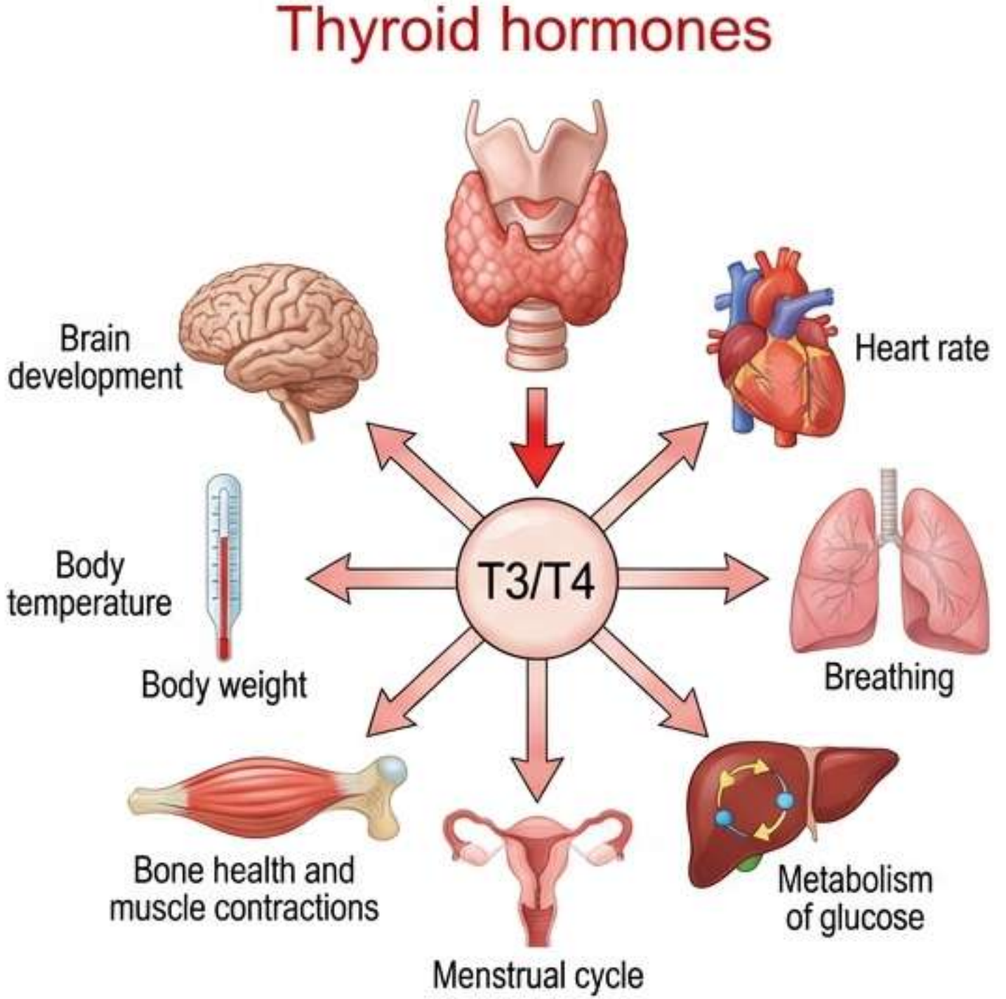
THYROID PHYSIOLOGY
HORMONES THYROÏDIENNES

Hormone Production

- Produces thyroid hormones from the mineral Iodine. [Ref: Q3]
- Hormones:
    1. Tetraiodothyronine (T4)
    2. Triiodothyronine (T3)

Roles

- Regulating the metabolism of carbohydrates, lipids, and proteins. [Ref: Q15]
- Regulating heart rate. [Ref: Q3]
- Thermoregulation.
- Growth and development of bone, nerve, and reproductive tissues. [Ref: Q3]



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THE PARATHYROID GLANDS
LES GLANDES PARATHYROÏDES

Anatomy

- There are four of them. (Ref: Q12, Q15])
- **Located** on the **back of the thyroid gland** (accolated to **posterior** wall). (Ref: Q8, Q12, Q15])
- **Arrangement:** Two upper and two lower glands.

Function

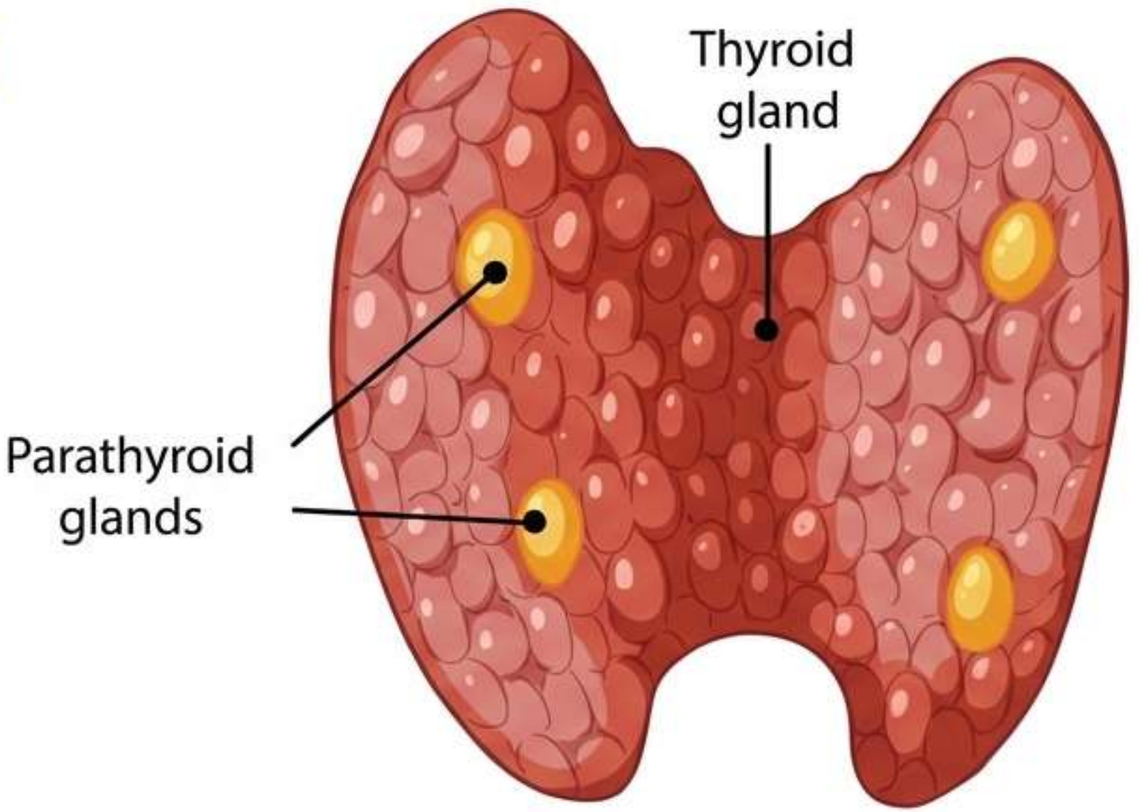
- Secrete Parathyroid Hormone (PTH).
- Regulate blood calcium and phosphorus levels.

Action of PTH

- **Hypercalcemic** (Increases blood calcium).
- **Hypophosphatemic** (Decreases blood phosphate).

Mechanisms

1. **Kidneys**: Increases Ca2+ reabsorption; decreases **phosphate** reabsorption.
2. **Bones**: Increases bone **resorption** by activating osteoclasts.
3. **Small Intestine**: Indirect effect (activates Vitamin D3 to **Calcitriol** which increases Ca2+ absorption).



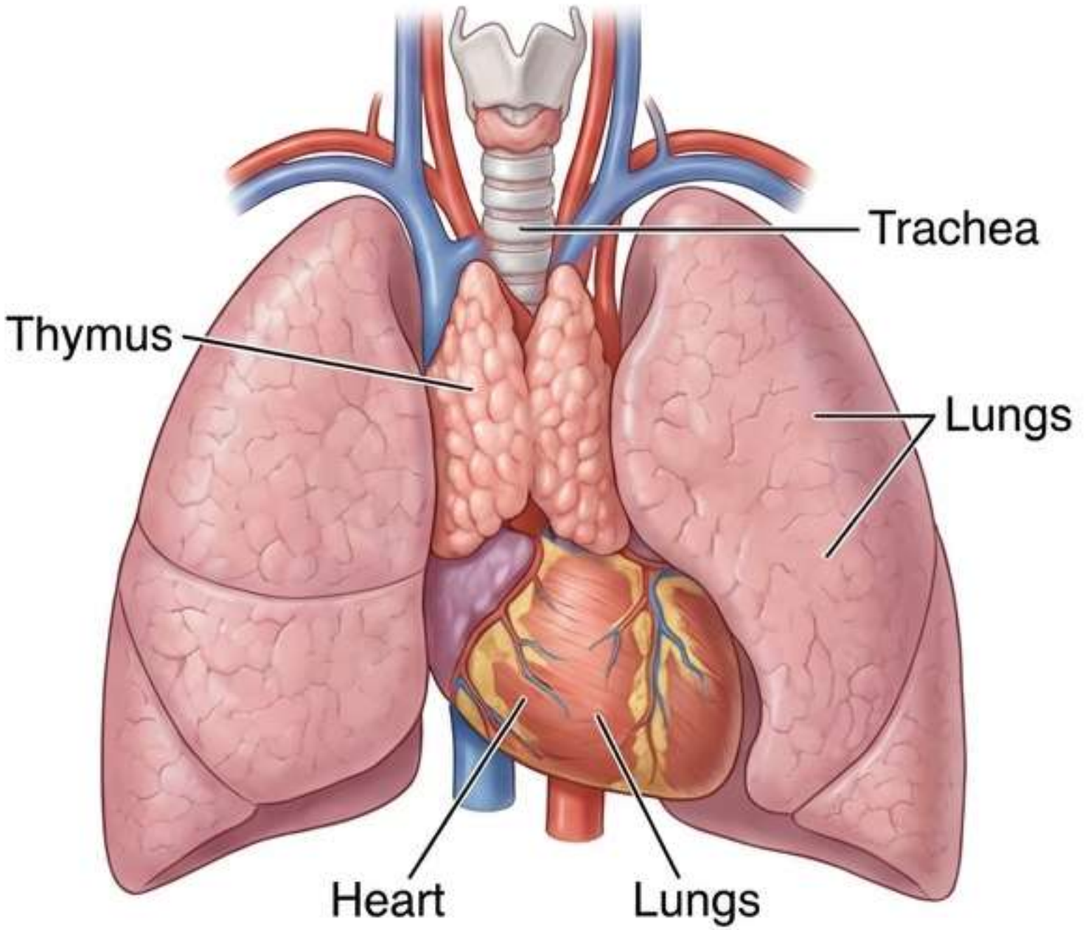
THE THYMUS
LE THYMUS

Location & Evolution

- Located at the base of the neck and extending into the thorax.
- **Size**: Large at birth but **disappears in adulthood**.

Function

- Secretes two hormones playing a role in **lymphocyte maturation**:
  1. **Thymopoietin**
  2. **Thymosin**



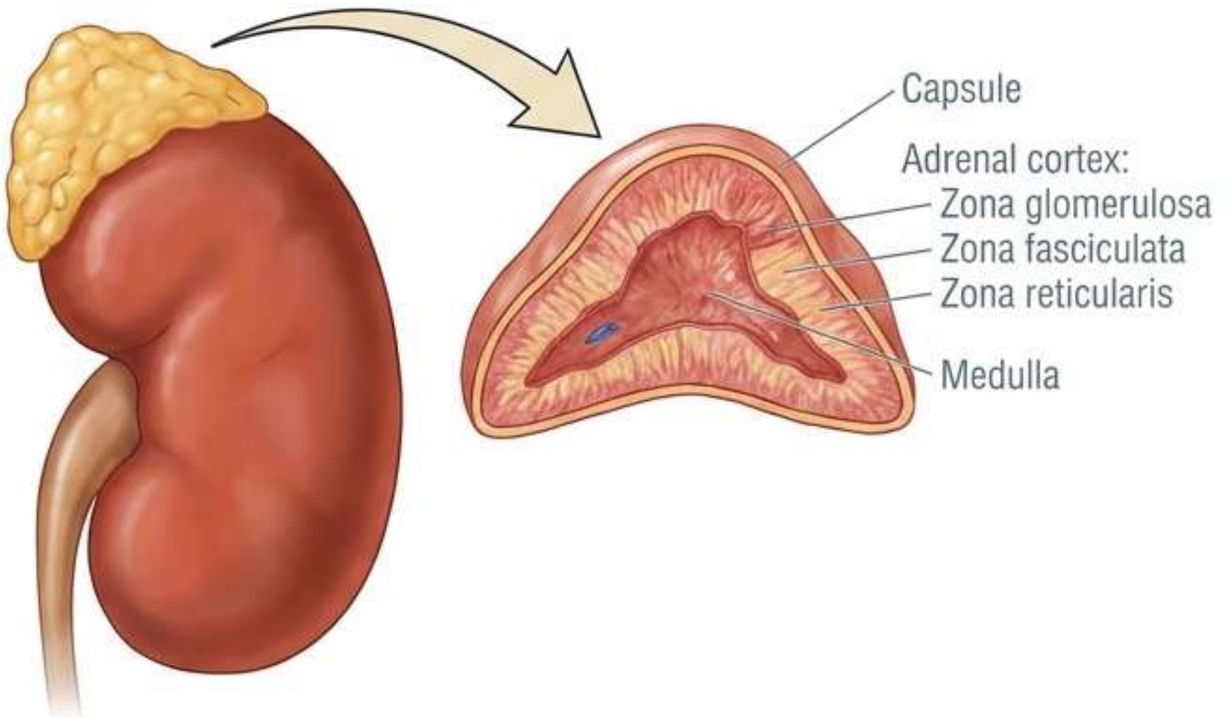
ADRENAL GLANDS ANATOMY
LA GLANDE SURRÉNALE

Location & Shape

- Located above the kidneys.
- There are two of them.
- **Shape:** Triangular.

Structure

- Composed of **two different structures** that overlap: (Ref: Q5)
  1. **Adrenal Medulla:** In the **center** (highly vascularized). (Ref: Q5)
  2. **Adrenal Cortex:** On the **periphery**. (Ref: Q5)

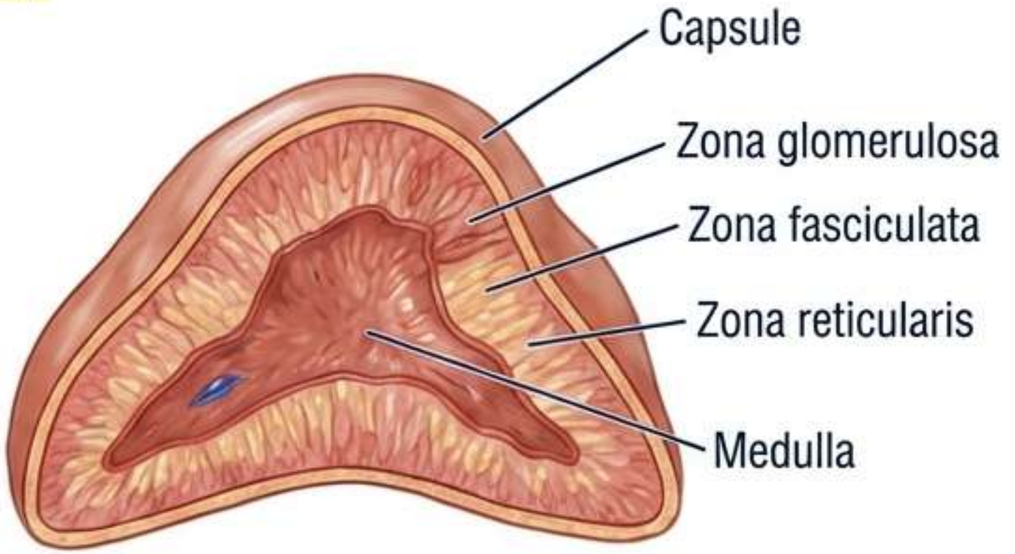


ADRENAL PHYSIOLOGY
PHYSIOLOGIE SURRÉNALE

Adrenal Cortex Layers (Outer to Inner)

***Note**: The cortex creates 3 layers. (Highlight Yellow [Ref: Q5])

1. **Zona Glomerulosa**: Secretes **Mineralocorticoids** (Water/electrolyte balance).
2. **Zona Fasciculata**: Secretes **Glucocorticoids** (Organic metabolism). (Highlight Yellow [Ref: Q5])
3. **Zona Reticularis**: Secretes **Androgens** (Adrenal sex hormones).



Adrenal Medulla (Center)

- Secretes **Catecholamines**: (Highlight Yellow [Ref: Q6])
  - Dopamine
  - Epinephrine
  - Nor-epinephrine

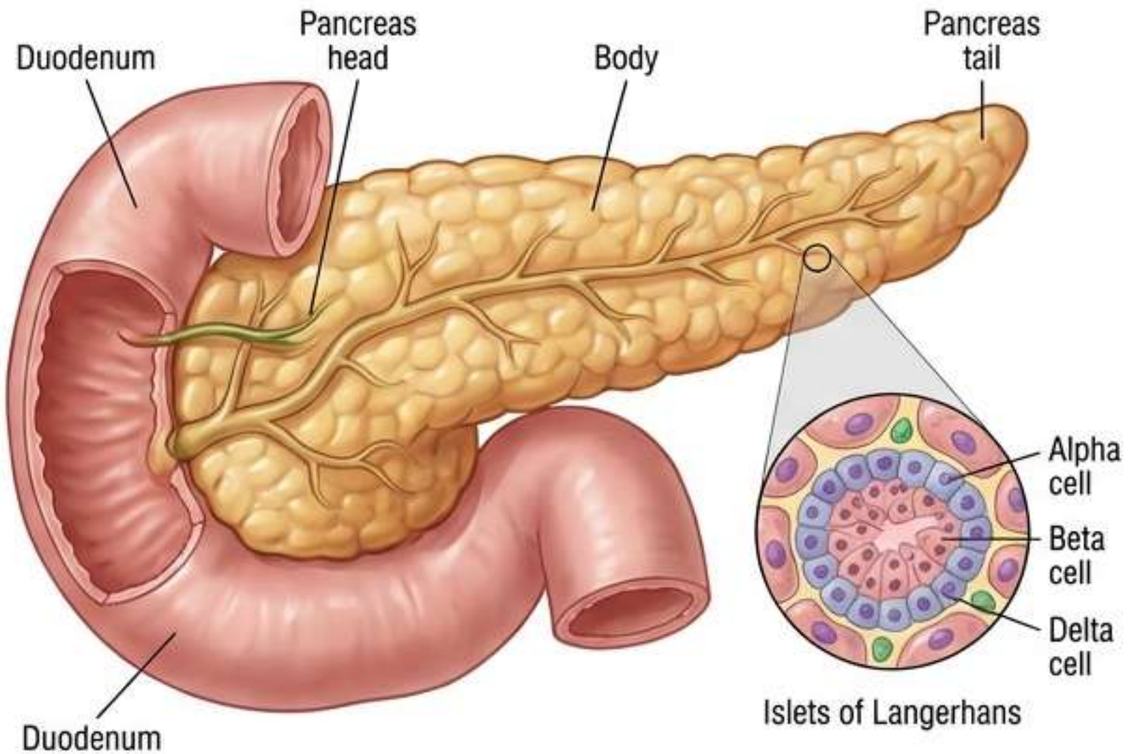
THE PANCREAS
LE PANCARÉAS

Anatomy

- Located in the abdomen, in the duodenal region, behind the stomach.
- **Parts:** Head, Body, and Tail.
- *Note: Contact with the duodenal frame.* [Ref: Q6]

Function

- **Type: Mixed gland (Amphicrine)**; endocrine and exocrine. [Ref: Q2]
  - *Exocrine:* Digestive enzymes.
  - *Endocrine:* Hormone secretion.
- **Endocrine Structure:** Specialized cells called **Islets of Langerhans.**
- **Hormones:** Secretes two antagonistic hormones:
  1. **Insulin**
  2. **Glucagon**



THE GONADS
LES GONADES

1. The Ovaries (Female)

- Located on either side of the uterus (two of them).
- **Function:** Cyclical endocrine function.
- **Hormones: Estrogens** and **Progesterone**.
- **Control:** Controlled by pituitary; start at puberty, stop at menopause.

2. The Testicles (Male)

- Located in the **scrotum** (two of them). [Ref: Q7]
- Connected to **spermatic ducts** (transport spermatozoa). [Ref: Q7]
- **Function:** Produce **Androgens** (mainly **Testosterone**).
- **Growth:** Volume is small until puberty.
- **Control:** Secretion controlled by the pituitary gland.

ovaries (female)

testis (male)