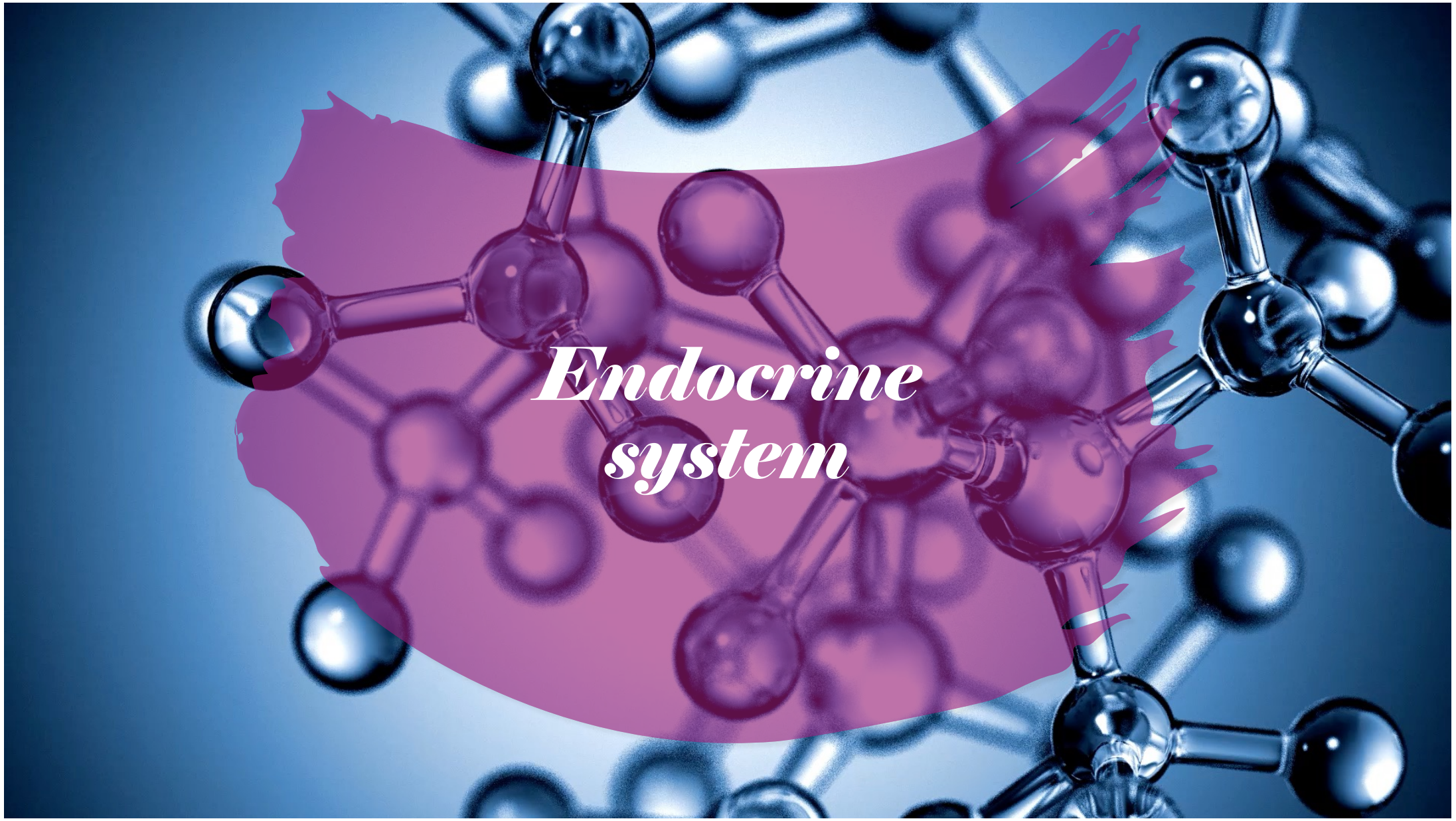
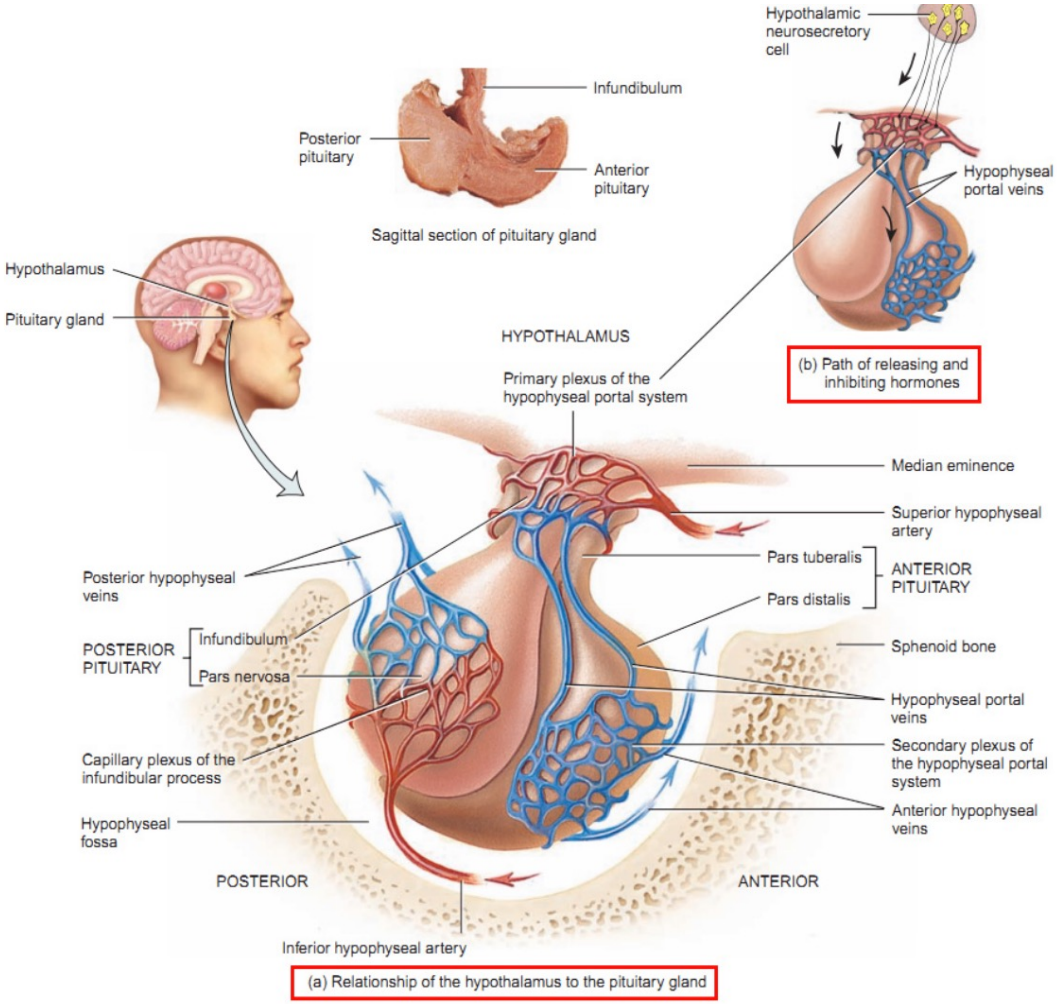

Endocrine
system

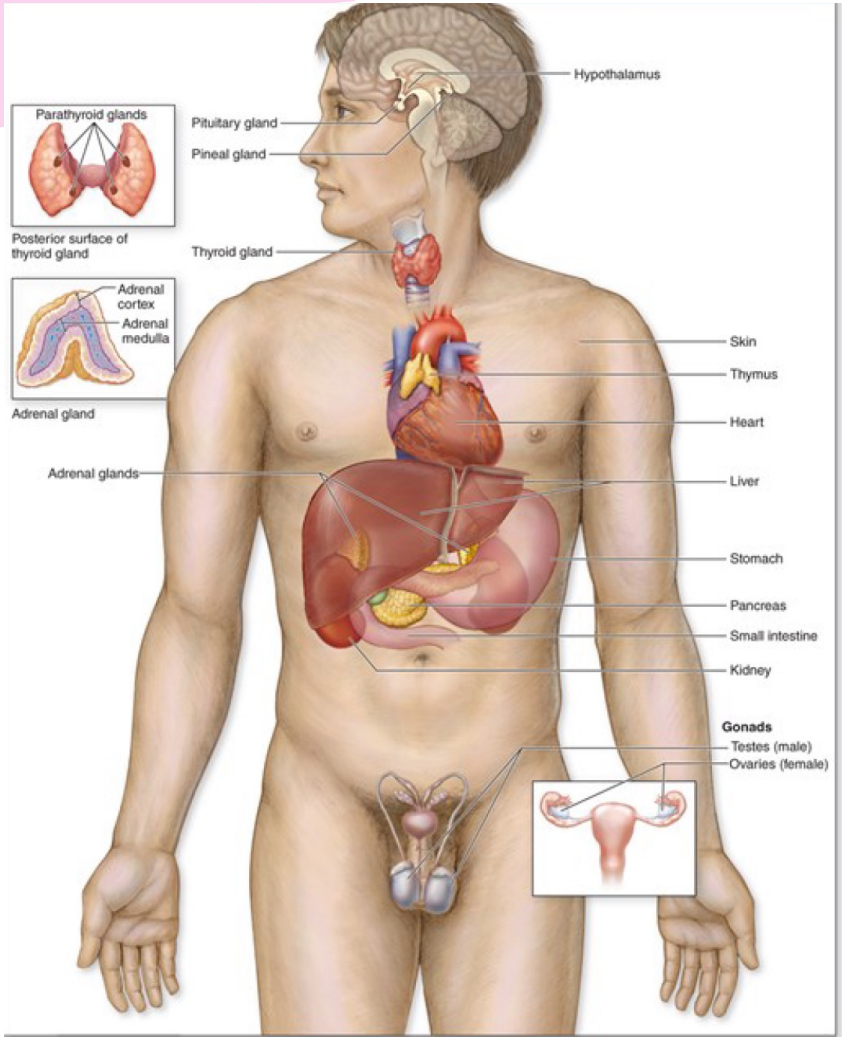
# *The endocrine system -Hypothalamus*

- Participates in the endocrine system by two mechanisms:

1. Secretions of two hormones.
2. Controlling the secretion of the pituitary hormones by: **Inhibitory and releasing** hormons



# Endocrine Glands

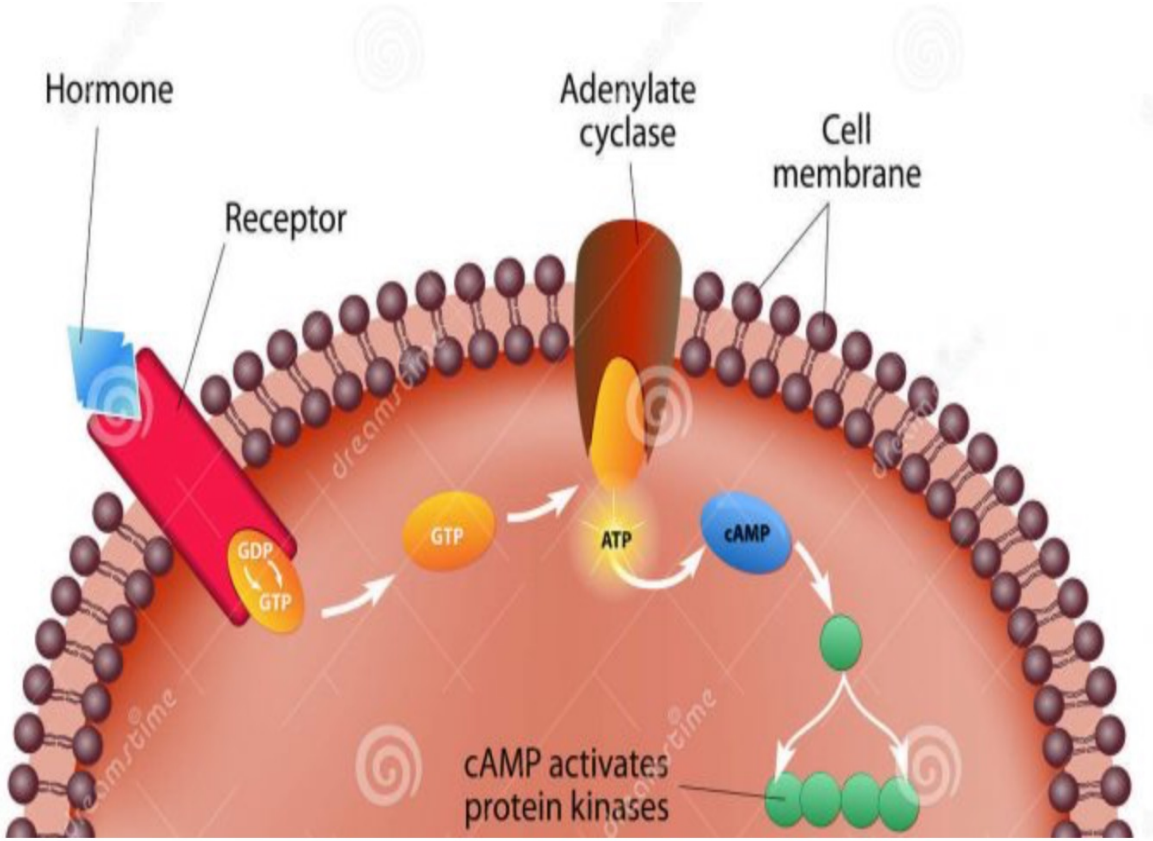



- Pituitary
- Pineal
- Thyroid
- Parathyroid
- Adrenal (suprarenal)

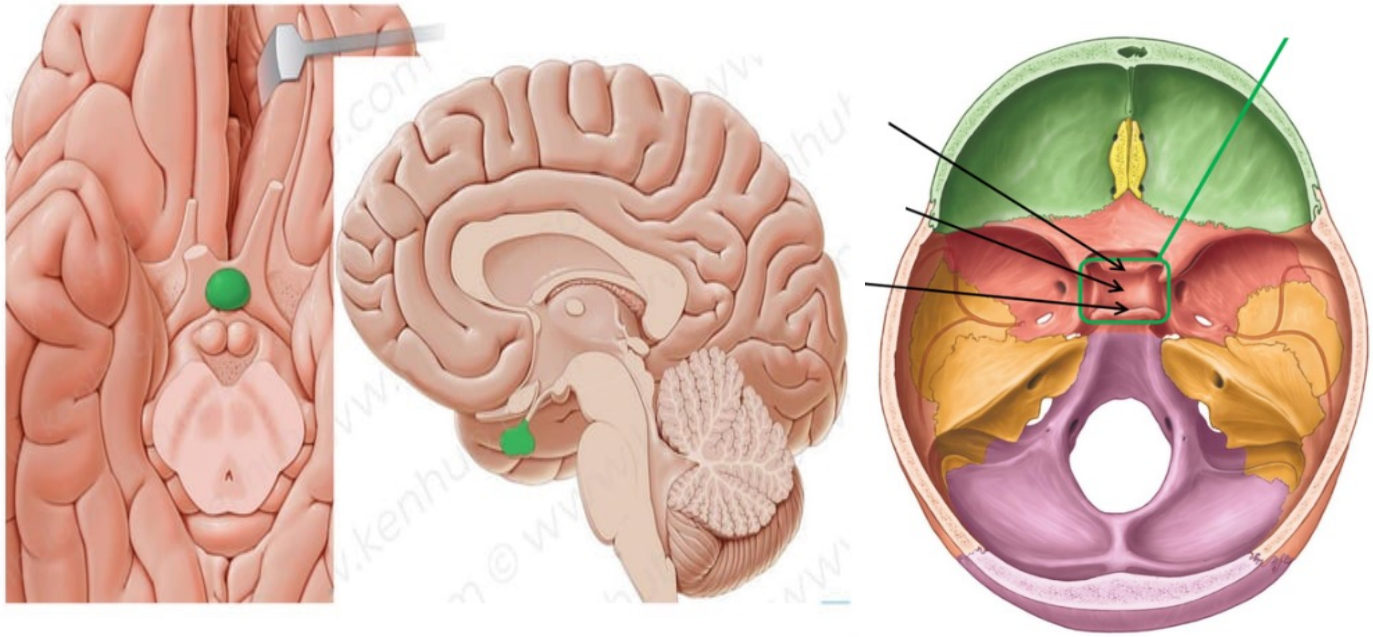
Hypothalamus
Thymus
Pancreas
Gonads etc……!!!

# Endocrine system

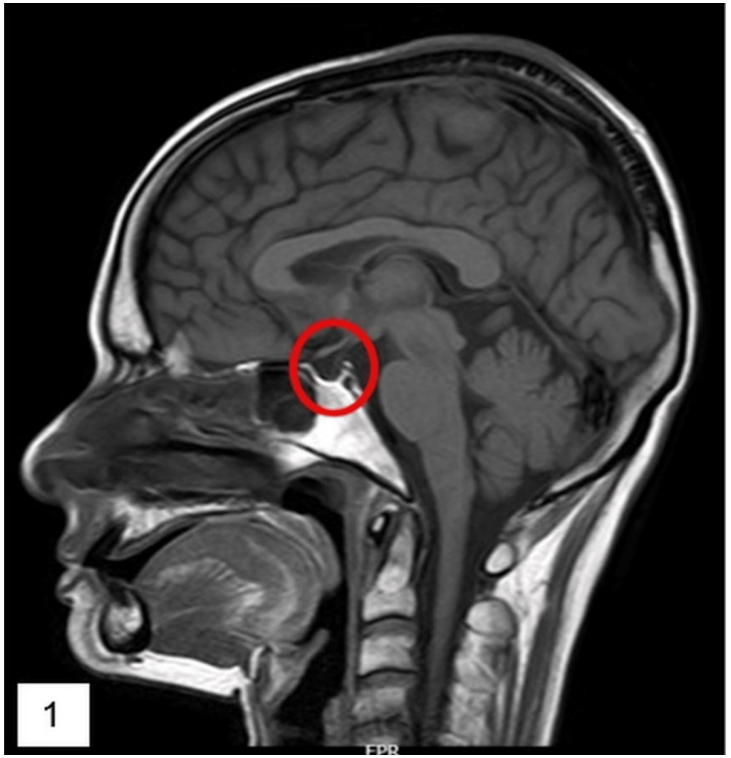
- Is made up of ductless glands that secrete chemical messengers called hormones into the bloodstream or in the extracellular fluid.
- A hormone is a chemical substance made and secreted by one cell that travels through the circulatory system or the extracellular fluid to affect the activities of cells in another part of the body or another nearby cell.



# *Pituitary Gland (master endocrine gland)*



- Also called hypophysis cerebri. Relatively small- 0.5 gm. Centrally located at the base of the brain.
- Rests in a saddle-like bony depression (sphenoid) called hypophyseal fossa of the sella turcica.

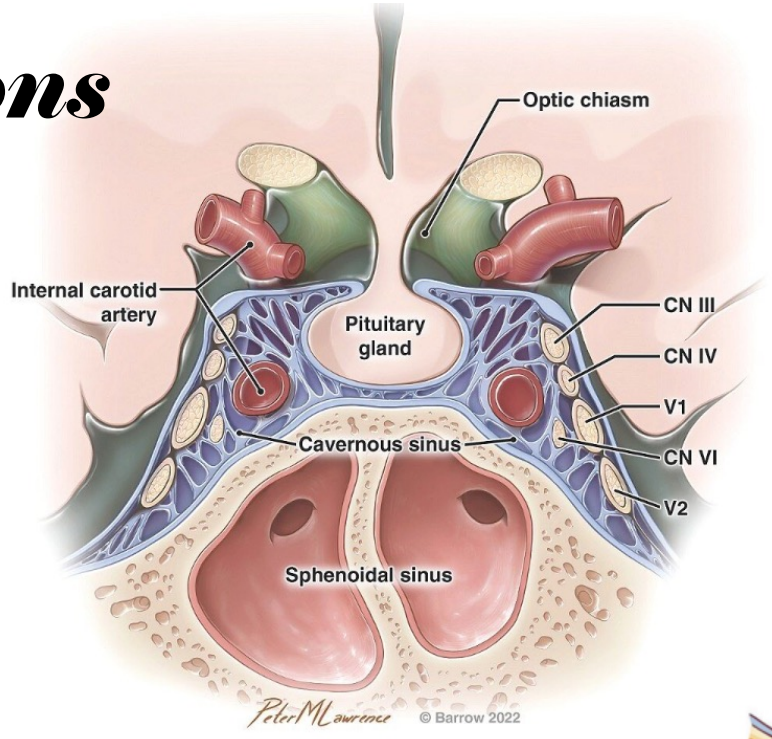



- Connected to the brain (hypothalamus) by a stalk called the infundibulum.
- Has two lobes: adenohypophysis and neurohypophysis.

# Pituitary/relations

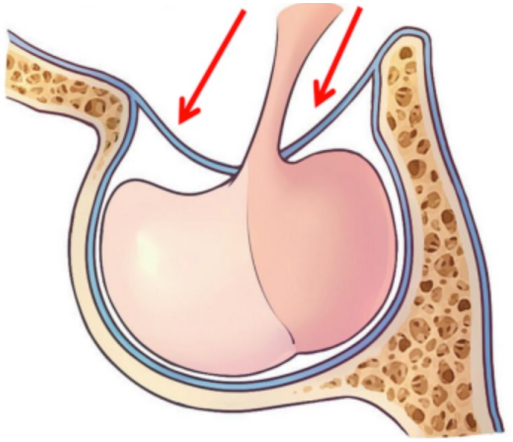
- **Anterior**: Sphenoid sinus.
- **Posterior**: dorsum sellae, basilar artery, pons.
- **Inferior**: body of the sphenoid (sinus).
- **Superior**: Diaphragma sellae.

  optic chiasm!!!!!
- **Lateral:** cavernous sinus (contents)

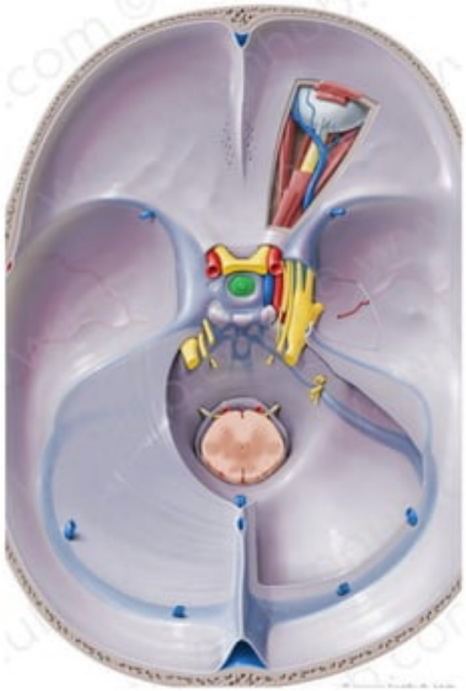


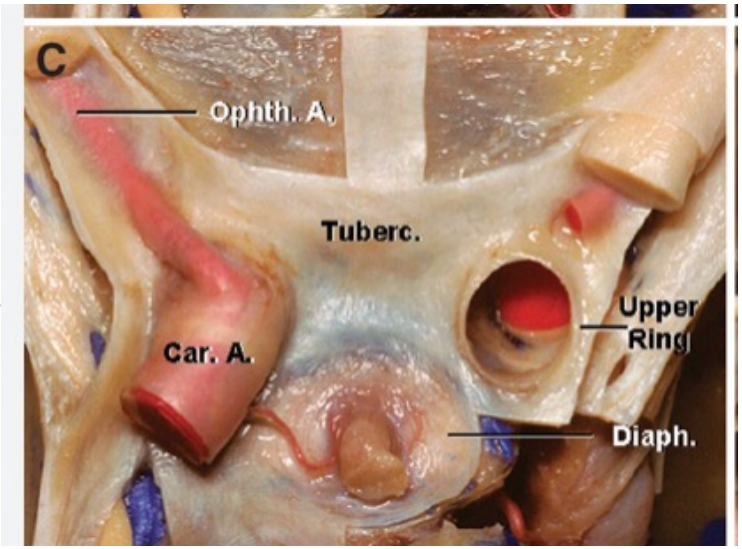

**Cavernous sinus**: dural venous sinuses (sphenoid bone, PG).

**Diaphragma sellae**: a fold of dura that acts as a roof with a central aperture that allows the passage of the infundibulum (stalk), and seprate the PG from overlying optic chiasma.



# Cavernous sinus

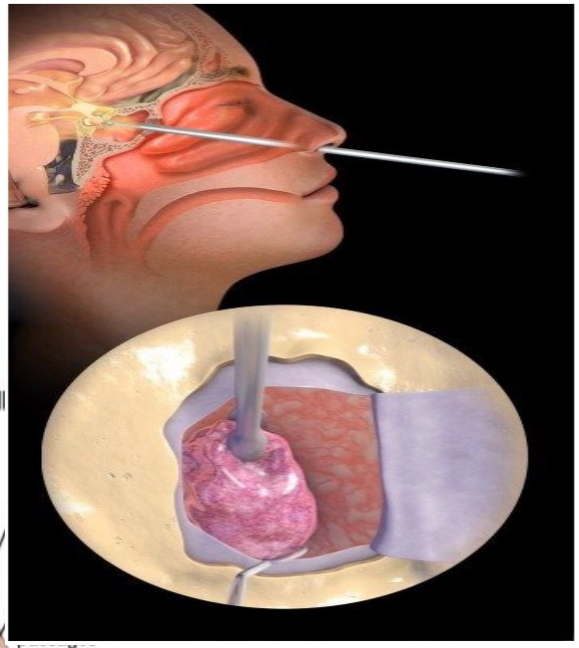


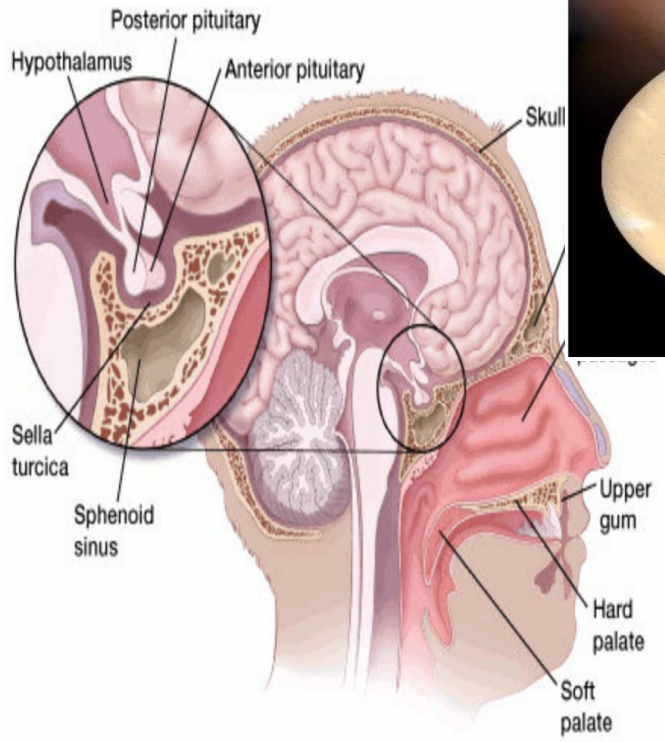


# *Endoscopic Transnasal/Transsphenoidal*

- Is the most common procedure for removing pituitary tumors.
- The neurosurgeon reaches the tumor through the nasal passages and the sphenoid sinus.
- Less-invasive approach--avoid important brain structures by accessing the pituitary gland from underneath the brain.
- Transsphenoidal surgery leaves no visible scar, minimizes the risk of complications, and enables faster recovery.

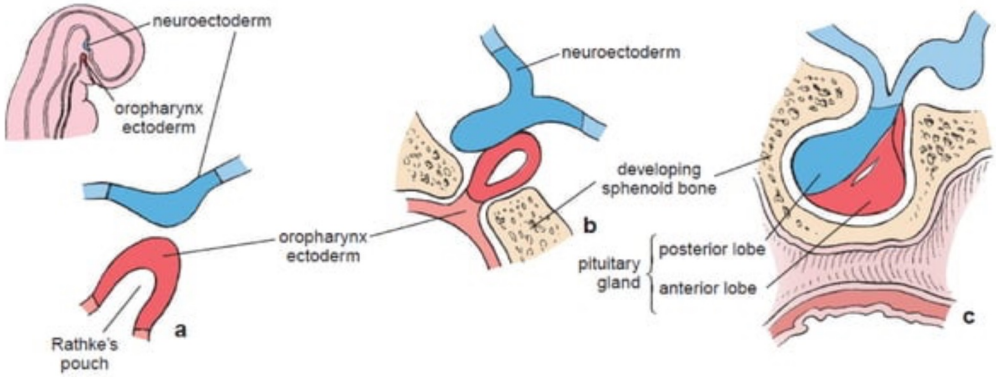
**Craniotomy!!!!**



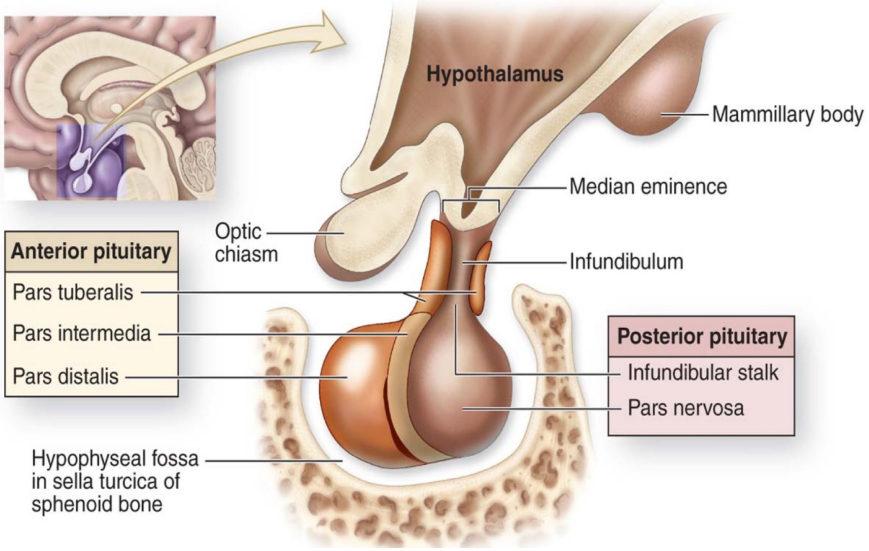


# Structure and Origin

- Two tissue types----two origins.
- Adenohypophysis (anterior lobe).
- Neurohypophysis (posterior lobe).




Development of pituitary gland




**Adenohypophysis (anterior lobe):**

Pars tuberalis.

Pars intermedia.

Pars distalis.

**Neurohypophysis (posterior lobe):**

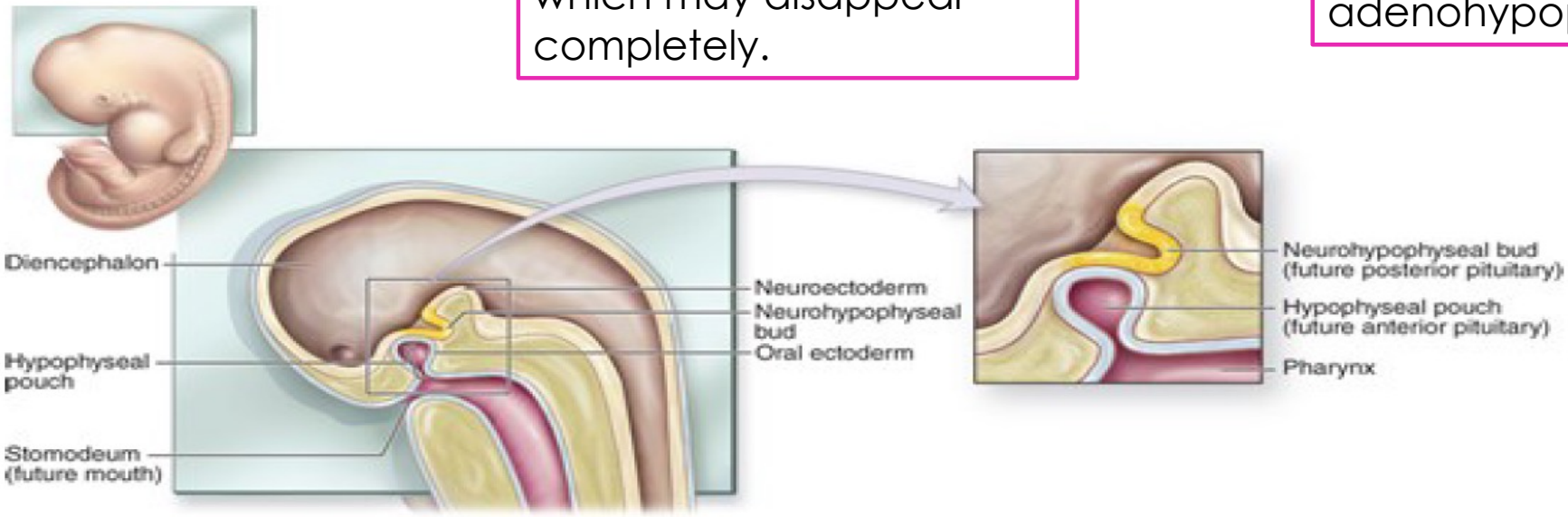
- Infundibular stalk.
- Pars nervosa.

# Pituitary organogenesis

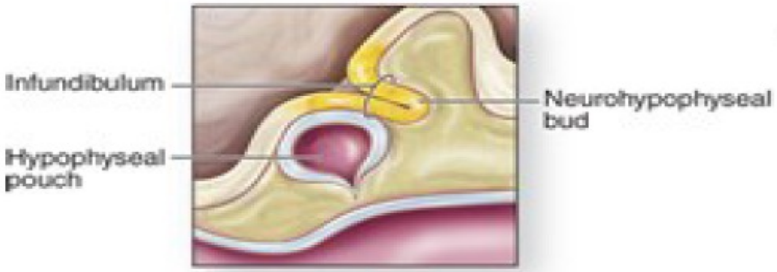
- Begins during week 4 of fetal development.
- A thickening of cells in the oral ectoderm form the hypophyseal placode, which gives rise to Rathke's pouch, an upward evagination that extends towards the neural ectoderm.
- A downward extension of the ventral diencephalon forms the posterior lobe (at the same time).
- The two nascent lobes connect to form the composite structure of the adult pituitary.
- Rathke's pouch constricts at its base and eventually separates altogether from the oral epithelium during week 6-8.

The cavity of the vesicle is reduced to a narrow cleft, which may disappear completely.

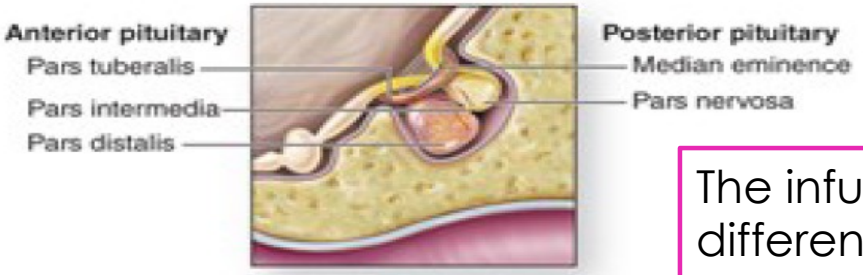
Cells of the pouch later differentiate to form different pars of the adenohypophysis.




(a) Week 3: Hypophyseal pouch and neurohypophyseal bud form



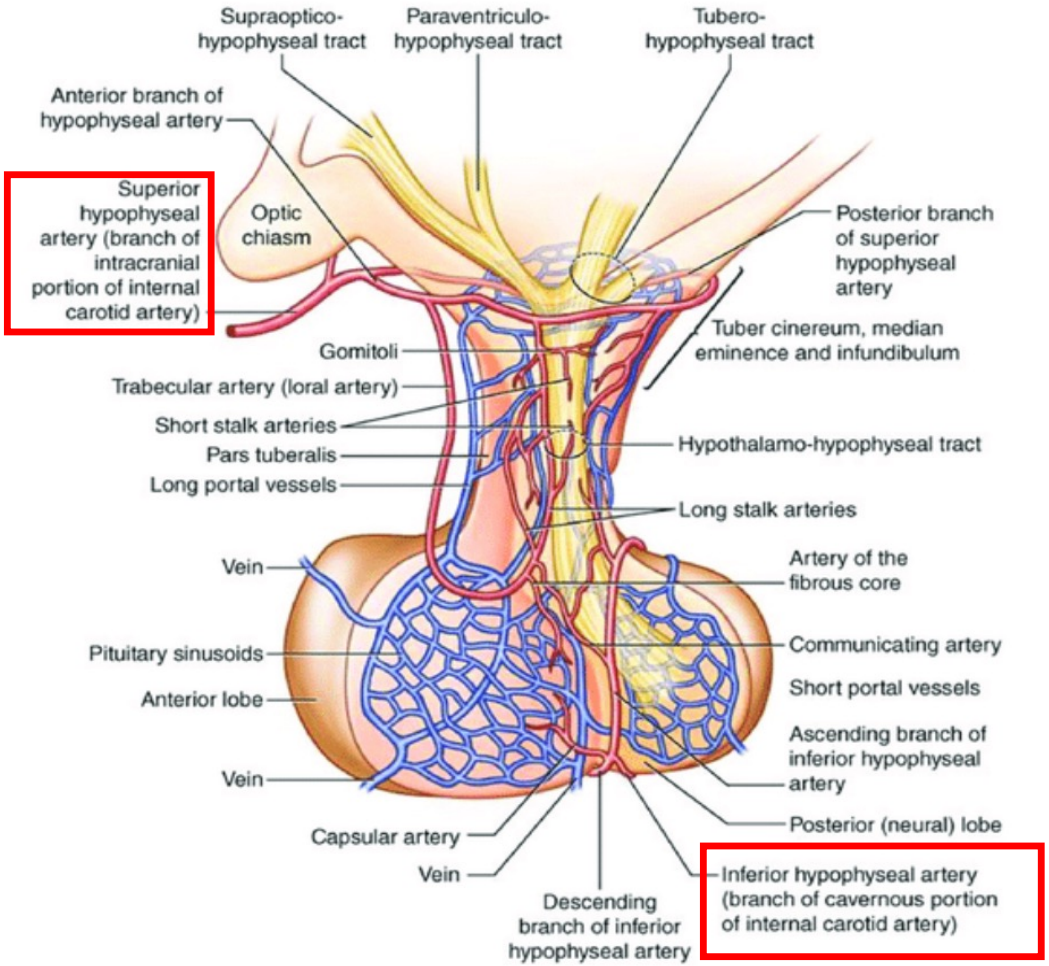

(b) Late second month: Hypophyseal pouch loses contact with roof of pharynx

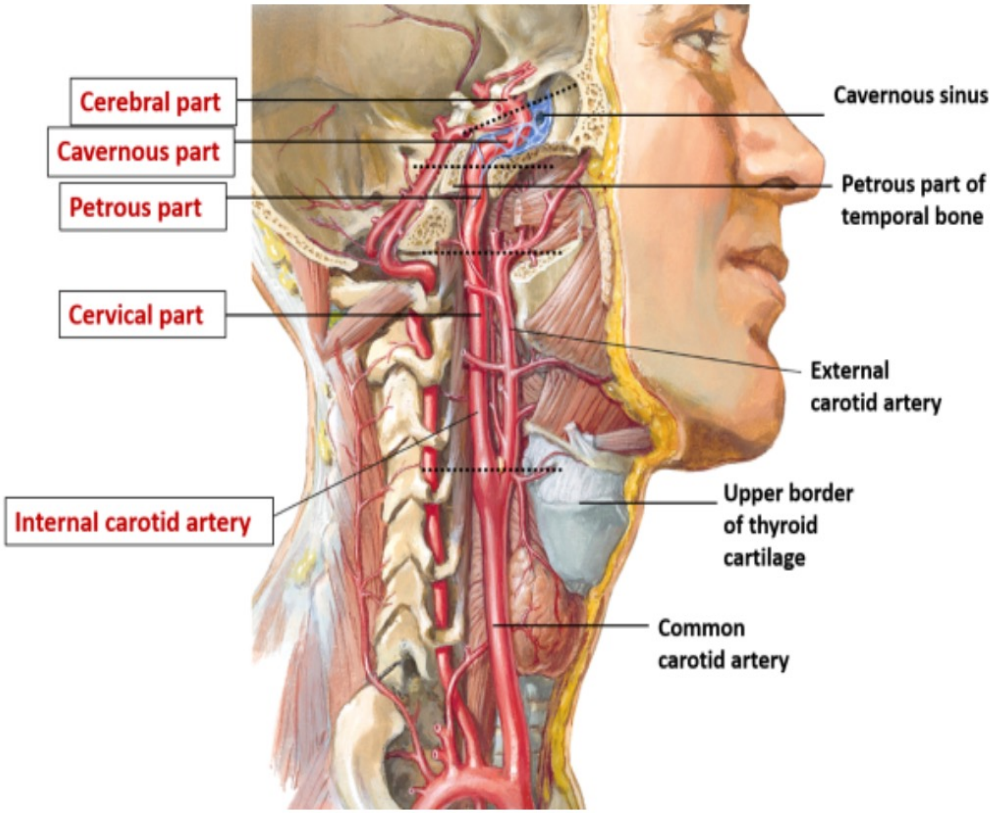



(c) Fetal period: Anterior and posterior parts of pituitary have formed

The infundibulum differentiates into the stalk and pars nervosa of the pituitary gland.

# Blood supply



# The hypothalamo-hypophyseal portal system

Superior hypophyseal artery

↓

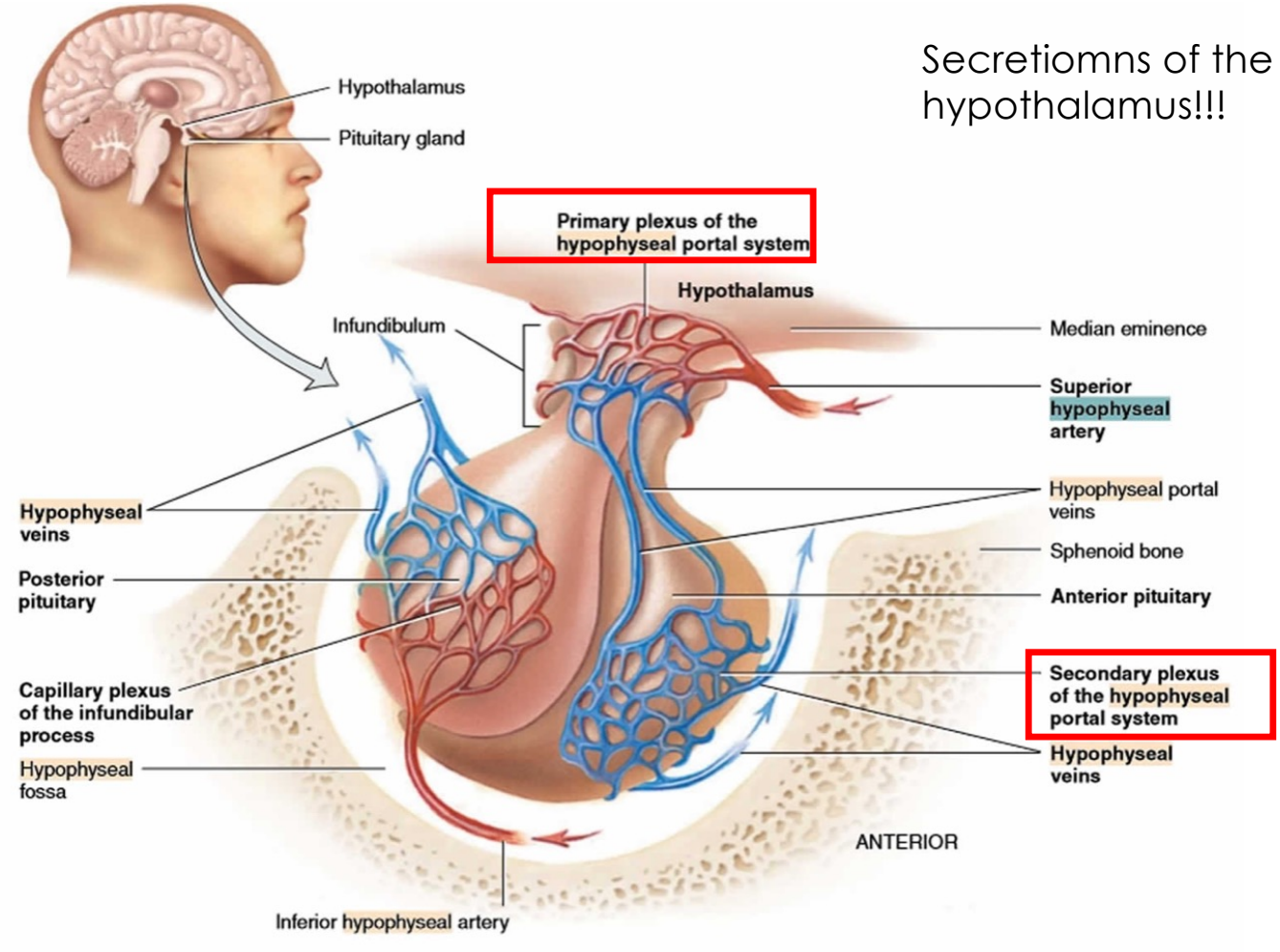
Primary plexus (capillaries)

↓

Hypophyseal portal viens

↓

Secondary plexus (capillaries)




Secretiomns of the hypothalamus!!!

# Secretions of the hypothalamus

- **to Neurohypophysis.**
  1. Hypothalamic-hypophyseal tract
  2. Supraoptic and the paraventricular Ns.
  3. Axonal transport-—pars nervousa.
  4. ADH, Oxytocin.

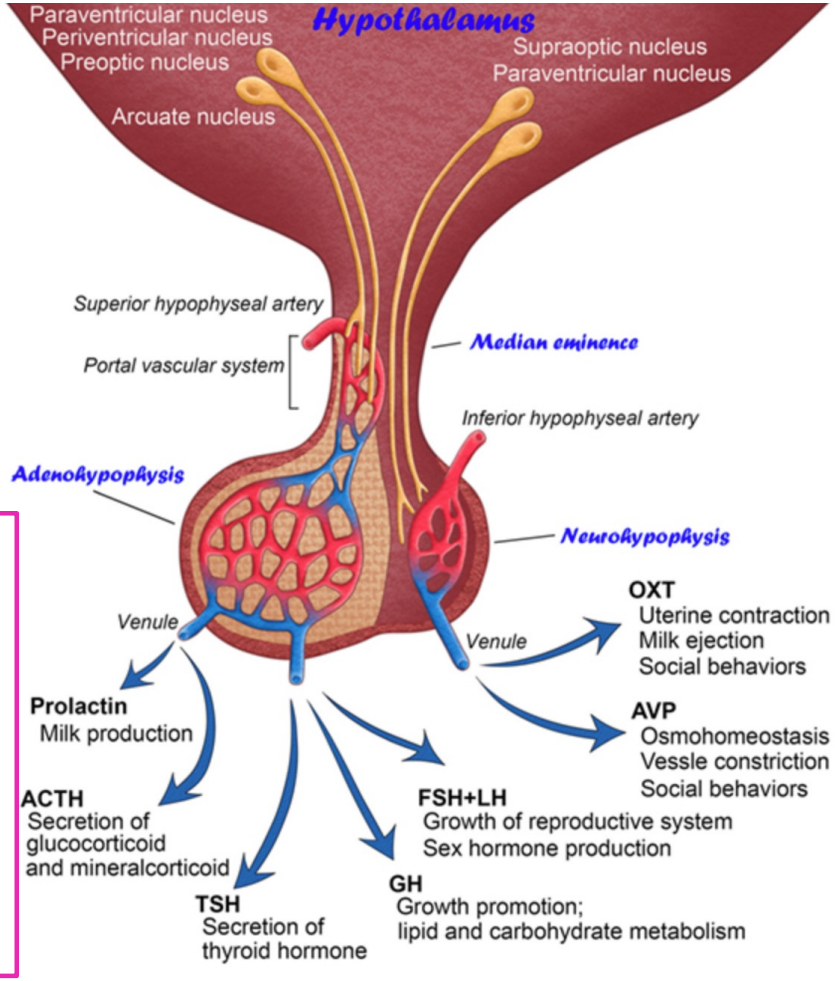
- **To Adenohypophysis**

Rreleasing and inhibitory hormones

The thyrotropin-releasing hormone (TRH), gonadotropin-releasing hormone (GnRH), growth hormone-releasing hormone (GHRH), corticotropin-releasing hormone (CRH).

Prolactin inhibitory hormone (dopamine, PIH) . Growth hormone—inhibiting hormone (GHIH, somatostatin)

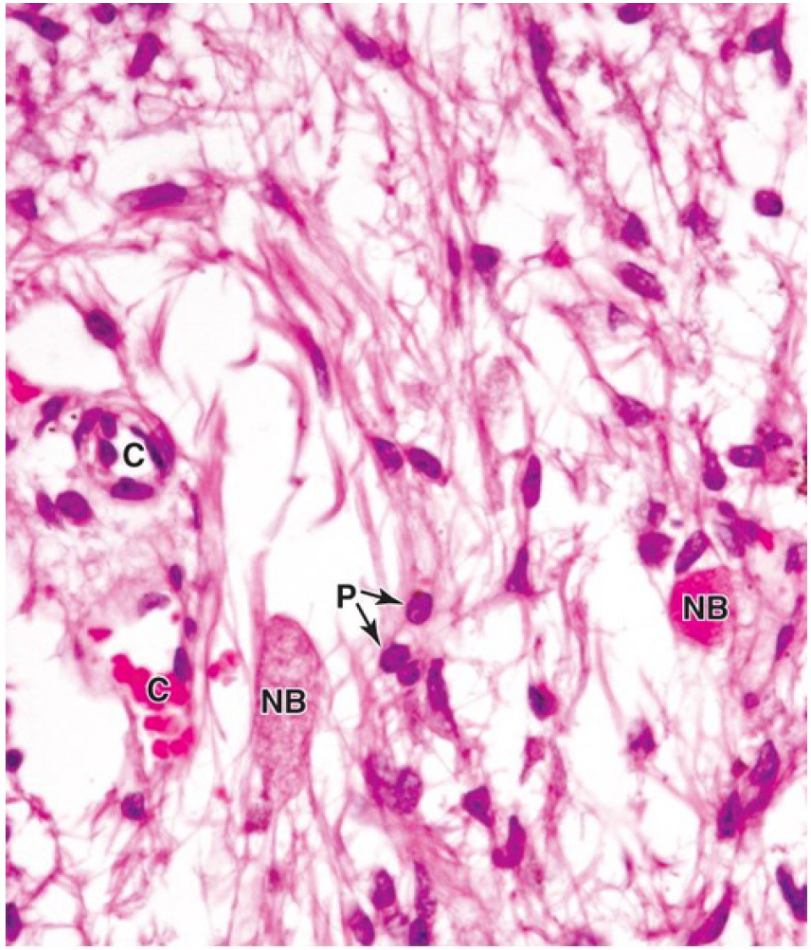
**The hypothalamic-hypophyseal tract** consists of axons extending from the hypothalamic supraoptic and paraventricular nuclei, through the infundibulum and into the pars nervosa



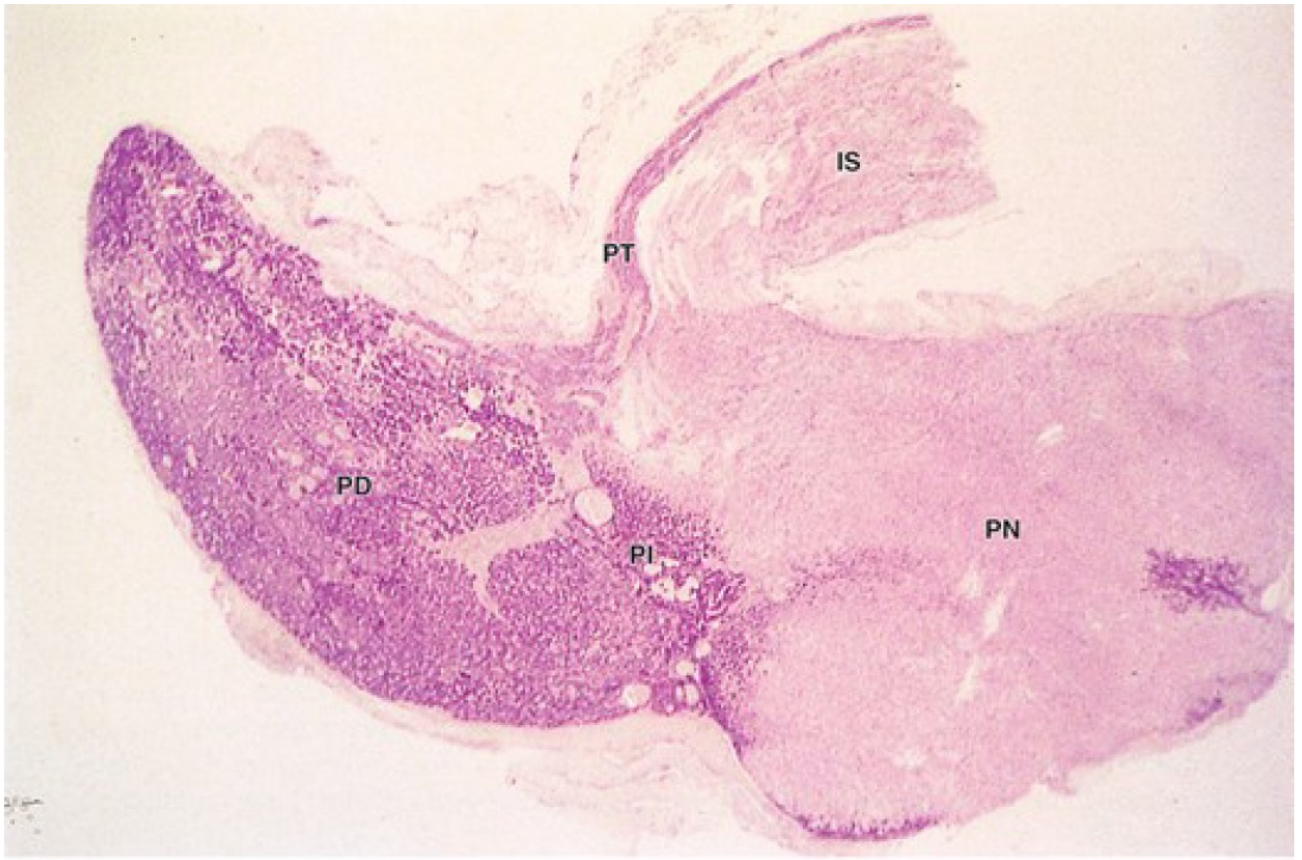
# Neurohypophysis

- Consists of the **pars nervosa** and the infundibular stalk
- Does not contain the cells that synthesize its two hormones.
- Contains around 100,000 unmyelinated axons of large secretory neurons with cell bodies in the supraoptic and paraventricular nuclei.
- Highly branched glial cells called pituicytes (most abundant).
- Neurosecretory (Herring) bodies contin either: antidiuretic hormone (ADH, arginine vasopressin) oxytocin
- Carrier proteins: neurophysin I and II.
- Nerve impulse!!!!

NB: neurosecretory (Herring) bodies



# *Adenohypophysis*



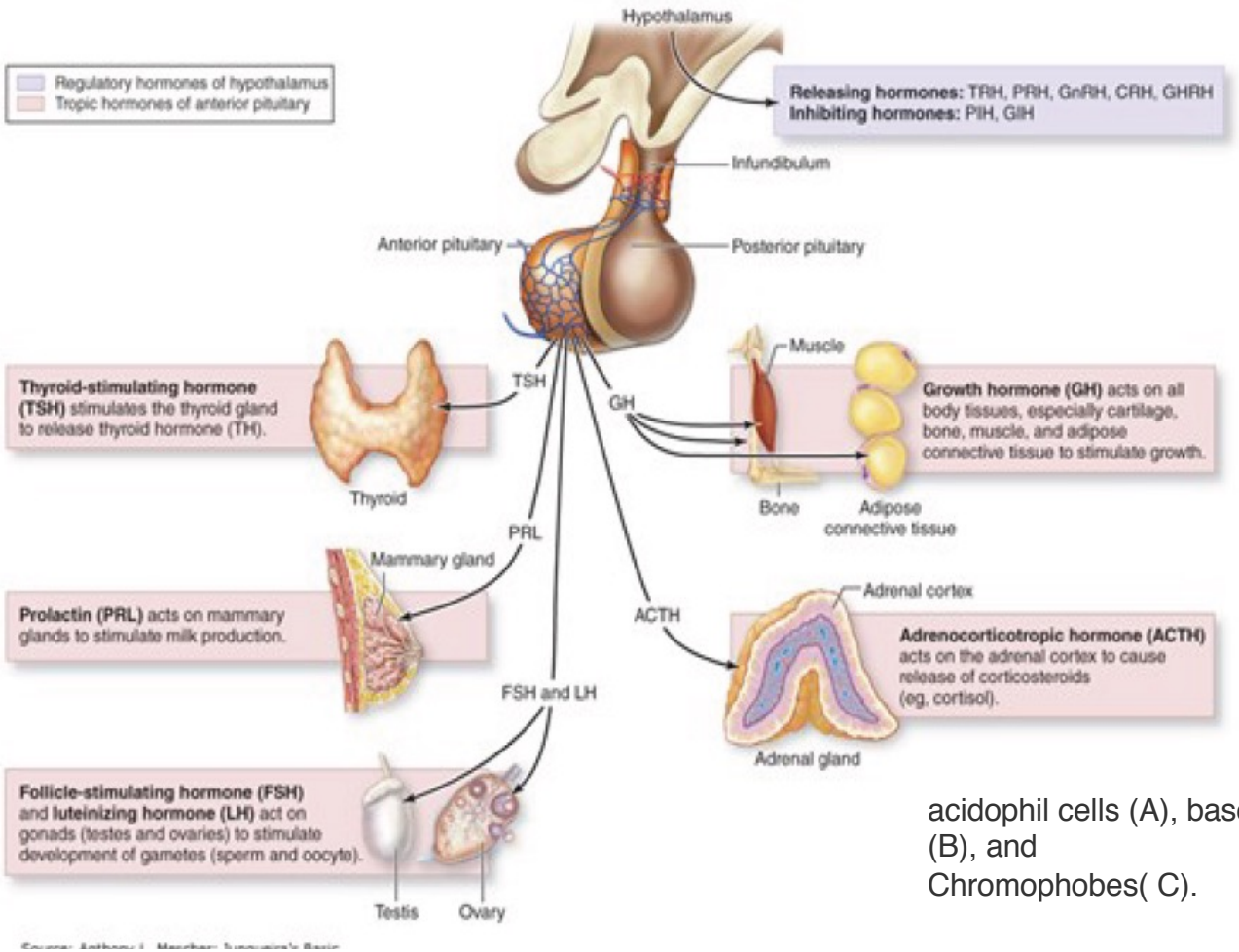
# Adenohypophysis—major cell types.

POMC: adrenocortical trophic hormone (ACTH) and β-lipotropin(β-LPH).

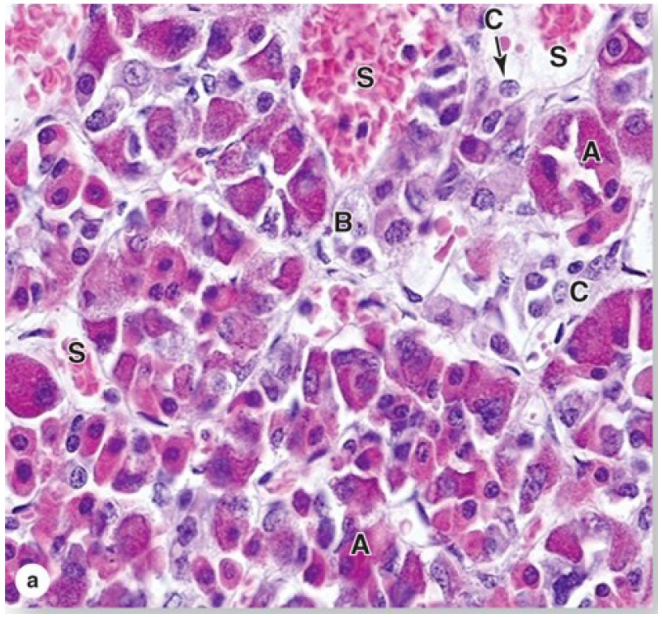
| Cell Type | % of Total Cells | Hormone Produced | Major Function |
|---|---|---|---|
| Somatotrophs | 50 | Somatotropin (growth hormone, GH), a 22-kDa protein | Stimulates growth in epiphyseal plates of long bones via insulin-like growth factors (IGFs) produced in liver |
| Lactotrophs (or mammotrophs) | 15-20 | Prolactin (PRL), a 22.5-kDa protein | Promotes milk secretion |
| Gonadotrophs | 10 | Follicle-stimulating hormone (FSH) and luteinizing hormone (LH; interstitial cell-stimulating hormone [ICSH] in men), both 28-kDa glycoprotein dimers, secreted from the same cell type | FSH promotes ovarian follicle development and estrogen secretion in women and spermatogenesis in men; LH promotes ovarian follicle maturation and progesterone secretion in women and interstitial cell androgen secretion in men |
| Thyrotrophs | 5 | Thyrotropin (TSH), a 28-kDa glycoprotein dimer | Stimulates thyroid hormone synthesis, storage, and liberation |
| Corticotrophs | 15-20 | Adrenal corticotropin (ACTH), a 4-kDa polypeptide<br>Lipotropin (LPH) | Stimulates secretion of adrenal cortex hormones<br>Helps regulate lipid metabolism |

# Adenohypopysis—Pars ditalis

- Biggest (75%)
- Has a thin fibrous capsule
- Cords of well-stained endocrine cells interspersed with fenestrated capillaries and supporting reticular connective tissue.
- Chromophils and chromophobes.
- Chromophils are secretory cells.
- Chromophils: hormone is stored in cytoplasmic granules….basophils and acidophils.
- Acidophils: somatotrophs and lactotrophs.
- Basophils: corticotrophs, gonadotrophs, and thyrotrophs

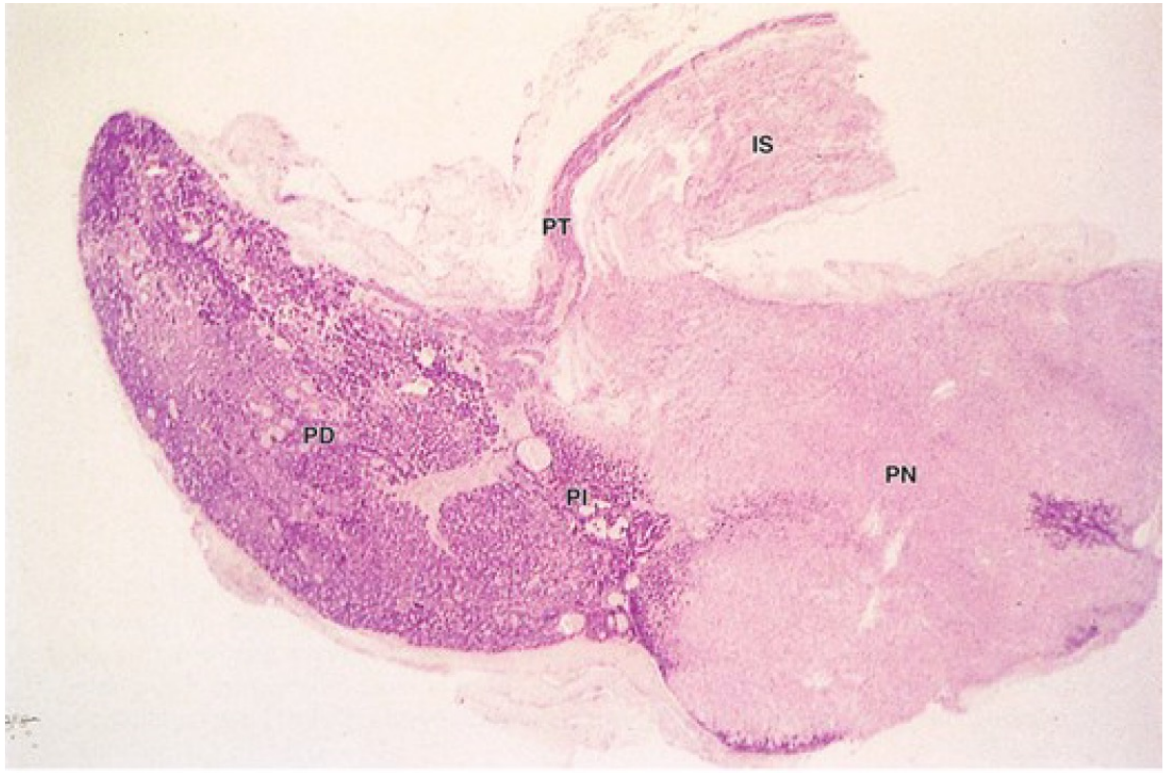



acidophil cells (A), basophils (B), and Chromophobes( C).



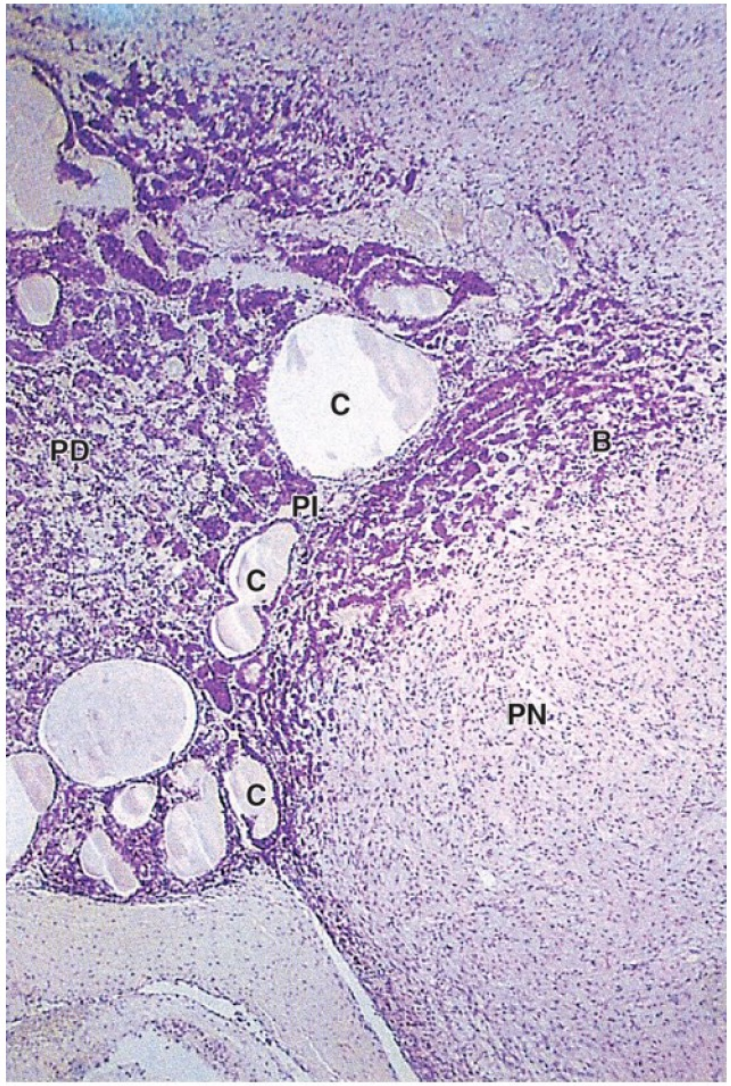
# *Pars tuberalis*

- Small funnel-shaped region surrounding the infundibulum.
- Most of the cells of the are gonadotrophs.



# *Pars Intermedia*

- A narrow zone lying between pars distalis and pars nervosa.
- Contains basophils (corticotrophs), chromophobes, and small, colloid-filled cysts derived from the lumen of the embryonic hypophyseal pouch.
- Best-developed and active during fetal life,
- Express POMC (pro-opiomelanocortin) but cleave it differently from cells in the pars distalis ((MSH), γ-LPH, and β-endorphin).



# Hypothalamic hormones

| Hormone | Chemical Form | Functions |
|---|---|---|
| Thyrotropin-releasing hormone (TRH) | 3-amino acid peptide | Stimulates release of thyrotropin (TSH) |
| Gonadotropin-releasing hormone (GnRH) | 10-amino acid peptide | Stimulates the release of both follicle-stimulating hormone (FSH) and luteinizing hormone (LH) |
| Somatostatin | 14-amino acid peptide | Inhibits release of both somatotropin (GH) and TSH |
| Growth hormone-releasing hormone (GHRH) | 40- or 44-amino acid polypeptides (2 forms) | Stimulates release of GH |
| Dopamine | Modified amino acid | Inhibits release of prolactin (PRL) |
| Corticotropin-releasing | 41-amino acid polypeptide | Stimulates synthesis of pro-opiomelanocortin (POMC) and release of both β-lipotropic |