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Endocrine Glands

The anatomical diagram shows a human torso with various organs and glands highlighted. Labels include: Hypothalamus, Pituitary gland, Pineal gland, Parathyroid glands, Thyroid gland, Adrenal gland (with sub-labels for Adrenal cortex and Adrenal medulla), Skin, Thymus, Heart, Liver, Stomach, Pancreas, Small intestine, Kidney, and Gonads (Testes (male) and Ovaries (female)).

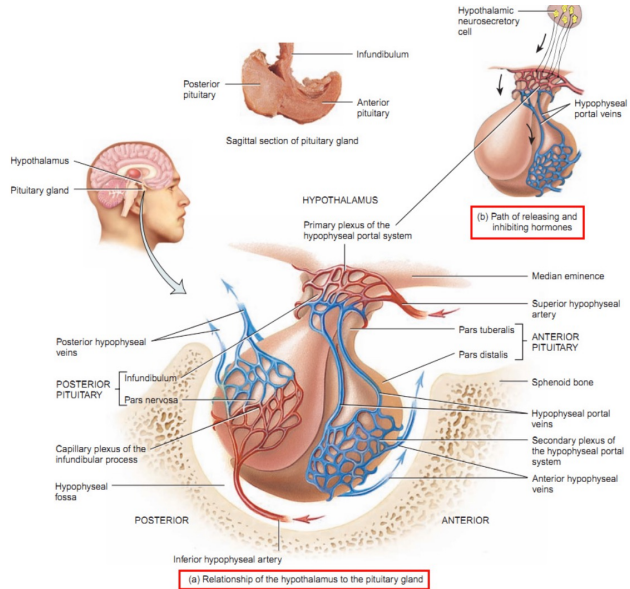
- Pituitary
- Pineal
- Thyroid
- Parathyroid
- Adrenal (suprarenal)

Hypothalamus
Thymus
Pancreas
Gonads etc.....!!!

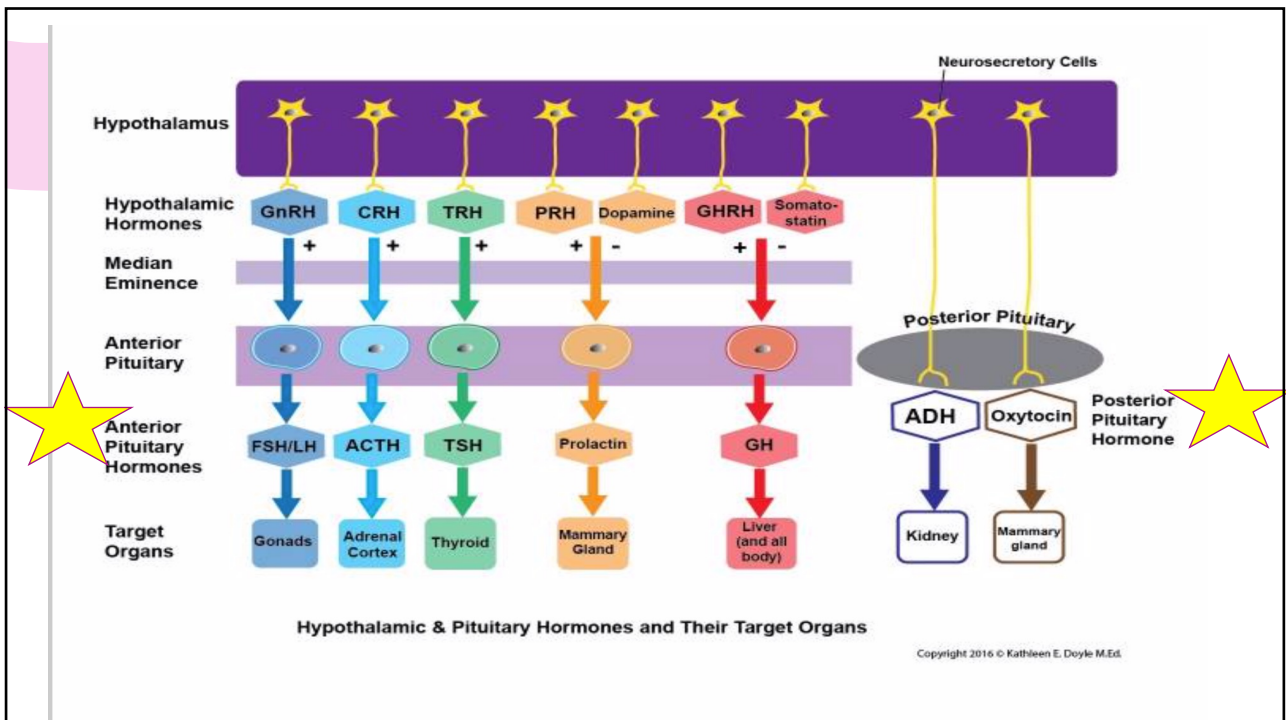
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The endocrine system -Hypothalamus

- 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 hormones**



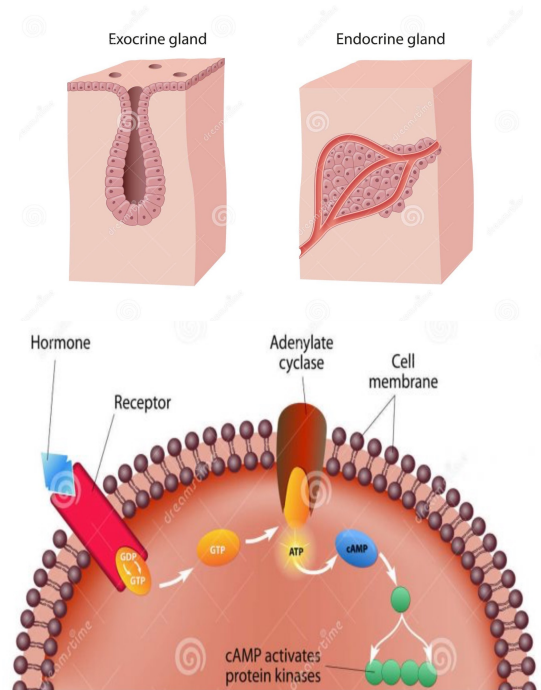
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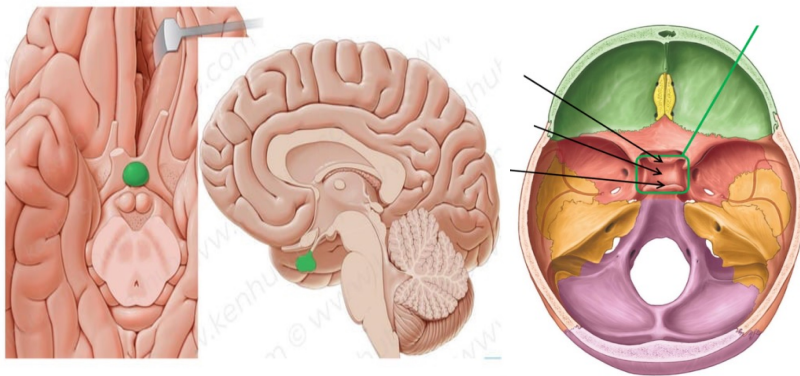
Endocrine system

- 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.



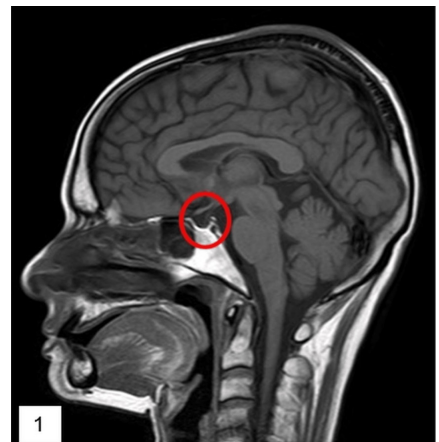
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Pituitary Gland (master endocrine gland)



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

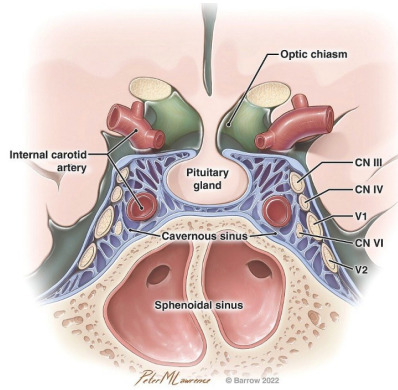
- Also called hypophysis cerebri. Relatively small- 0.5 gm. Centrally located at the base of the brain.
- Rests in a saddle-like bony depression (sphenoid) called hypophyseal fossa of the Sella turcica.



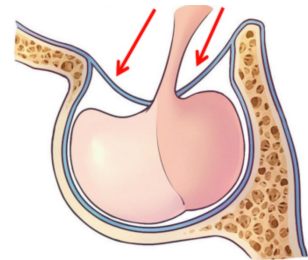
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Pituitary/relations

- **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).



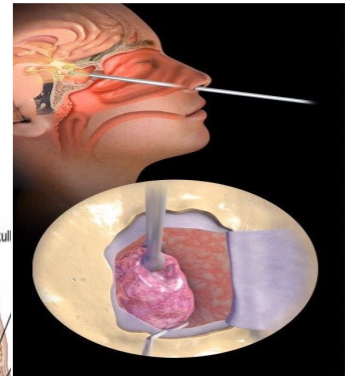
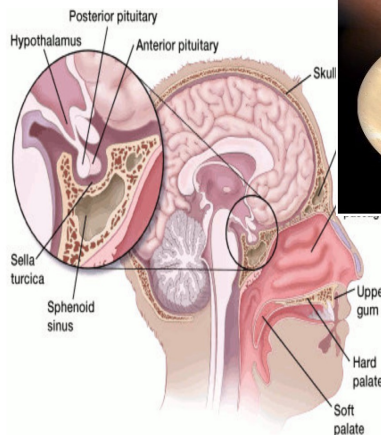
Diaphragma sellae: a fold of dura that acts as a roof with a central aperture that allows the passage of the infundibulum (stalk), and separate the PG from overlying optic chiasma.

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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.

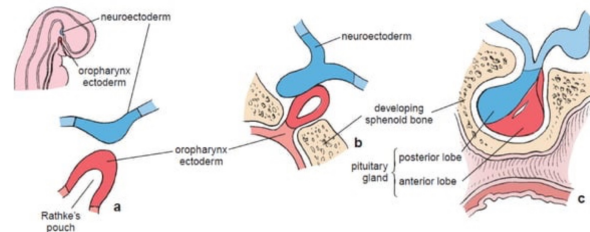
Craniotomy!!!!



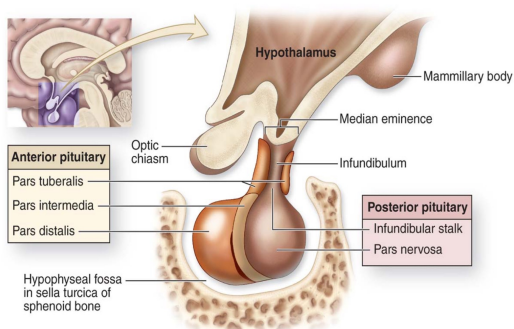
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Structure and Origin

- 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):

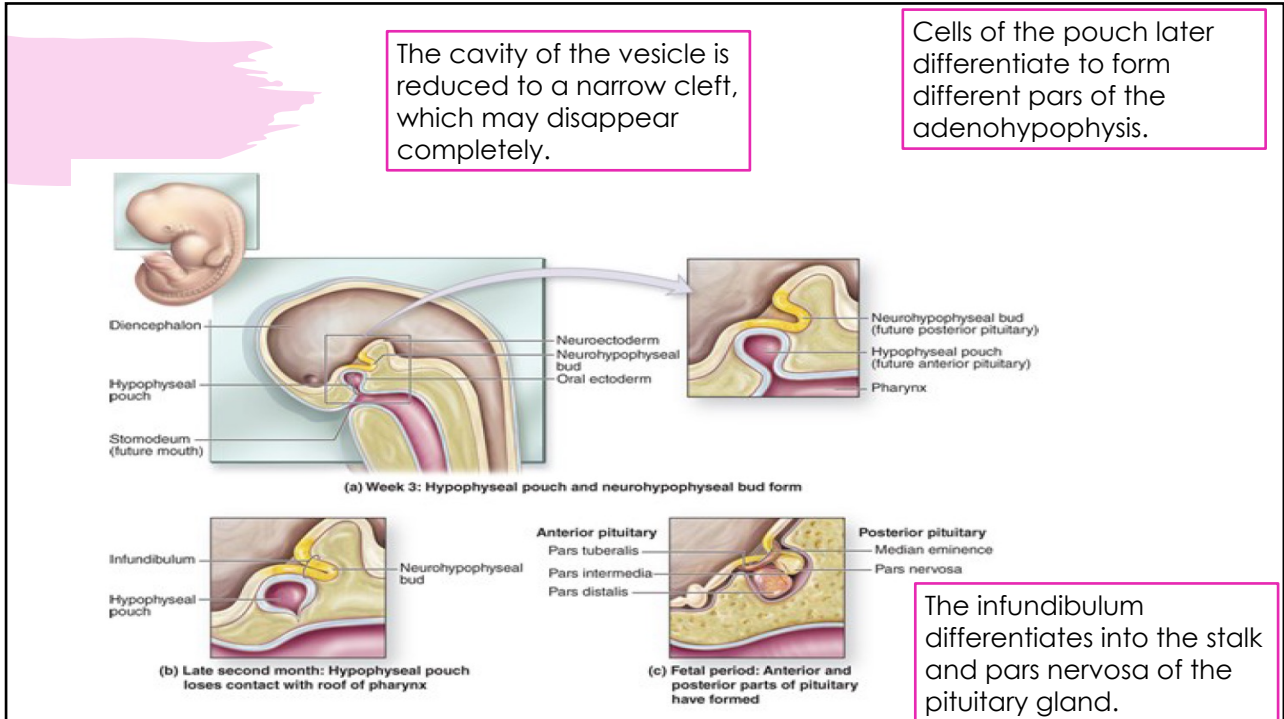
- Pars infundibularis.
- Pars nervosa.

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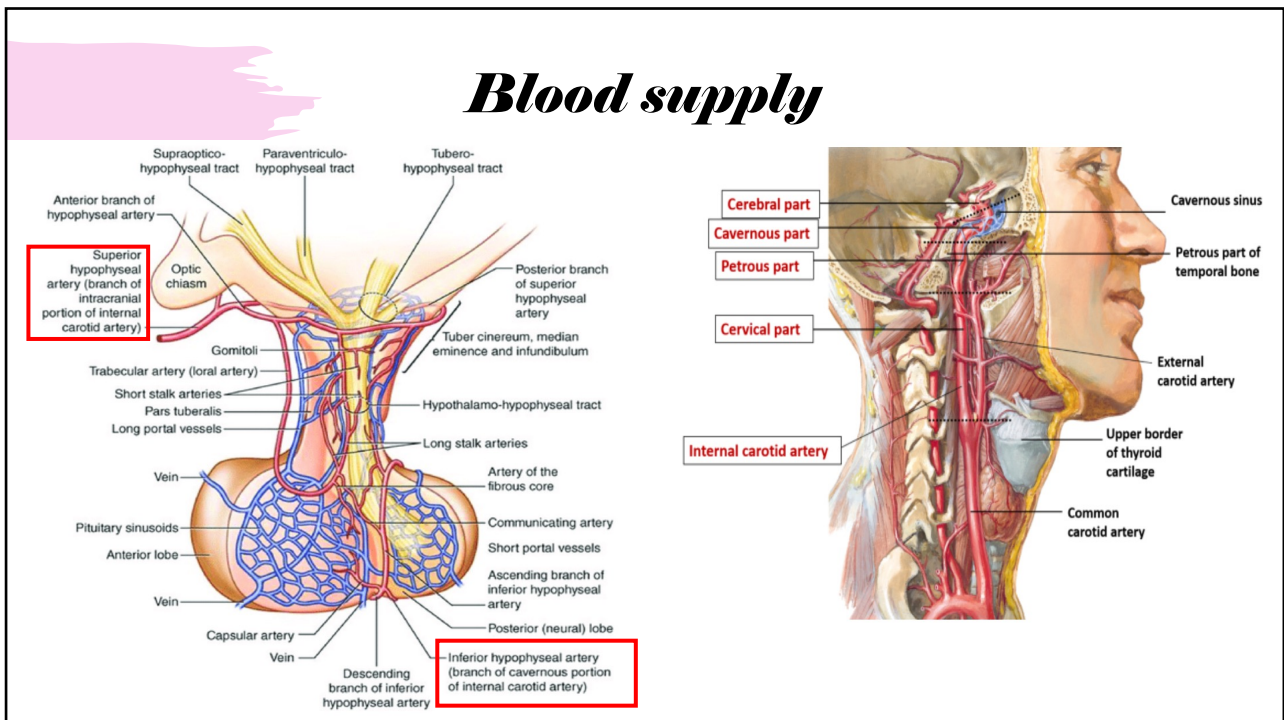
Pituitary organogenesis

- 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.

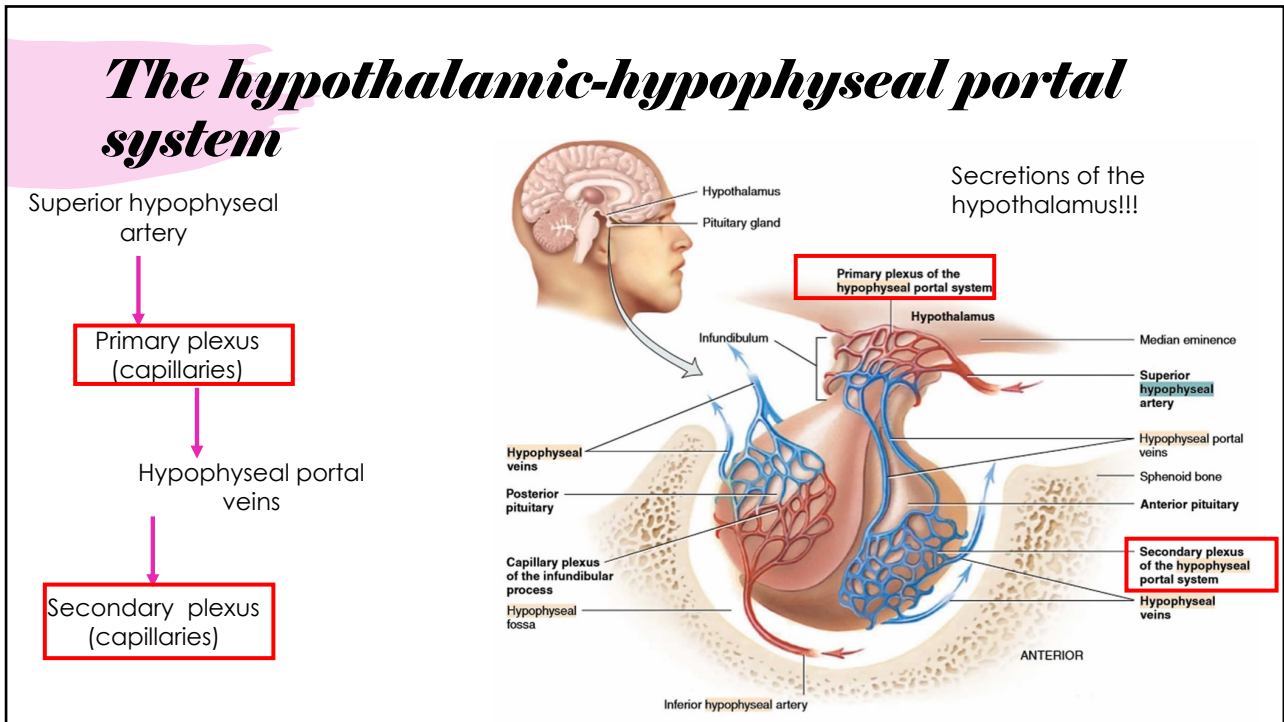
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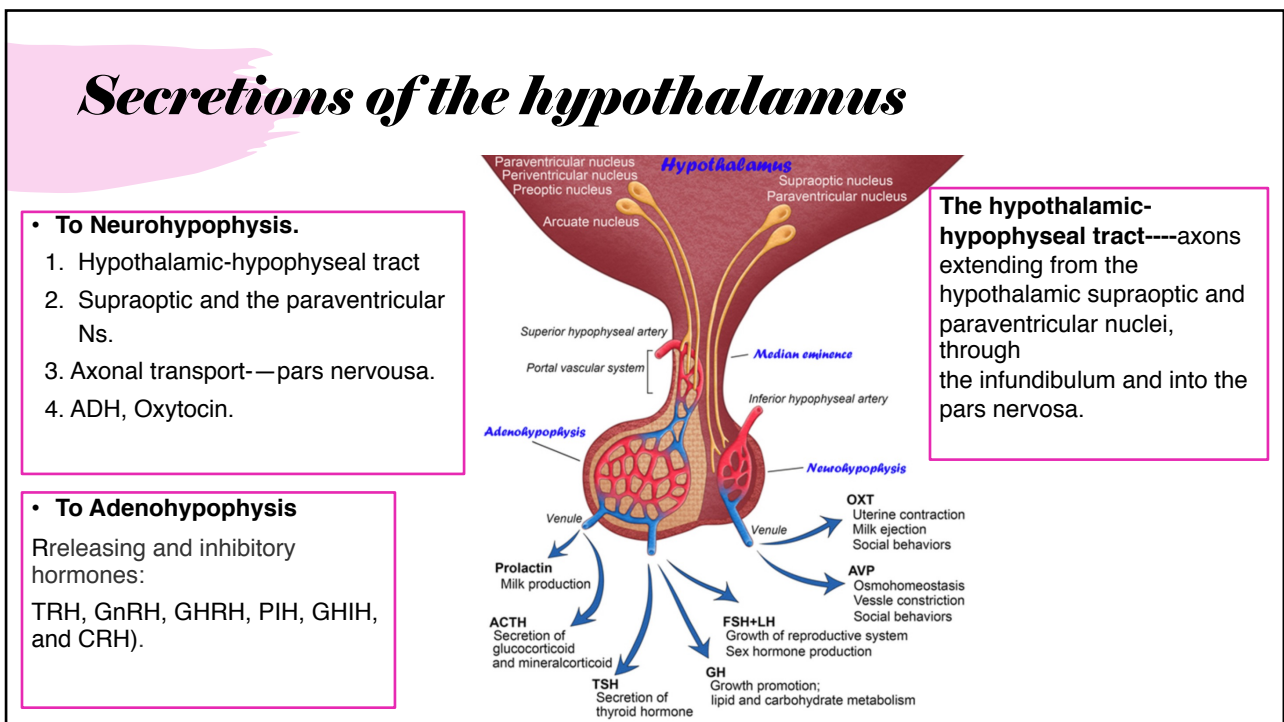
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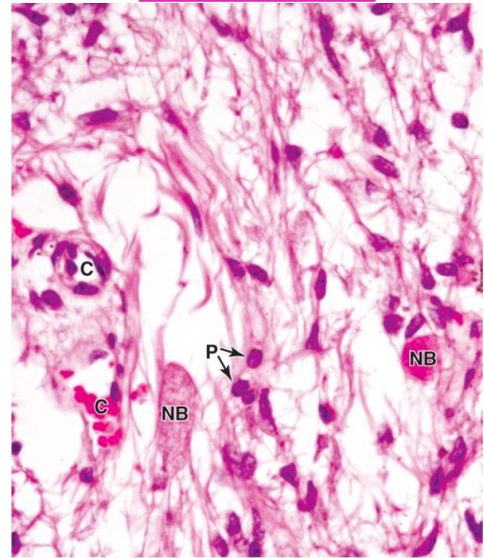


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Neurohypophysis

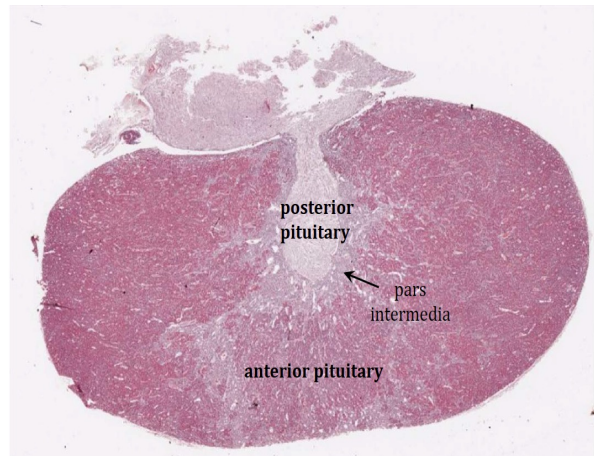
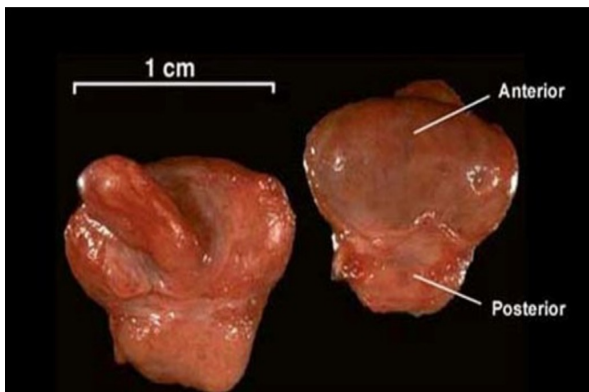
- Contains around 100,000 unmyelinated axons of large secretory neurons with cell bodies in the supraoptic and paraventricular nuclei.
- Highly branched glial cells called pituicytes (most abundant).
- Neurosecretory (Herring) bodies contain either: antidiuretic hormone (ADH, arginine vasopressin) or oxytocin.
- Carrier proteins: neurophysin I and II.
- Nerve impulse is required to release these two hormones

NB: neurosecretory (Herring) bodies



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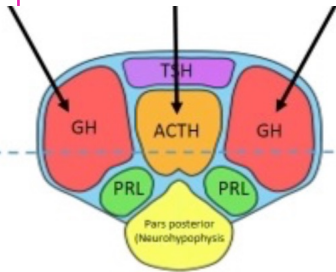
Adenohypophysis



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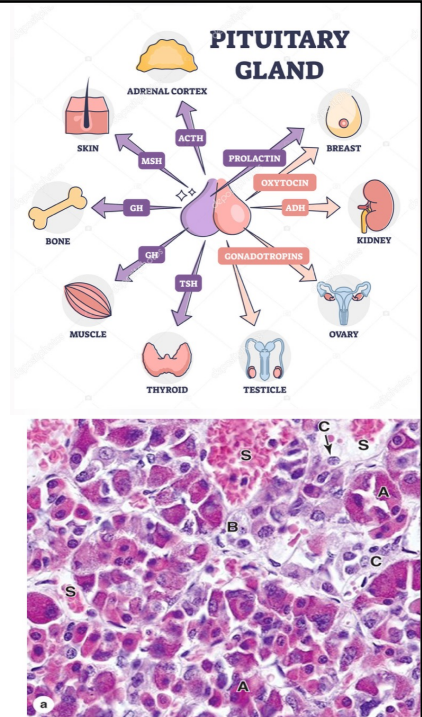
Adenohypophysis— Pars distalis

- Biggest part--75%
- 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 (50% of cells) and lactotrophs.
- **Basophils**: corticotrophs, gonadotrophs, and thyrotrophs (least numerous)



a mixture of different hormone producing cells in most pituitary acini, but the distribution of cells is not random.

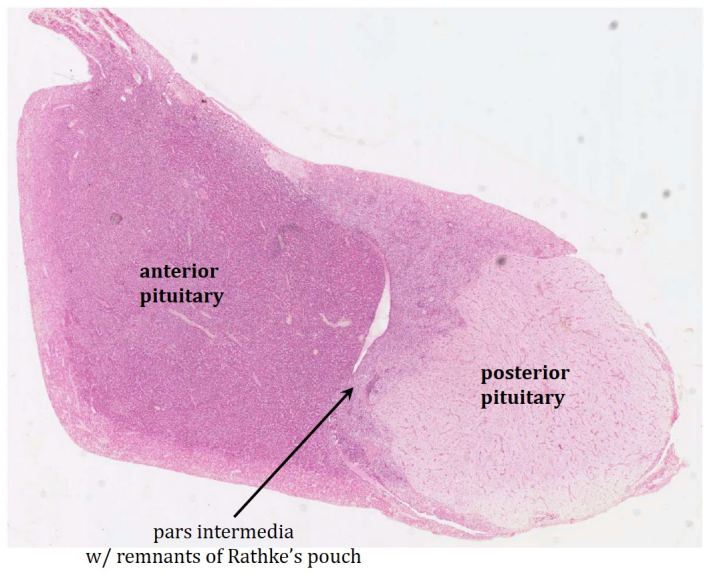
acidophil cells (A), basophils (B), and Chromophobes (C).



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Pars tuberalis

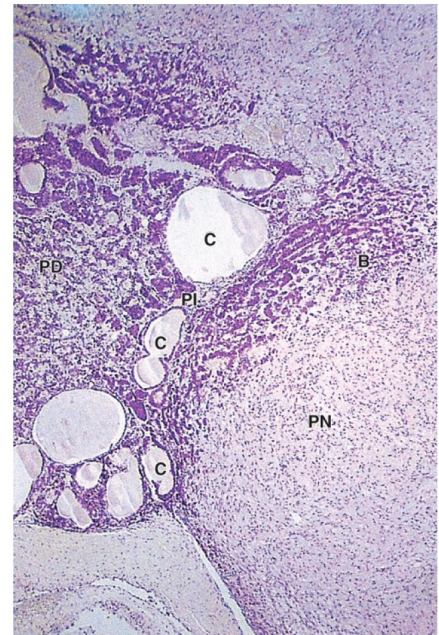
- Small funnel-shaped region surrounding the infundibulum.
- Most of the cells of the are gonadotrophs.



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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 cleaves it differently from cells in the pars distalis ((MSH), γ -LPH, and β -endorphin).



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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	<u>Follicle-stimulating hormone (FSH) and luteinizing hormone (LH)</u> ; 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 Lipotropin (LPH)	Stimulates secretion of adrenal cortex hormones Helps regulate lipid metabolism

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Hypothalamic hormones/Adenohypophysis

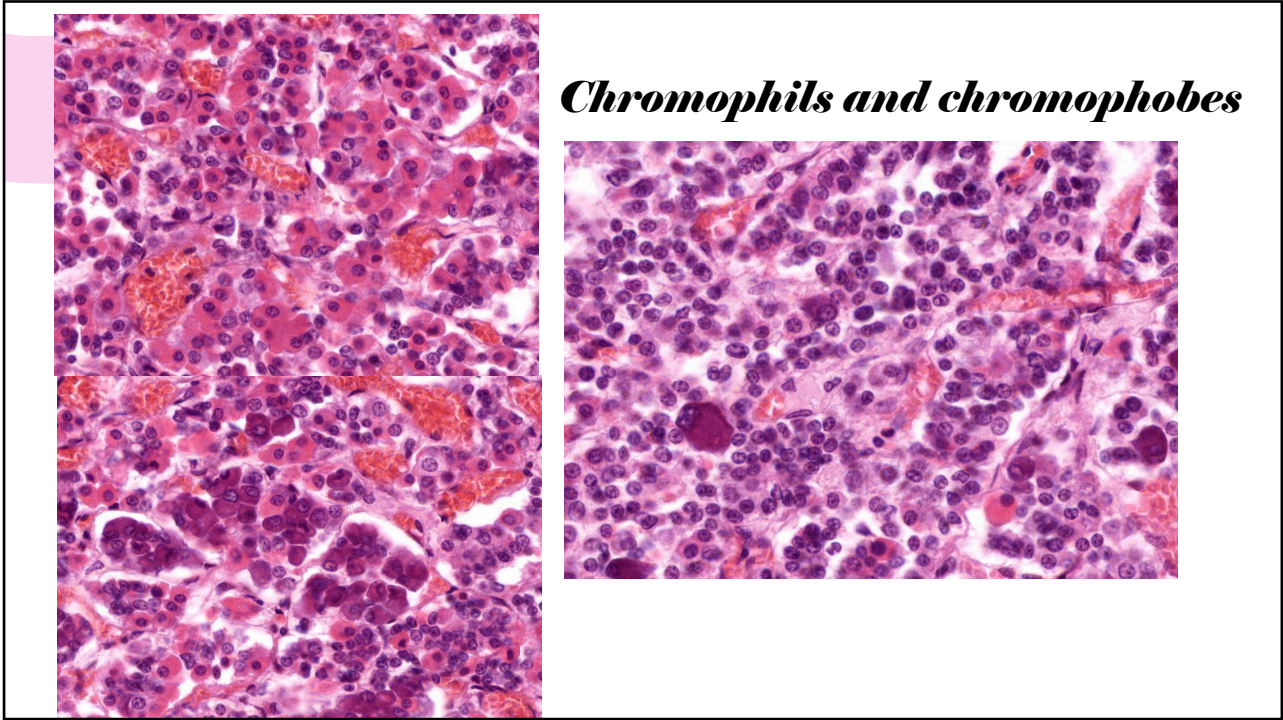
Hormone	Chemical Form	Functions
Thyrotropin-releasing hormone (TRH)	3-amino acid peptide	Stimulates release of thyrotropin (TSH)
Gonadotropin-releasing hormone (GnRH)	10-amino acid peptide	Stimulates the release of both follicle-stimulating hormone (FSH) and luteinizing hormone (LH)
Somatostatin	14-amino 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

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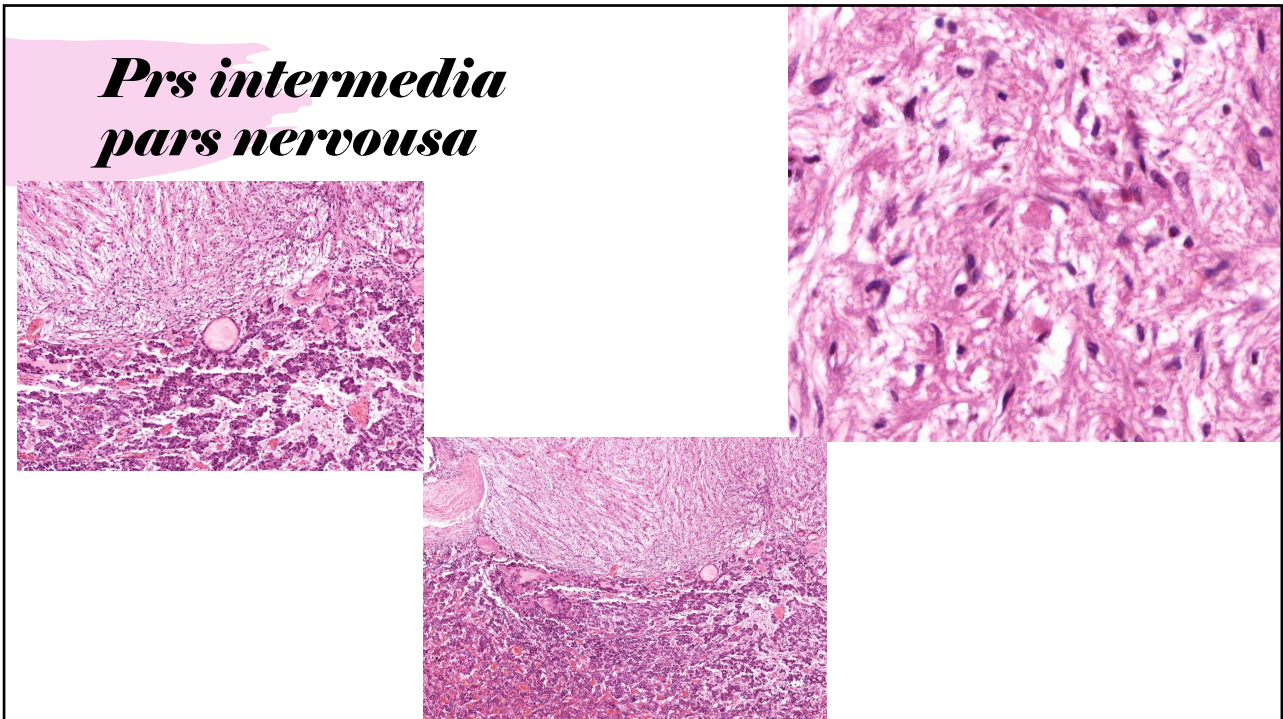
Hypothalamic hormones/Neurohypophysis

Hormone	Function
Vasopressin/antidiuretic hormone (ADH)	Increases water permeability of renal collecting ducts
Oxytocin	Stimulates contraction of mammary gland myoepithelial cells and uterine smooth muscle

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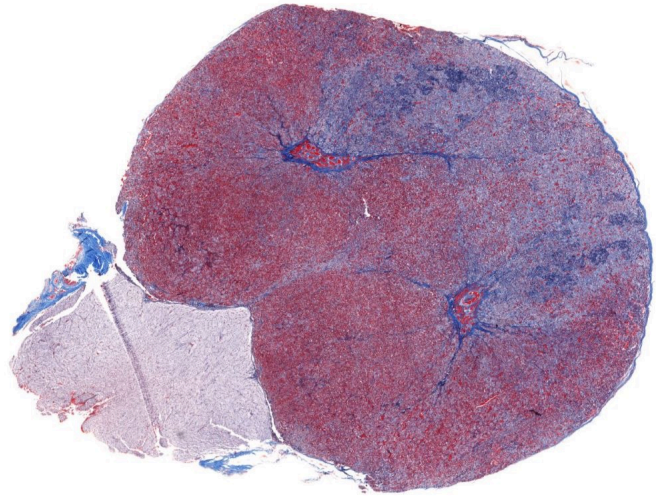
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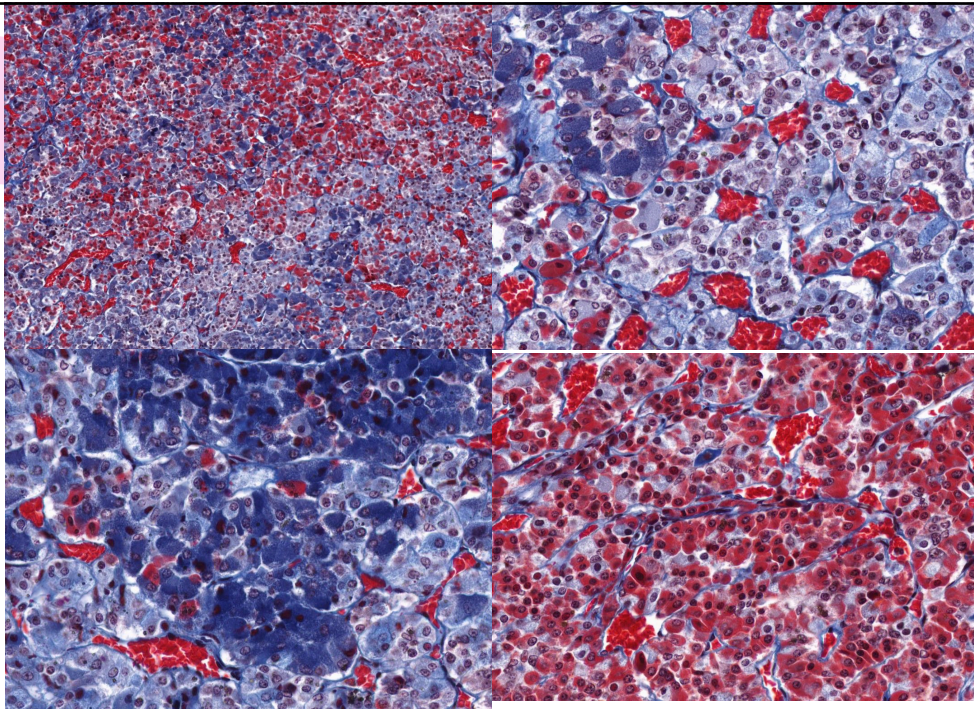
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AZAN staining

- Azocarmine: colors the nuclei red
- Aniline blue: stain collagen or mucin.
- Orange g: colors the cytoplasm



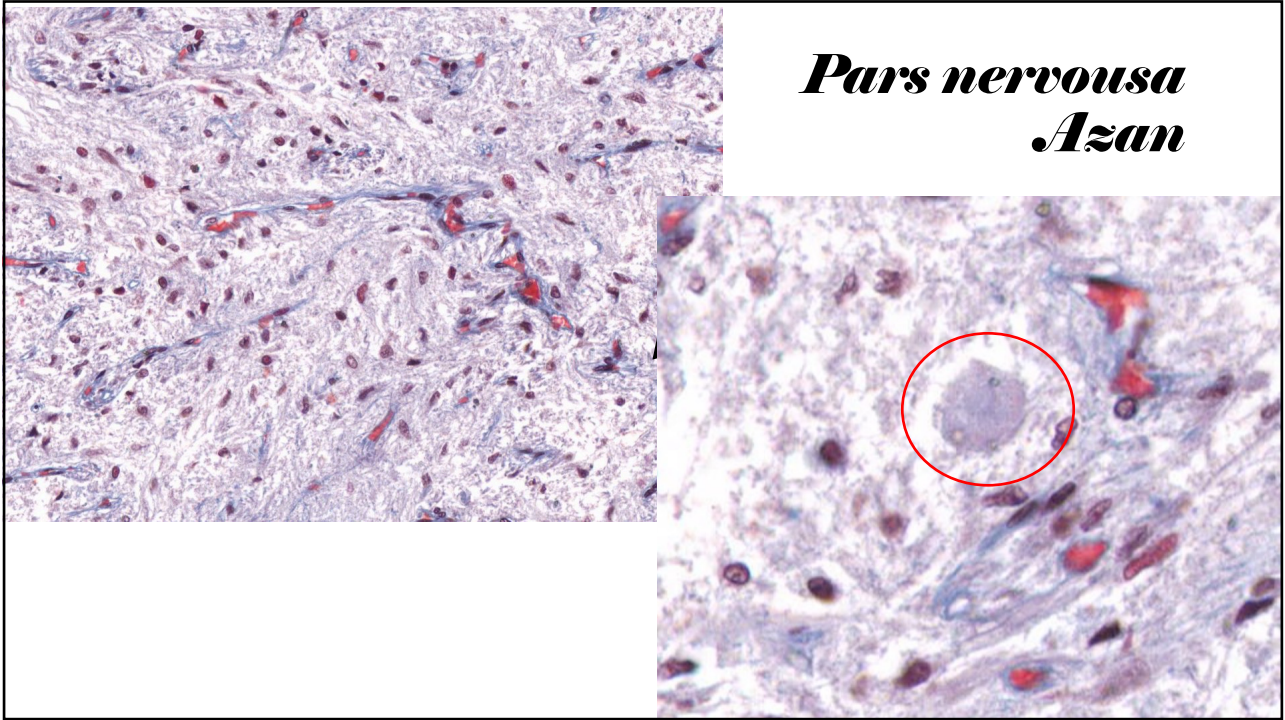
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Azan stain

- Dark red=acidophils.
- Dark blue: basophils.
- Light blue: chromophobes.

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