

ENDOCRINE SYSTEM

Anatomy & Histology
Lec.2

الجينات



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Adenohypophysis--- Pars distalis

ما ينطق به الدكتور من شرح سيكون باللون الاحمر
وما يكون مهم في شرح الدكتور يكون باللون البنفسجي
ما يكون مهم في السلايدات يكون بخطين أو بخط

•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)

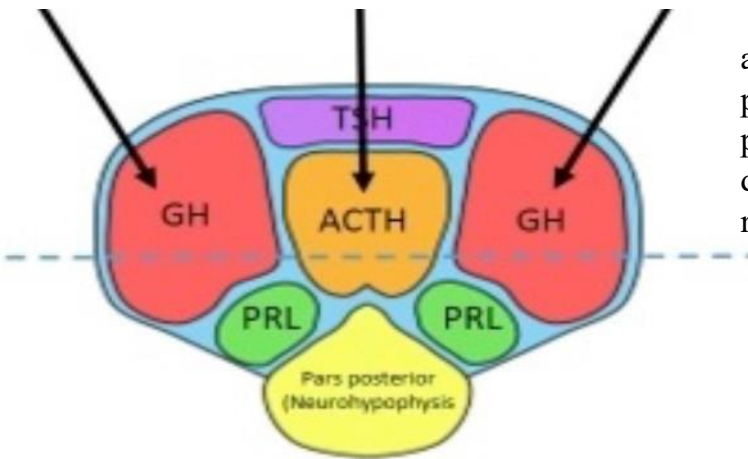
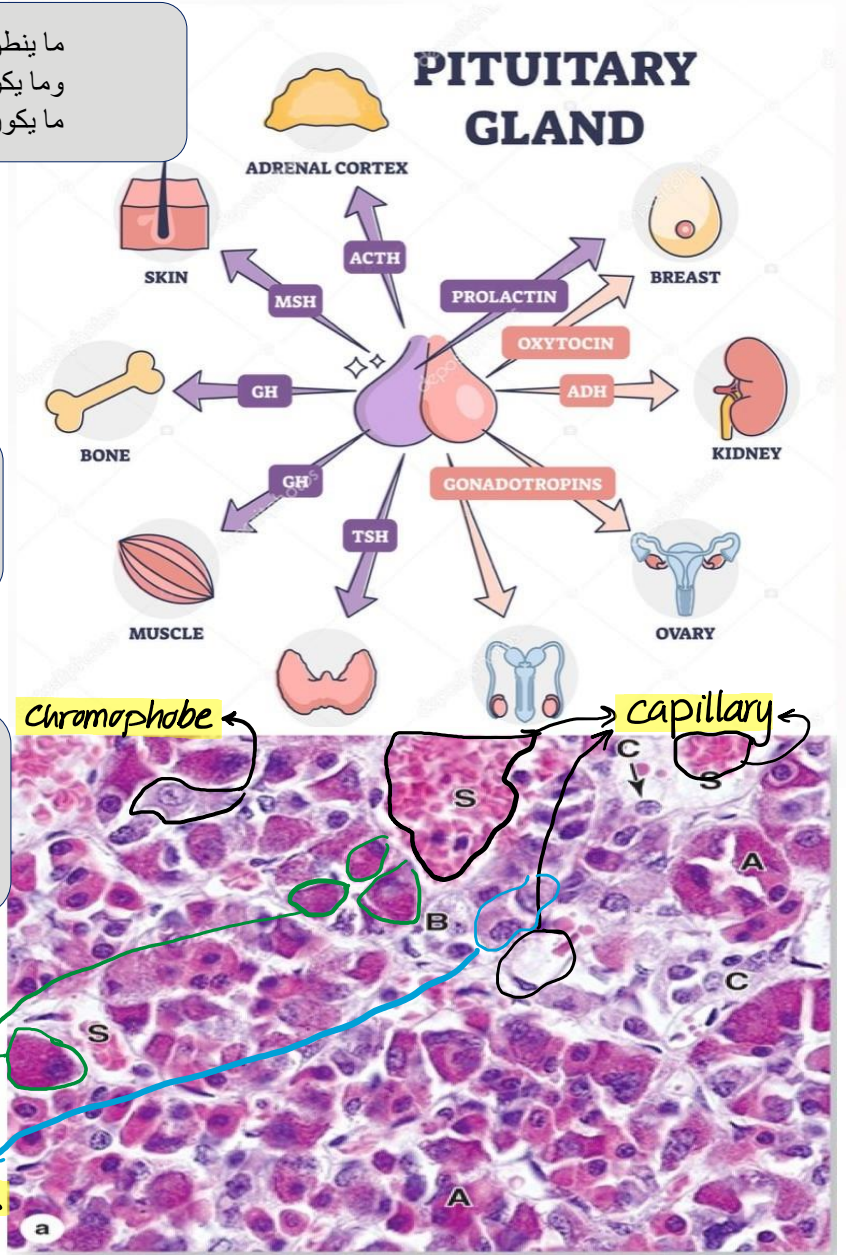
Thin capsule: NO septae, NO lobes, NO lobules

Fenestrated not continuous capillaries to ease the anterior pituitary cells' access to blood supply

Classified according to the staining philosophy=loving | phobes=hating

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).



Acidophils

Basophils

Chromophobe

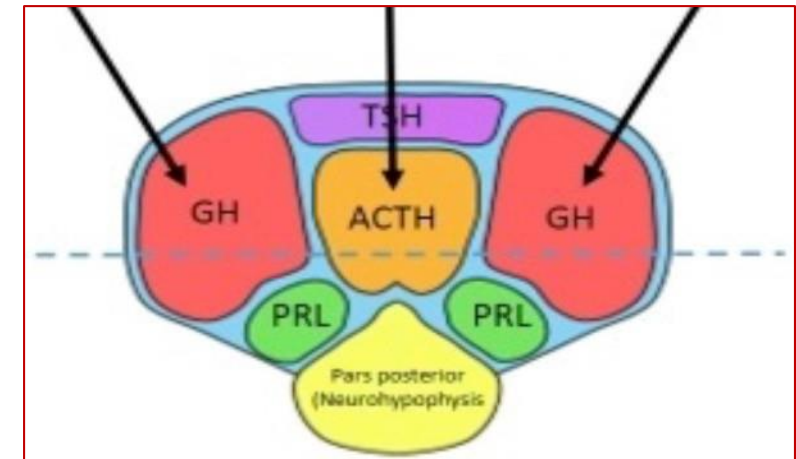
capillary

This is an easily identified glandular tissue with clear cells and cytoplasm



We notice the zoning in here:

- **Somatotrophes (GH)** have more lateral distribution
- **corticotrophes (ACTH)** are more medially located
- **Thyrotrophes (TSH producing)** are in the centre between somatotrophes and anterior to corticotrophes and
- **The lactotrophes (prolactin producing)** are closer to the posterior lobe
 - Only in borders they can get mixed



Quick recap of the first lecture:

- **The body controls itself by 2 mechanisms: neural (fast and short acting) and the hormonal (slow and long acting)**
- **Types of endocrine tissues: 1-solely endocrine ones 2-part of their function is endocrine but have other functions (such as: gonads -> they secrete hormones but their function is the production of gametes: sperms & ova)**
- **Hypothalamus oversees every part of the endocrine system through the pituitary gland (indirect control) but pituitary gland is the direct affecting one.**
- **ADH works on kidneys while oxytocin works on the uterus (hormones of posterior pituitary)**
- **All the pituitary is originated from ectoderm (anterior: from oral ectoderm, posterior: from neural ectoderm) and it's developed in the 4th week of gestation**
- **We can reach the pituitary gland in a less invasive way through the transnasal approach**
- **The blood supply to anterior:superior hypophyseal artery (portal circulation) and to posterior: inferior hypophyseal**

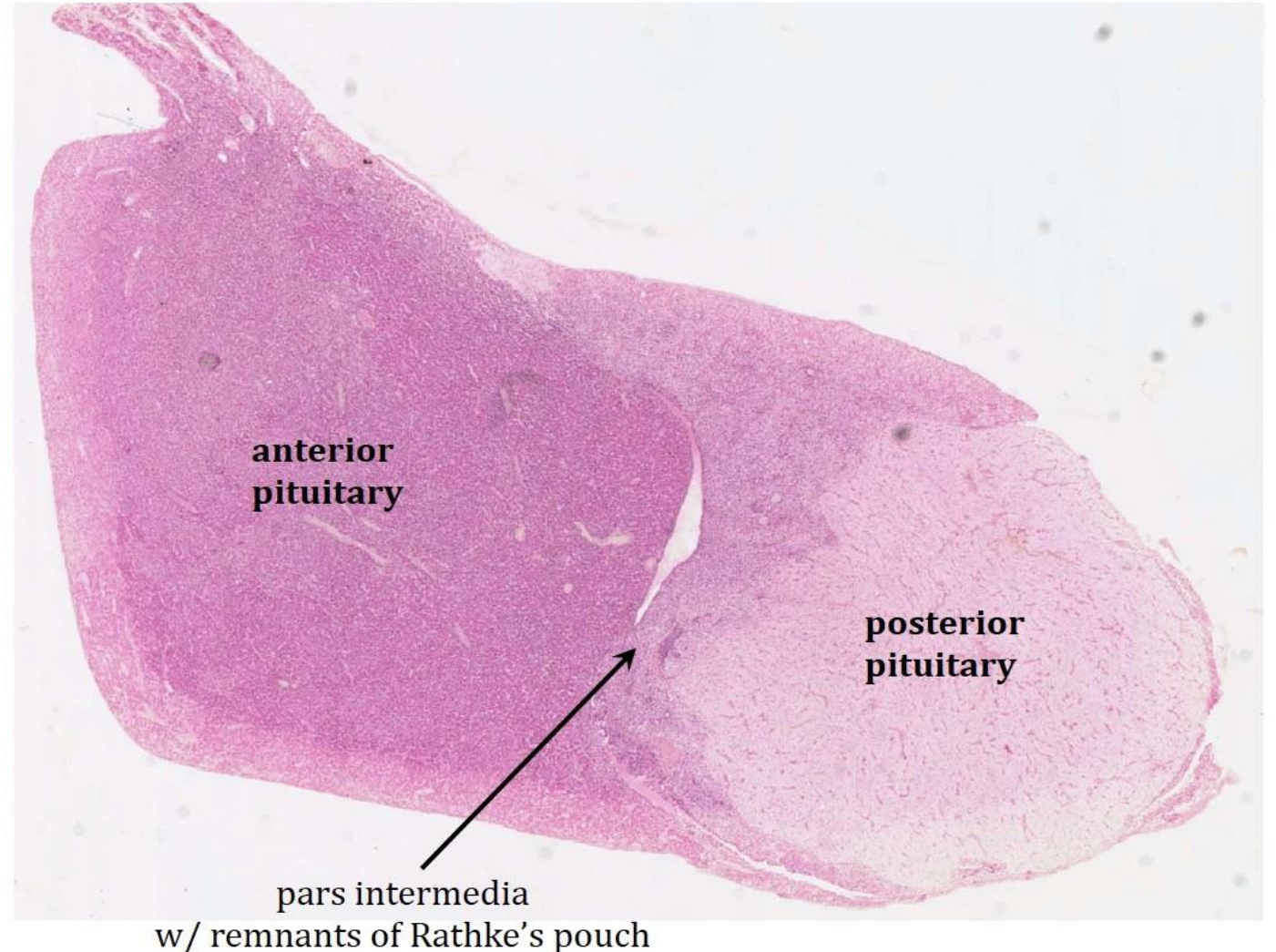


Pars tuberalis

**Smaller portion of anterior pituitary
(remember: 75% are porta distalis)**

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

Gonadotrophes: so we will have a number of basophils



-Pars intermedia in humans is rudimentary, but in some mammals it is big
-It is the small squeeze part between nervosa and distalis
-A huge part of it is called colloid filled cysts , where do they come from ?!

Do you remember Rathke's pouch" hypophyseal pouch " , from inside there was a space (that was not really a space) later on it becomes colloid , so the space doesn't disappear, we see it as cysts in pars intermedia

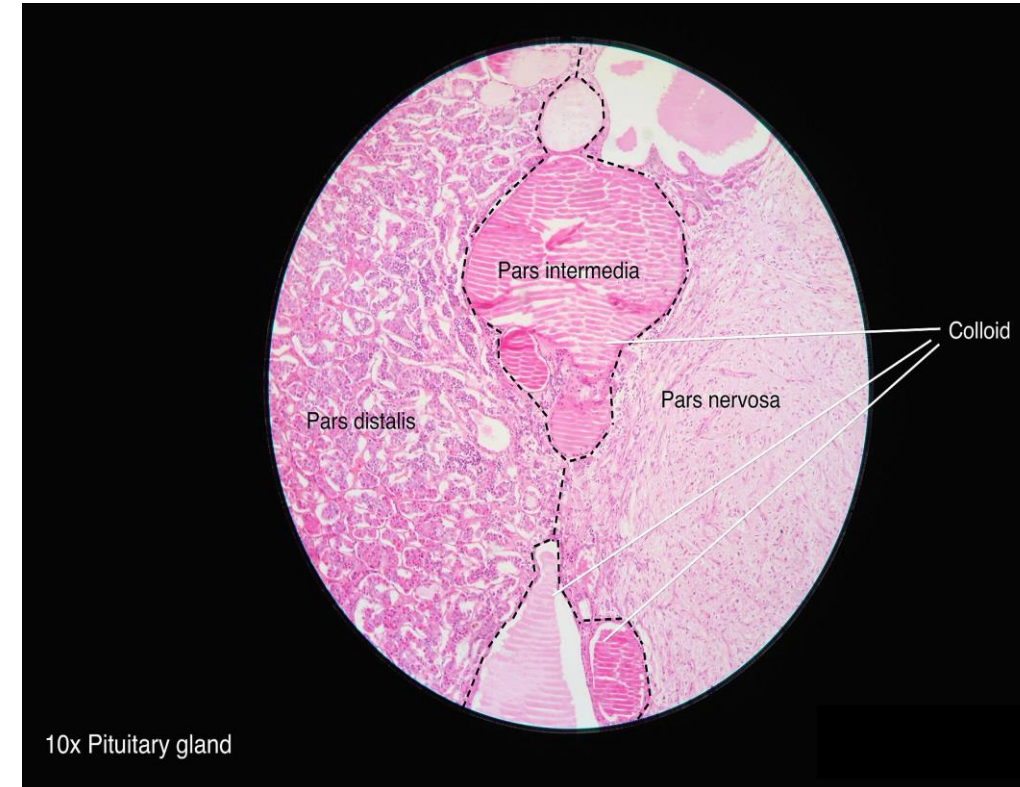
-Do I have cells?

Yes I have some , mainly basophils (corticotrophs->secreting ACH to adrenal gland) & we have some chromophobes (Again , they don't stain ,neither eosinophils nor basophils "don't have granules") they are actually chromophils that ended producing , or will produce hormones or they could be stem cells

-It is best developed during fetal life because pituitary gland during growing ages is bigger and more active than adults



Additional picture



Adenohypophysis—major cell types.

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

Read the major function , you will study it in physiology :)

Cell Type	% of Total Cells	Hormone Produced	Major Function
Somatotrophs	50 The most	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 The least	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) <small>20</small>	Stimulates secretion of adrenal cortex hormones Helps regulate lipid metabolism

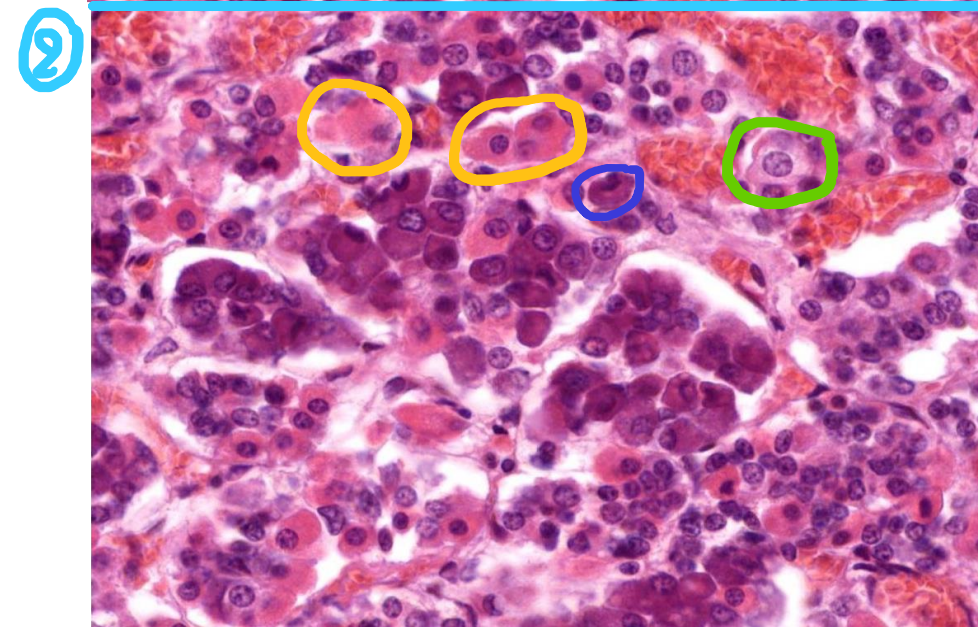
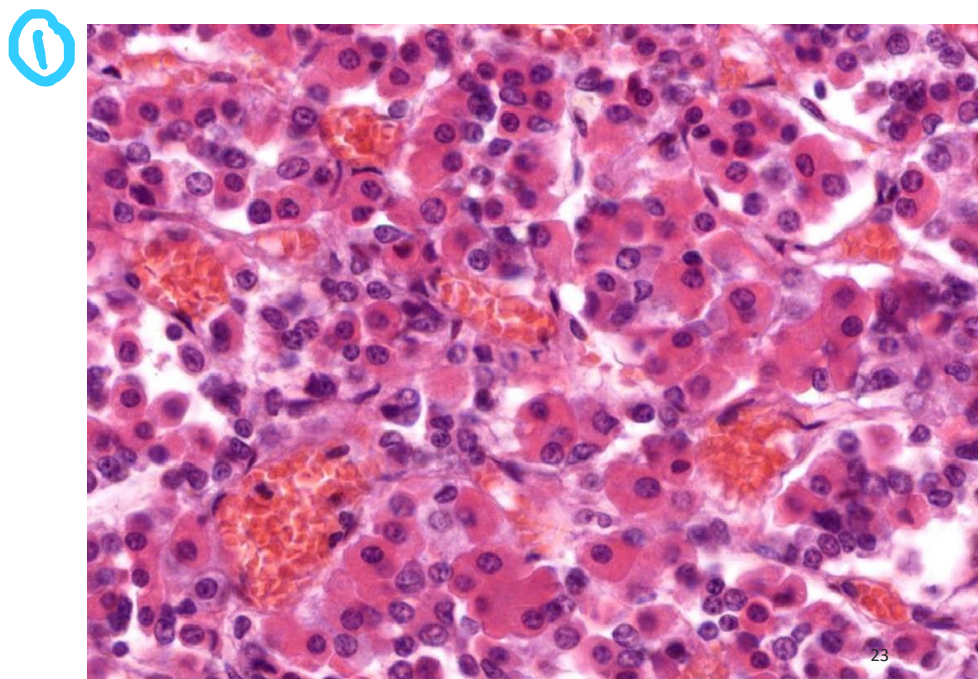
Hypothalamic hormones/Adenohypophysis

Regulatory hormones from hypothalamus

Hormone	Chemical Form	Functions
Thyrotropin-releasing hormone (TRH)	3-amino acid peptide	Stimulates release of thyrotropin (TSH) TRH will bind to thyrotrophs which will synthesize and release 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 hormone (CRH)	41-amino acid polypeptide	Stimulates synthesis of pro-opiomelanocortin (POMC) and release of both β -lipotropic hormone (LPH) and adrenocorticotropic hormone (ACTH)

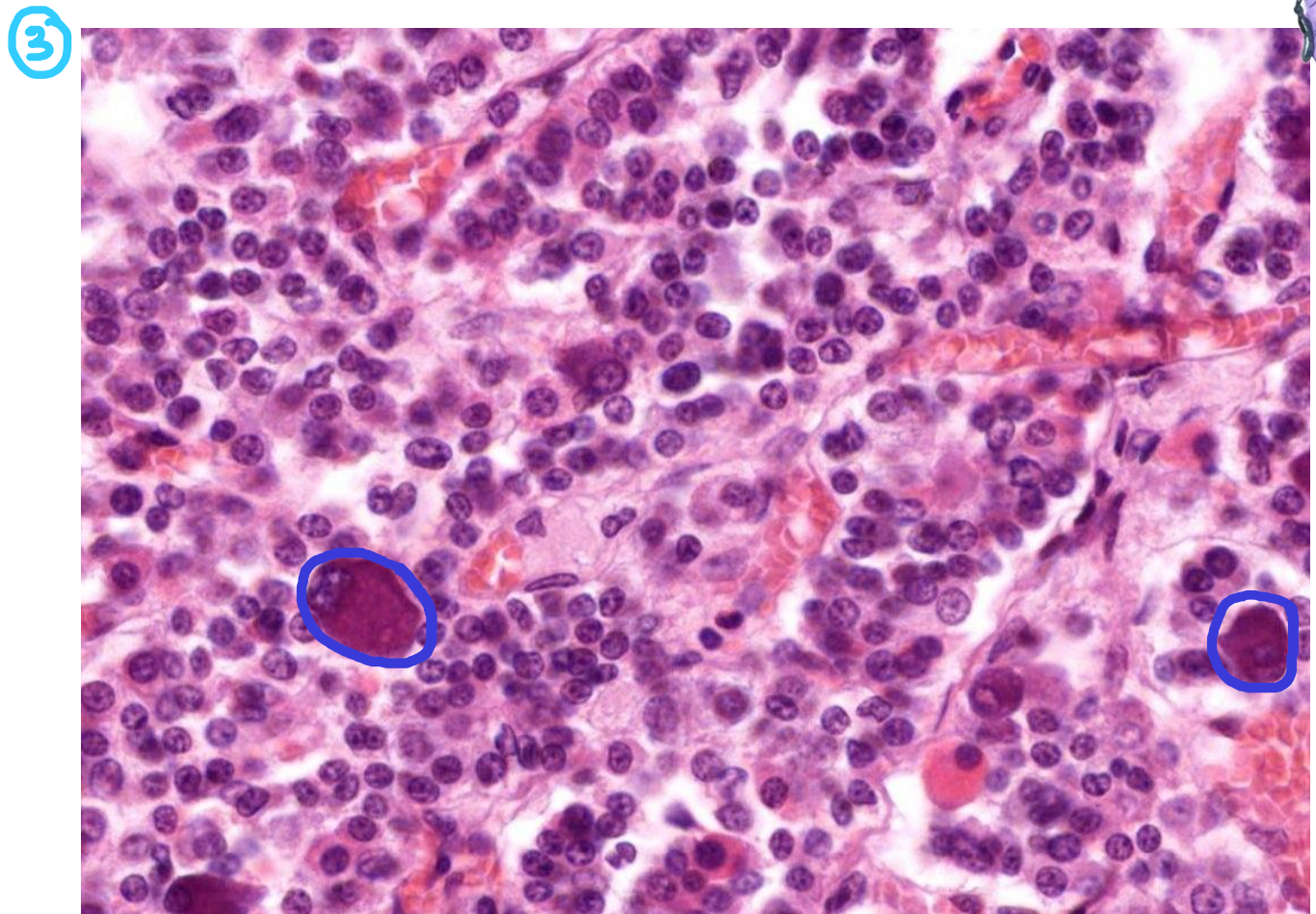
Hypothalamic hormones/ Neurohypophysis

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



"للأسف" for exam purposes there's no colored pictures so it is hard to identify, there will be clear images

Chromophils and chromophobes



- True or false :

I see lots of capillaries (sinusoids)

Ans: true

I see a contrast in stain

Ans: true

- Which one contain more chromophopes?

Ans: Number 3

- The pictures on the right and left , are they different or the same images ?

Ans: Different

- The one on the top (number 1) , contains more acidophils or basophils (in your opinion 😊) ?

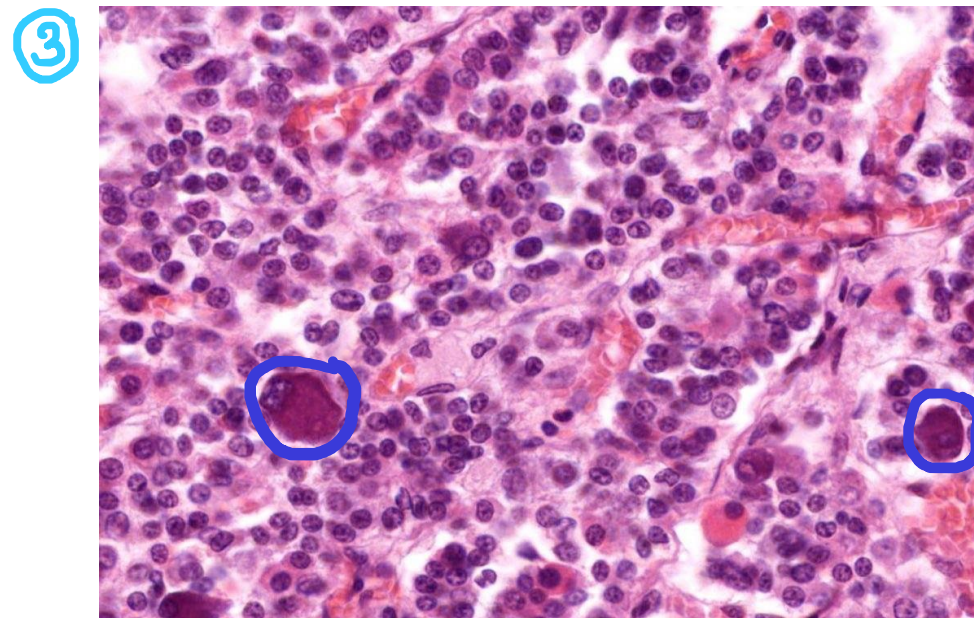
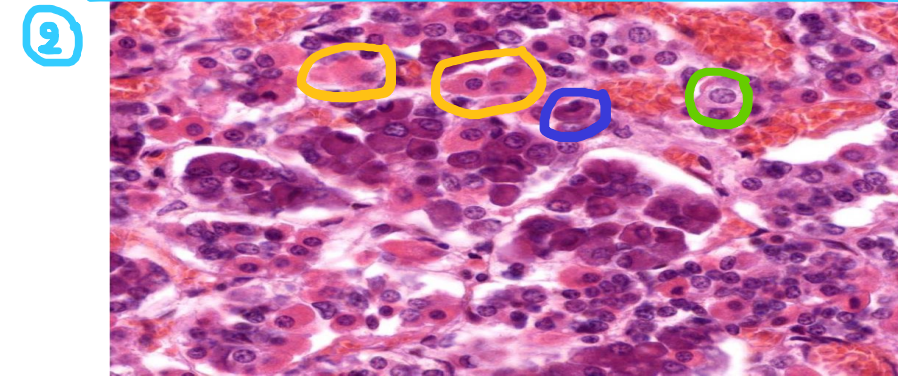
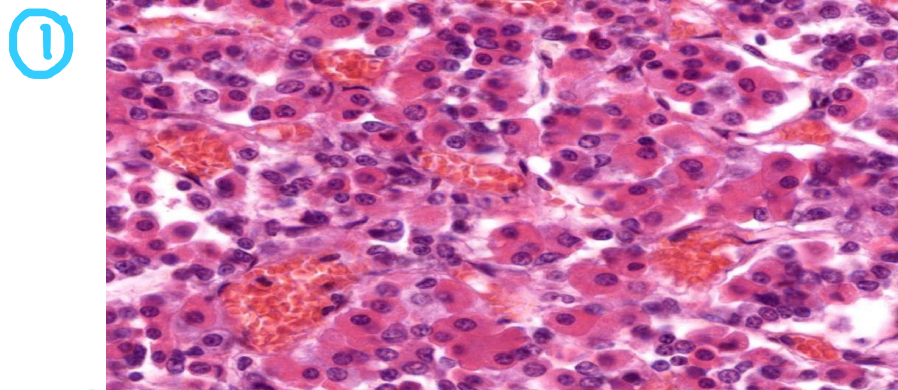
Ans: acidophils

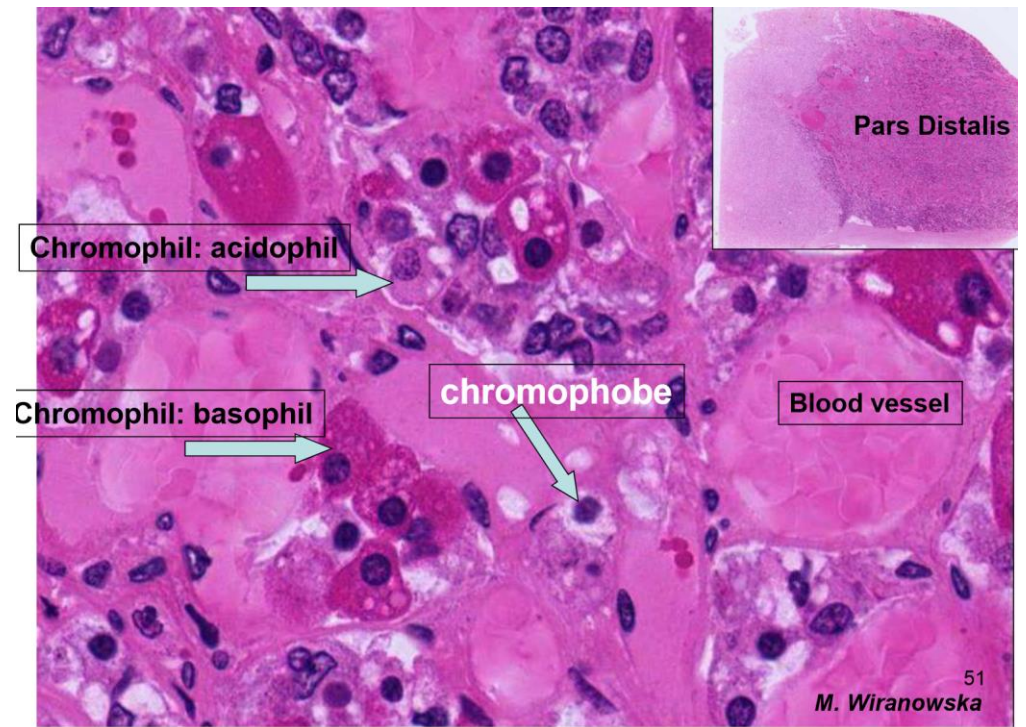
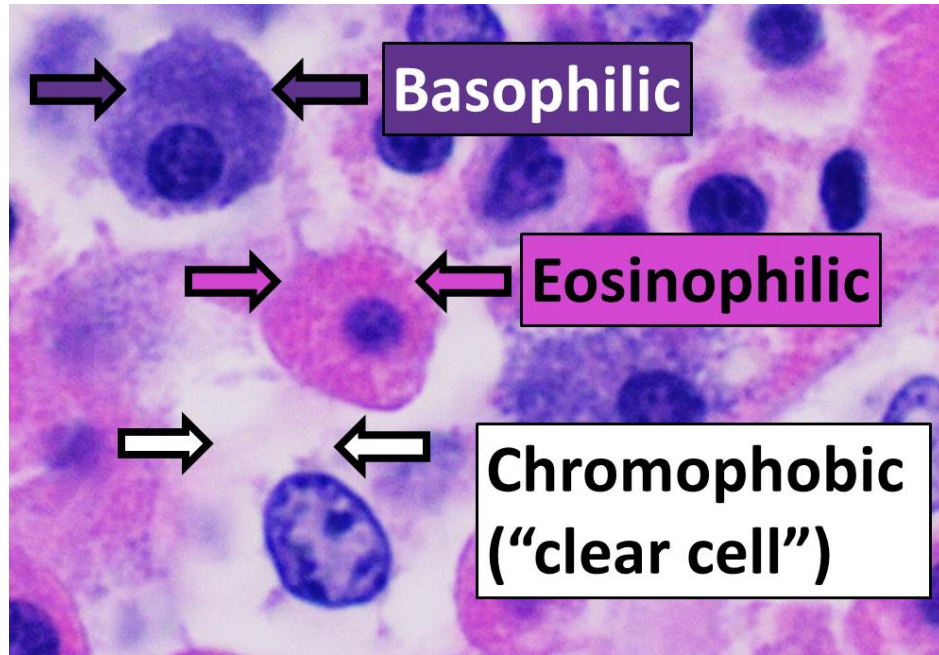
- But in number 2 : basophils are more than acidophils

-Identify the green circle : chromophopes

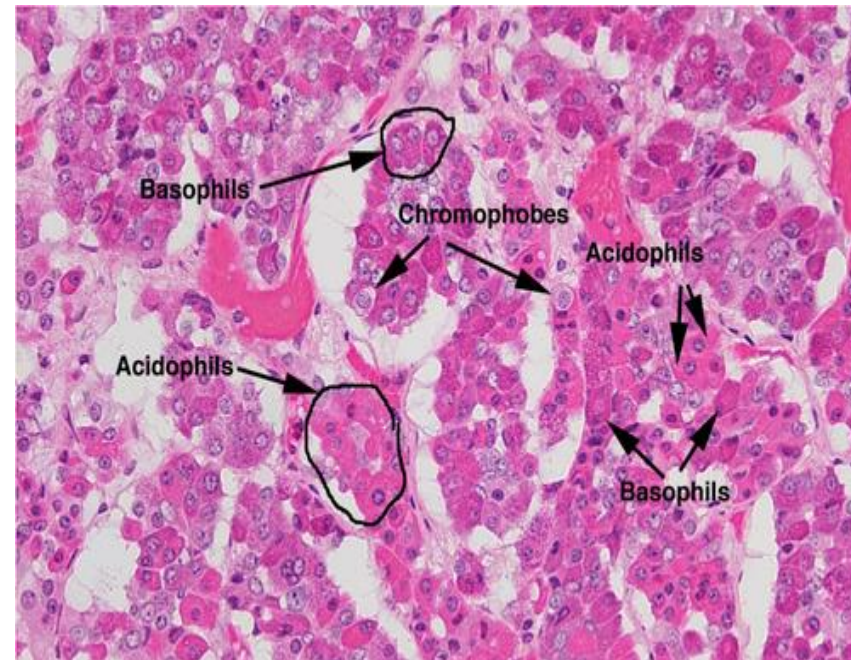
-Identify the yellow circles : acidophils

-Identify the dark blue circles : basophils





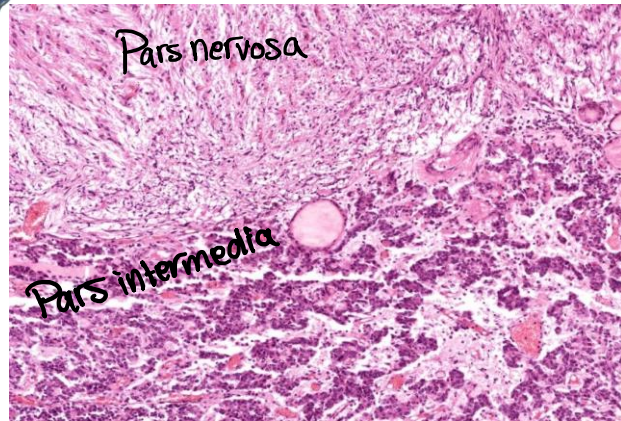
Additional pictures for better understanding



Pars intermedia pars nervosa ^{5/11/24}

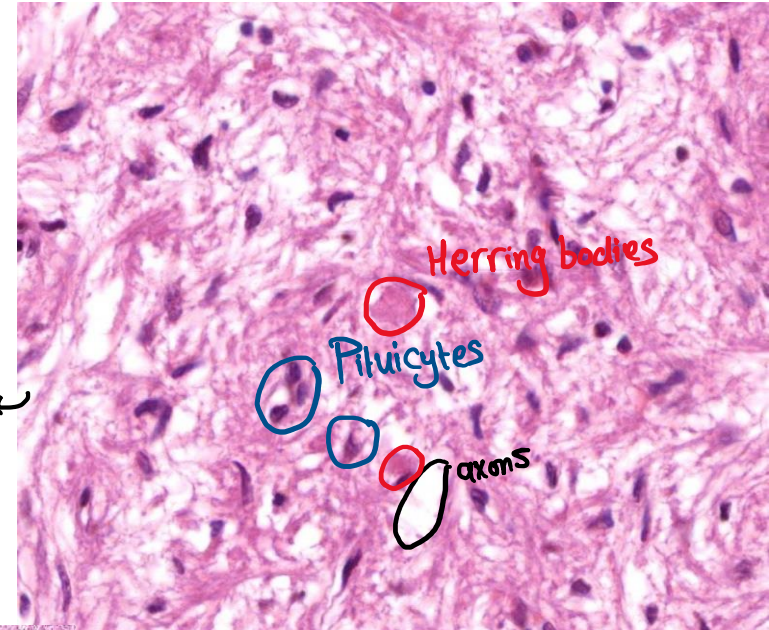


©



Ⓐ

Pars nervosa



-we do have reticular fibers but we can't see it with H&E stain, we need special stain to see it, such as trichrome stain or AZAN staining

white axons

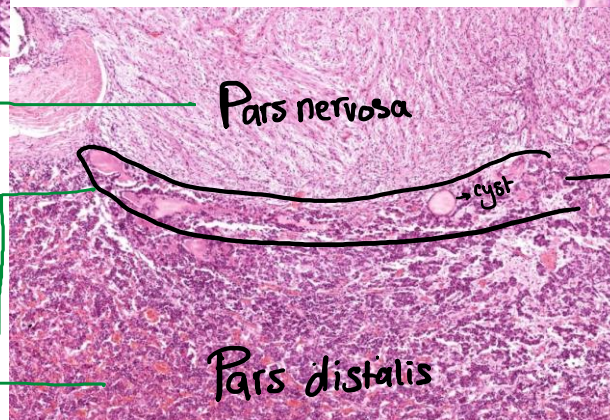
Herring bodies

Pituitocytes

axons

Ⓑ

neurohypophysis (Posterior)
distalis+intermedia
=
adenohypophysis (anterior)

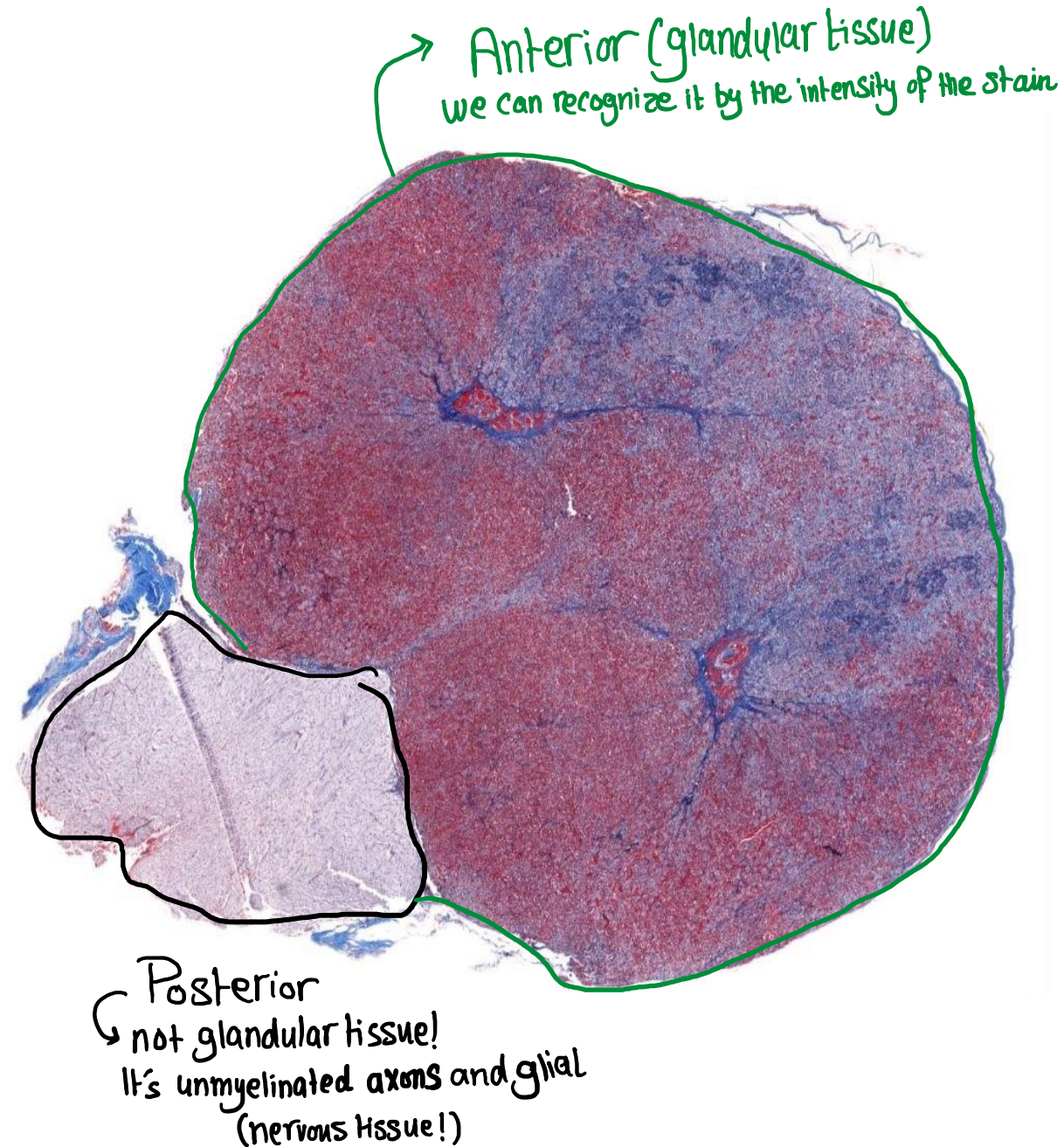


Pars intermedia
"most of the cells are basophils (orthotrophs)"
it's closer to nervosa

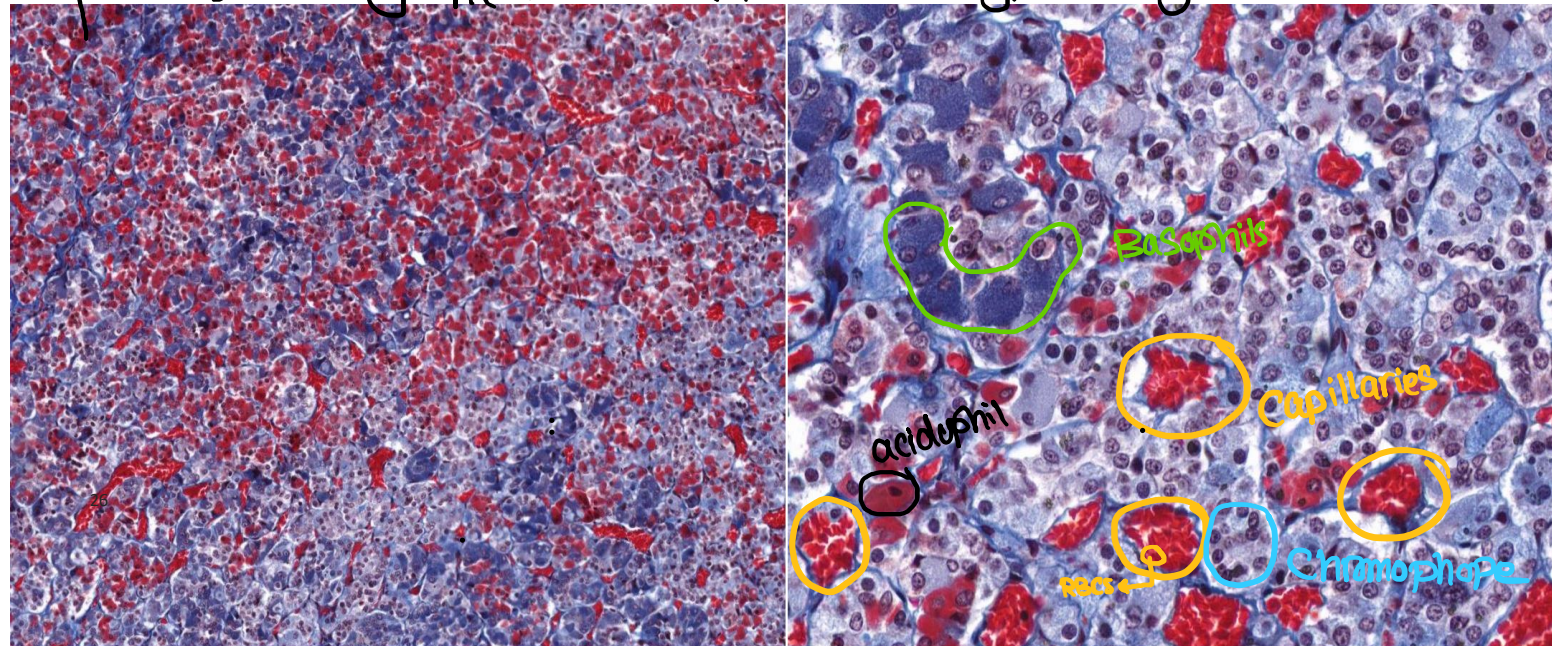
AZAN staining

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

25



→ low magnification, others are higher magnification

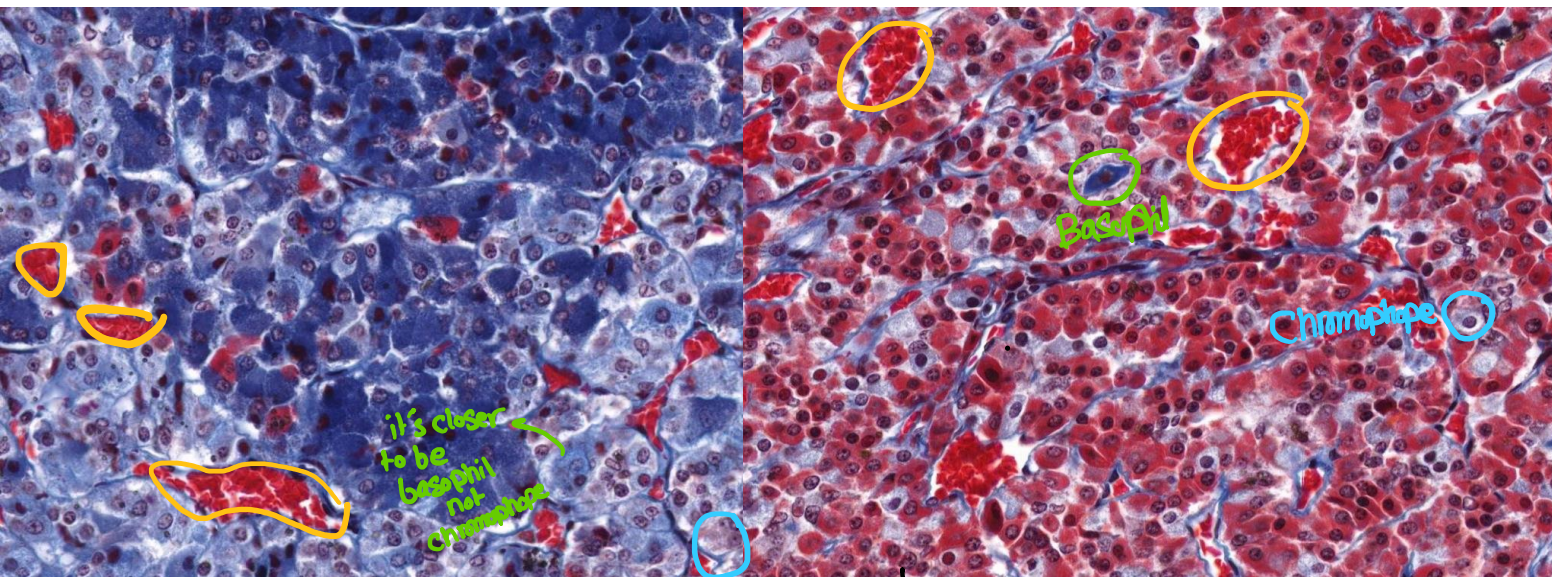


in yellow = capillaries **Azan stain**

Like fireworks



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



→ abundant of basophils

for sure it's a chromophobe

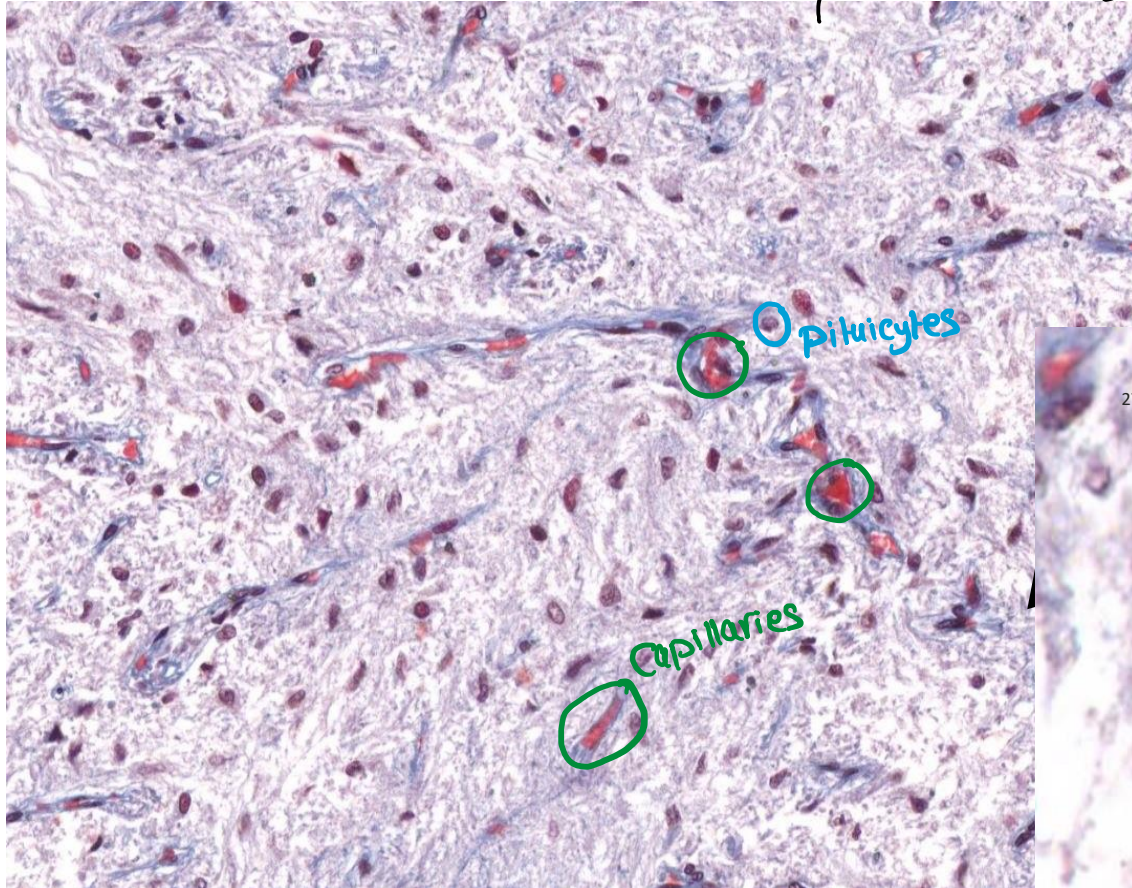
→ abundant of acidophil (eosinophil)

it's closer to be basophil not chromophobe

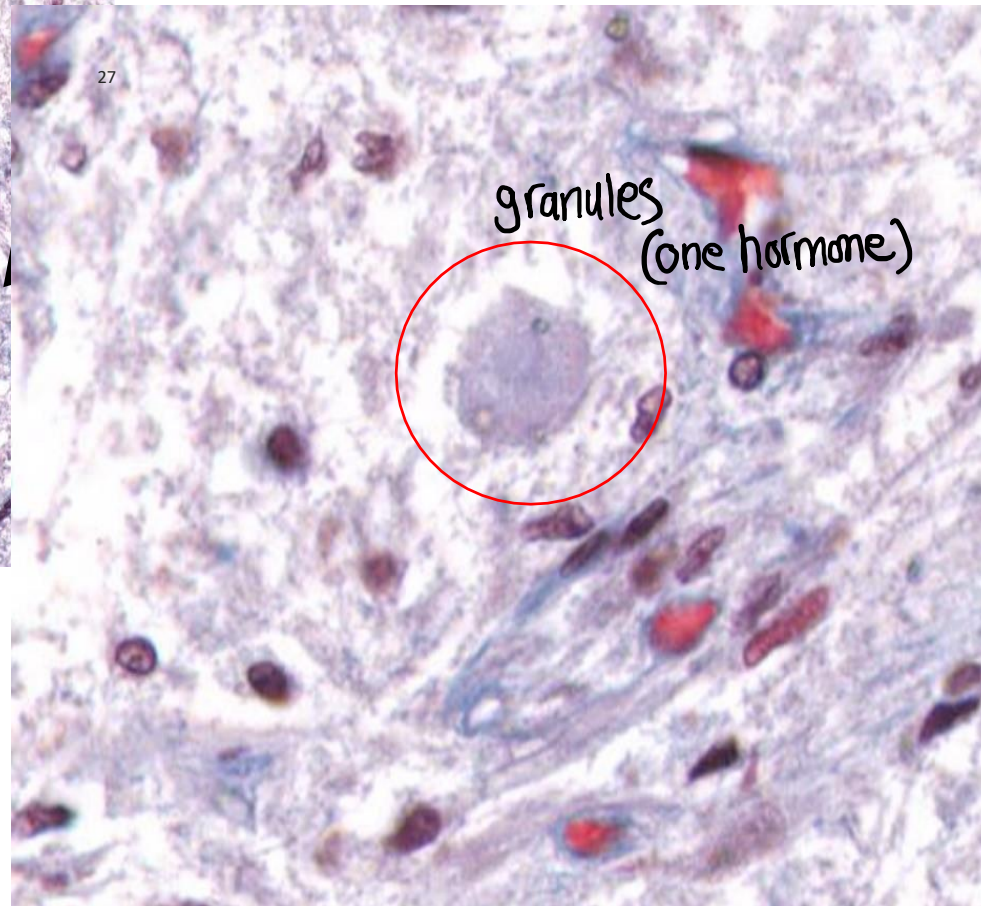
- What we mean by zoning is that the different sub populations seem to isolate themselves (zone themselves) depending on the type of hormone that they secrete
 - Even though in the same subpopulations there variability in the intensity depending on how much granules of the hormone they have

Pars nervosa Azan

whitish spaces = were occupied by axons



- The eosinophilia & basophilia are not intense



The posterior is always lightly stained

True or false :

- **The hypophyseal portal population circulation carries ADH and oxytocin to the pituitary gland**
- **Ans: False (it carries regulatory hormones to the anterior part)**
- **The release of oxytocin requires an action potential**
- **Ans: true (remember it needs neural stimulation or signals to be released)**
- **-The organogenesis of pituitary starts at week 6 of fetal development**
- **Ans: false (at week 4)**
- **The neural ectoderm separates from hypothalamus**
- **Ans: false (it remains)**
- **60% of adenohypophysis is pars distalis**
- **Ans: false (75%)**



Now the doctor showed some lab pictures so I will put them (screenshots) until the doctor uploads the lab file then you can check the pictures with higher resolution there

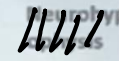
P.distalis P.intermedia P.nervosa
(Pearse trichrome stain) one of the best stainings



to visualize
the pituitary

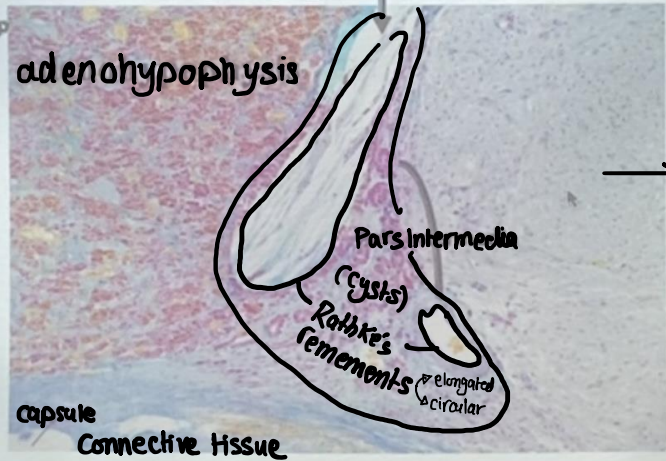
Rathke's pouch

* trichrome stain



adenohypophysis

* when you see blue-turquoise color then the stain is trichrome (also yellow, pink..)



neurohypophysis (Posterior)

Pars distalis Pars nervosa

light closer to whitish

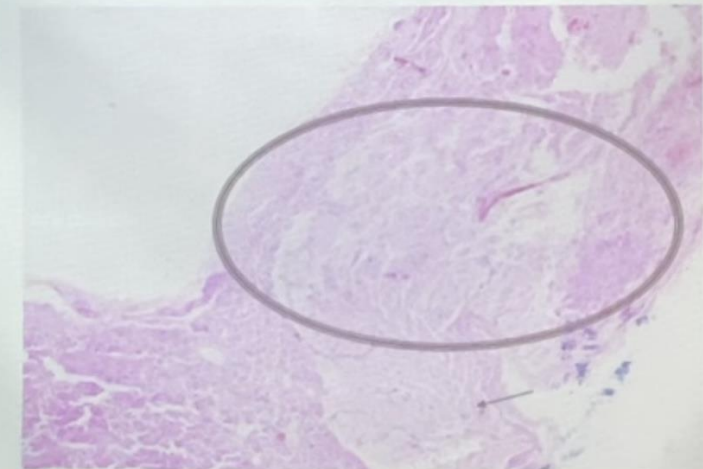


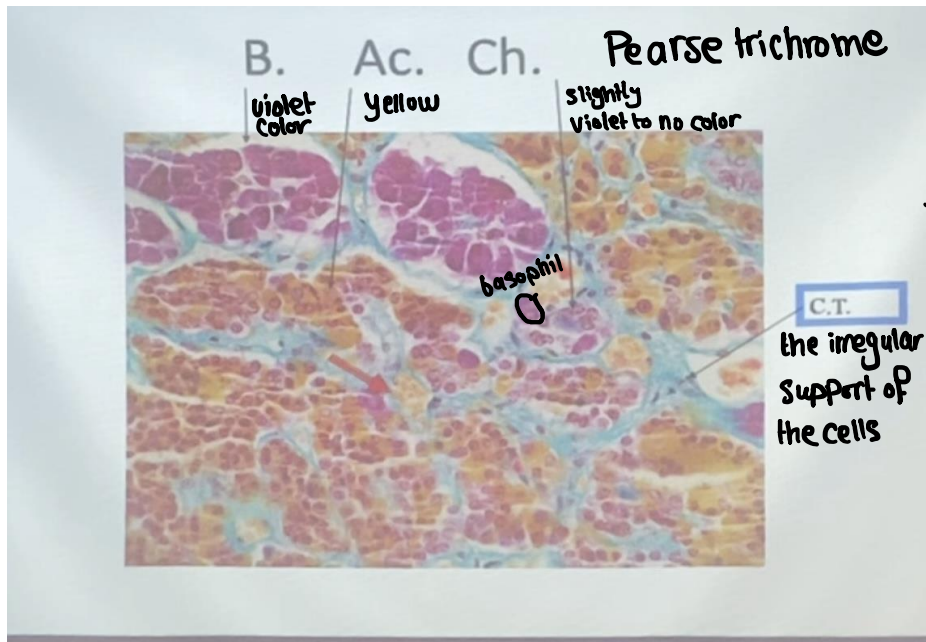
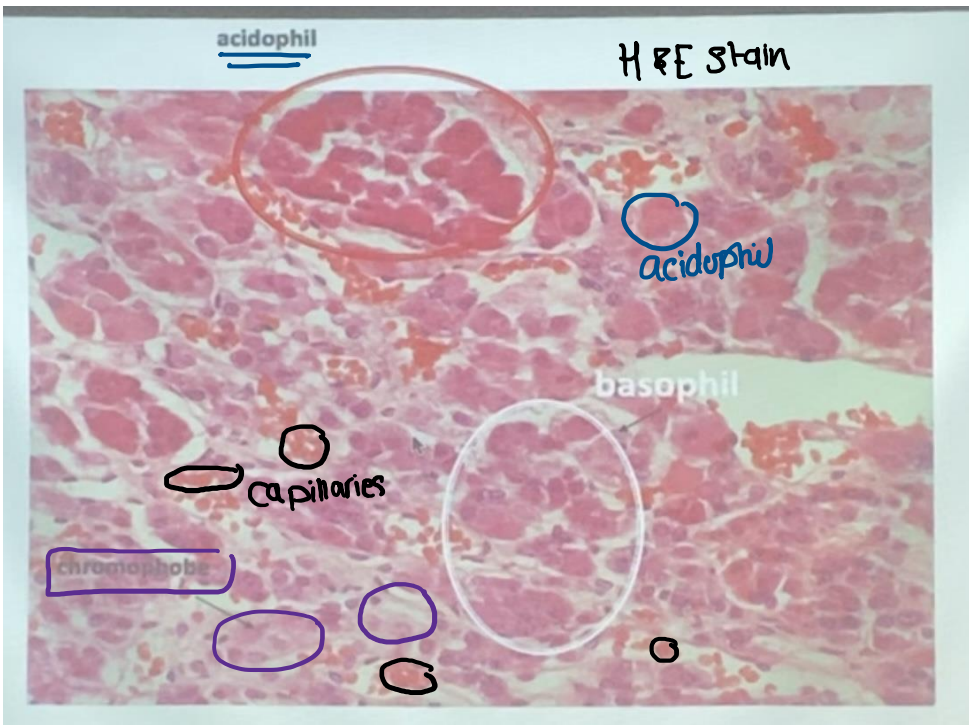
more intense in color & closer to posterior → Pars tuberalis

Pars intermedia

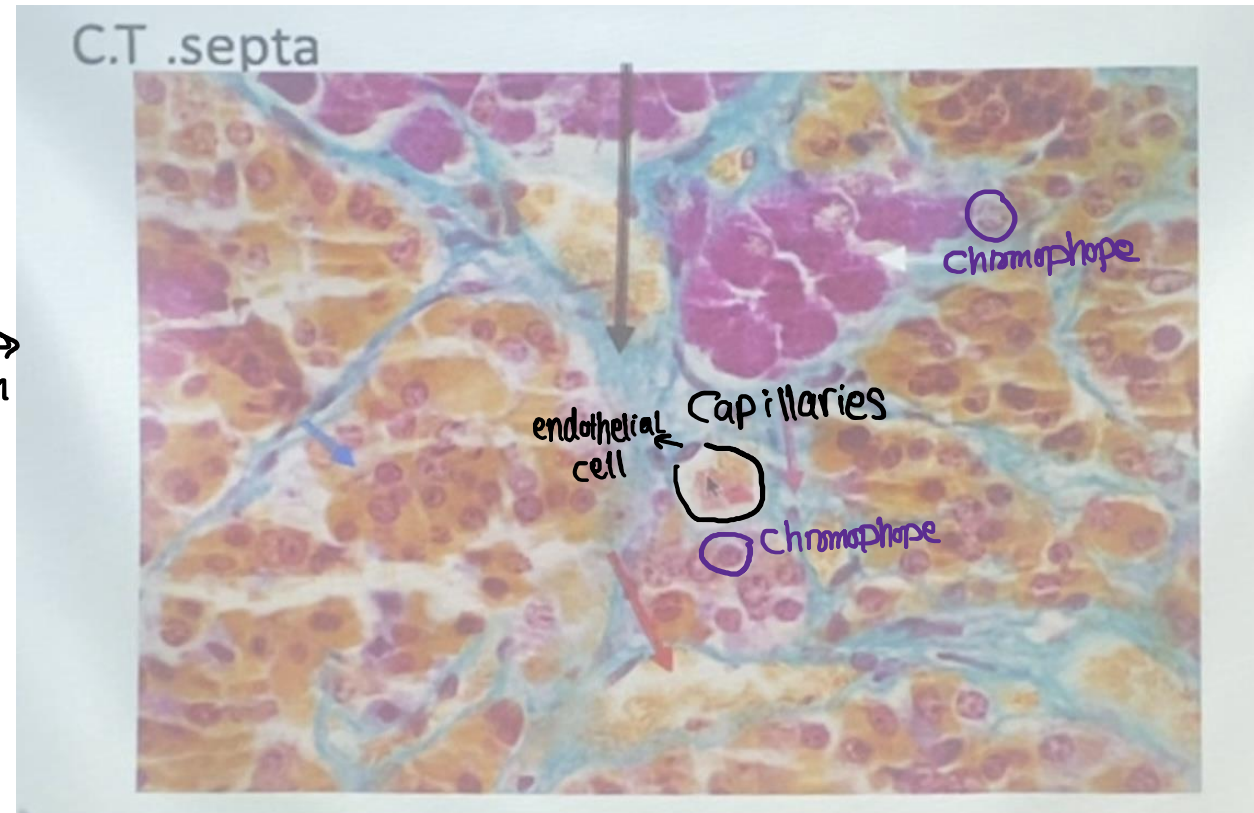
Hypophyseal stalk

pars tuberalis

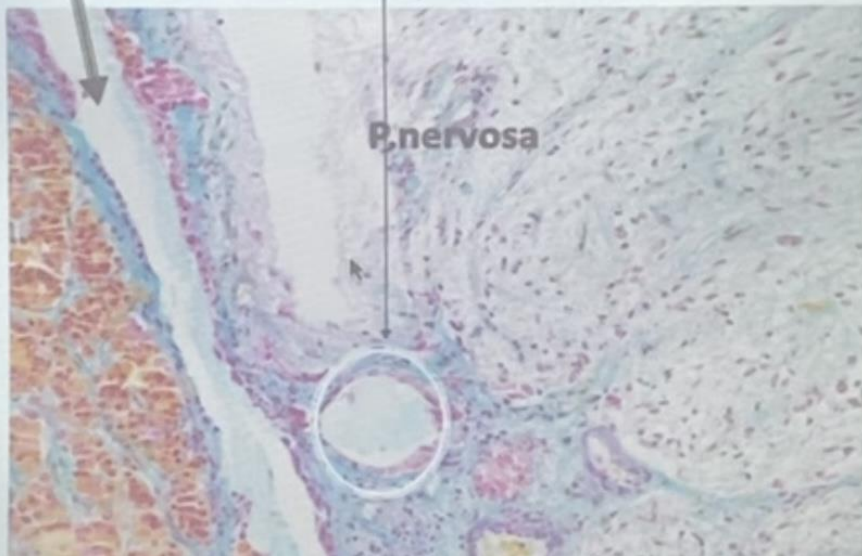




higher magnification →



Rathke's pouch
follicles of p.intermedia



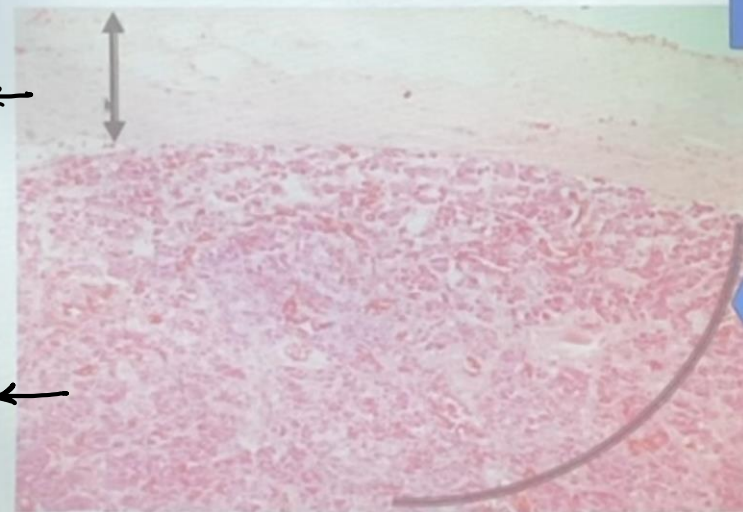
P.nervosa

P.distalis

Capsule – adenohypophysis
H&E stain

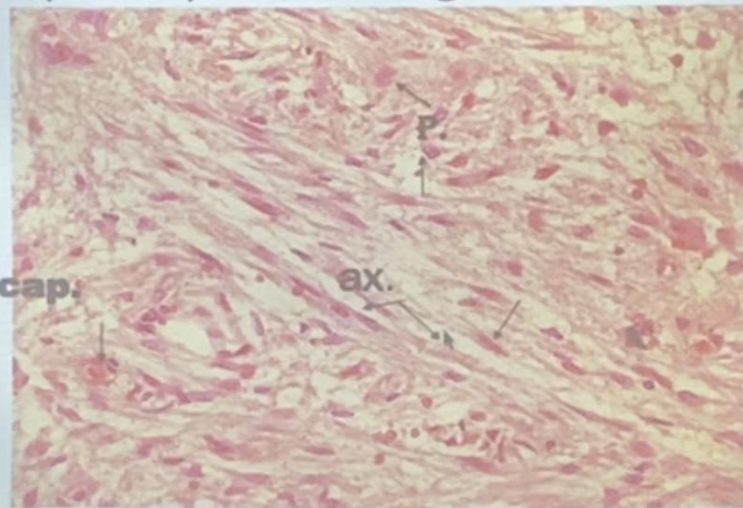
outer capsule

distalis



Axons of unmyelinated
nerve fibers, pituicytes, Hering bodies

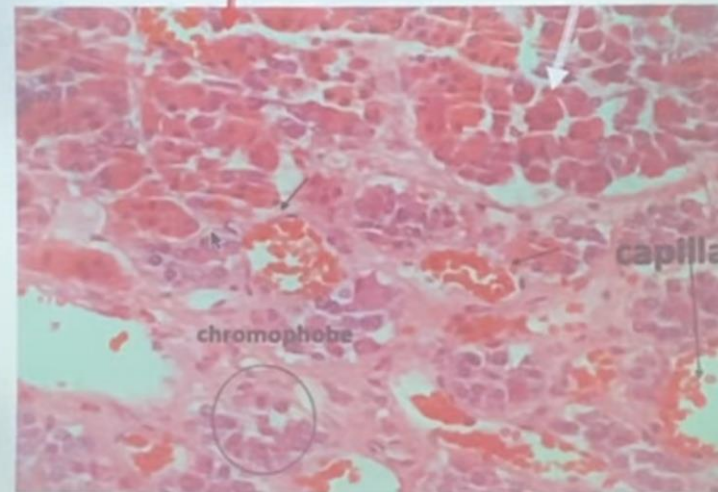
-Capillaries are in close
association with
Hering bodies



-the distal
ends of axons
also are close
to capillaries
(so when hormones
are released they
go directly into the blood)

Acidophil

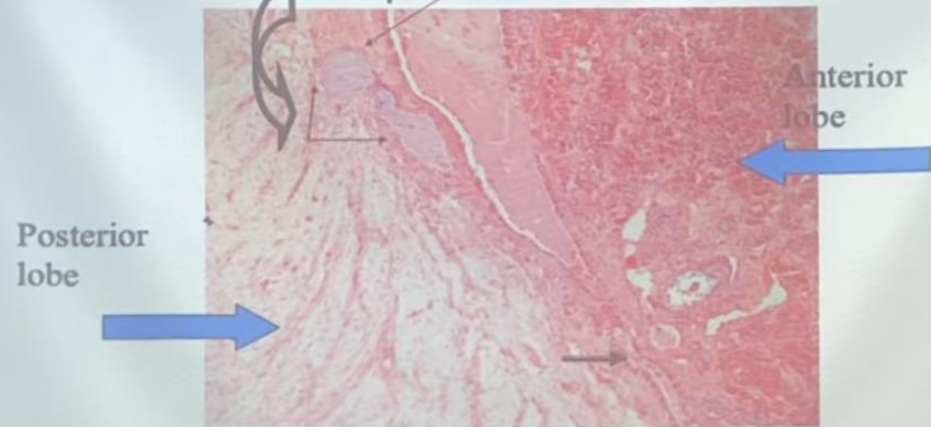
basophil



capillaries

chromophobe

H&E stain pituitary gl.
Colloid: follicles of p.intermedia



Neurohypophysis (posterior lobe)

