



# ENDOCRINE

## ANATOMY

#1



**WRITER:**  
Noor Abuhantash

**CORRECTOR:**  
Rama Hrab

**DOCTOR:**  
Ghada Abu Al-Ghanam

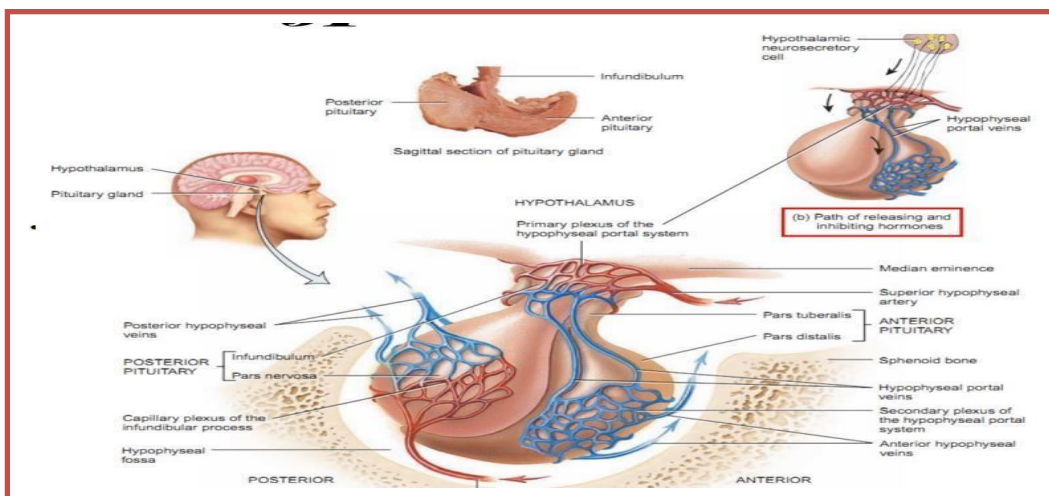
# THE ENDOCRINE SYSTEM -HYPOTHALAMUS

It seems our topic stands on glands and their secretions, so what is a gland from your histological memories? ;)

-glands: are invaginations of epithelial tissue toward the connective tissue and can be divided into two main types:

-Exocrine glands: have ducts to deliver their secretions

-Endocrine glands: (NO DUCTS) deliver their secretions (mainly hormones) to the interstitial fluid and then transported by neighboring blood vessels binding to their receptors on the target cells inducing an effect((( no specific receptor for the hormone, no effect)))



-let's deepen in:

The hypothalamus, thalamus, and epithalamus are major endocrine glands, the three form the "brain diencephalon".

-the maestro of the three is the HYPOTHALAMUS, since it affects the endocrine system in 2 ways:

**1. Secretions of two hormones. (ADH and oxytocin)**

**2. Controlling the secretion of the pituitary hormones by:**

**-Inhibitory (decrease pituitary gland secretions) and releasing hormones (increase the secretion)**

-beneath the hypothalamus, there is the master gland of the endo: the pituitary gland: the hypophyseal gland, which connects with the hypothalamus physically.

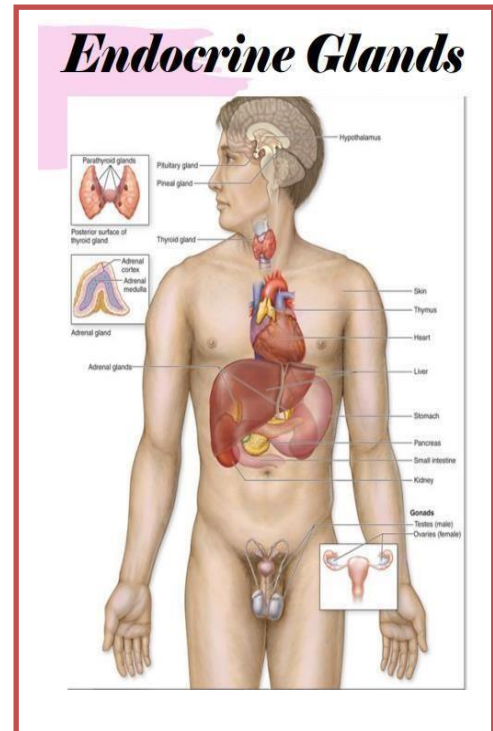
-there are glands having another function in addition to endocrine secretions, like:

- Hypothalamus (brain function, endo)**
- Thymus (neural function, endo)**
- Pancreas (mixed endo and exo gland)**
- Gonads etc.....!!!**

But:

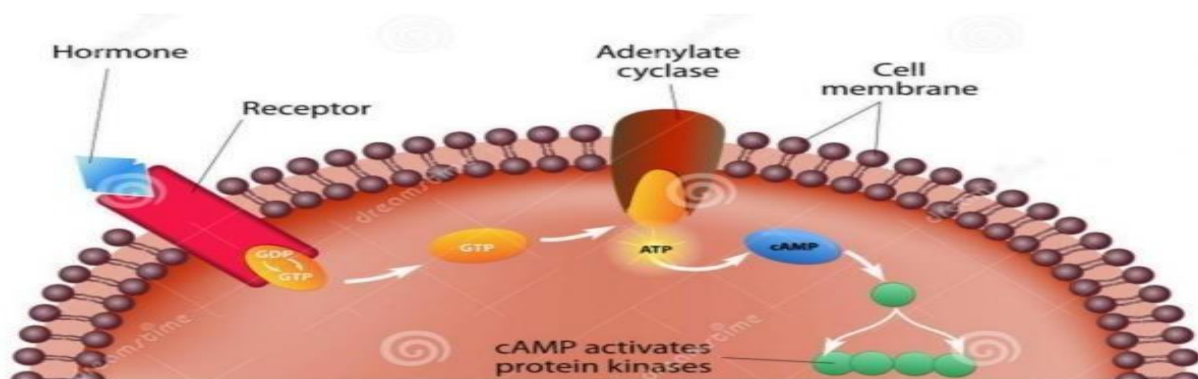
- **Pituitary \*\***
- **Pineal**
- **Thyroid**
- **Parathyroid**
- **Adrenal (suprarenal)**

-are exclusively endocrine glands



## 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.



-these hormones could be:

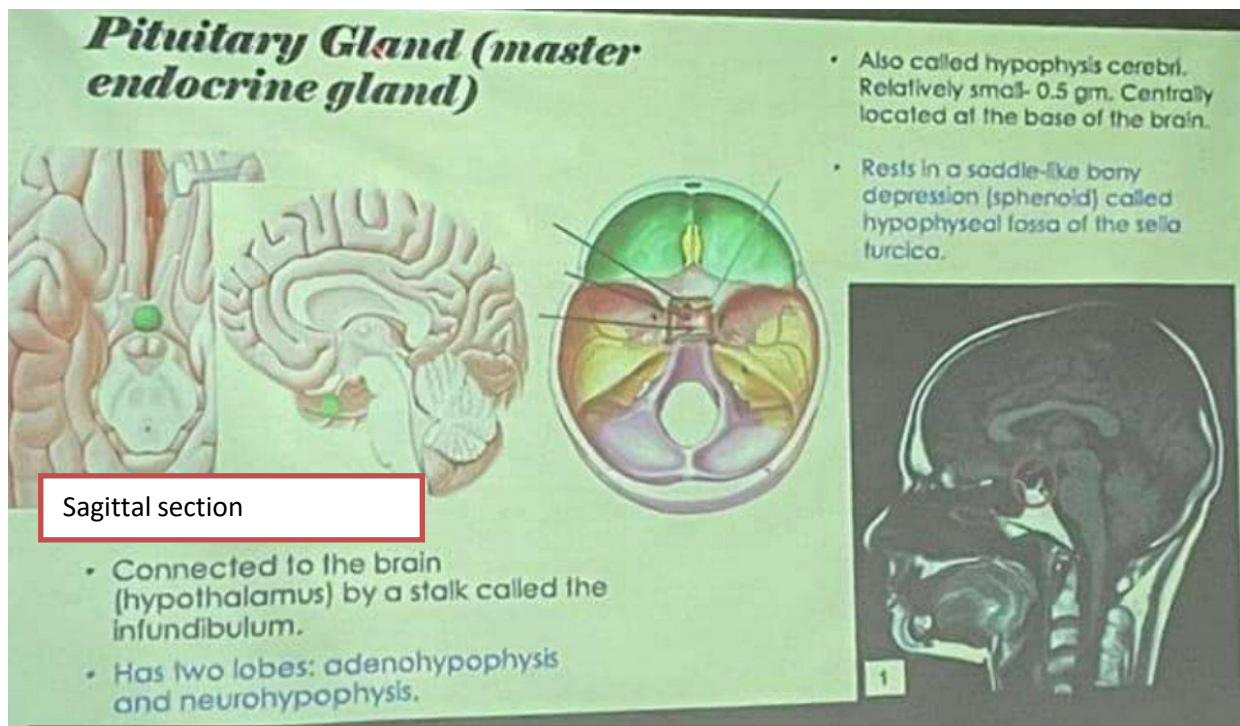
\*lipid soluble: penetrate the plasma membrane, entering the intracellular space, then they may bind to cytoplasmic receptors or enter the nucleus inducing genetic effects, either upregulating or downregulating a specific



gene....(upregulate gene expression → mRNA → cytoplasmic message → producing the hormone)

\*water soluble: can't penetrate the plasma membrane, bind to extracellular receptors inducing cascade signaling, and achieve the function.

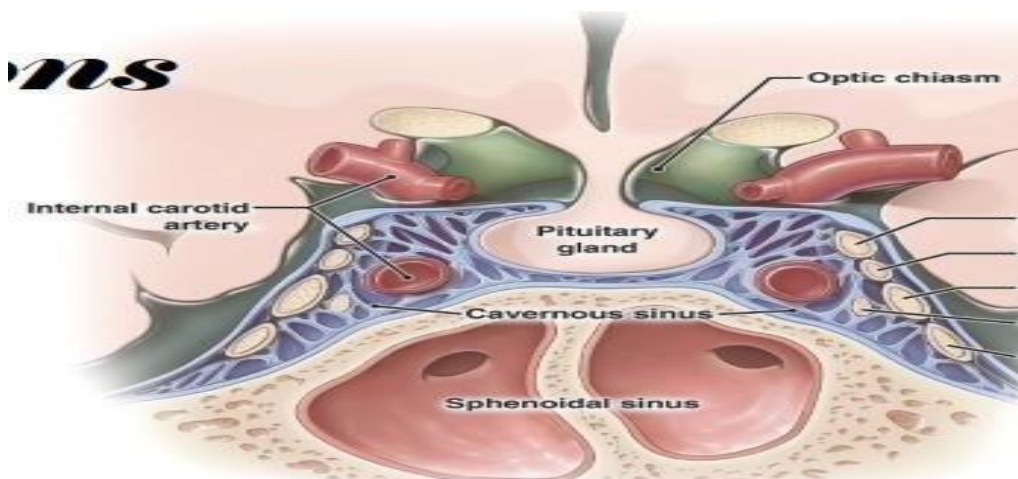
-an interpretation from the doc<sup>^</sup>-<sup>^</sup>: some hormones act by paracrine and autocrine pathways but most of them work by endocrine, also these endocrine hormones may not be able to affect nearby cells and the secreting cell.



Sagittal section

Black areas in x-rays: are less dense and have allowed more x rays to pass through  
White areas: dense tissue ( bone, teeth, etc)

## PITUITARY/RELATIONS



Cavernous sinus contents: Cranial nerves 3,4,6 and the maxillary and ophthalmic branches of CN 5 (Mandibular doesn't pass the cavernous!)  
-internal carotid A. from the common carotid emerging from THE brachiocephalic trunk of the aortic arch

## Coronal (frontal) view of the pituitary (hypophyseal) gland

-a tiny pea-shaped gland-

-it is located in depression called hypophyseal fossa (Sella turcica) of the sphenoid bone

-sella turcica means Turkish saddle

### **-Anterior: Sphenoid sinus.**

(sinus: space within the bone in the nasal cavity surrounded by mucosa)

• **Posterior: dorsum sellae** (the posterior part of the sphenoid body), basilar artery, pons.

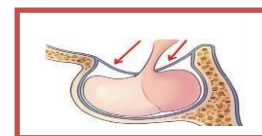
• **Inferior: the body of the sphenoid (sinus).**

• **Superior: Diaphragma sellae.**

-Diaphragm means an opening

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

-optic chiasma: where the left and right optic nerves cross each other before reaching the orbits. Any adenoma or carcinoma in this place will affect the vision.



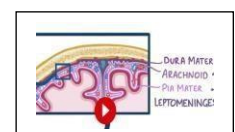
-note: diaphragma sellae doesn't cover the whole roof of the PG, since there is physical communication between the hypothalamus and PG (infundibulum)

• **Lateral: cavernous sinus (contents)**,,, there is no medial relation, since the PG is the midline itself

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

-clarification: the brain is covered by meninges, which have 3 layers (the inner: pia, middle: arachnoid and the outer

(toughest: dura). The dura mater is embedded in the brain to the spinal cord. In the spinal cord, it has one layer, while in the brain, it has 2

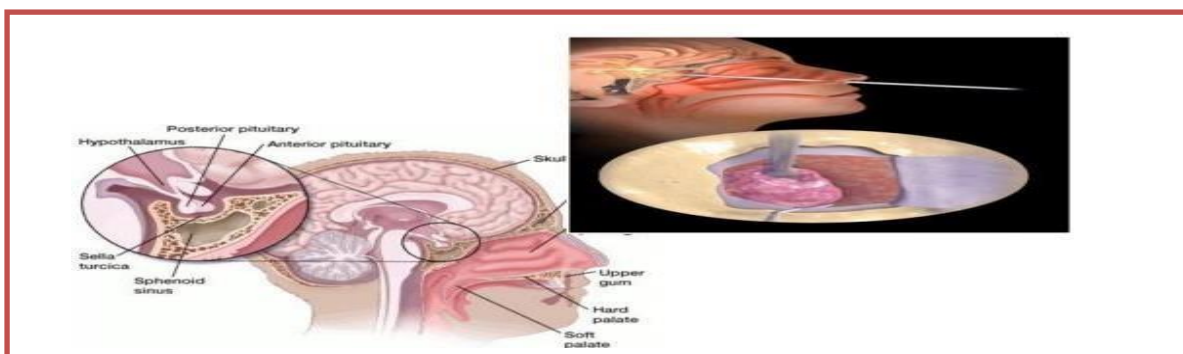


layers(external and internal) within a space between them filled with a venous network called a cavernous sinus.

-so, the cavernous sinus has a venous network responsible for orbital drainage, carotid artery, and ophthalmic artery,...



## ENDOSCOPIC TRANSNASAL/TRANSPHENOIDAL



- **Is the most common procedure for removing pituitary tumors.**

-if there is adenoma or benign enlargement and increase in the number of secreting hormone cells, then the first approach is supervision, if it is still complicated, the solution would be endoscopy rather than surgery.

- **The neurosurgeon reaches the tumor through the nasal passages and the sphenoid sinus.**

-the instrument has to enter the nasopharynx and then posteriorly to the sphenoid sinuses reaching PG, hence it is called transsphenoidal.

- **Less-invasive approach--avoid important brain structures by accessing the pituitary gland from underneath the brain.**

-surgical approach requires removing the skull vault and some brain to reach the PG.

- **Transsphenoidal surgery leaves no visible scar, and minimizes the risk of complications, and enables faster recovery.**

-the more conservative the procedure is, the better the cost of the condition(quick recovery, fewer side effects)

## •Craniotomy!!

-unfortunately, in some serious cases, especially malignant carcinoma, and when the endoscopic approach is not effective enough, surgery is the solution.

\*note: the pharynx join with three parts forming: nasopharyngeal(anterior to PG), oropharyngeal and laryngopharyngeal.

## STRUCTURE AND ORIGIN

**Two tissue types--- two origins.**

-PG has 2 lobes:

### • Adenohypophysis (anterior lobe):

- **Pars tuberalis.**(it forms when the Rathke`s pouch attaches to the infundibulum)

- **Pars intermedia.**

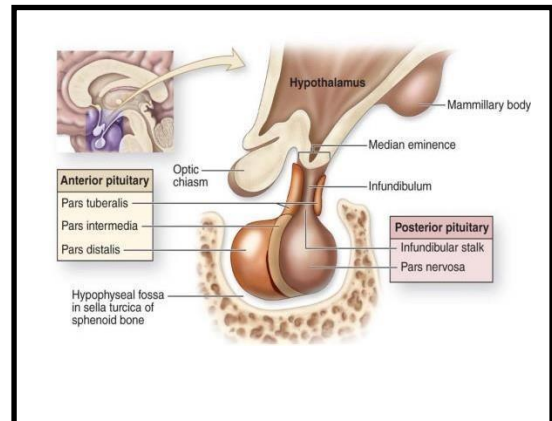
-**Pars distalis.**

### • Neurohypophysis (posterior lobe):

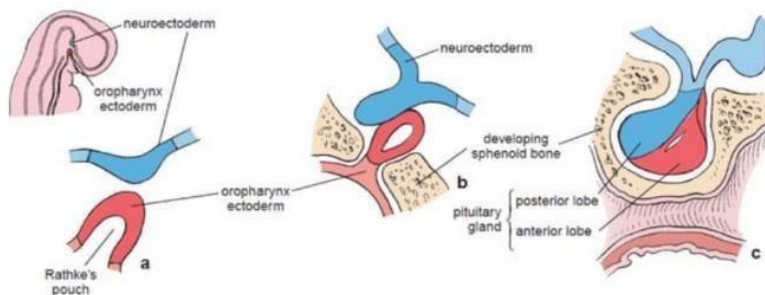
It is connected to the hypothalamus by a stalk called the infundibulum

- **Infundibular stalk.**

-**Pars nervosa**



## PITUITARY ORGANOGENESIS



Development of pituitary gland

• 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.

Some clarification, just read and enjoy 😊

The 2 lobes of the PG are embryologically, histologically, and anatomically different,

-The anterior lobe is derived from the upward evagination of the oral ectoderm, forming a pouch-like structure called RATHEK'S POUCH.

### At the same time

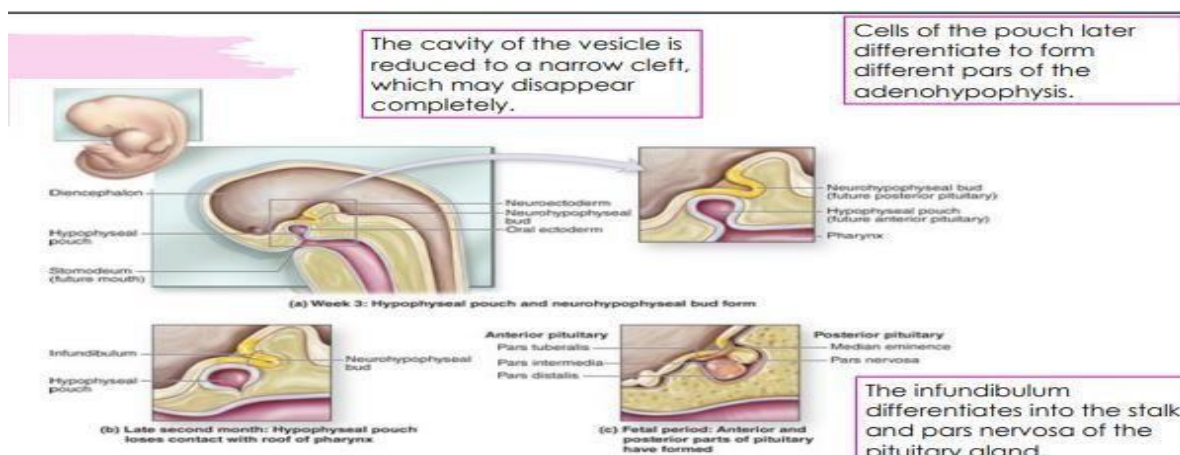
-the posterior lobe will be derived from a downward evagination of the neuroectoderm of the diencephalon, forming a stalk-like structure, the future infundibulum

-notice that both originated from thickened ectoderm

-at weeks 6-8, Rathke's will lose connection with the **oral cavity**, while the posterior lobe will maintain the connection with the hypothalamus through the infundibulum, according to its signaling pathway significance.

-the floor of the PG will ossify eventually.

-the space btw the 2 lobes will be filled with the differentiated cells till becoming microscopic space.





--to conclude, as it is mentioned previously the 2 functions of the hypothalamus is:

- 1) releasing and inhibitory secretion: the effect of the anterior lobe of PG
- 2) secreting its own hormones: the effect will be on the posterior lobe:  
HOW?

The hypothalamus has many nuclei(collection of neurons), and some of these nuclei are responsible for producing ADH and oxytocin, which will transmit through the axons of these neurons in the infundibulum to the pars nervosa(a nervous tissue), SO WE CAN CALL THIS WAY A TRACT although it is short, and this tract is called: HYPOTHALAMO-HYPOPHYSEAL TRACT.

## **PAST PAPER**

**1. Which one of the following pairs is mismatched:**

- A. Neuroendocrine - Anterior Pituitary
- B. severe headache – pituitary apoplexy

**2. Wrong about pituitary:**

- A. Hypothalamohypophyseal tract injury lead to ADH deficiency
- B. Posterior pituitary contain neurosecretory granules
- C. Anterior lobe give bright spot
- D. The gland is inferior to the optic chiasm

A  
C



# V2

Page 8: hypothalamus → oral cavity

-note the box in page 4, was added by the doc in another section lecture