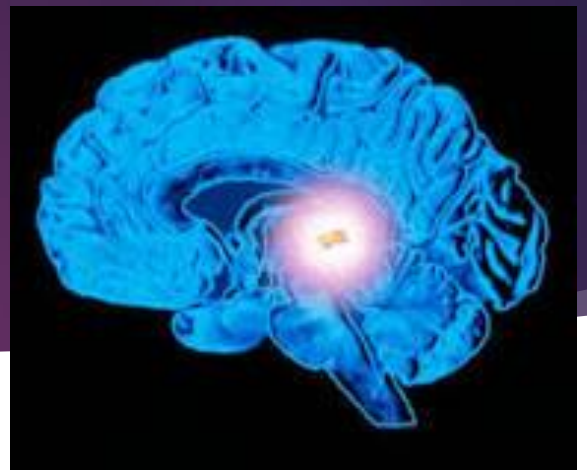


Suprarenal gland
Pineal body
DNES

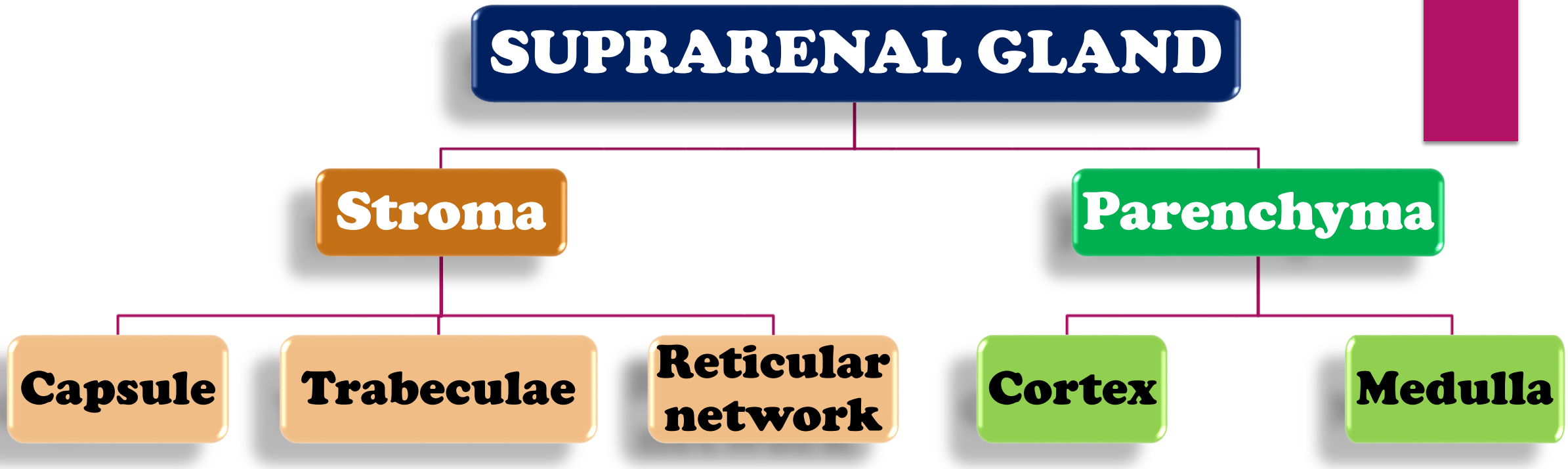
HISTOLOGY

Semester 2, Year 2 •

Dr . Amira Osman

Associate professor of Human histology & Cell Biology

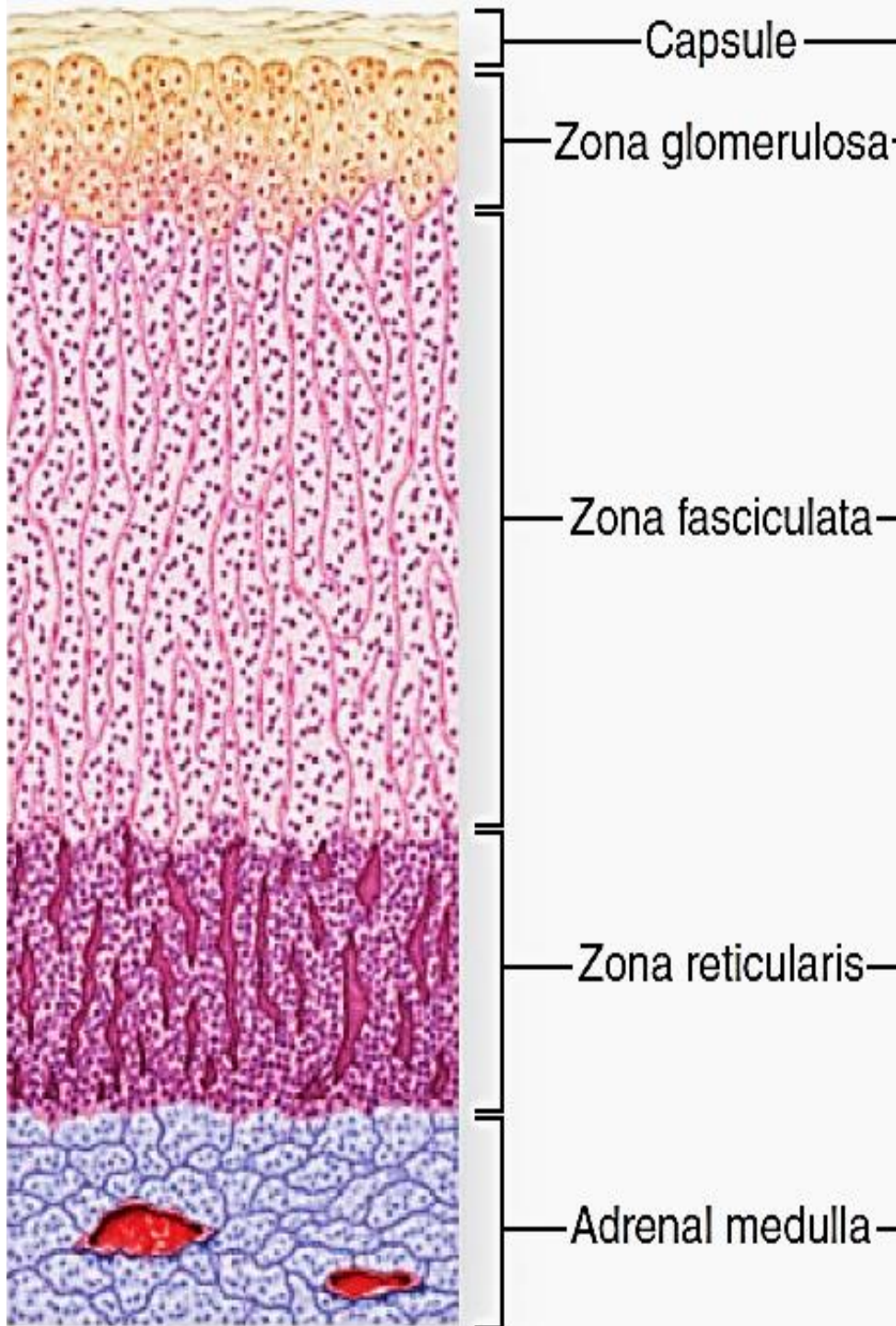
SUPRARENAL GLANDS



	Cortex	Medulla
Origin:	Mesodermal	Ectodermal (neural crest)
Size:	Thick	Thin
Colour:	Yellowish (lipid)	Pink (vascular)
Function:	Essential for life	Not essential for life

Suprarenal Cortex

- Zona Glomerulosa
- Zona Fasciculata
- Zona Reticularis

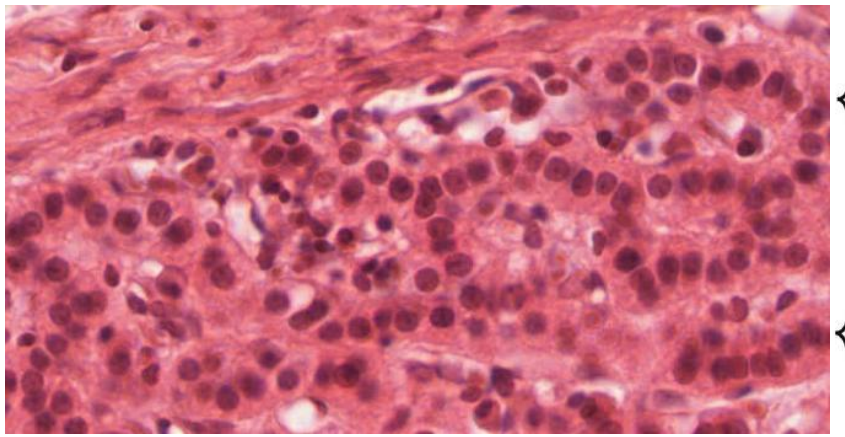


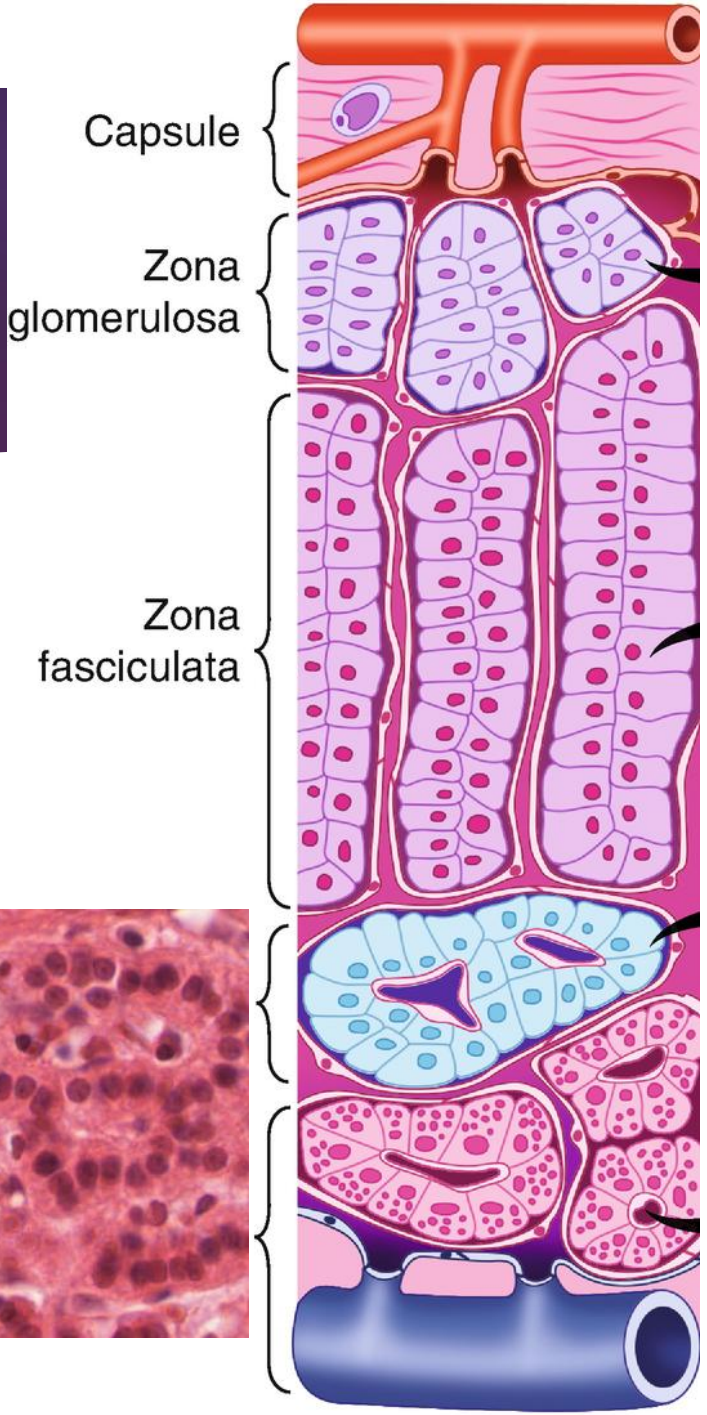
Zona Glomerulosa

- Under the capsule
- 15 %
- Round, oval glomeruli or inverted U-shaped arched cords
- Fenestrated capillaries surround glomeruli

Cells:

- L/M
  - Columnar or pyramidal
  - Spherical, closely packed nuclei
  - Few lipid droplets





Zona Glomerulosa

Cells:

- **E/M**
  - **Well-developed sER**
  - **Numerous mitochondria**
  - **Well-developed Golgi & rER**

Function:

Mineralocorticoid (aldosterone)

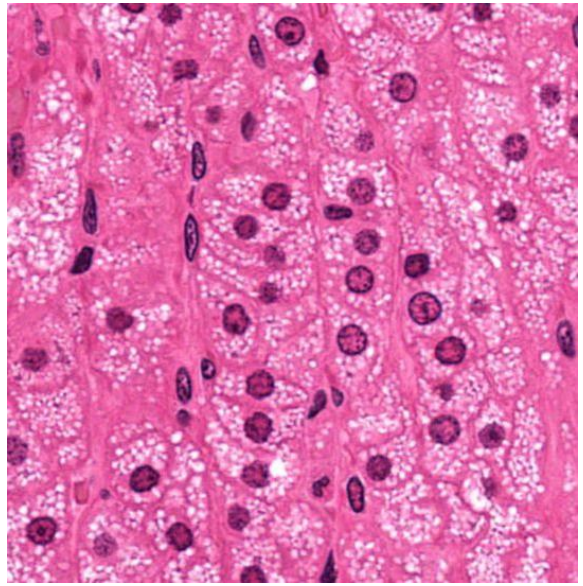
- **↑ Na reabsorption from DCT**

Control:

Angiotensin II

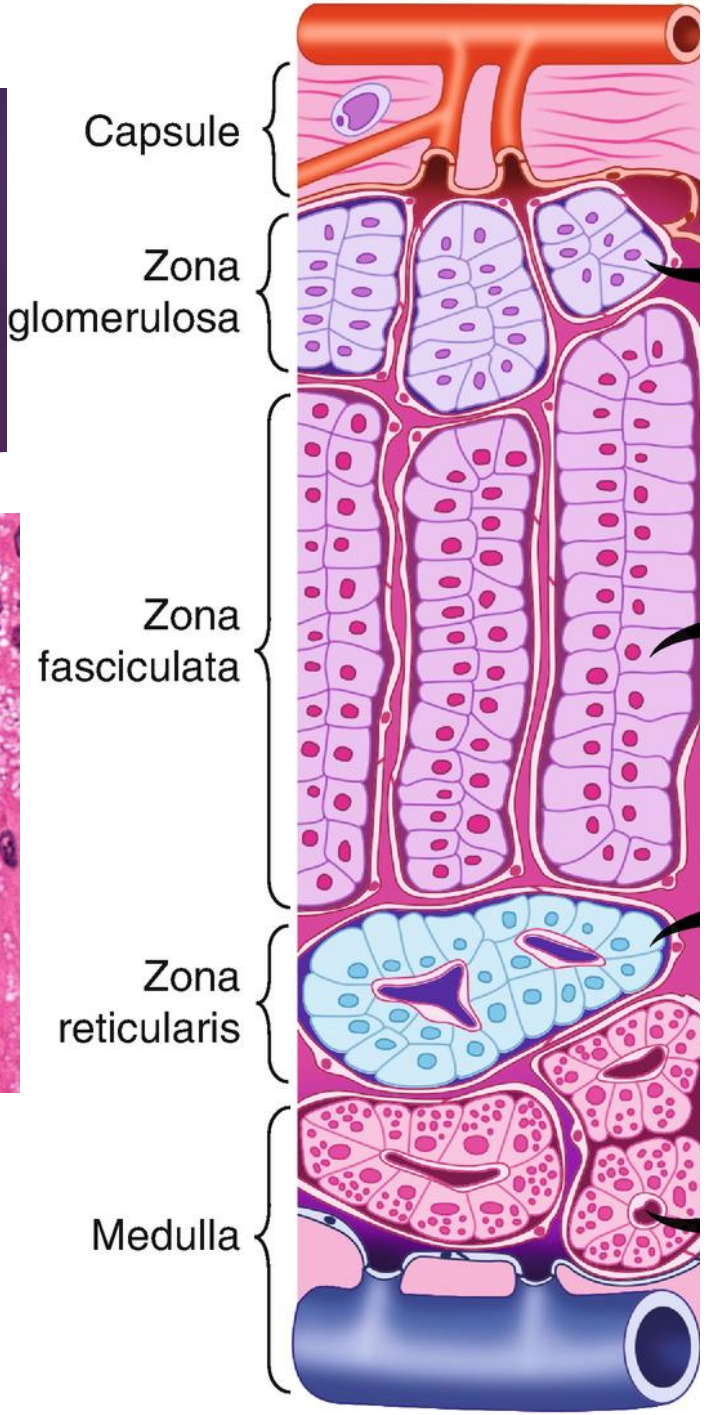
Zona Fasciculata

- **Middle** **65-80 %**
- **Parallel cords (1-2 cells)**
- **Longitudinal fenestrated capillaries**



Cells: (Spongiocytes)

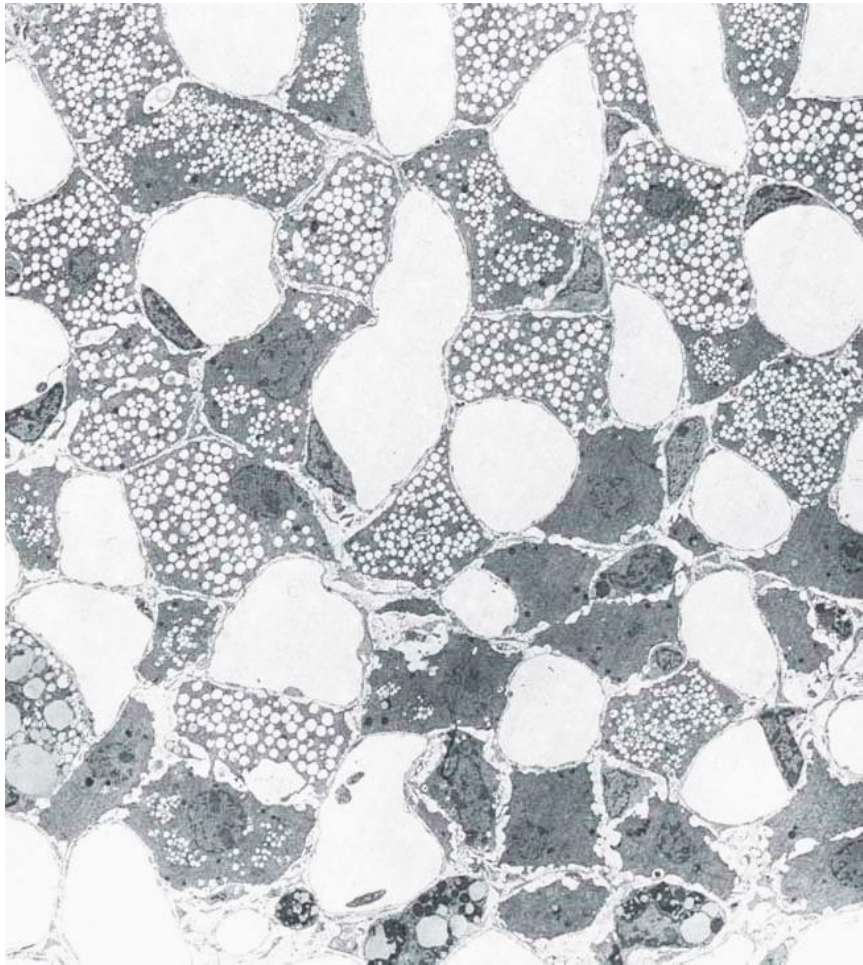
- **L/M**
  - **Large polyhedral**
  - **Large vesicular nuclei ± binucleated**
  - **Vacuolated cytoplasm (lipid)**



Zona Fasciculata

Cells:

- **E/M**
  - **Well-developed sER**
  - **Numerous mitochondria & tubular cristae**
  - **Well-developed Golgi & rER**
- **Function:**
- **Glucocorticoids (cortisol & hydrocortisone)**
- **Control:** **ACTH**

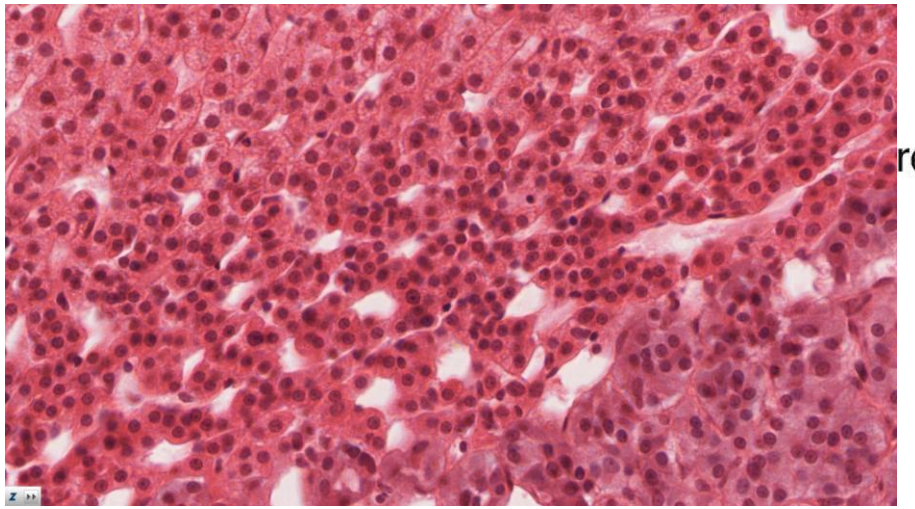


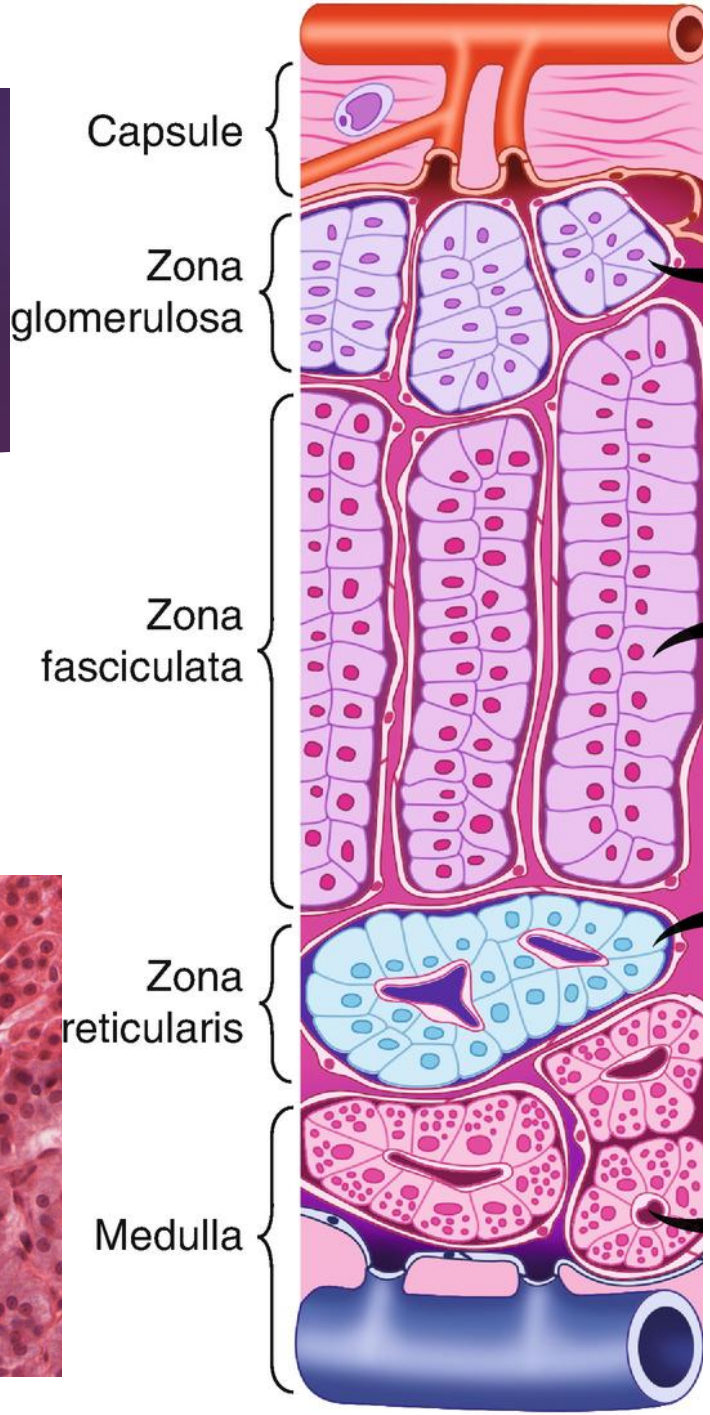
Zona Reticularis

- **Deepest** **10 %**
- **Branching & anastomosing cords**
- **Fenestrated capillaries between**

Cells:

- **L/M**
  - **Small polyhedral**
  - **Closely packed nuclei**
  - **Few lipid droplets**





Zona Reticularis

Cells:

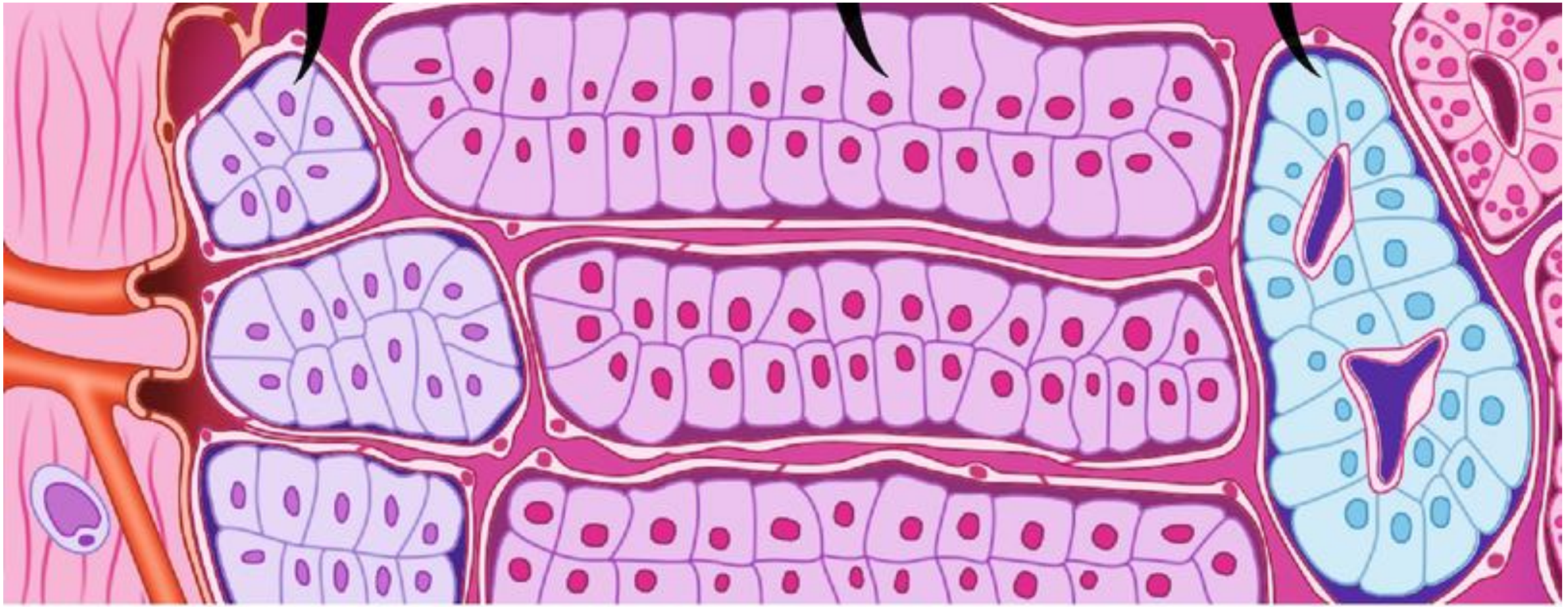
- **E/M**
  - **Well-developed sER**
  - **Numerous mitochondria & tubular cristae**
  - **Little rER**

Function:

- **Sex hormones (androgen)**
- **Few glucocorticoids**

	Zona Glomerulosa	Zona Fasciculata	Zona Reticularis
Site	Under the capsule	Middle	Deepest
Thickness	15 %	65-80 %	10 %
Arrangement	Round, oval glomeruli or inverted U-shaped arched cords	Parallel cords of cells (1 – 2 cells in width) in a radial direction toward the medulla	Branching & anastomosing cords of cell
Capillaries	Surround the glomeruli	Longitudinal	Between cells
Cells:			
L/M		Spongiocytes	
Shape	Columnar or pyramidal	Large polyhedral	Small polyhedral
Nucleus	Spherical, closely packed	Large vesicular, may be binucleated	Closely packed
Cytoplasm	Few lipid droplets	Vacuolated (numerous dissolved lipid droplets)	Few lipid droplets
		Neutral fats ,fatty acids, cholesterol, phospholipid	
E/M			
sER	Well-developed	Well-developed	Well-developed
Mitochondria	Numerous	Numerous & tubular cristae	Numerous & tubular c.
Golgi + rER	Well-developed	Well-developed	Little

	Zona Glomerulosa	Zona Fasciculata	Zona Reticularis
Function	Secrete mineralocorticoid (aldosterone) → ↑ sodium reabsorption from DCT.	Secrete glucocorticoids (cortisol & hydrocortisone)	Secrete sex hormones and few glucocorticoids
Control	Angiotensin II	ACTH	



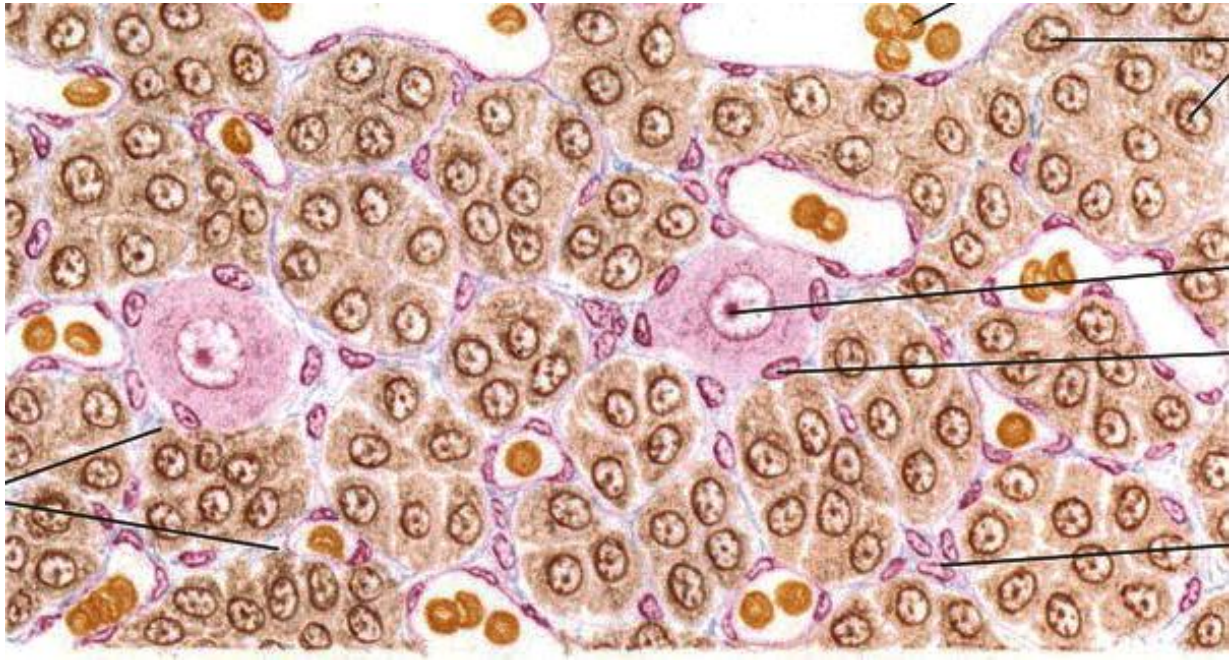
Suprarenal Medulla

- **Anastomosing cords of cells surrounded by fenestrated blood capillaries.**

Cells:

- **Chromaffin cells**
- **Sympathetic ganglion cells**

Nerve cells



Chromaffin Cells

Chromaffin cells (or chromaffin positive) because they develop an intense brown color when exposed to a strong oxidizing agent (chromium salts). This is called ***chromaffin reaction***. This reaction is specific for cells containing catecholamines.

Chromaffin Cells

- Modified sympathetic neurons
- Specialized as secretory cells
- No axons or dendrites

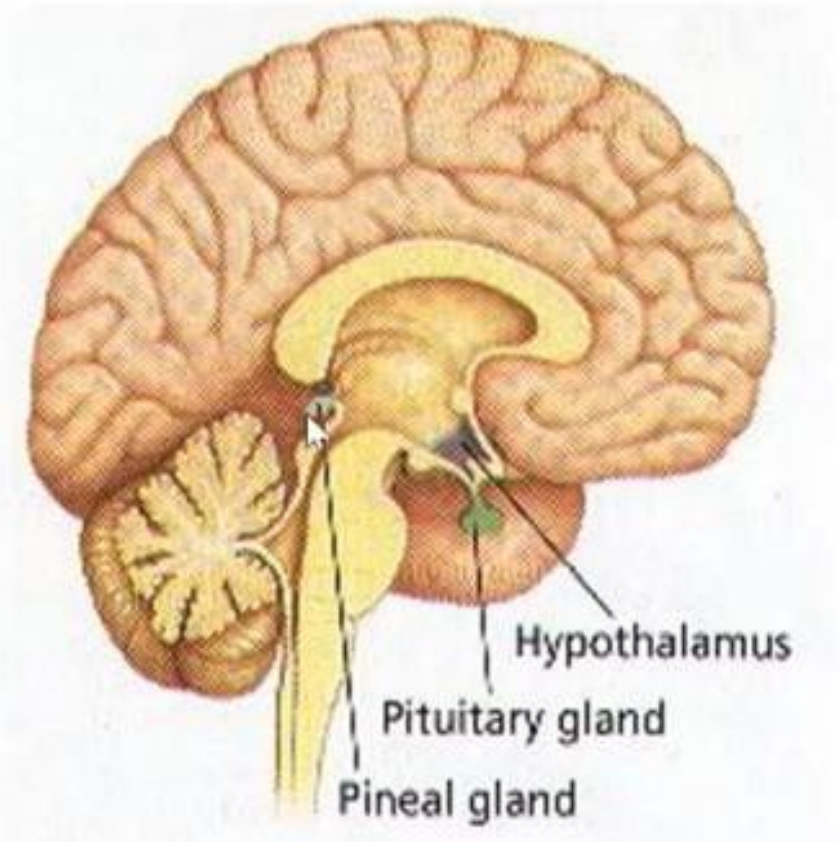
- L/M
  - Polyhedral
  - Pale basophilic cytoplasm
  - Chromaffin reaction: +ve

- E/M
  - rER & Golgi
  - Electron dense granules (density & size)

- Function
  - Adrenaline 80%
  - Noradrenaline 20%

Pineal gland

Site: on the posterior part of third ventricle at the mid line between two cerebral hemispheres .

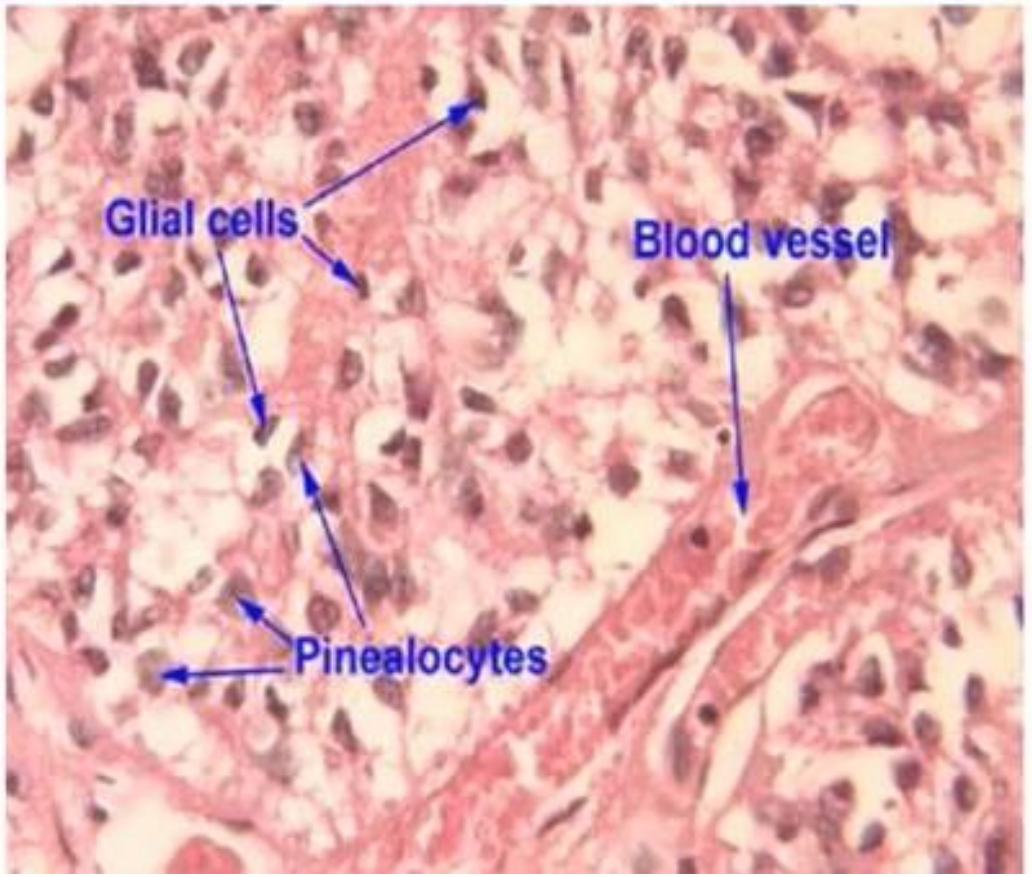


Structure of the pineal gland

- It is covered by pia matter which sends CT septa carrying *the blood vessels.*
- It consists of 2 types of cells:

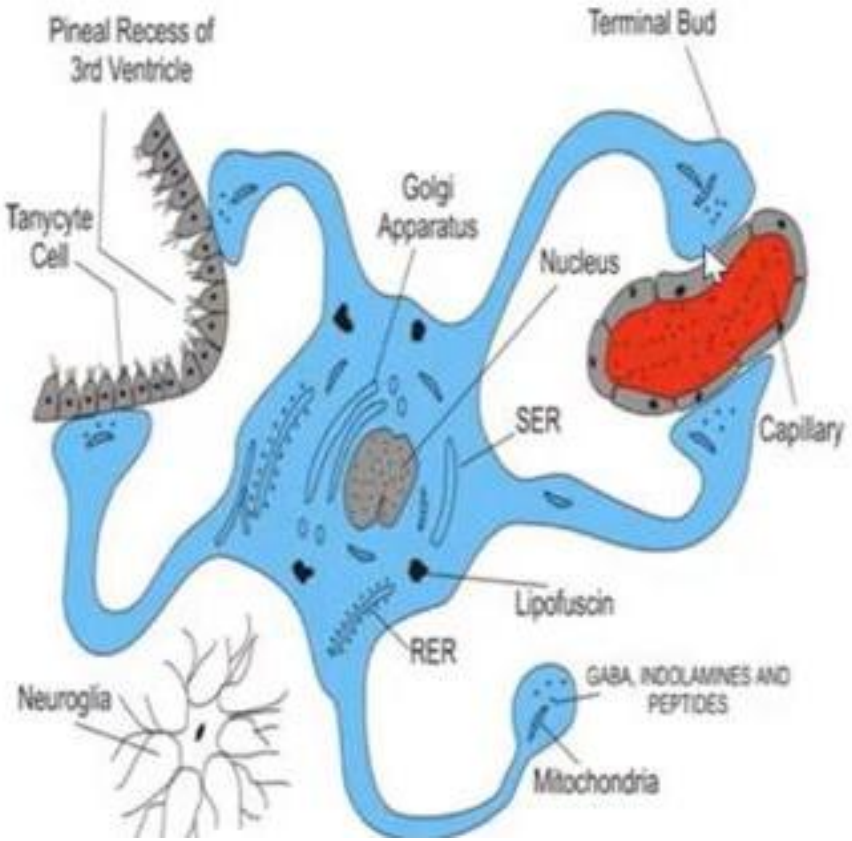
A- Pinealocytes (secretory cells).

B- Glial cells (resemble astrocytes): for support.



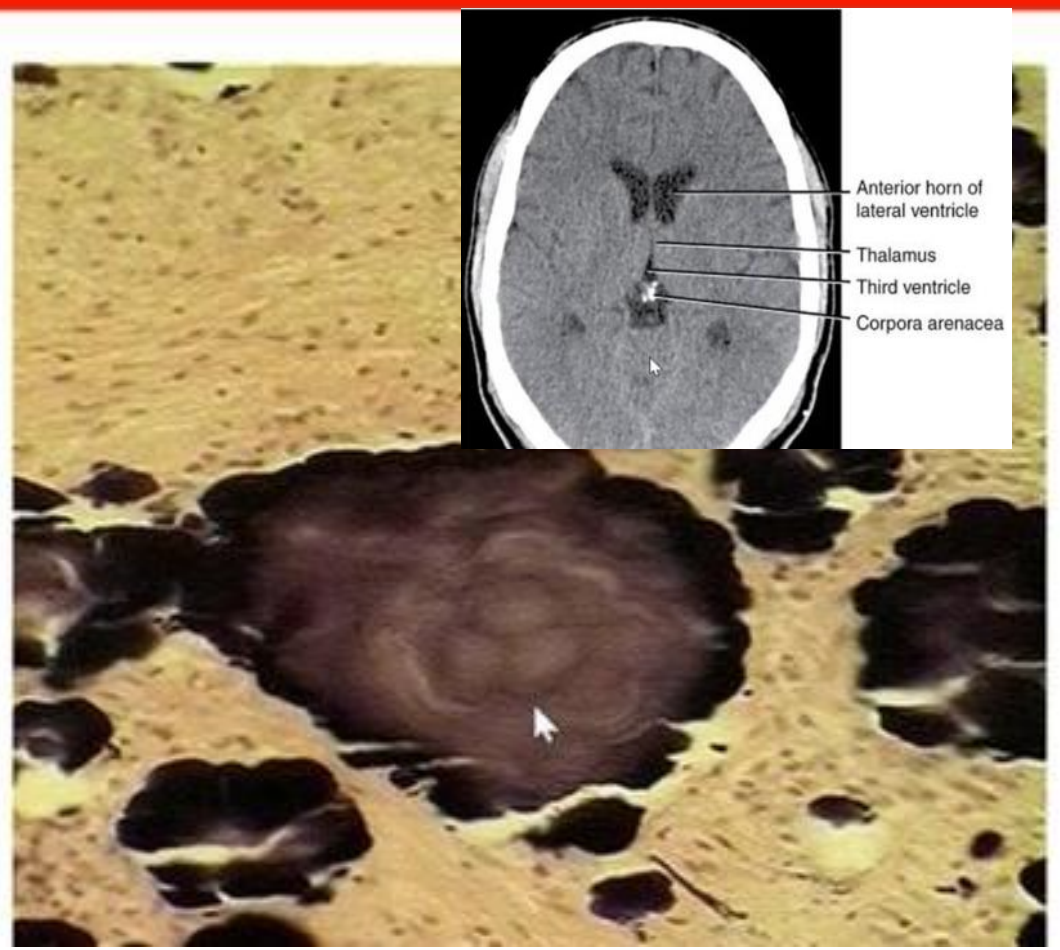
Pinealocyte

- **Shape:** branching with long tortuous processes end as flat dilatations near blood capillaries (WHY).
- **Nucleus:** large, lobulated with prominent nucleoli.
- **Cytoplasm:** pale basophilic (WHY)with secretory granules.
- **Function:** secretion of melatonin.



Corpora arenacea (brain sand)

- **Definition:** Formation of calcified bodies which increase in number & size by age.
- **Importance:** it can be used as a clinical landmark for the midline location of the pineal gland during radiological examination of the brain.



Functions of Melatonin

1- Controls circadian rhythm

2- Induces feeling of sleepiness

3- Decreases gonadotropin

4- Protects CNS from oxidative stress

DIFFUSE NEUROENDOCRINE SYSTEM

- They are small granules-containing cells that exist individually or in small groups.

- They are endocrine cells present among non-endocrine cells.

Origin: They are endodermal in origin

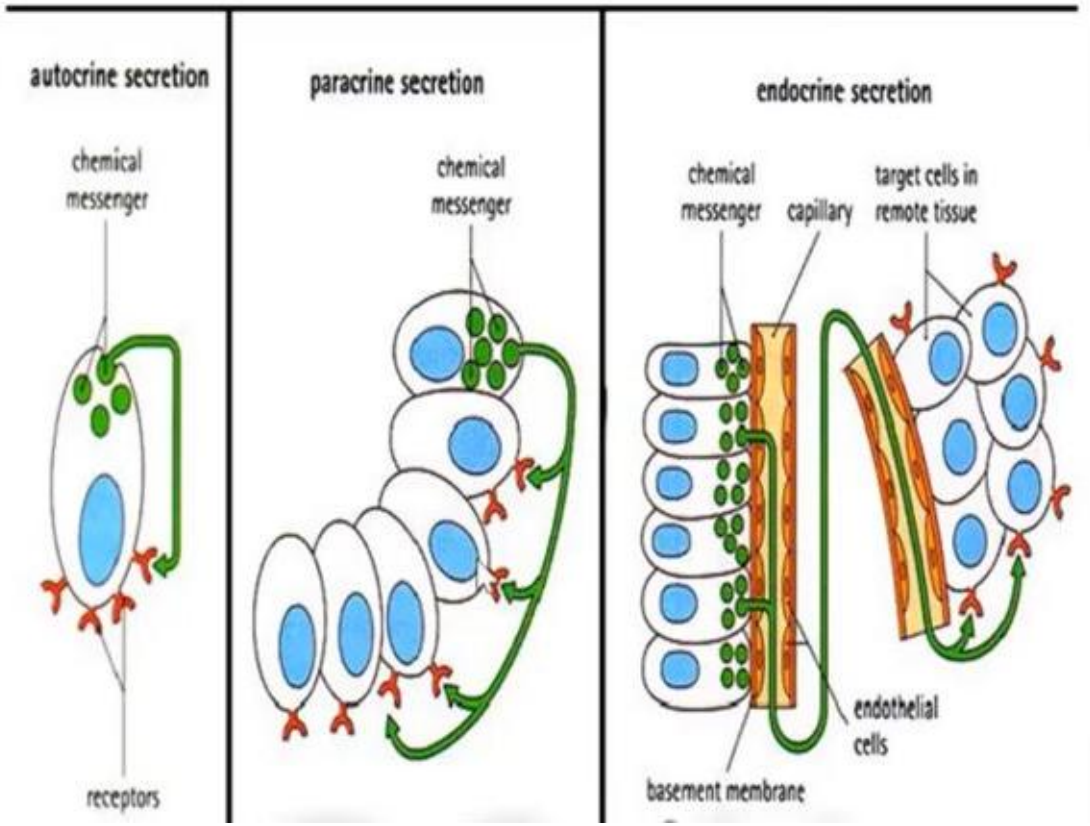
Sites: these cells are wide spread throughout the body .

Modes of action of their hormones

1- Paracrine: act on the neighboring cells.

2- Autocrine: act on the cell that secrete the hormone itself.

3- Endocrine: act on target cells in remote tissue.



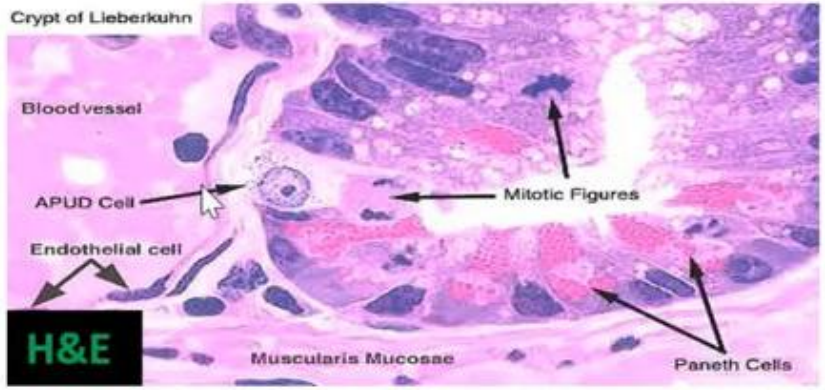
How to identify the DNES in histological sections?

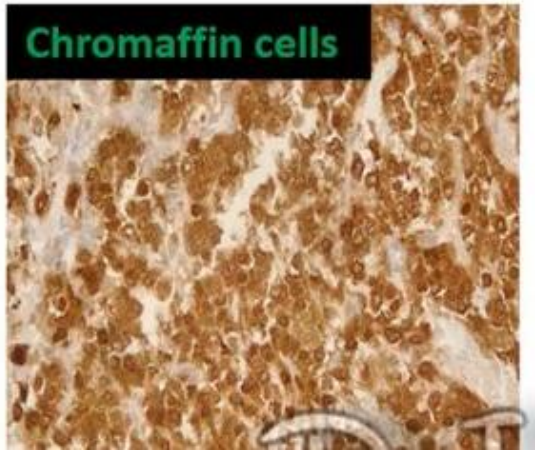
1- H&E: These cells are not well seen.

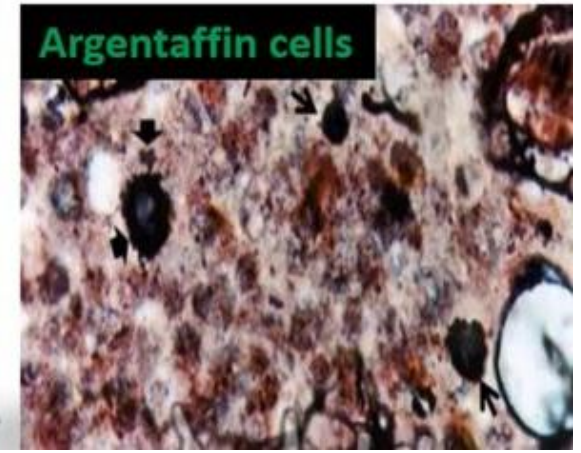
2- Special stain:

- chromium salts (chromaffin cells).
- silver salts (argentaffin cells).

3- Immunohistochemical stain: using antibodies against their peptide hormone.







DIFFUSE NEUROENDOCRINE SYSTEM

L/M:

- Many DNES cells are stained by solutions of chromium salts and have therefore called enterochromaffin cells or stained with silver salts, so they are also called argentaffin or argyrophil cells, or can be identified by immunocytochemical methods.

E/M:

- Small amount of **rER**.
- Supranuclear **Golgi**.
- Basal **secretory granules.**

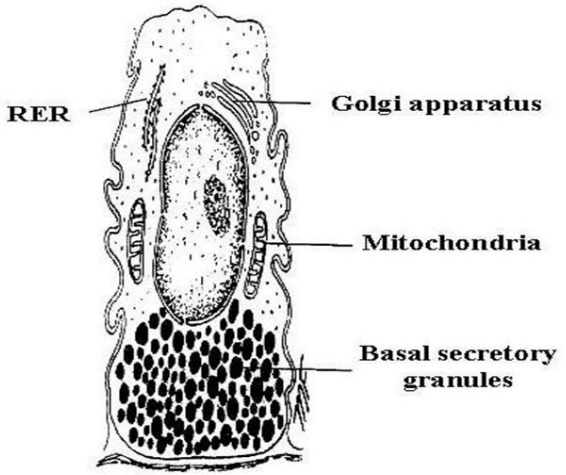
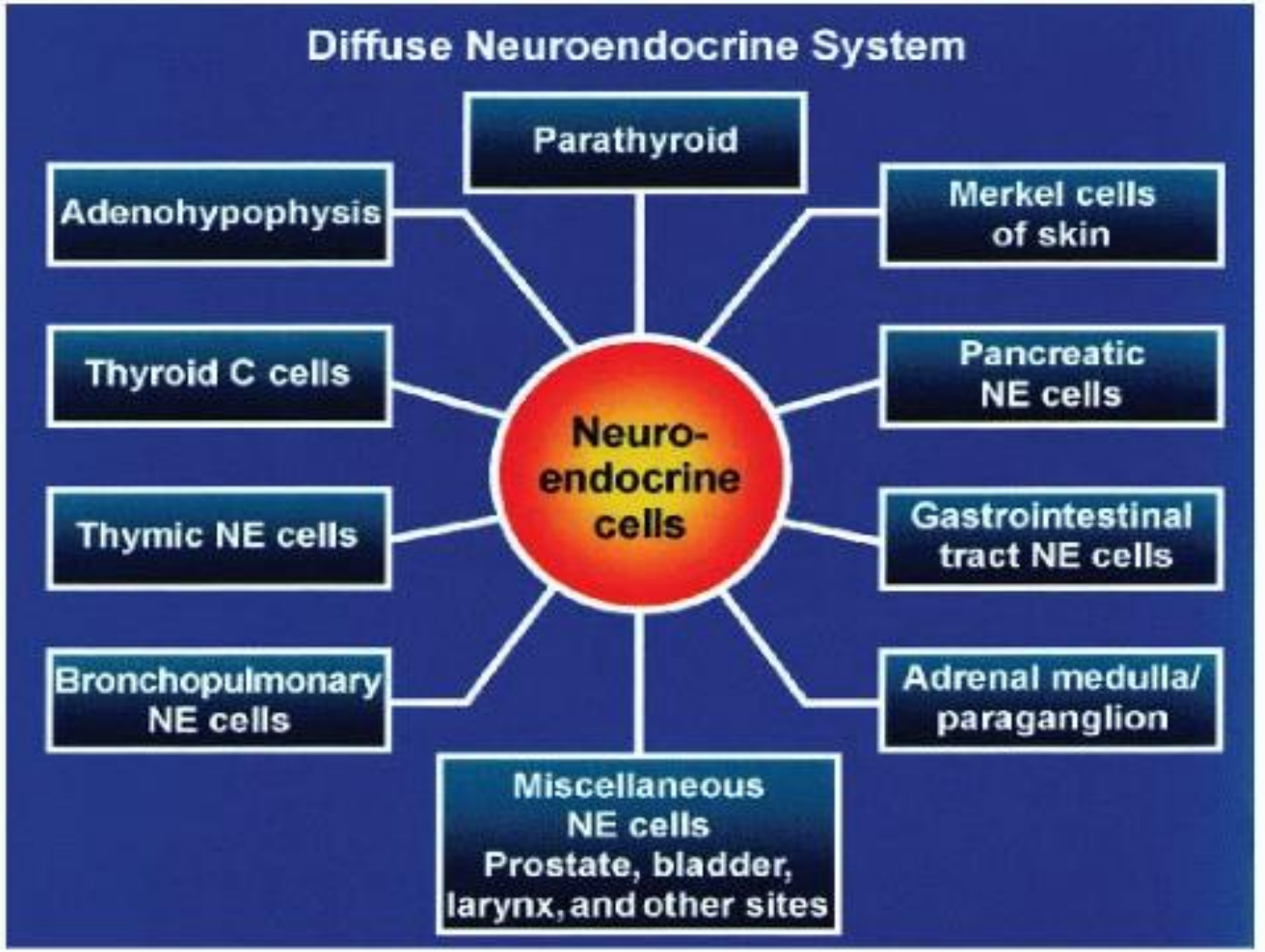


Fig. 2-12: Neuroendocrine (DNES) cell

Distribution

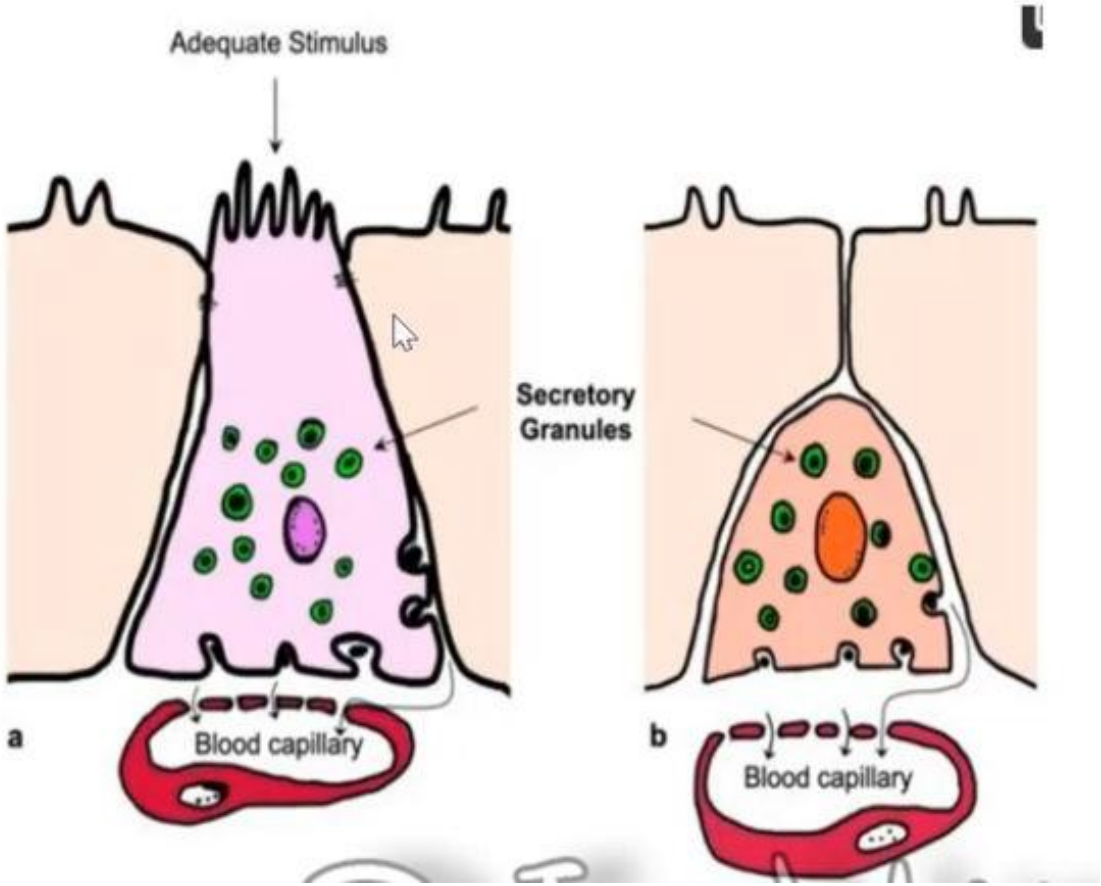
- Gastrointestinal tract (enteroendocrine cells).
- Respiratory system.
- Supraoptic and paraventricular hypothalamic nuclei.
- Parafollicular cells of thyroid gland.
- Chief cells of parathyroid gland.
- Chromaffin cells of the suprarenal medulla.
- Cells of islets of Langerhans.
- Pinealocytes.



Types of DNES

1-Open type: the cell has long microvilli extending into the lumen of the organ.

2- Closed type: where the cell apex is covered by other epithelial cells of the organs.



Characters:

- These cells synthesize and release polypeptide hormones or amines (epinephrine, norepinephrine & serotonin) with hormonal activity.

- These cells are able to take up amine precursors and exhibit amino acid decarboxylase activity. This explain its old name APUD cells (amine precursor uptake and decarboxylation), but as not all of these cells are able to concentrate amine precursors, the APUD name has been replaced by DNES cells (diffuse neuroendocrine system).


Thank You!