
بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ
IN THE NAME OF ALLAH

THE ENDOCRINE SYSTEM

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The Suprarenal glands

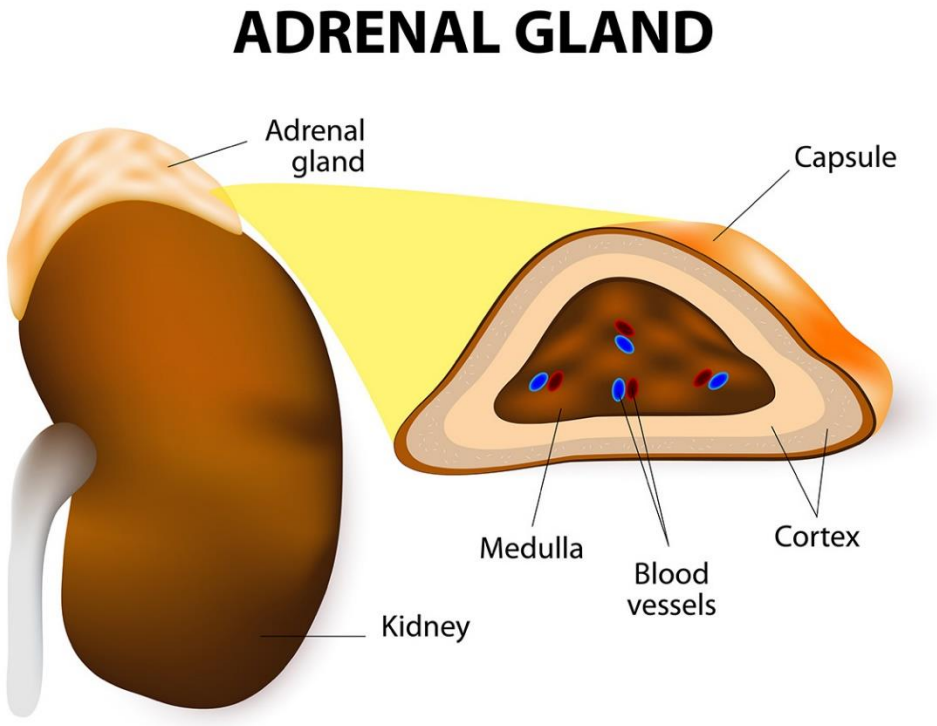
- They are paired glands, lying over the superior margin of the kidney.
- The gland consists of stroma and parenchyma.

I. The Stroma:

1. Capsule
2. Trabeculae
3. Reticular fibres

II. The parenchyma:

- Is divided into **cortex** and **medulla**.



The Suprarenal cortex

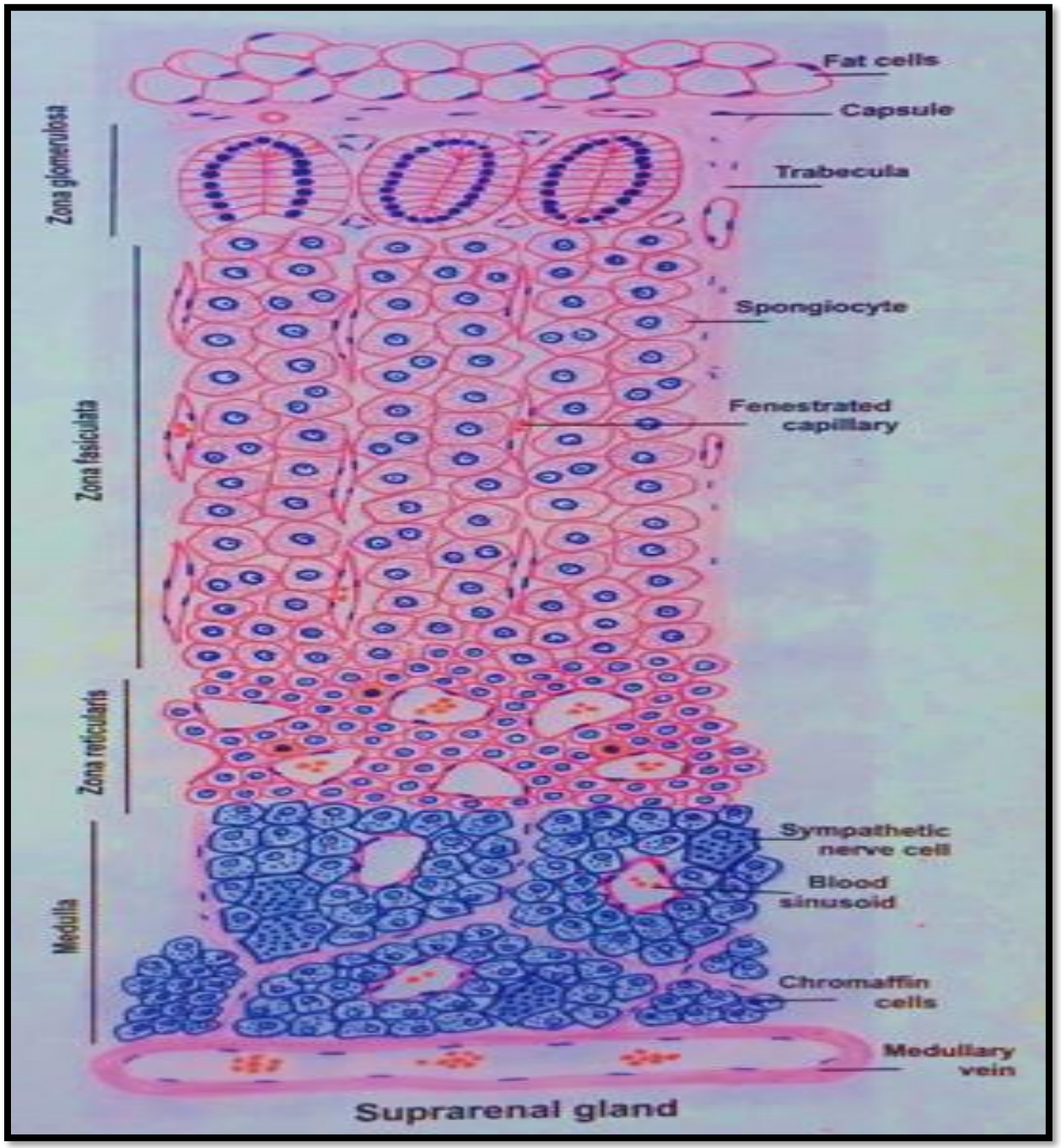
- It is thick and yellowish in colour due to high content of lipid.
- It is essential for life.

It is divided into three zones:

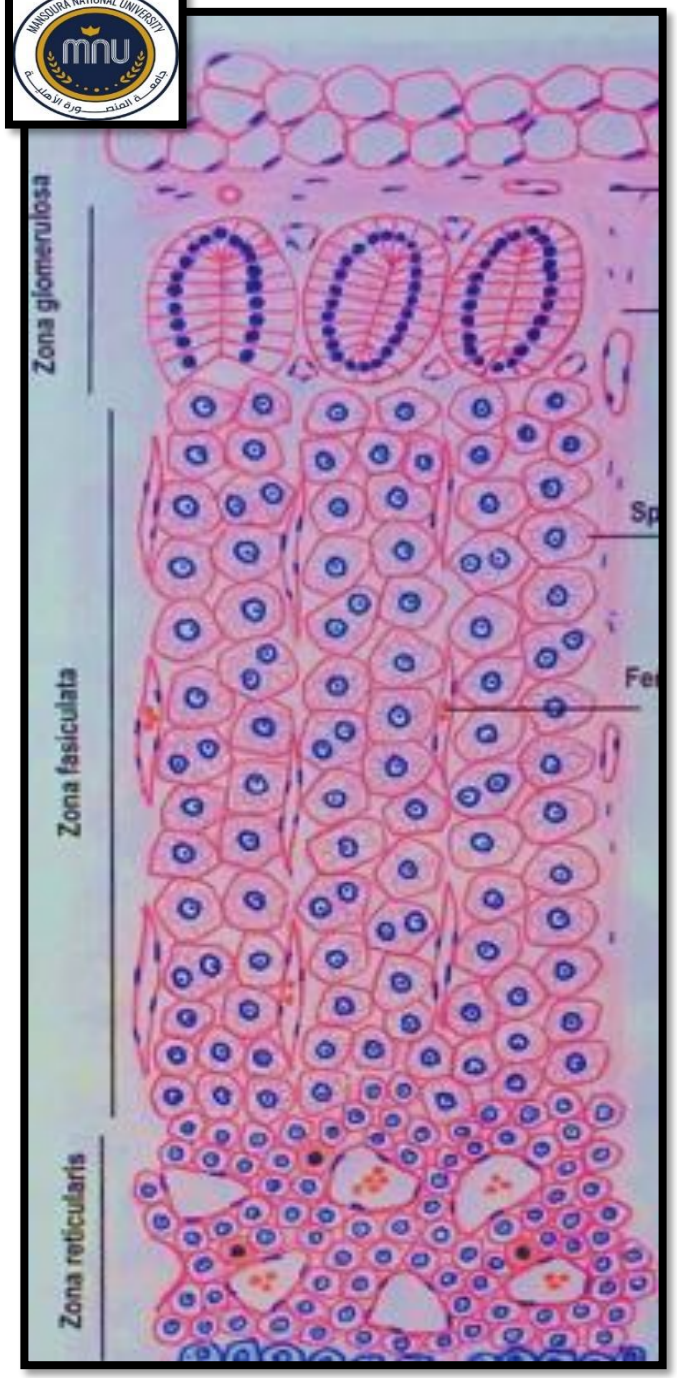
Zona glomerulosa

Zona Fasciculata

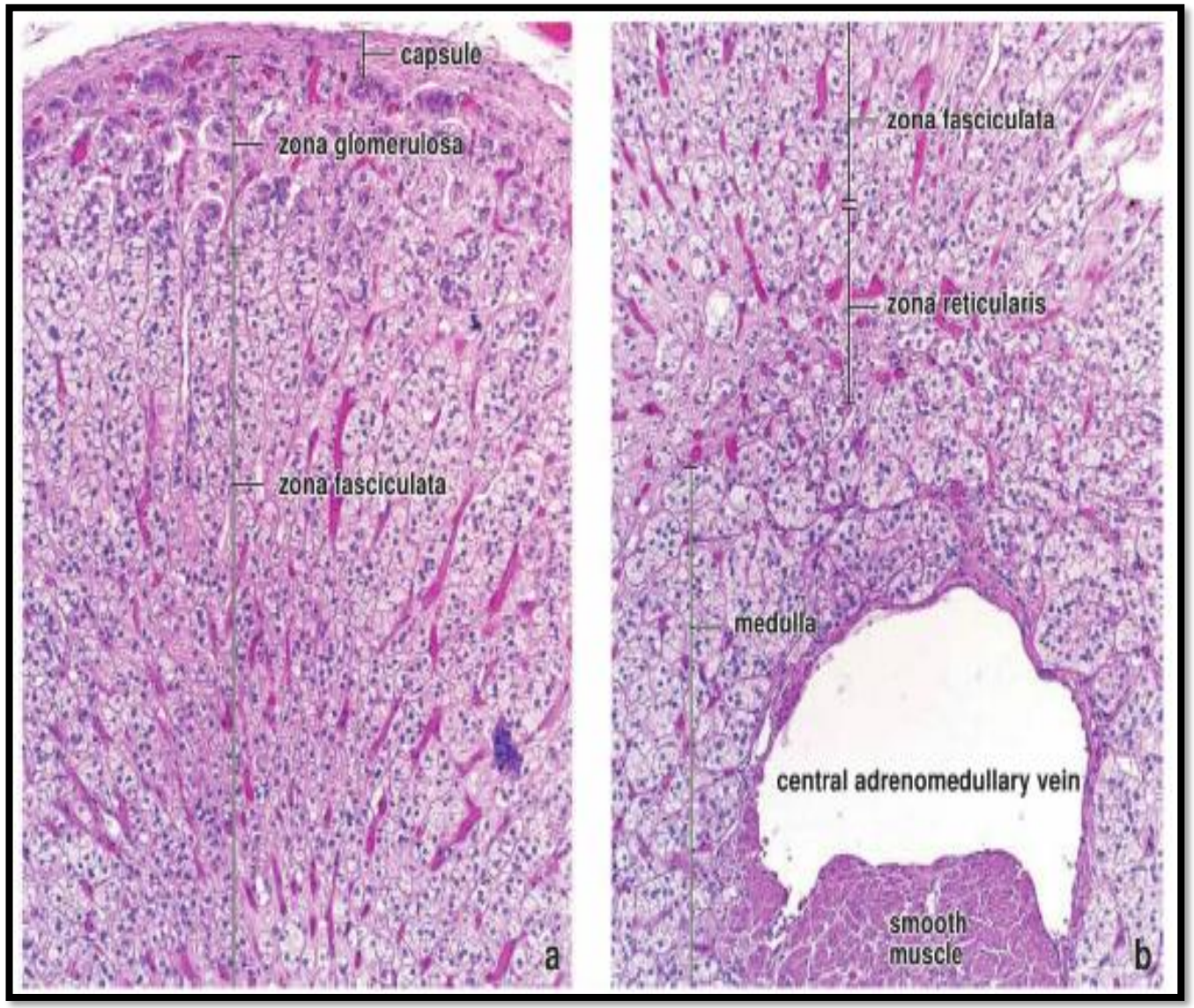
Zona reticularis

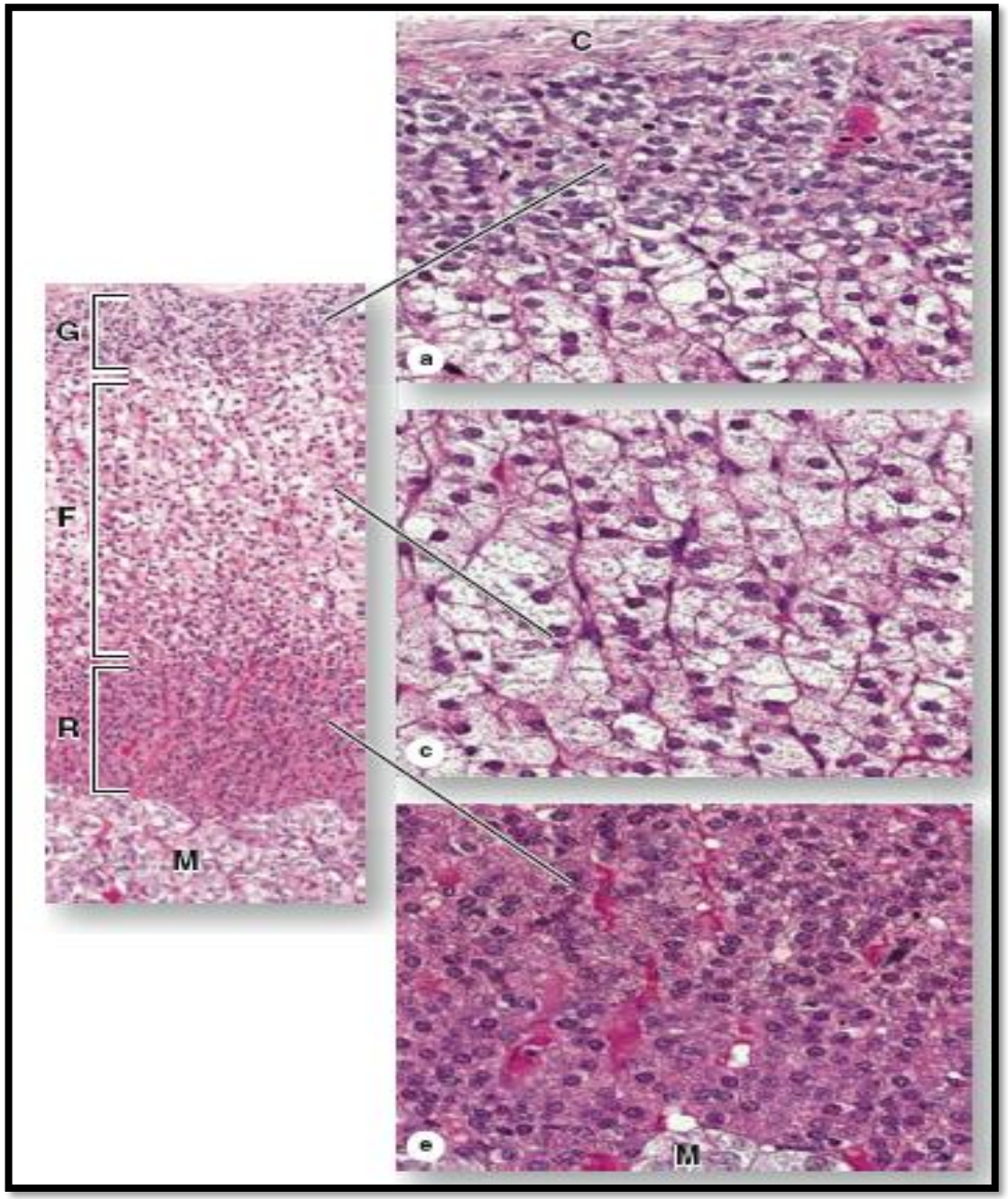


Zona glomerulosa	Zona Fasciculata	Zona reticularis
It is a relatively narrow zone under the capsule. The cells are arranged into round and oval groups (glomeruli) without a central cavity.	➢ It is the broadest zone, composed of straight parallel cords of cells coursing in a radial direction toward the medulla. ➢ The cords are usually one or two cells in width, and they are surrounded by a longitudinally oriented network of fenestrated sinusoidal capillaries.	➢ It is a relatively thin zone as zona glomerulosa. ➢ It is composed of branching and anastomosing cords of cell which are separated by fenestrated blood sinusoidal capillaries.



Zona glomerulosa:	Zona Fasciculata	Zona reticularis
The cells are columnar and have spherical deeply stained nuclei and few lipid droplets. A rich network of capillaries surrounds the glomeruli.	➢ The cells are polyhedral, with large vesicular nuclei, binucleated cells are frequently seen. ➢ Their cytoplasm is vacuolated (due to dissolved lipid droplets) and has a spongy appearance; therefore the cells are called spongiocytes.	➢ The cells are small, polyhedral with few lipid droplets. ➢ Some cells are darker (**dark cells**) as they contain lipofuscin pigment. They are present toward the inner part of zona reticularis.
Function: The cells secrete mineralo-corticoid (aldosterone)	**Function:** The cells secrete gluco-corticoids (Cortisol and hydro-cortisone).	**Function:** The cells secrete sex hormones and small amounts of gluco-corticoids.


capsule
zona glomerulosa
zona fasciculata
a
zona fasciculata
zona reticularis
medulla
central adrenomedullary vein
smooth muscle
b


C
G
F
R
M
a
c
e
M

The Suprarenal Medulla

- In the fresh state, it has a pink colour.
- It is not essential for life.

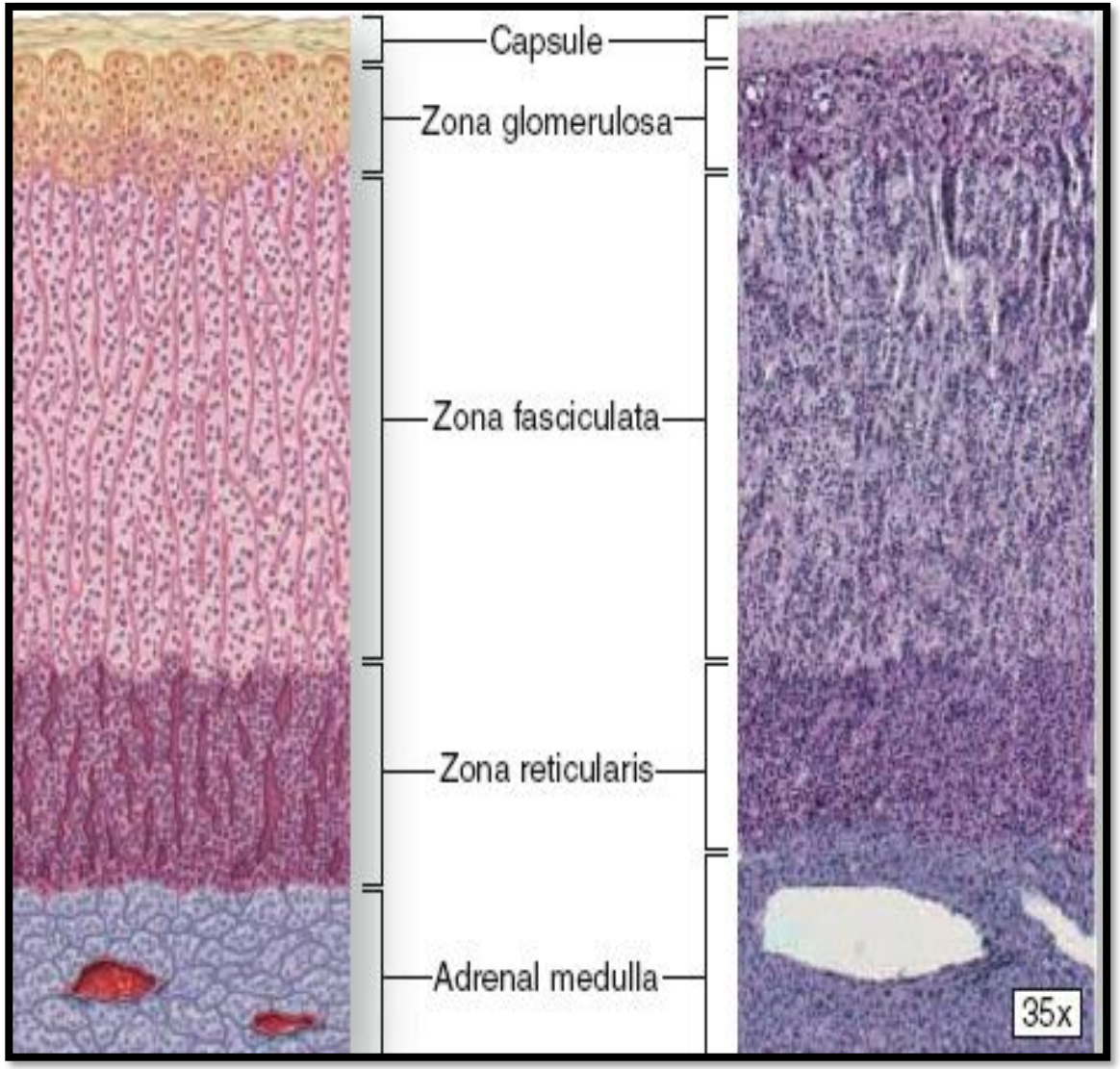
Structure:

It consists of a stroma and parenchyma.

I. The stroma: is a highly vascular connective tissue.

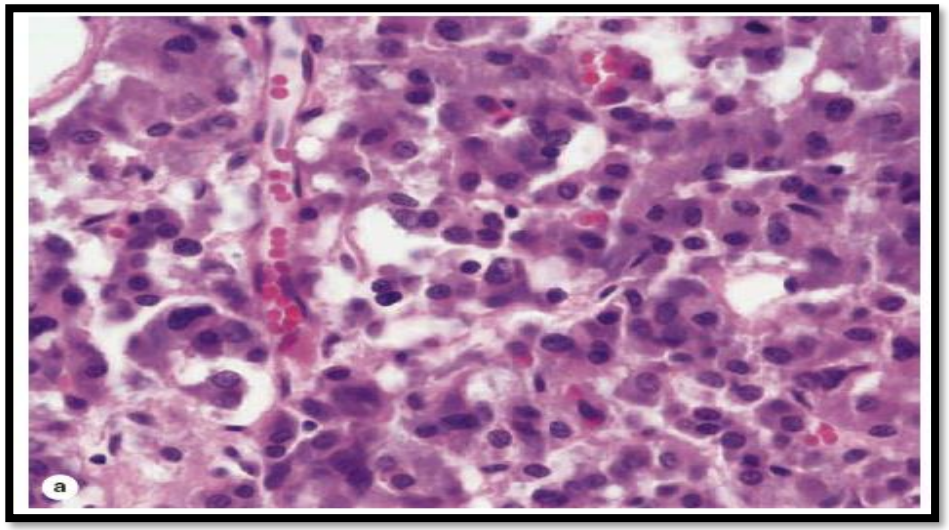
II. The parenchyma: is formed of:

1. Chromaffin cells.
2. Few scattered ganglion cells.
3. sinusoidal capillaries.

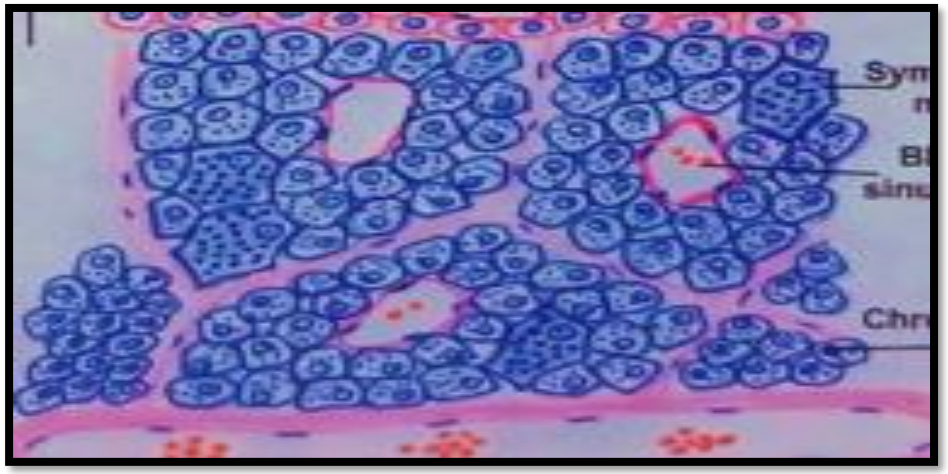


Chromaffin cells

They are the secretory cells in the medulla.

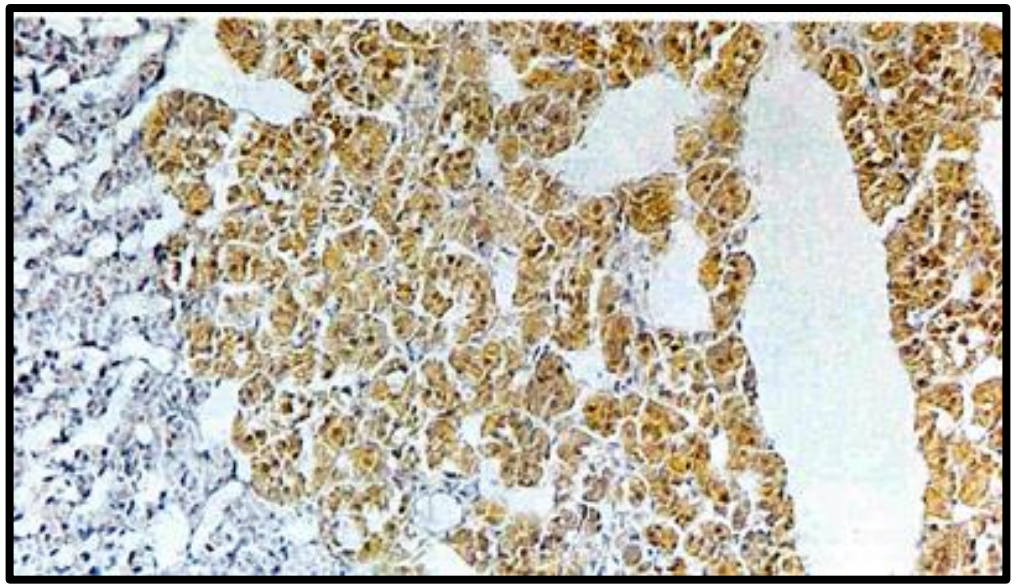


They are arranged in groups around the blood vessels or in anastomosing cords.



The cells are large, pale-staining polyhedral cells, with eccentric nucleus.

The cytoplasm is basophilic containing fine granules of adrenaline and nor-adrenaline.



Identification of the medulla from the cortex:

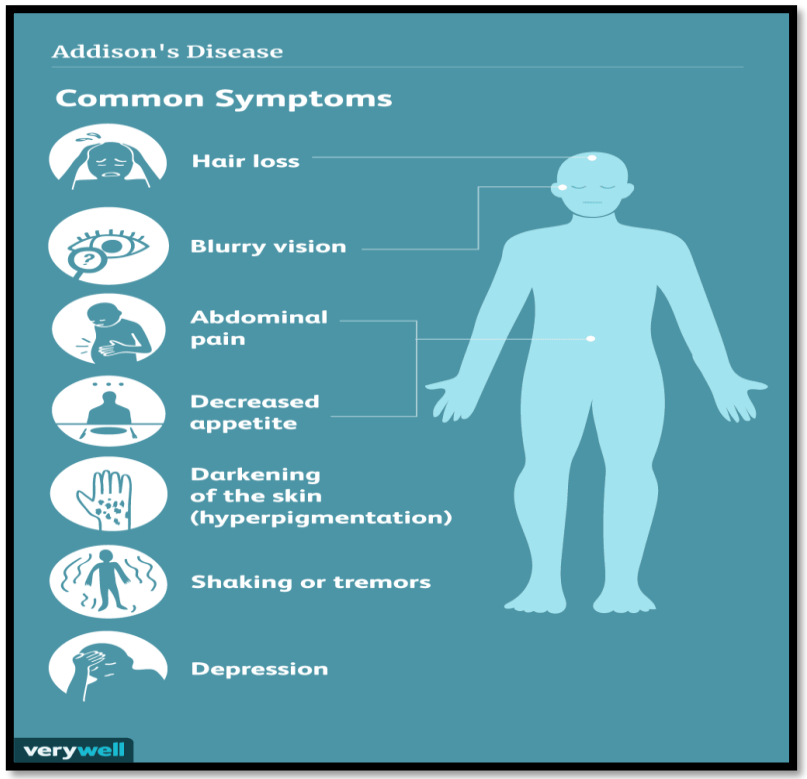
Chromaffin reaction:

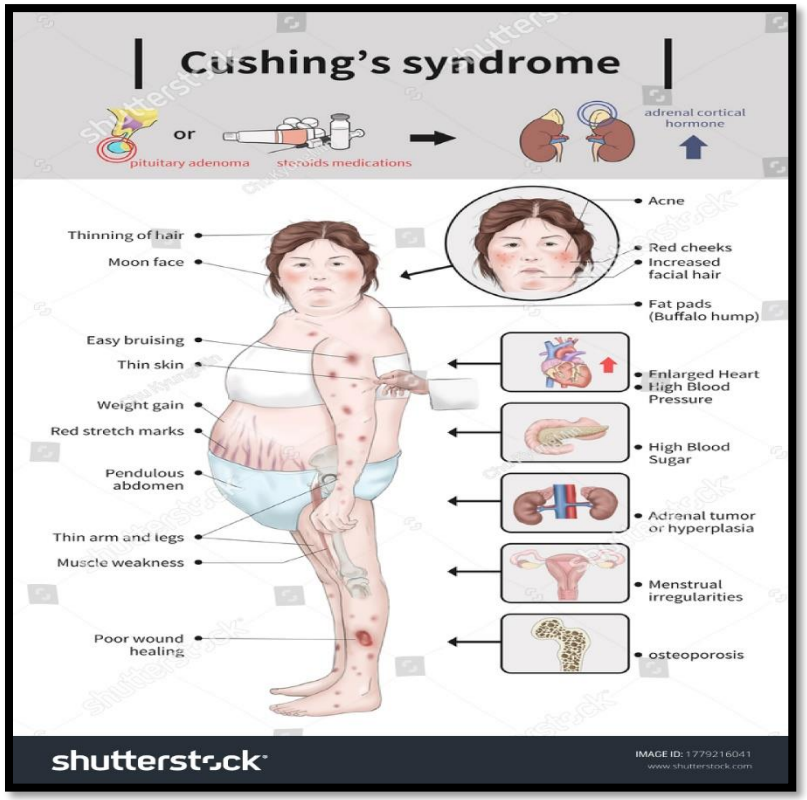
Fresh specimens of the suprarenal gland + potassium dichromate → the cells of the medulla revealed brown granules. (Positive chromaffin reaction).

Function of chromaffin cells:

Under stress conditions they secrete adrenaline and noradrenaline directly into the blood causing a rapid generalized sympathetic effect to meet emergency situations.

- Destruction of the suprarenal cortex → Addison's disease.
- Hyperfunction of the suprarenal gland → Cushing syndrome (↑ glucocorticoids).
- → **Conn syndrome (** ↑ aldosterone **)**
- Tumours of the suprarenal medulla are called pheochromocytoma.





The Pancreas

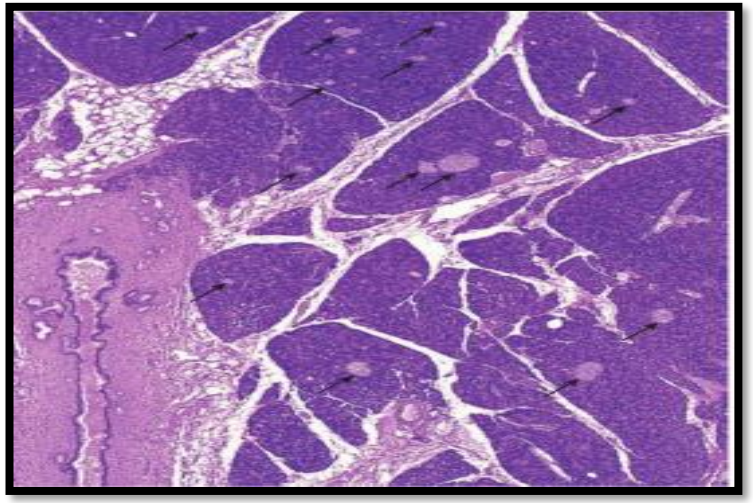
General structure:

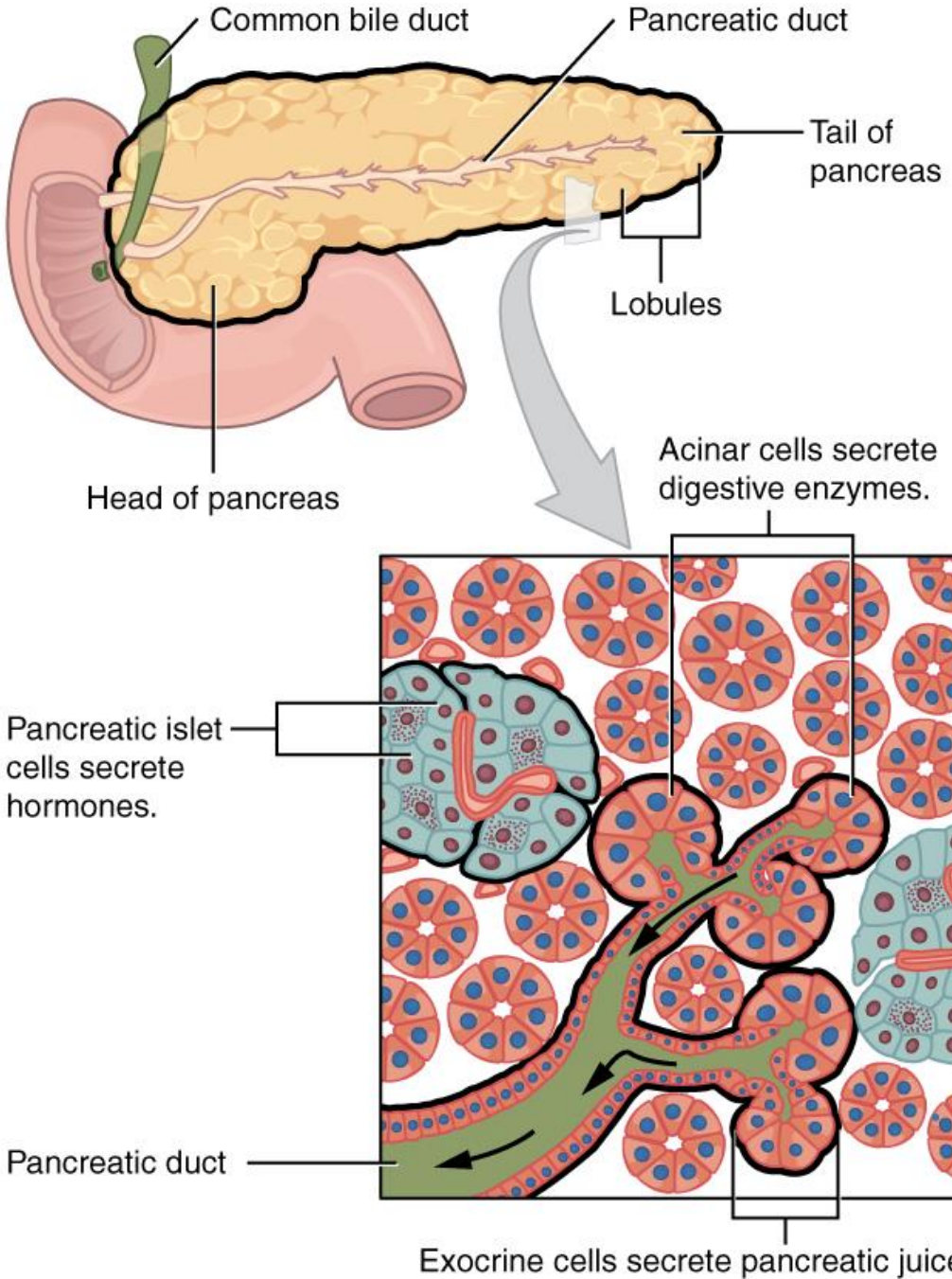
- It performs both exocrine and endocrine functions. The two functions are performed by two separate parenchyma.

Exocrine Pancreas

is formed of two parts:

1. **Pancreatic acini.**
2. **Duct system**





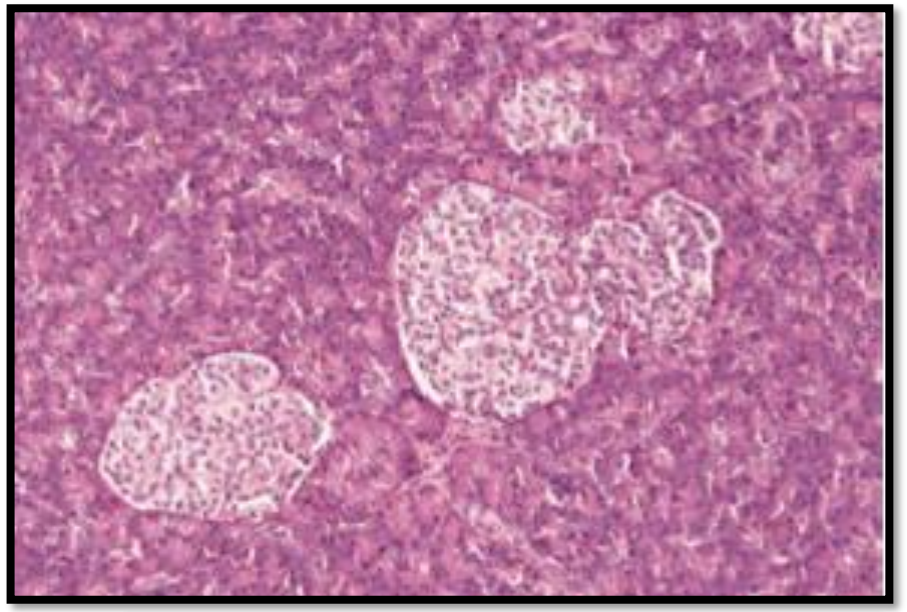
Islets of langerhans

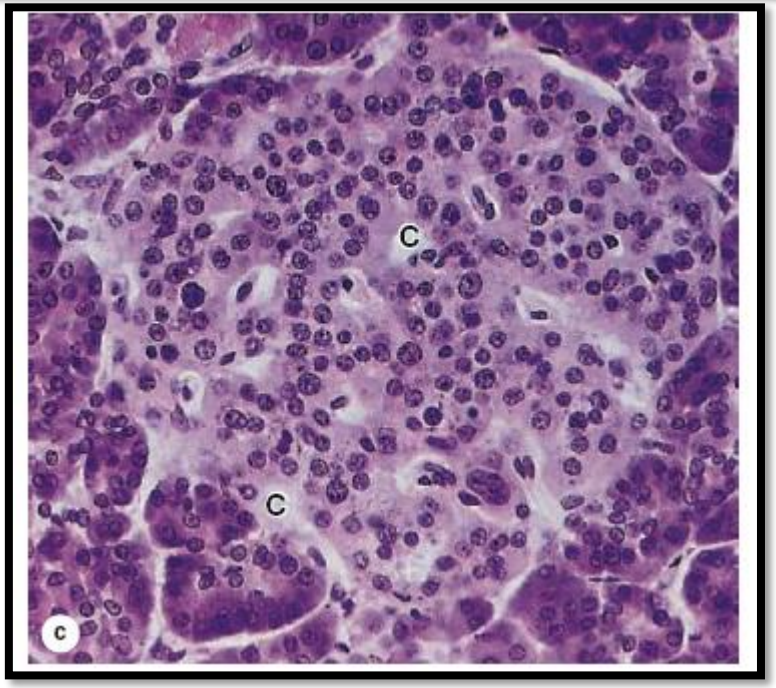
Definition: non capsulated masses of endocrine cells scattered in the pancreatic lobules especially at the tail region.

Number: about ¼ - ¾ million (in human).

Structure:

1. They are formed of anastomosing cords of epithelial cells separated by fenestrated blood capillaries.
2. They are separated from the exocrine acini by a layer of reticular connective tissue.
3. In H. & E. stained sections they appear as lighter non capsulated areas surrounded by darker acini. The endocrine cells can not be differentiated from each other.





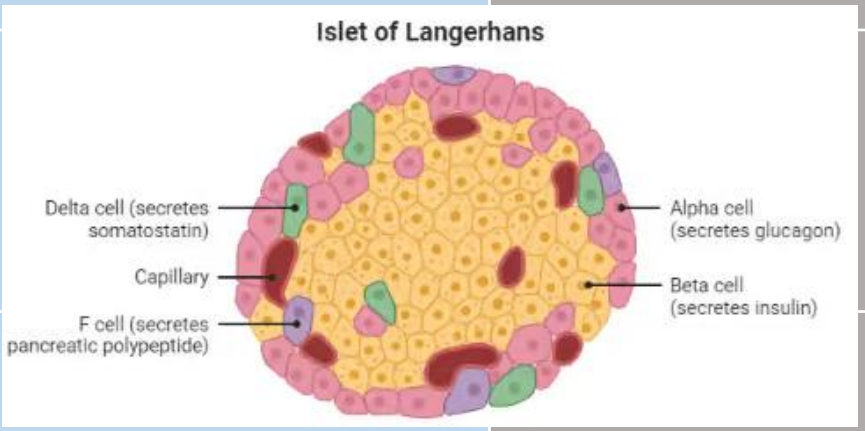
4. Differentiation of the islet cells depends on:
   a. Special stains.
   b. E/M features.
   c. Immunohistochemical techniques.

5. The endocrine cells forming the islets of Langerhans are:

A (α) cells: secrete glucagon	B (β) cells: secrete insulin	D (δ) cells: secrete somatostatin	F (pp) cells: secrete pancreatic polypeptide

6. **Ganglion cells (sympathetic neurons)** scatter between the endocrine cells to regulate their functions.

A (α) cells	B (β) cells	D (δ) cells	F or (PP) cells
Nearly **oval** in shape.	Nearly oval in shape.	Oval in shape. Variable in size and granular content.	Small oval cells
Present at the periphery of the islets.	Present mainly in the center of the islets.	Scattered between α cells in the periphery of the islets	
Represent about 20% of cells.	Represent about 60-75% of cells.	Represent about 2% of cells.	represent about 2%
Can be stained by immunohistochemical technique using a primary antibody against glucagon hormone.	Can be stained by immunohistochemical technique using a primary antibody against insulin hormone.		
Function: **S**ecretion of glucagon which elevates the glucose level in blood.	**Function:** Secretion of insulin which lowers the glucose level in blood	**Function:** Secretion of somatostatin which suppresses the function of both A and B cells and also inhibits the release of growth hormone.	**Function:** Secrete pancreatic polypeptide hormone involved in carbohydrates and protein metabolism.



MCQ

1. Chromaffin reaction stains cells of suprarenal medulla

a. Blue
b. Brown
c. Magenta
d. Black
e. Turquoise blue

b

2. B cells of pancreas can be stained immunohistochemical using a primary antibody against

a. Insulin
b. Glucagon
c. Pancreatic polypeptide
d. Somatostatin
e. Digestive enzymes

a

References

- Student medical histology book, Mansoura university.
- Junqueira's Basic Histology: Text and Atlas, Fourteenth Edition. 14th edn. New York, USA: McGraw-Hill Education.
- **Pawlina, W. and Ross, M.H. (2019)**. Histology: A Text and Atlas, International Edition: With Correlated Cell and Molecular Biology. 8th edn.


Thank
you