HISTOLOGY

Endocrine Block – 432 Histology Team

Lecture 4: Adrenal Gland

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Color Guide:

- **Black: Slides.**
- **Red: Important.**
- **Green: Doctor's notes (Female).**
- **Blue: Doctor's notes (Male).**
- **Orange: Explanation.**

Objectives

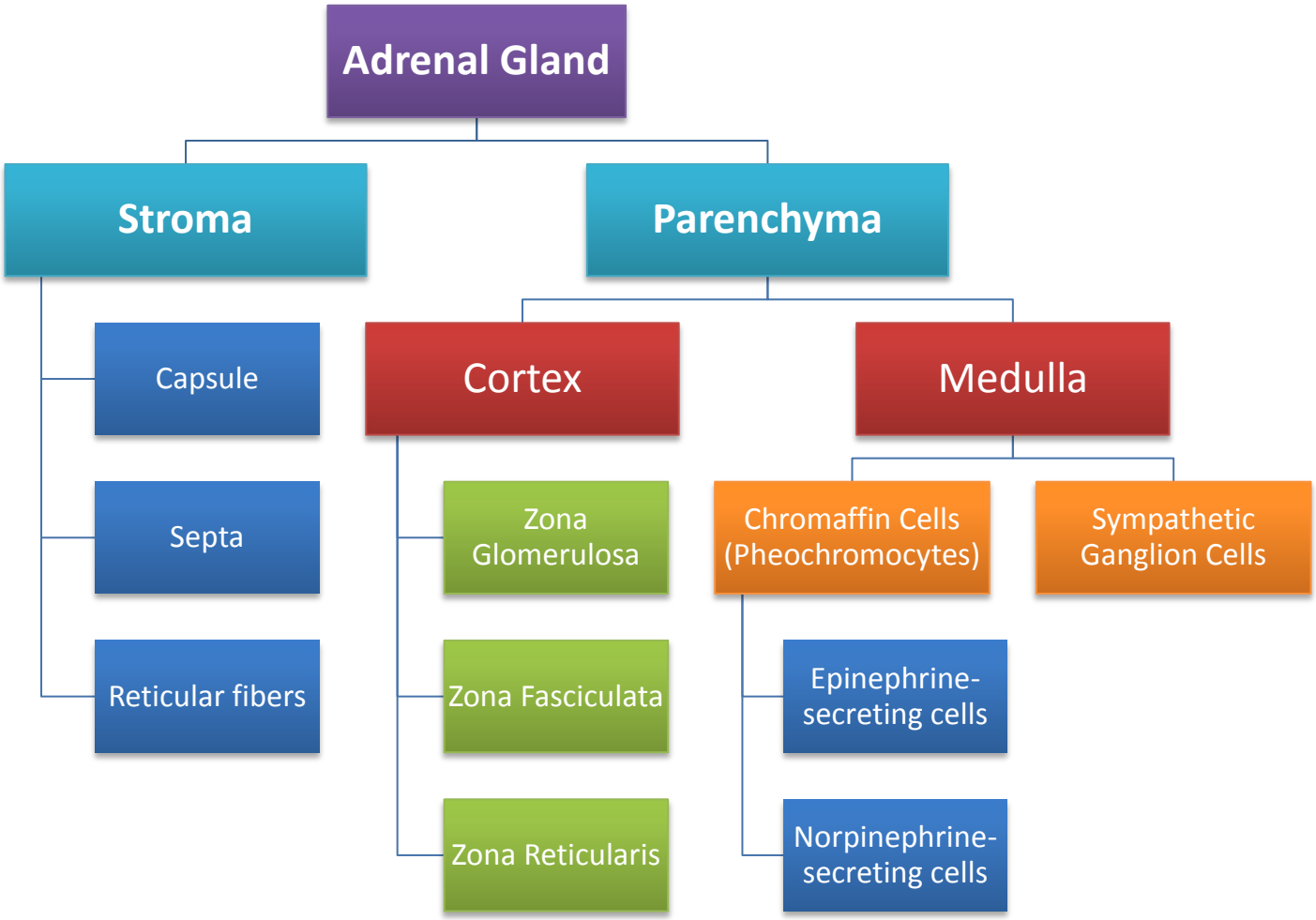
At the end of this lecture, you should be able to:

1- Differentiate between adrenal cortex and medulla.

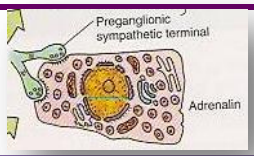
2- Identify the histological features of each cortical zone and its cells.

3- Identify the histological features of the medullary cells.

Mind Map

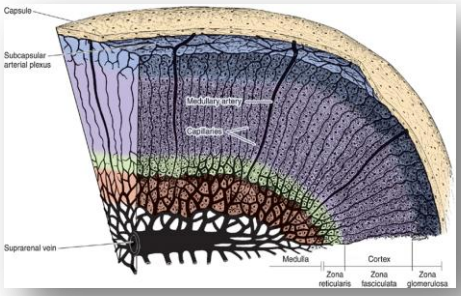


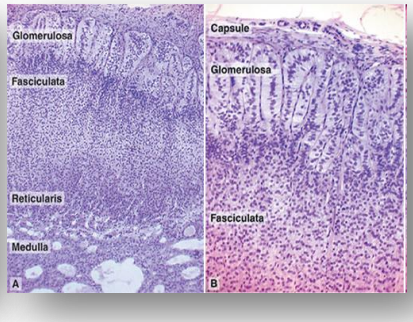
Adrenal Gland

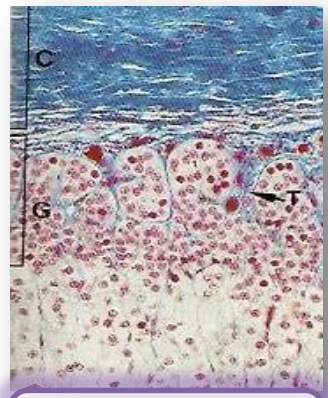
Stroma (Non-Functional Part)	
Capsule	• Dense collagenous connective tissue. • Appears blue when stained with "trichrome" stain.
Septa	• If cells are overcrowded, then septa will NOT be clear. And vice versa.
Parenchyma (Functional Part)	
Cortex	• Surrounds the medulla completely. • Blood capillaries are delicate and compressed. • Divided into 3 zones according to the arrangement of cells. • Cells of all these zones are acidophilic cytoplasm.
	1- Zona Glomerulosa (Sub-Capsular): • The most outer layer. • Formed of clusters of small columnar cells (look like glomerulus). • Rich in smooth endoplasmic reticulum and mitochondria (as these cells secretions are lipid in nature; they need SER to be synthesized and mitochondria because they're secretory active cells). • Produces mineralocorticoids e.g. aldosterone hormone (Reabsorb all the remaining Na^+, and passively the Cl^-, from the lumen of the distal renal tubules into the renal interstitium. In addition, K^+ and H^+ ions are actively secreted into the lumen).
	2- Zona Fasciculata (Spongiocytes; foamy appearance): • Middle & the thickest layer of the cortex. • Formed of columns (fascicles) of large polyhedral cells that are separated by longitudinal sinusoidal capillaries. • Rich in lipids so they appear empty in sections (spongiocytes; they have numerous fat droplets). • Its cells are rich in mitochondria (with tubular cristae), SER and lipofuscin pigments. • Its cells secrete glucocorticoids. • It is regulated by ACTH of pituitary.
	3- Zona Reticularis: • It's the most inner layer. Cells are arranged in a reticular or net-like arrangement. • It is formed of anastomosing cords of **deep acidophilic cells**. • Its cells contain few lipofuscin and lipid droplets. • The cells secrete androgens (in both sexes).
Medulla	• As the name medulla implies, it is the central portion of adrenal gland. • It is completely invested with adrenal cortex (not separated from it by C.T. septa). • Main characteristic feature is presence of dilated large sinusoidal capillaries. • Medulla is considered as a part of the nervous system, mainly sympathetic. • Is a collection of 2 type of cells:
	1- Chromaffin cells (Pheochromocytes): • Contains granules of catecholamine as that of sympathetic NS (granular because the cytoplasm will be rich in rER and ribosomes) so the cytoplasm of these cells is basophilic. • They produce epinephrine and norepinephrine. • They stain deep brown with chromic salts (e.g. potassium chromate). • They have the nerve endings of the preganglionic sympathetic ganglia.
	2- Sympathetic ganglion cells: • Relay on chromaffin cells. 

L/M of Adrenal Gland & Their Explanation

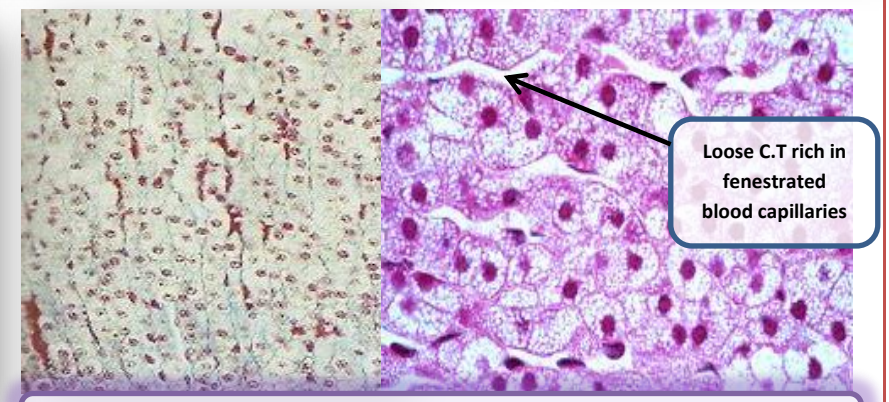
Adrenal Gland (Cortex & Medulla)



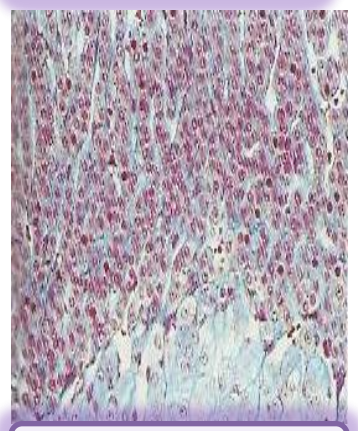




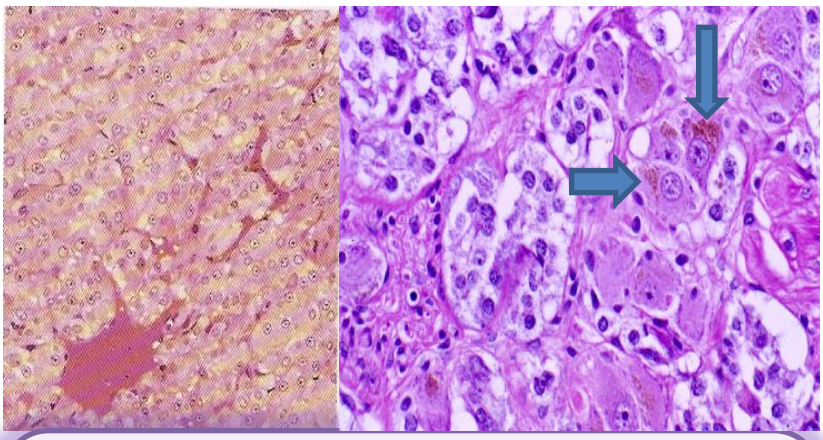
Zona Glomerulosa
(with trichrome stain)



Zona Fasciculata



Zona Reticularis

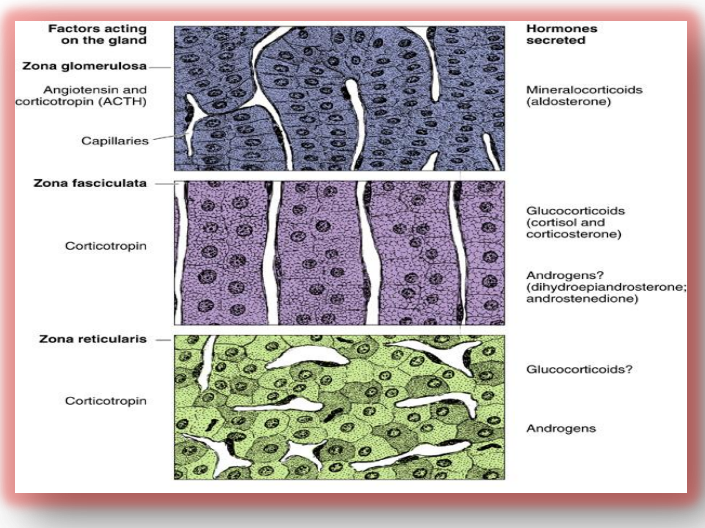


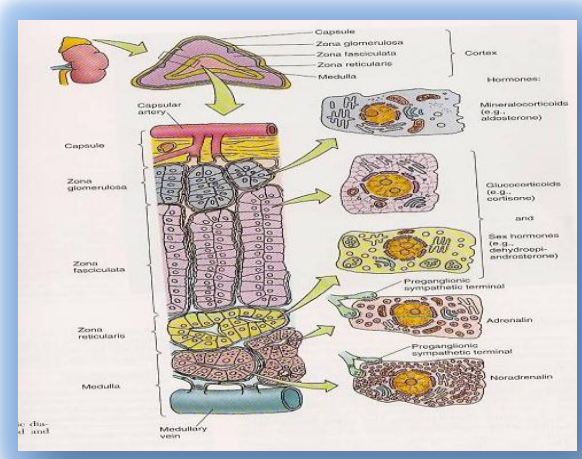
Neurons in Adrenal Medulla

The arrows refer to cells with pigments, which are the neuronal cells (sympathetic ganglionic cells) containing lipofuscin pigments. They are large in size, and basophilic as they contain Nissel bodies. (Their number is less than the chromaffin cells)

Summary

Structure	Parenchyma			
	Cortex			Medulla
	1- Zona Glomerulosa	2- Zona Fasciculata	3- Zona Reticularis	
Formation	- The most outer layer. - It's formed of clusters of small columnar cells.	- It's the intermediate & the largest layer of the cortex. - It's formed of columns of large polyhedral cells that are separated by longitudinal sinusoidal capillaries.	- It's the innermost layer. - It is formed of anastomosing cords of **deep acidophilic cells**.	- It is the central portion of adrenal gland. - It is completely invested with adrenal cortex (not separated from it by C.T. septa).
The most abundant organelles / Cells	Rich in SER and mitochondria.	- Rich in lipids so they appear empty in sections (spongiocytes). - Its cells are rich in mitochondria (with tubular cristae), SER and lipofuscin pigments.	Its cells contain few lipofuscin and lipid droplets.	1- **Pheochromocytes**: Contain granules of catecholamine as that of sympathetic NS. 2- **Sympathetic ganglion cells**: Relay on chromaffin cells.
Hormonal secretion	Produces mineralocorticoids e.g. aldosterone hormone.	Its cells secrete glucocorticoids.	The cells secrete androgens.	- Chromaffin cells produce epinephrine and norepinephrine. - They stain deep brown with chromic salts.
Function of the hormone / Regulation	Reabsorb Na^+ and passively Cl^-, from the lumen of the distal renal tubules into the renal interstitium. In addition, K^+ and H^+ ions are actively secreted into the lumen.	It is regulated by ACTH of pituitary.	----	----





Questions

Q1: The thickest layer of adrenal cortex is:

A. Zona Glomerulosa.
B. Zona Fasciculata.
C. Zona Reticularis.
D. Capsule.

Q2: Which of the following statements is NOT true:

A. Medulla is in the central portion of adrenal gland.
B. Medulla & cortex are NOT separated by any kind of tissue.
C. Androgens are secreted by Zona Reticularis.
D. ACTH is released by Zona Fasciculata.

Q3: We can differentiate between epinephrine & norepinephrine secretory cells when we:

A. Use E/M.
B. Use L/M.
C. Use E/M with H&E stain.
D. Use E/M or L/M using immunohistochemistry (special antibodies).

Q4: The remarkable feature of neuronal cells in medulla when looking at a histological picture is:

A. Size of cells.
B. The arrangement of cells.
C. The lipofuscin pigments that stain different.
D. The number of cells.

Q5: Zona Glomerulosa is formed of:

A. Simple columnar epithelium.
B. Connective tissue.
C. Small columnar cells.
D. Cuboidal cells.

Answers

1	2	3	4	5
B	D	D	C	C

If you have any questions or suggestions please do not hesitate to contact us on:

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Best of luck!