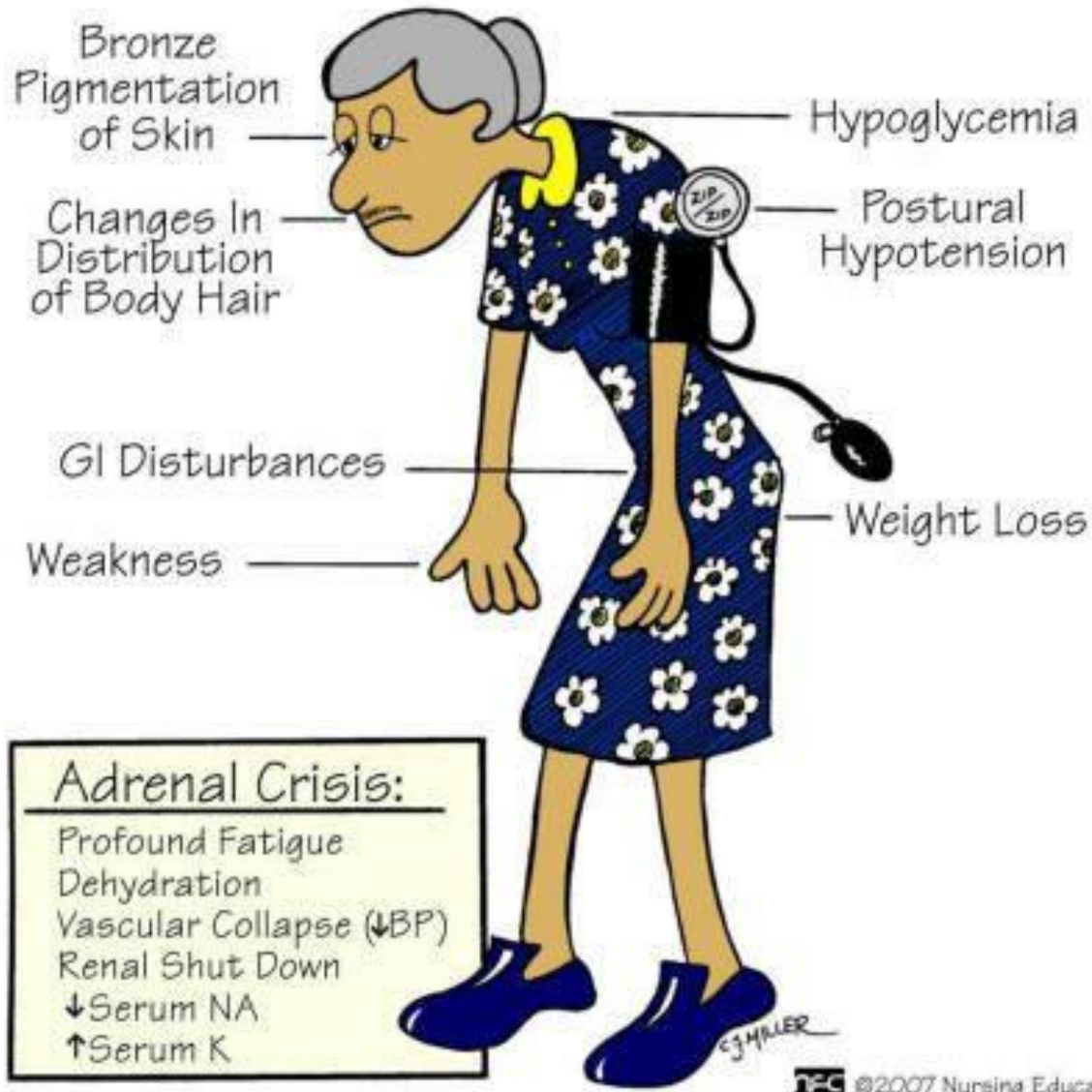


# ADRENAL GLAND

BY

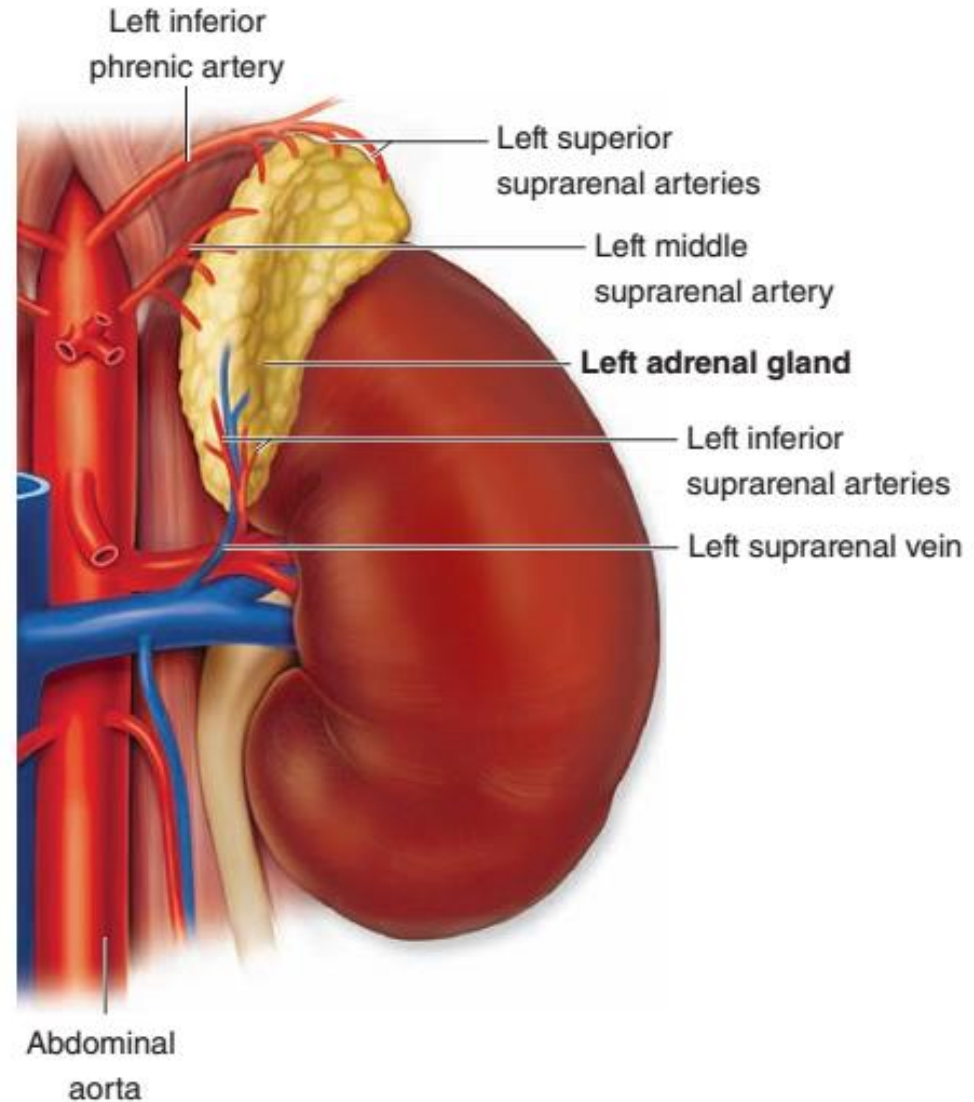
A/P DR.ZAHID SARFARAZ KHAN

# ADDISON'S DISEASE



# ADRENAL GLANDS

- The adrenal (or suprarenal) glands are paired organs
- Lying near the superior poles of the kidneys
- Embedded in the perirenal adipose tissue.
- They are flattened structures with a half-moon shape
- About 4 to 6 cm long, 1 to 2 cm wide, and 4 to 6 mm thick in adults.
- Together, they weigh about 8 g,
- but their weight and size vary with the age and physiologic condition of the individual.

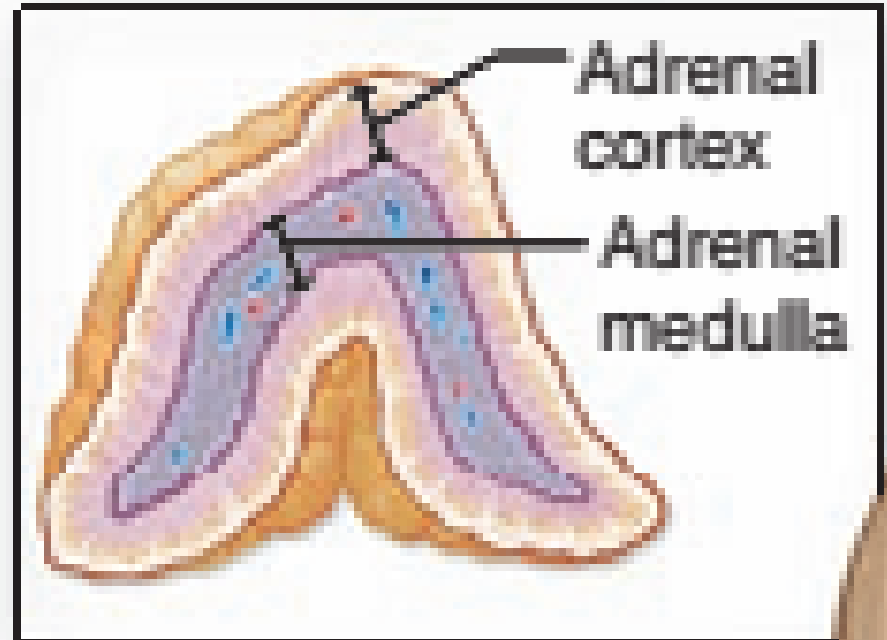


# Stroma Of Adrenal Cortex

- ❑ Adrenal glands are each covered by a dense connective tissue capsule.
- ❑ That sends thin trabeculae into the gland's parenchyma.
- ❑ Consists mainly of reticular fibers supporting the Secretory cells and Microvasculature.

Each gland has two concentric regions:

- A yellowish adrenal cortex .
- A reddish brown central adrenal medulla.



Adrenal gland

# Adrenal Gland

- The adrenal cortex and medulla can be considered two different organs
- With distinct embryonic origins, functions, and morphologic characteristics
- That become united during embryonic development.

## **The cortex.**

Arises from Mesoderm

## **The medulla.**

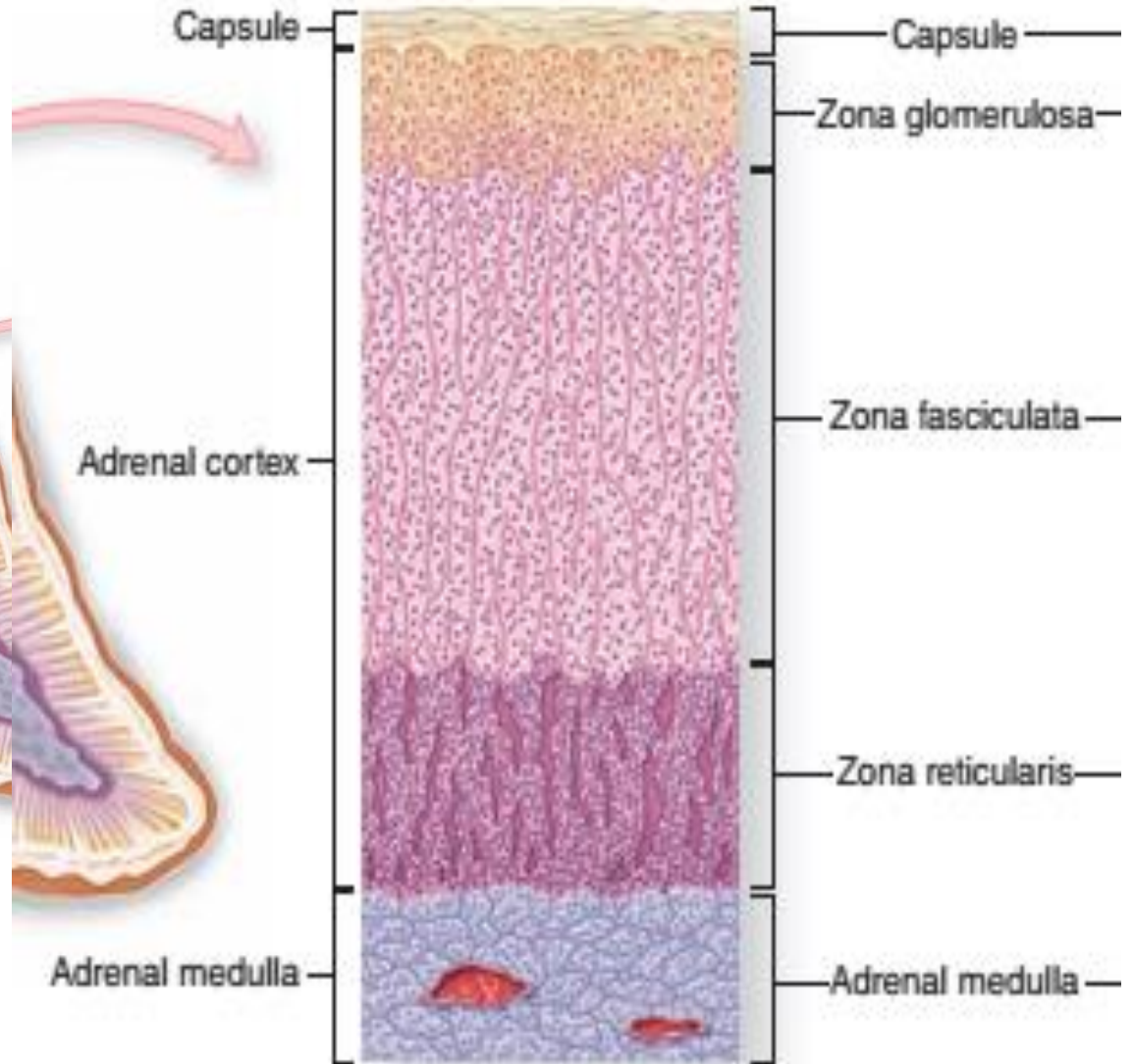
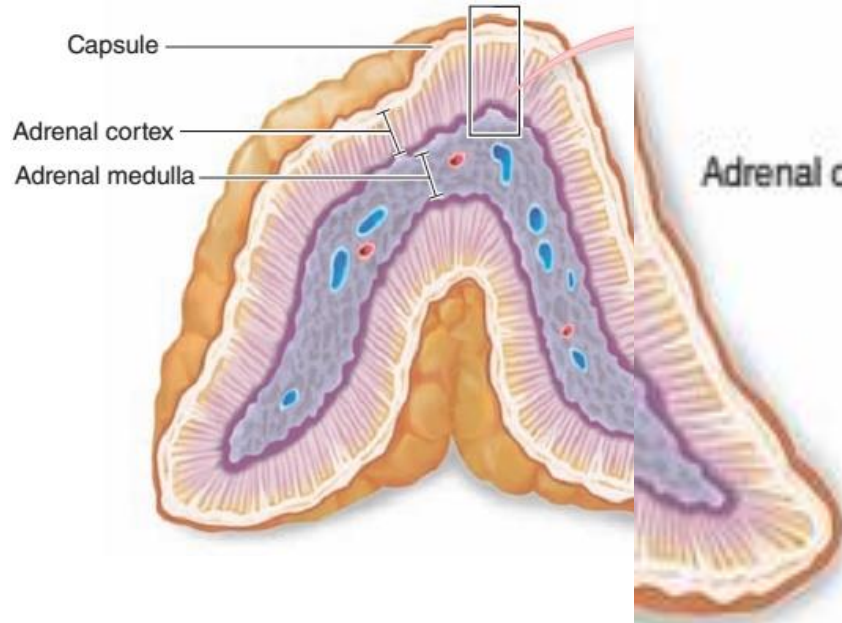
From the Neural crest.

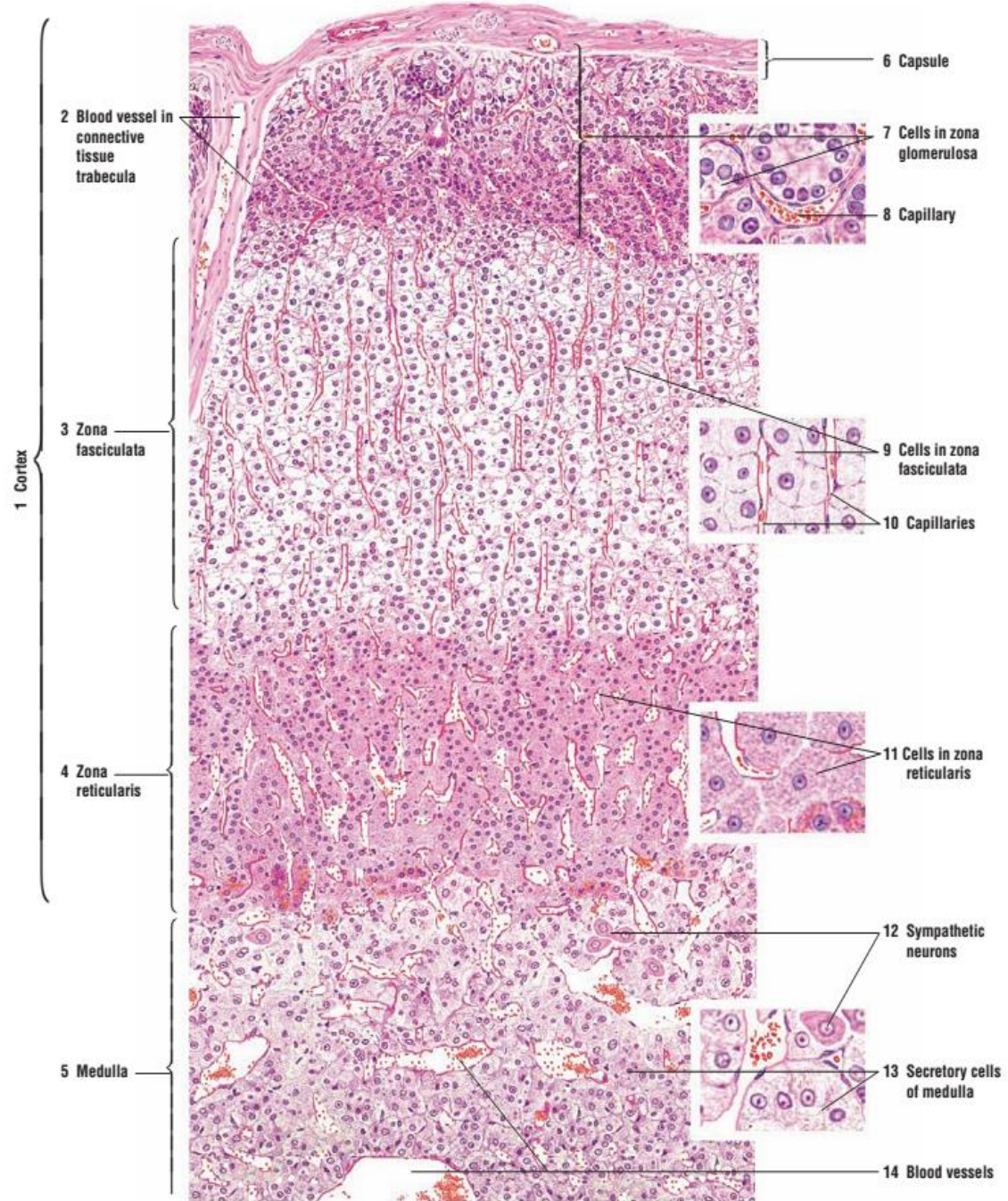
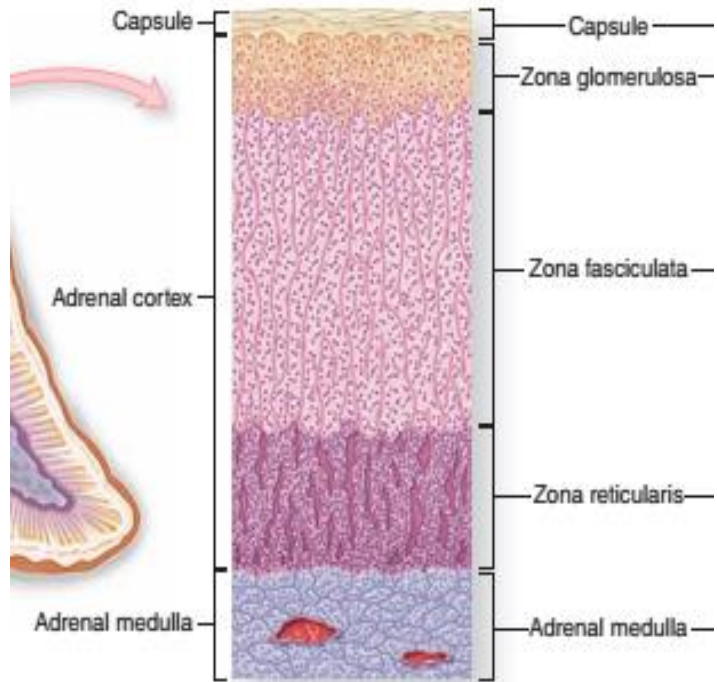
# General Histologic Appearance of the Adrenal Gland

- Like typical of an endocrine gland
- Cells of both cortex and medulla are grouped in cords along wide capillaries

# Adrenal Cortex

- Three concentric

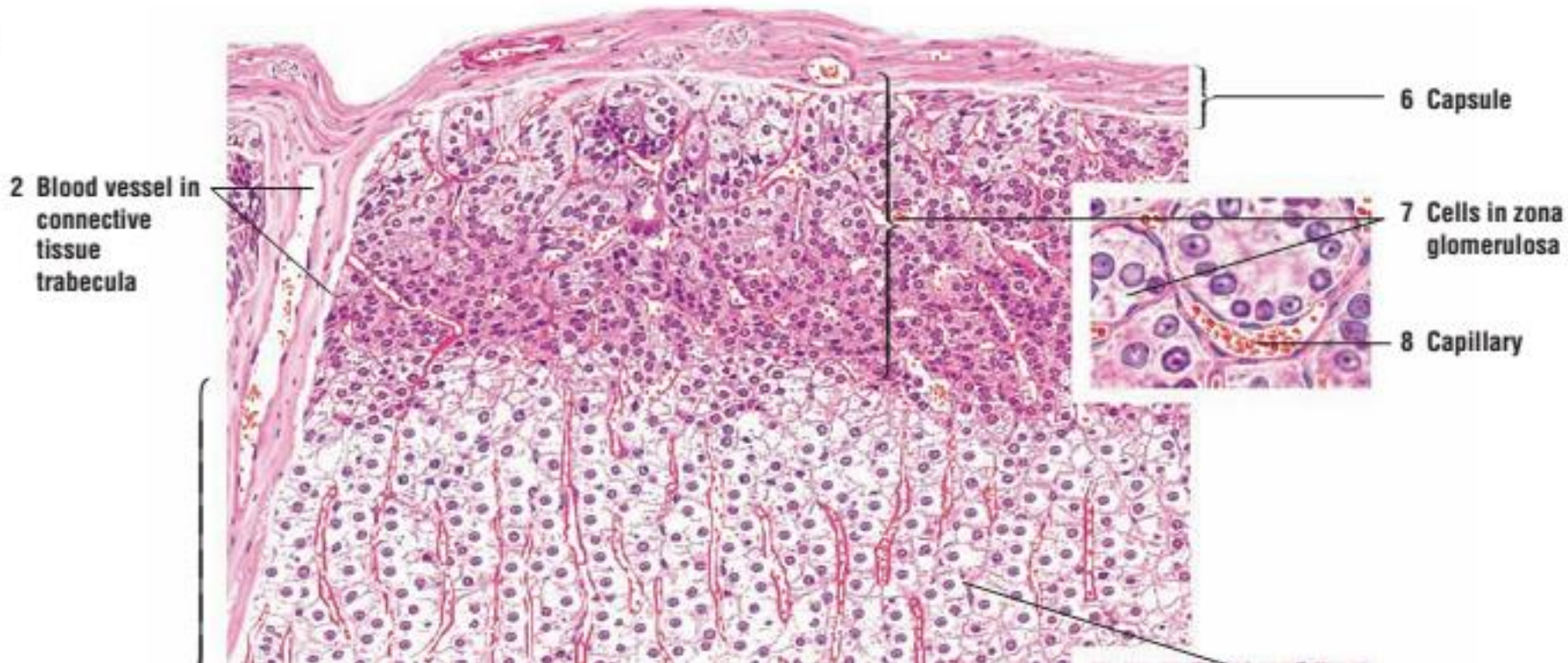






# Zona Glomerulosa

- Present Immediately inside the capsule
- Comprising about 15% of the cortex
- Consists of closely packed, rounded or arched cords of columnar or pyramidal cells with many capillaries .



# Zona Glomerulosa

- The steroids made by these cells are called mineralocorticoids
- Because they affect uptake of  $\text{Na}^+$ ,  $\text{K}^+$ , and water by cells of renal tubules.

The principal product is:-

- Aldosterone, the major regulator of salt balance.
- which acts to stimulate  $\text{Na}^+$  reabsorption in the distal convoluted tubules.

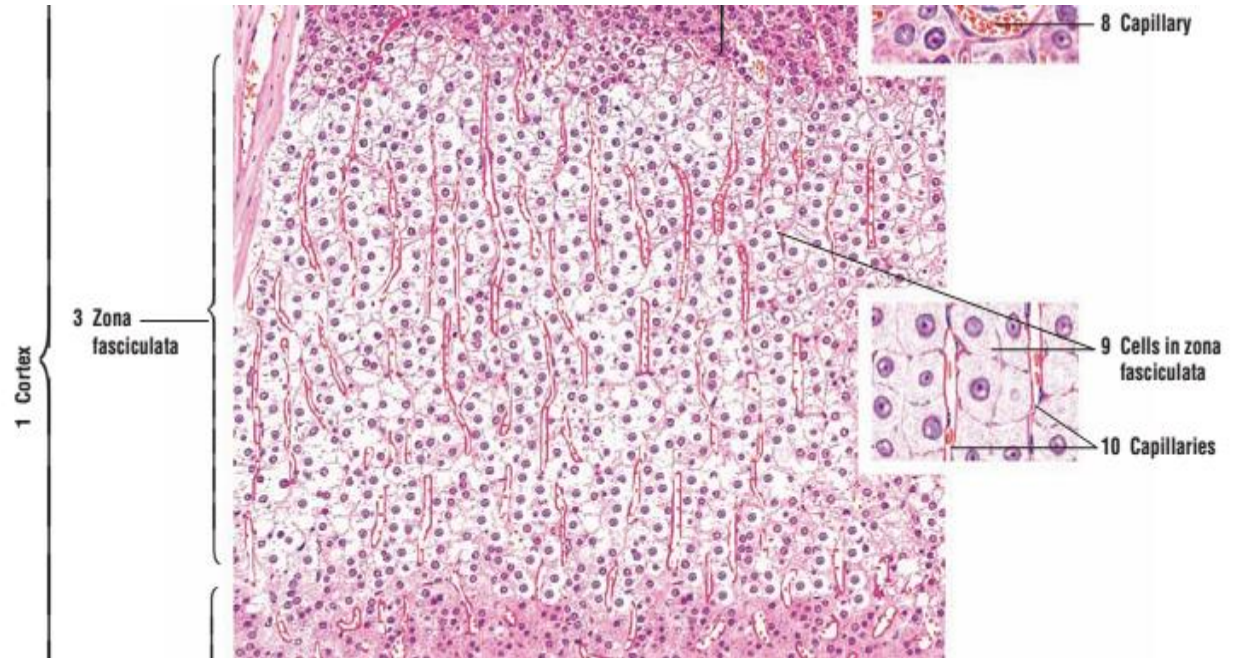
# Middle Zona Fasciculata

- Occupies 65% to 80% of the cortex.
- Consists of long cords of large polyhedral cells
- One or two cells thick.

Separated by Fenestrated sinusoidal capillaries .

- The cells are filled with lipid droplets and appear vacuolated in

routine histologic preparations.



# Middle Zona Fasciculata

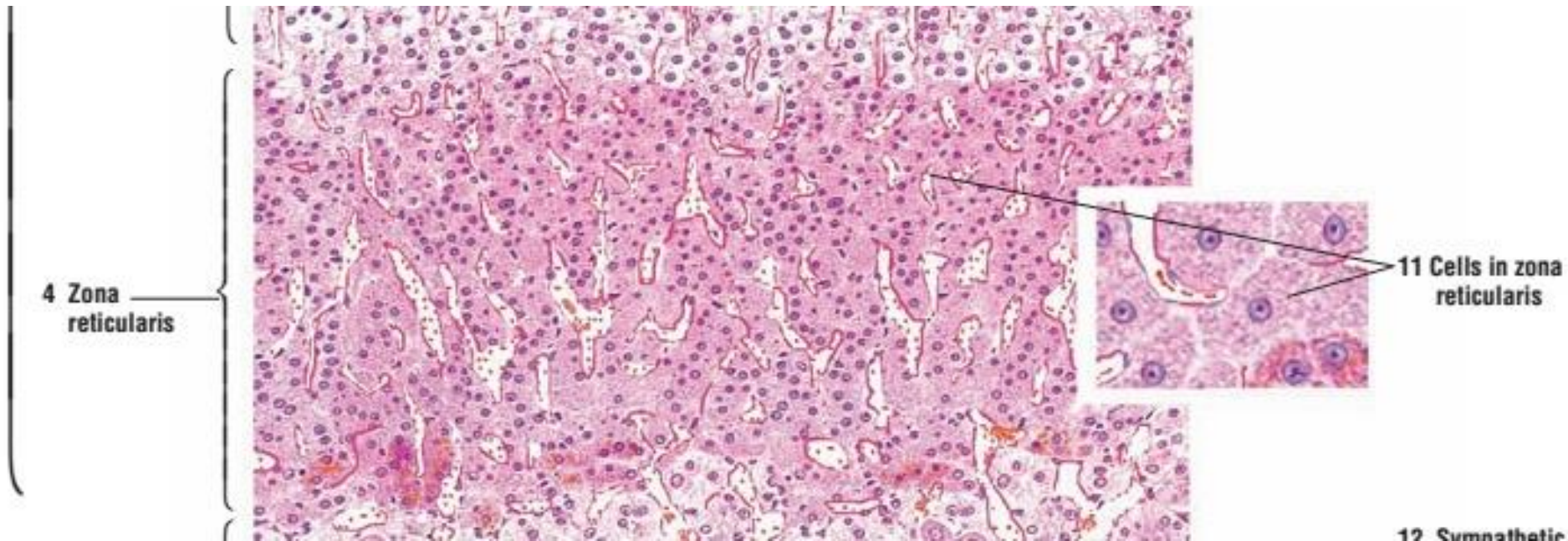
These cells secrete:-

- Glucocorticoids, especially cortisol.
- which affect carbohydrate metabolism by stimulating gluconeogenesis in many cells and glycogen synthesis in the liver.

Cortisol:-

- Also suppresses many immune functions and can induce fat mobilization and muscle proteolysis.
- Secretion is controlled by ACTH with negative feedback proportional to the concentration of circulating glucocorticoids
- Small amounts of weak androgens are also produced here.

# Zona Reticularis

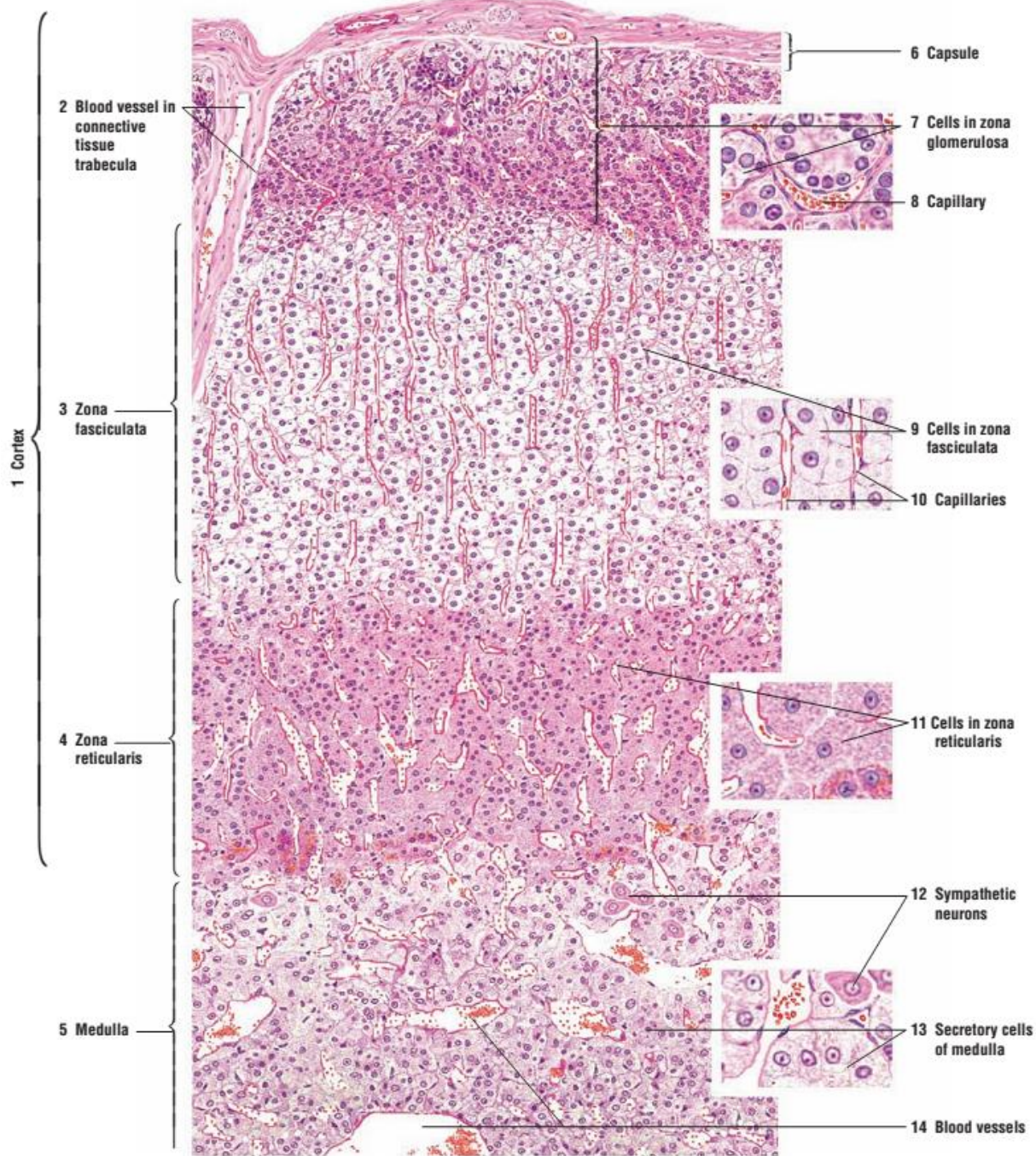


The innermost Zona Reticularis comprises about 10% of the cortex

Consists of smaller cells in a network of irregular cords interspersed with wide capillaries

The cells are usually more heavily stained, than those of the other zones

Because they contain fewer lipid droplets and more lipofuscin pigment



# Zona Reticularis

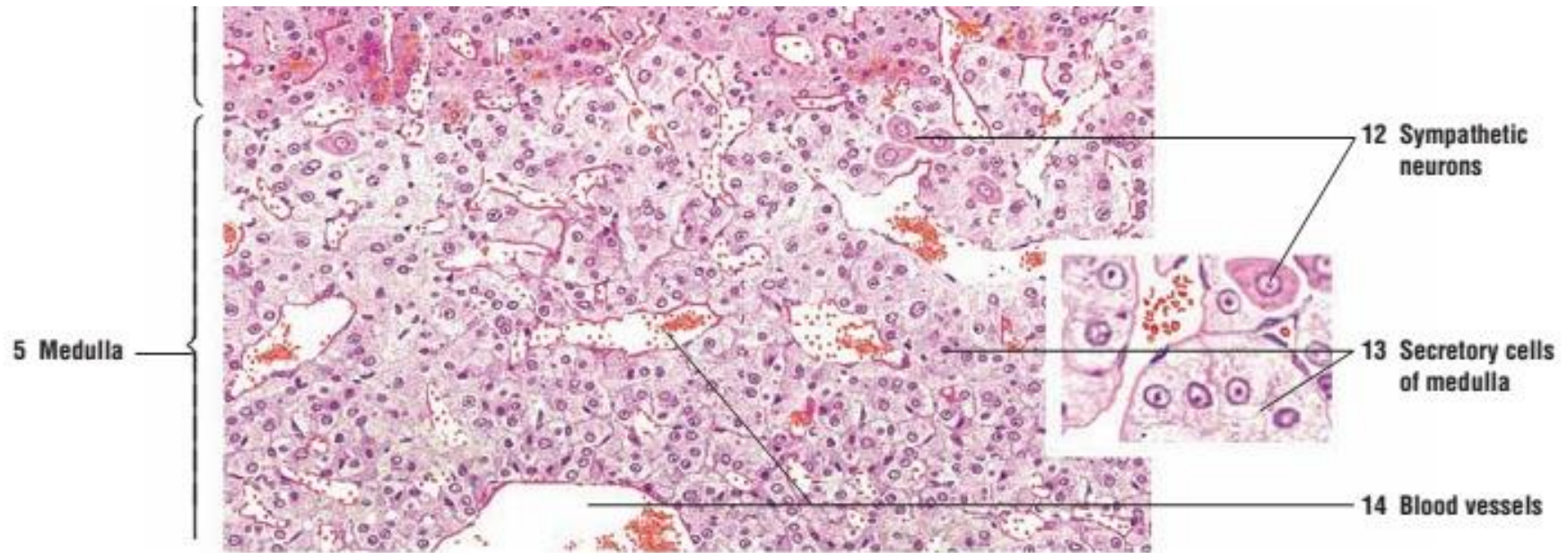
- Cells of the also produce cortisol
- But primarily secrete the weak androgens,
- Including dehydroepiandrosterone (DHEA) that is converted to testosterone in both men and women.
- Secretion by these cells is also stimulated by ACTH with regulatory feedback.

# MEDICAL APPLICATION

- ❑ Addison disease or adrenal cortical insufficiency is a disorder,
- ❑ Usually autoimmune in origin
- ❑ Which causes degeneration in any layer of adrenal cortex
- ❑ With concomitant loss of glucocorticoids, mineralocorticoids, or androgen production

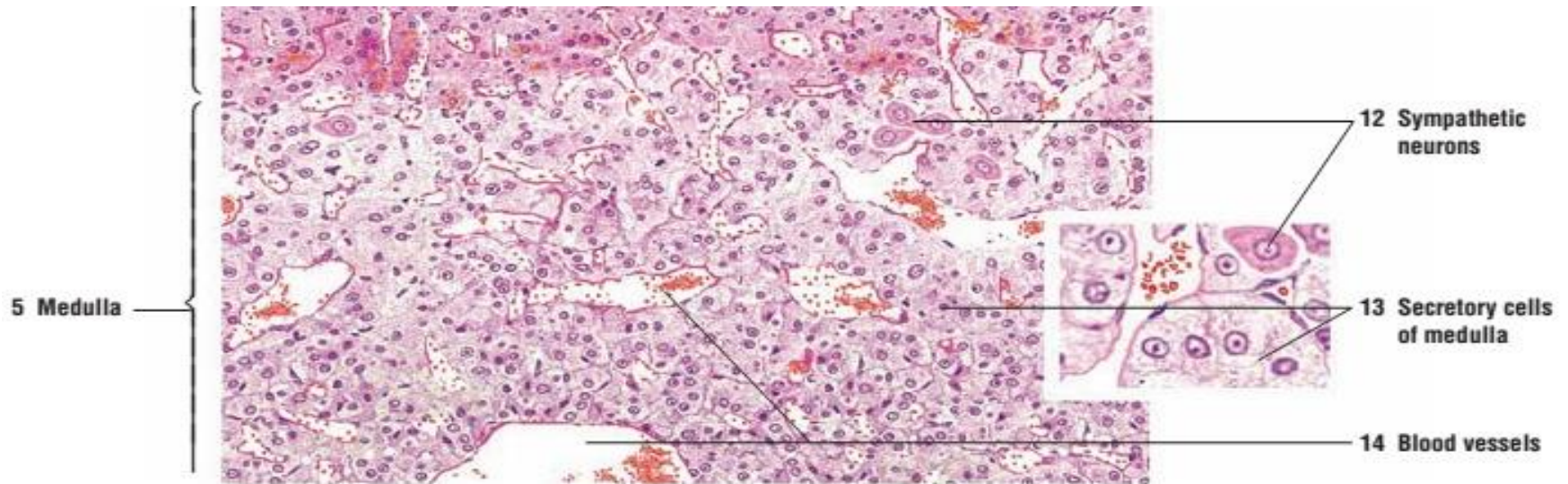


# Adrenal Medulla



- Is composed of large, pale-staining polyhedral cells arranged in cords or clumps and supported by a reticular fiber network.
- A profuse supply of sinusoidal capillaries intervenes between adjacent cords and a few sympathetic ganglion cells are present.

# Adrenal Medulla



- Medullary parenchymal cells, known as chromaffin cells.
- Arise from neural crest cells.
- Chromaffin cells can be considered modified sympathetic postganglionic neurons.
- lacking axons and dendrites and specialized as secretory cell.

# Adrenal Medulla

## Chromaffin cells:-

- Contain many electron-dense granules, 150 to 350 nm in diameter,
- For storage and secretion of catecholamines, Either Epinephrine or Norepinephrine.

# MEDICAL APPLICATION

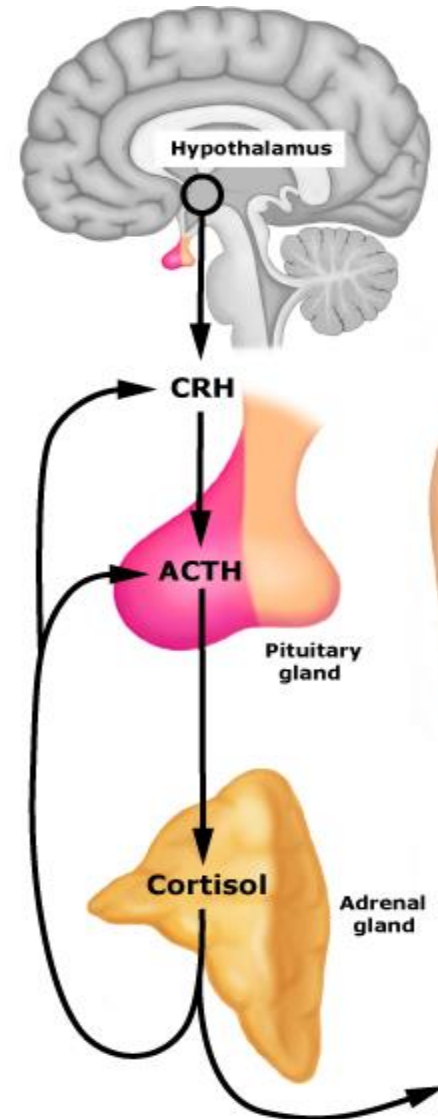
Adrenal Medulla:-

(Benign pheochromocytoma).

- **Periodically secrete high levels of catecholamines**
- That cause swings in blood pressure between hypertension and hypotension.

# Normal cortisol production by the adrenal glands

- Cortisol levels are normally regulated by the hypothalamus and pituitary gland.
- The hypothalamus sends corticotropin-releasing hormone (CRH) to the pituitary gland.
- The pituitary gland responds by producing several hormones, one of which is ACTH (Adrenocorticotropin).
- ACTH stimulates the adrenal gland to produce cortisol.
- Cortisol levels help to control the pituitary's production of ACTH.



# PRIMARY ADRENAL INSUFFICIENCY

- Also known as Addison's disease,
- Occurs when the adrenal glands cannot produce an adequate amount of hormones despite a normal or increased corticotropin (ACTH) level .

## **SIGN AND SYMPTON:-**

- Fatigue, generalized weakness, loss of appetite, and weight loss.
- Other common symptoms include:
- Darkening of the skin, especially on the face, neck, and back of hands
- Gastrointestinal symptoms such as nausea and vomiting (vomiting and abdominal pain may be a sign of an adrenal crisis)
- Low blood pressure with lightheadedness after standing or sitting up
- Muscle and joint pain
- Salt cravings
- In women, decreased hair in the armpits and pubic area and decreased sexual desire

# SECONDARY AND TERTIARY ADRENAL INSUFFICIENCY

- An insufficient amount of corticotropin (ACTH) is produced by the pituitary gland.
- In tertiary adrenal insufficiency, an insufficient amount of corticotropin-releasing hormone (CRH) is produced by the hypothalamus.

# SECONDARY AND TERTIARY ADRENAL INSUFFICIENCY

## Symptoms :-

Similar to those of primary insufficiency, with a few exceptions:

- Darkening of the skin
- Dehydration do not occur
- Gastrointestinal symptoms are less common
- Symptoms of hypoglycemia (low blood sugar) are more common.
- A tumor or other growth in the pituitary or hypothalamus can cause other symptoms, including headaches and difficulty seeing objects in the periphery of vision (to the far left and right).
- Also, low levels of pituitary hormones can develop and may cause infertility, erectile dysfunction (impotence), fatigue, hoarseness, constipation,
- A delay in beginning puberty, or short stature in children.



# Primary adrenal insufficiency



- A) A 57-year-old woman presented with symptoms of primary adrenal insufficiency secondary to autoimmune Addison's disease. Diffuse skin hyperpigmentation had developed during the last year, as illustrated by her facial appearance.
- (B) The hands demonstrate increased pigmentation of the palmar creases and wrists compared to a normal female control (far right).
- (C) With long-term glucocorticoid and mineralocorticoid therapy, her hyperpigmentation resolved, as shown by the normal palmar skin pigmentation in the patient at age 83. Of note, she wears a medical bracelet indicating her requirement for glucocorticoids in case of severe illness.

# Adrenal Insufficiency.

- This photo shows the inner lip of a man with adrenal insufficiency. The lip has darkened areas caused by a hormone imbalance.



- Hyperpigmentation of nails





Thank You