

Periyar Govt Arts College



ADRENAL GLANDS

DR K.ARULDOSS
ASSISTANT PROFESSOR

ADRENAL GLANDS



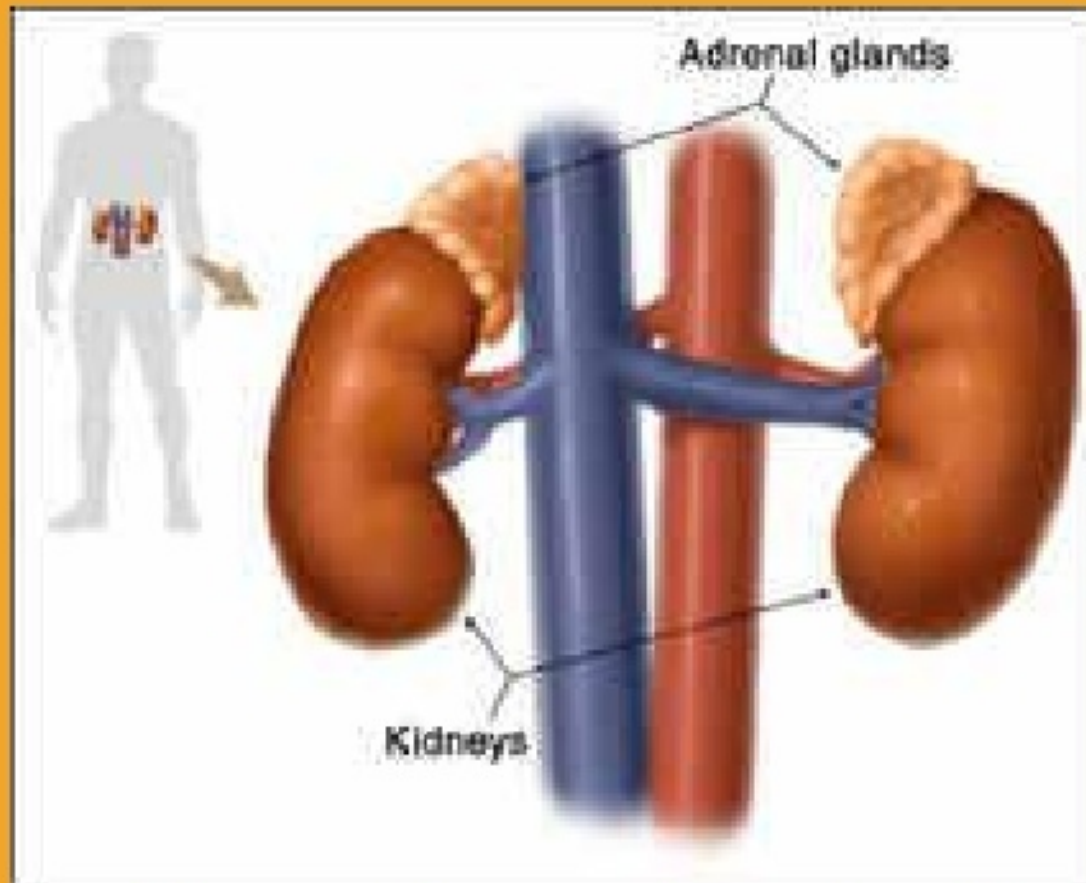
- Paired organs
- Flattened structure with half – moon shape
- Surrounded by **dense irregular connective tissue – reticular fibers for support**
- Embedded in **adipose tissue**
- 2 concentric layers:
 - Adrenal cortex
 - Adrenal medulla

ADRENAL GLANDS



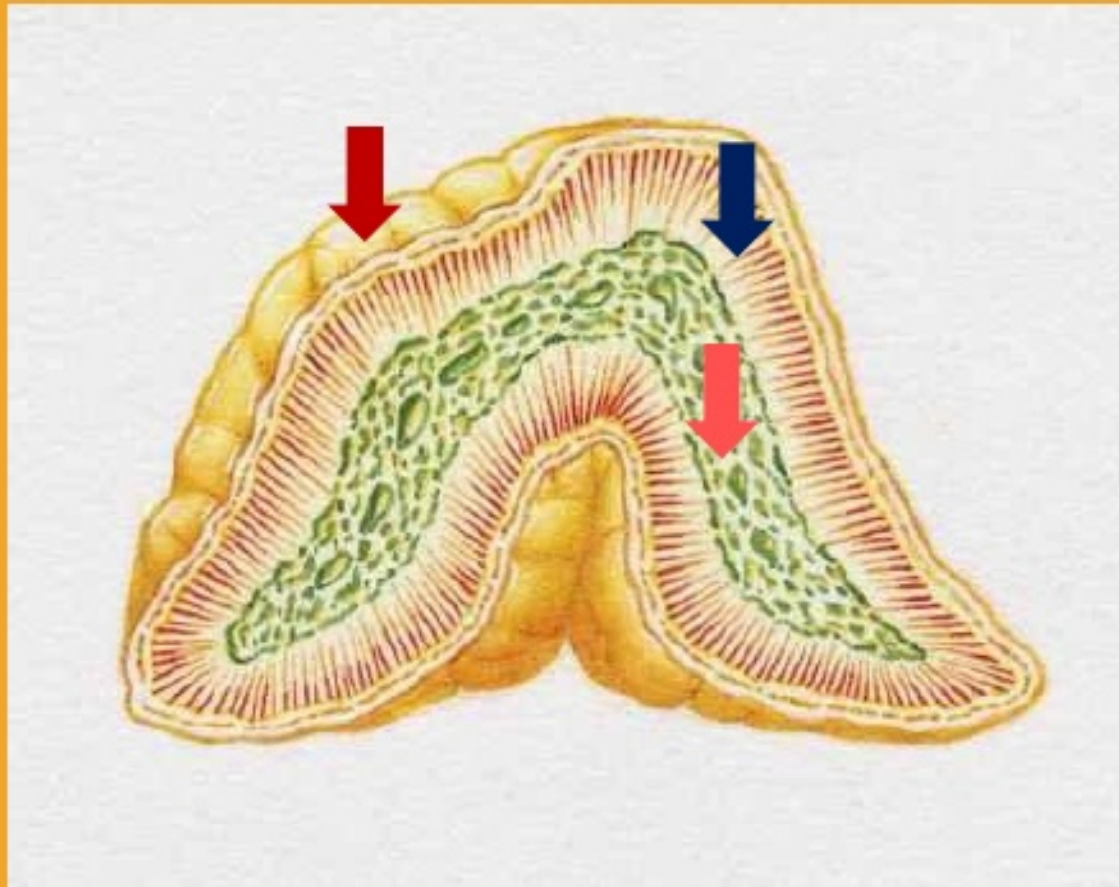
- Cells of both layers are grouped in cords along capillaries
- Dense CT capsule sends thin septa to the interior of the gland – **trabeculae**

LOCATION



**Lie near the superior poles of
kidneys**

COMPOSITION

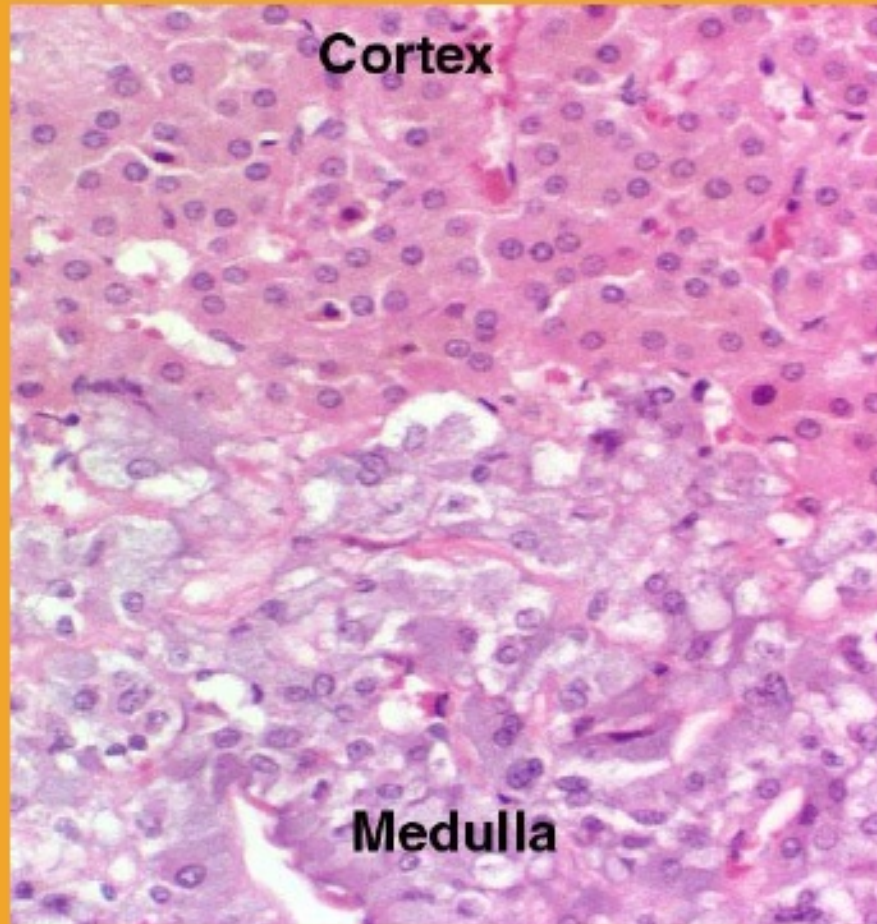


RED – Capsule

BLUE – Cortex

PINK – Medulla

COMPOSITION



ADRENAL CORTEX



- Cells contain numerous lipid droplets
- **Spongyocytes**
- Cells that secrete **glucocorticoids**, **mineralocorticoids**, and **gonadocorticoids**
- Has 3 concentric layers with fenestrated capillaries

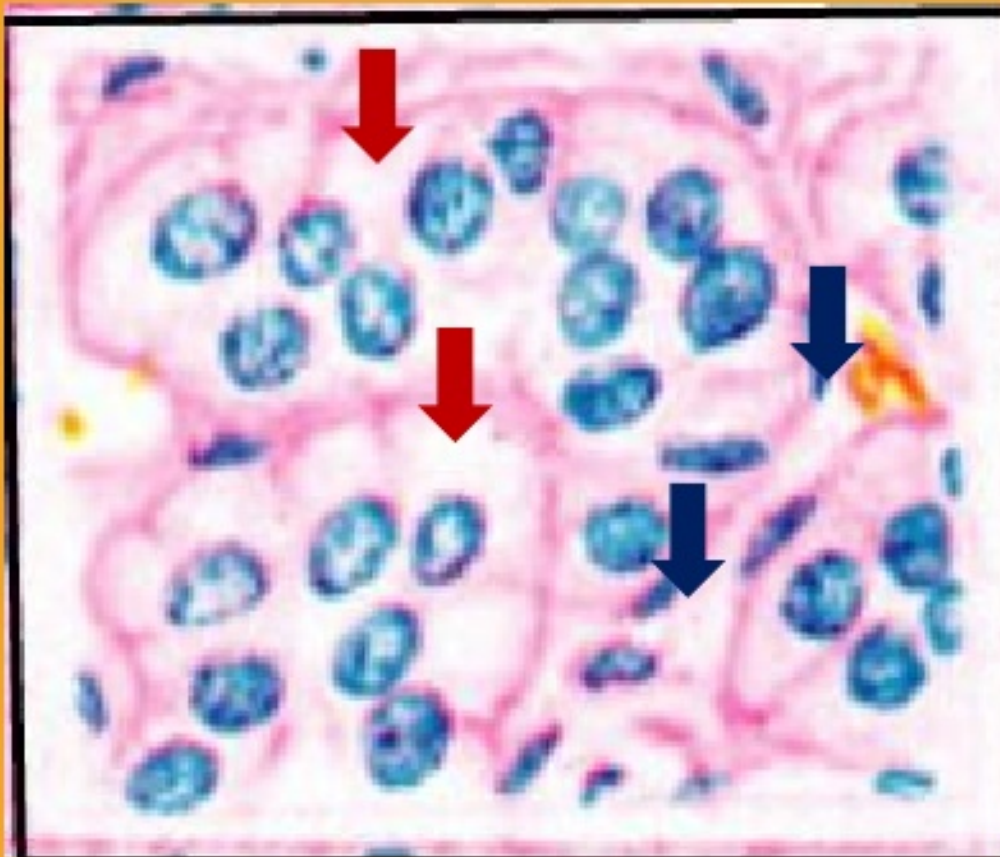
3 CONCENTRIC LAYERS



- **Zona glomerulosa**

- Occupy 15% of the cortex
- Immediately beneath the capsule
- Columnar or pyramidal cells
- Arranged in closely packed, rounded, arched cords, or small clumps

ZONA GLOMERULOSA



RED – Cells of
zona glomerulosa

BLUE – sinusoidal
capillaries and
endothelial cells

3 CONCENTRIC LAYERS



- **Zona Fasciculata**

- Occupy 65% of the cortex
- Intermediate zone
- Polyhedral, often binucleated cells with lipid droplets in their cytoplasm
- Cells are also called spongyocytes due to vacuolization
- Arranged in one or two – cell thick straight cords

3 CONCENTRIC LAYERS



- **Zona Reticularis**

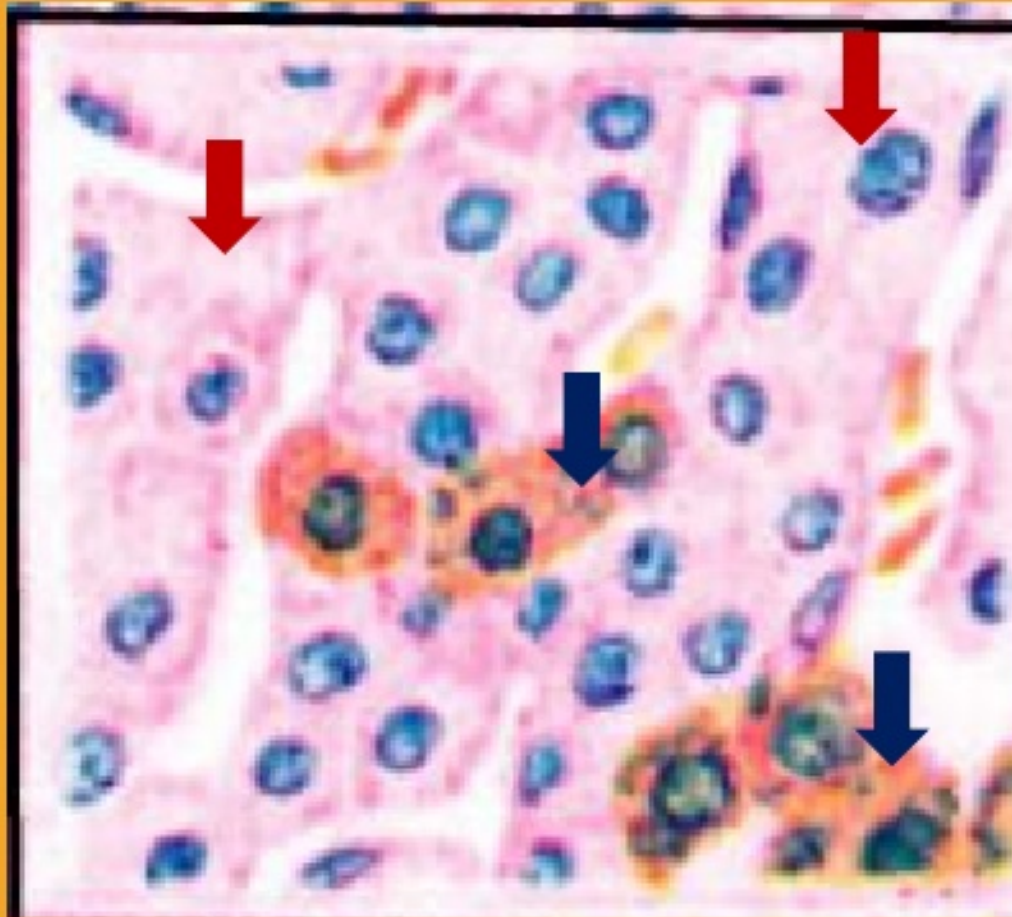
- occupy 7% of the cortex
- Innermost layer – lies between zona fasciculata and medulla
- Smaller cells disposed in irregular cords forming an anastomosing network
- Presence of lipofuscin pigment granules – large and numerous

3 CONCENTRIC LAYERS



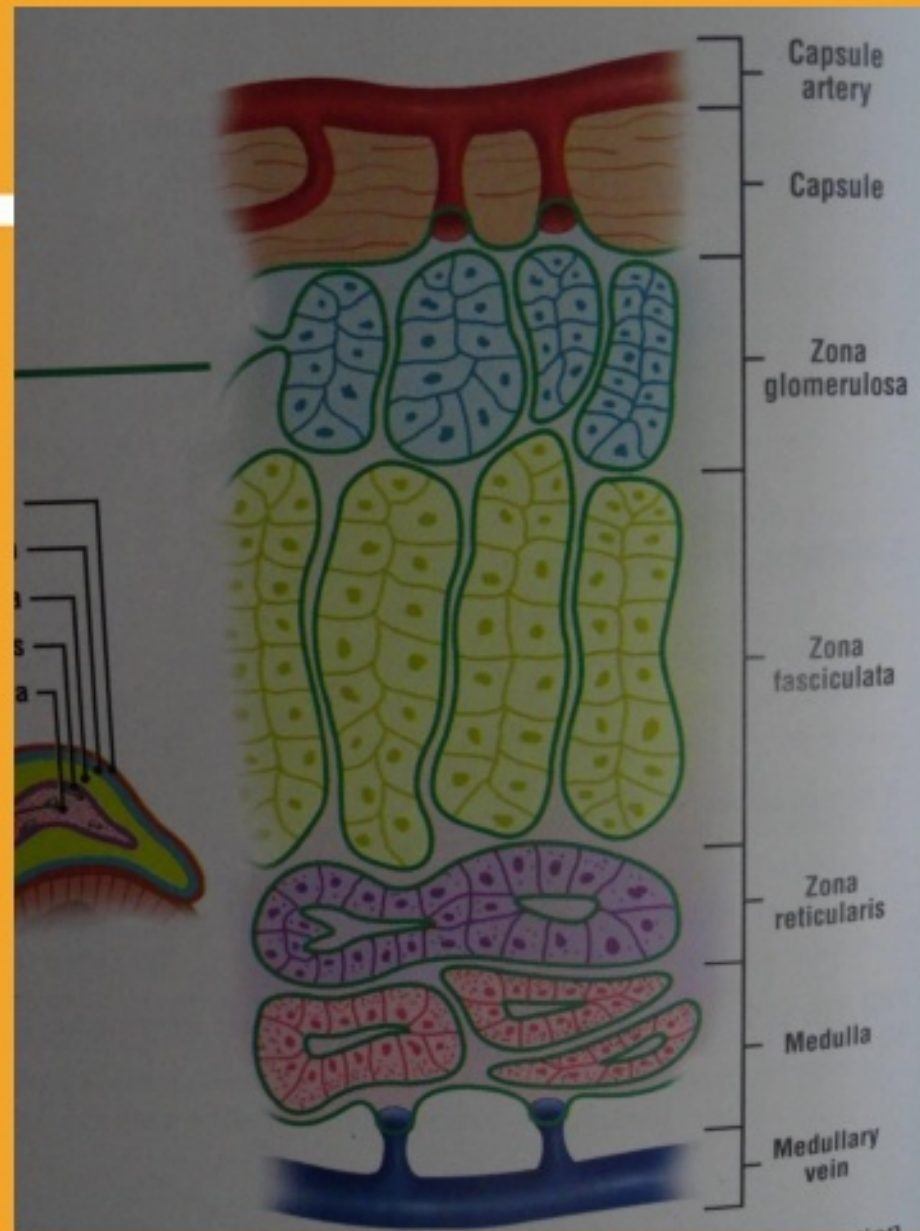
- Irregularly shaped cells with pyknotic nuclei – suggesting cell death
- Arranged in cords or clumps

ZONA RETICULARIS



RED – Cells of zona reticularis

BLUE – Pigmented cells



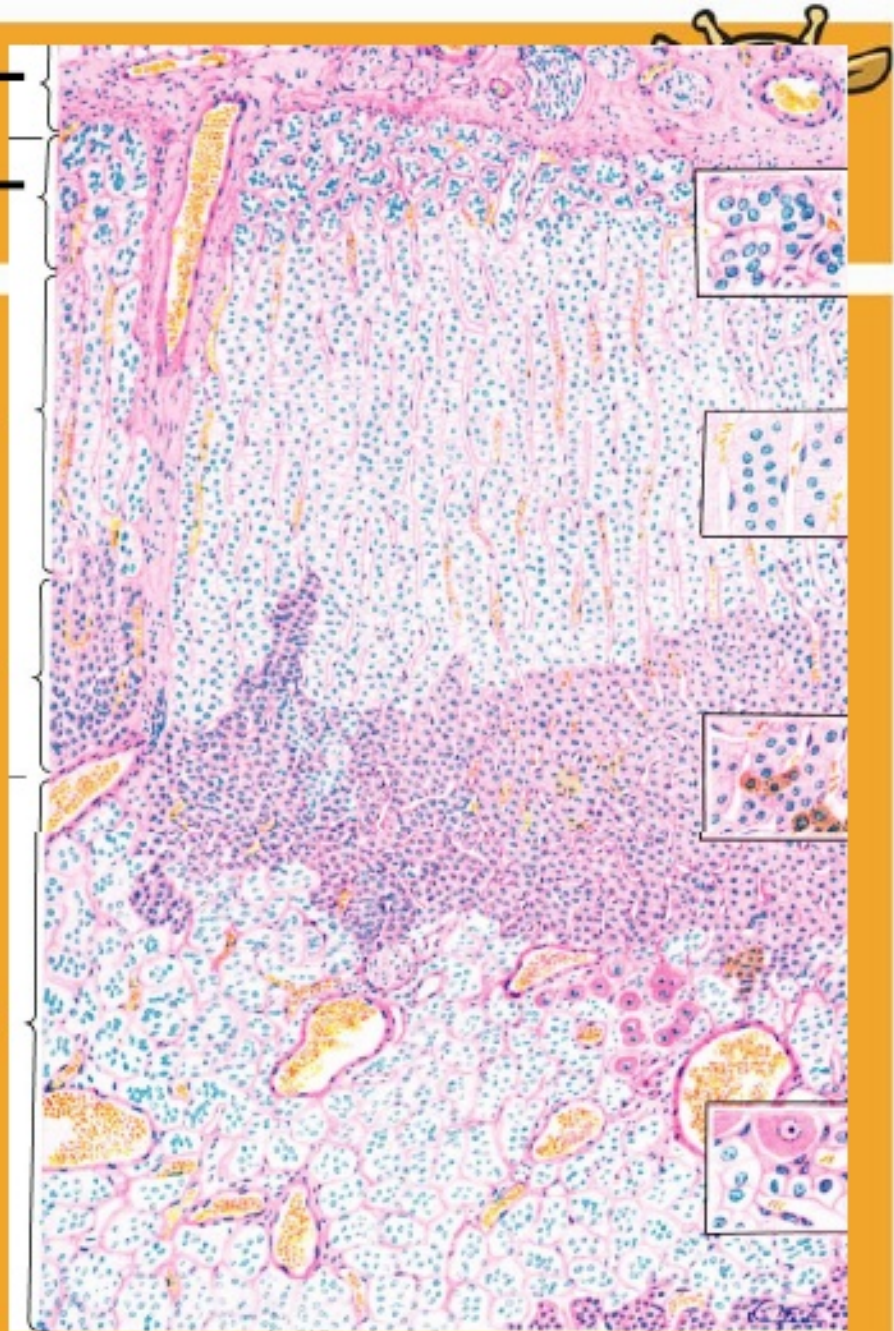
CAPSULE

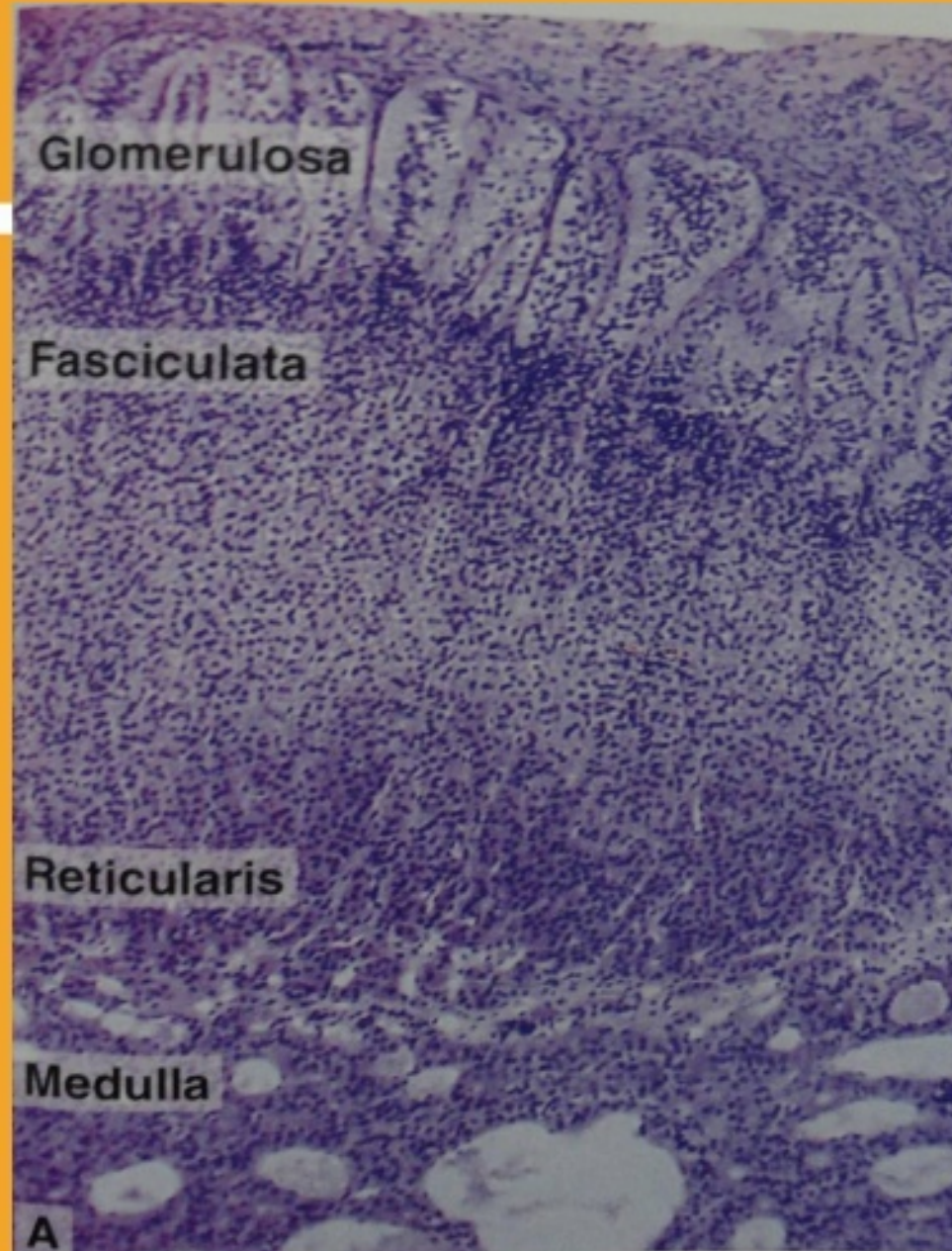
ZONA GLOMERULOSA

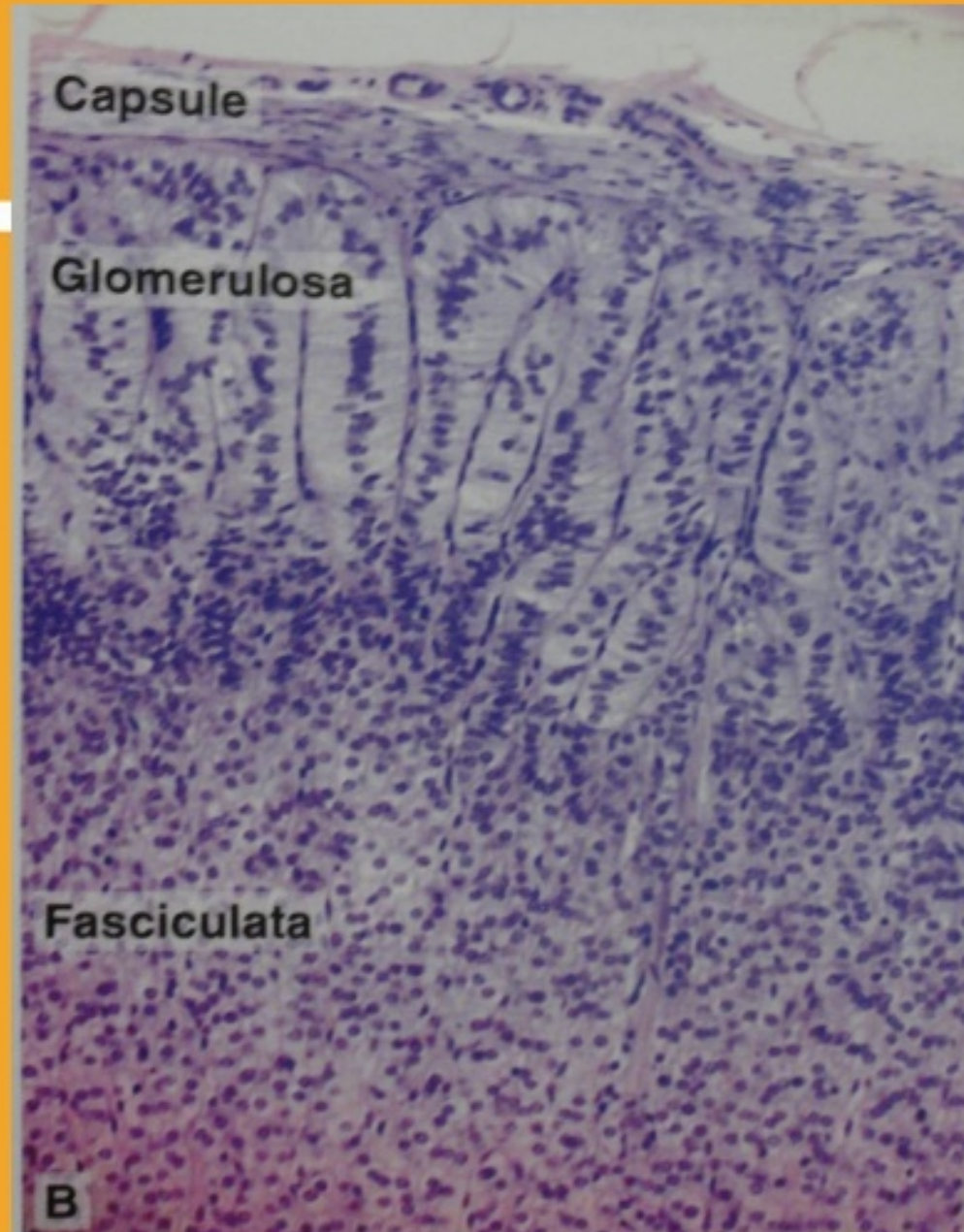
ZONA FASCICULATA

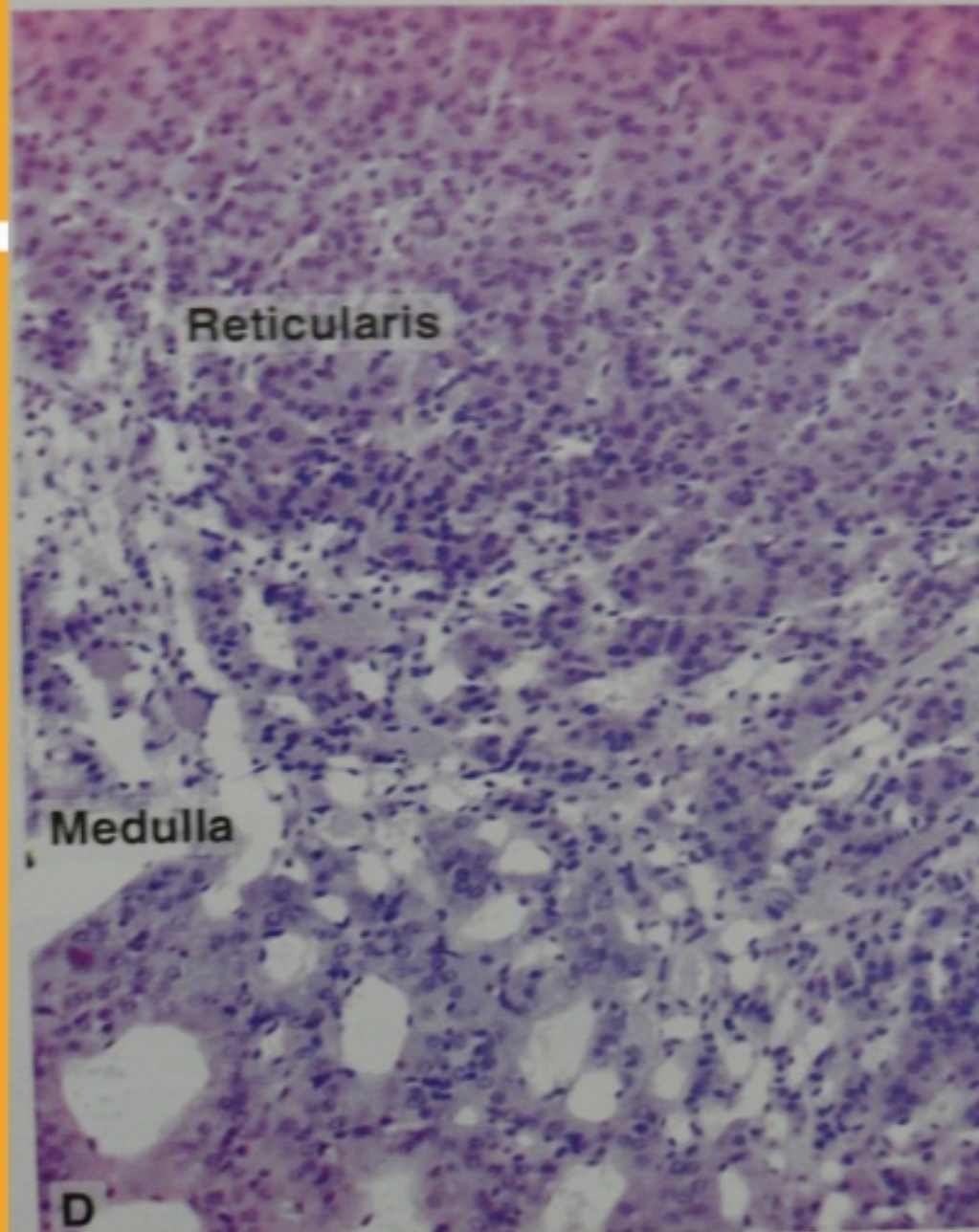
ZONA RETICULARIS

MEDULLA









HORMONES (CORTEX)



- Mineralocorticoids
- Glucocorticoids
- Androgens

MINERALOCORTICOIDS



- Secreted from adrenal cortex – **zona glomerulosa**
- Steroid hormones – **aldosterone**
- Important for electrolyte homeostasis and water balance
- Act mainly on the distal kidney tubules, salivary glands, and sweat glands



- Stimulates **reabsorption of sodium and increase potassium excretion into urine**

GLUCOCORTICOIDS



- Secreted from adrenal cortex – **zona fasciculata**
- Include the principal hormone - **cortisol**
- Affect the metabolism of carbohydrates, proteins, and lipids
 - Stimulation of gluconeogenesis

GLUCOCORTICOIDS



- Mobilization of amino acids from extrahepatic tissues
- Inhibition of glucose uptake in muscle and adipose tissues
- Stimulation of fat breakdown
- Suppress immune response
 - Destroying circulating lymphocytes
 - Inhibiting mitotic activity

ANDROGEN



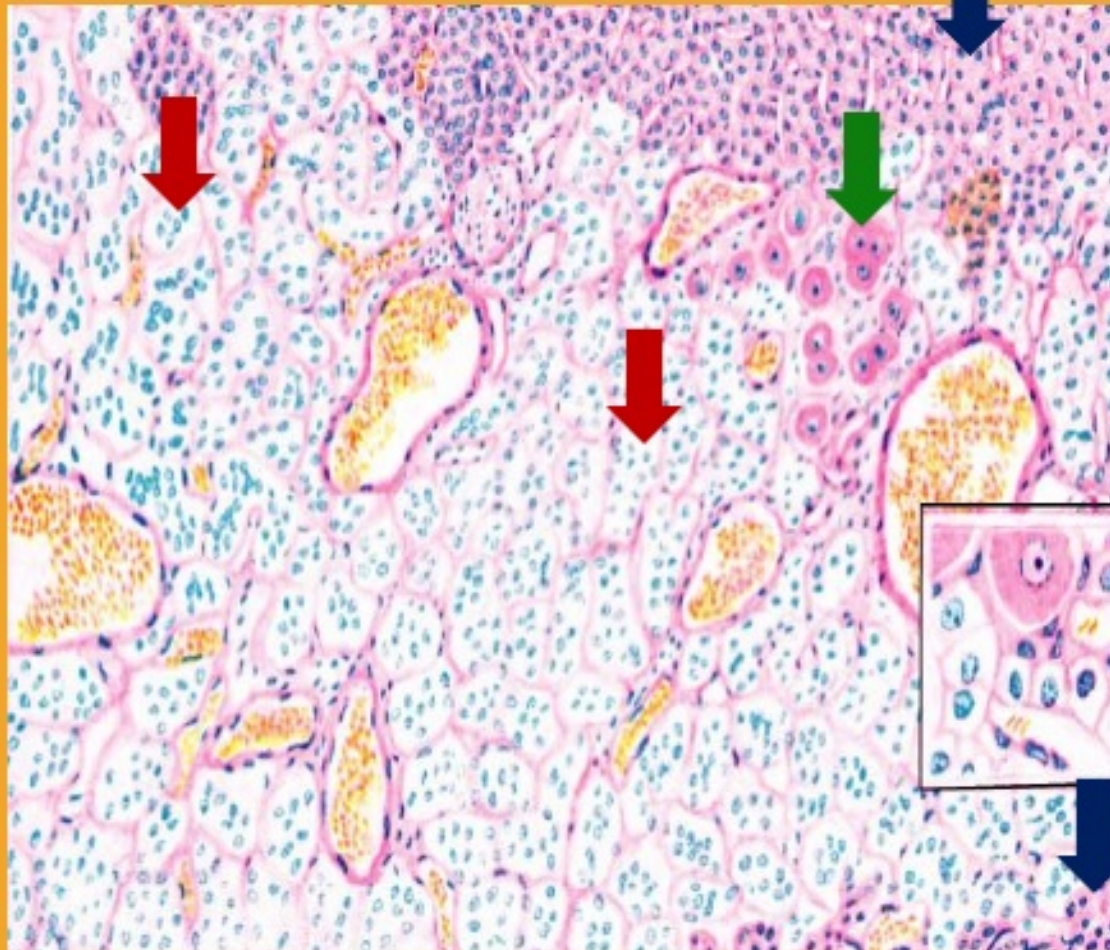
- Secreted from the adrenal cortex - **zona reticularis**
- Males: male sexual characteristics
- Females: female sex drive
- **Dehydroepiandrosterone**
 - Weak androgen
 - Circulates the blood as a sulfate
 - Exerts its actions after being converted to testosterone

MEDULLA



- Lies in the center of the adrenal gland
- Composed of polyhedral cells
- Arranged in cords or clumps, supported by reticular fiber network
- Composed of **chromaffin cells**
- Secretes **catecholamines**
- Contains sympathetic ganglion cells

MEDULLA

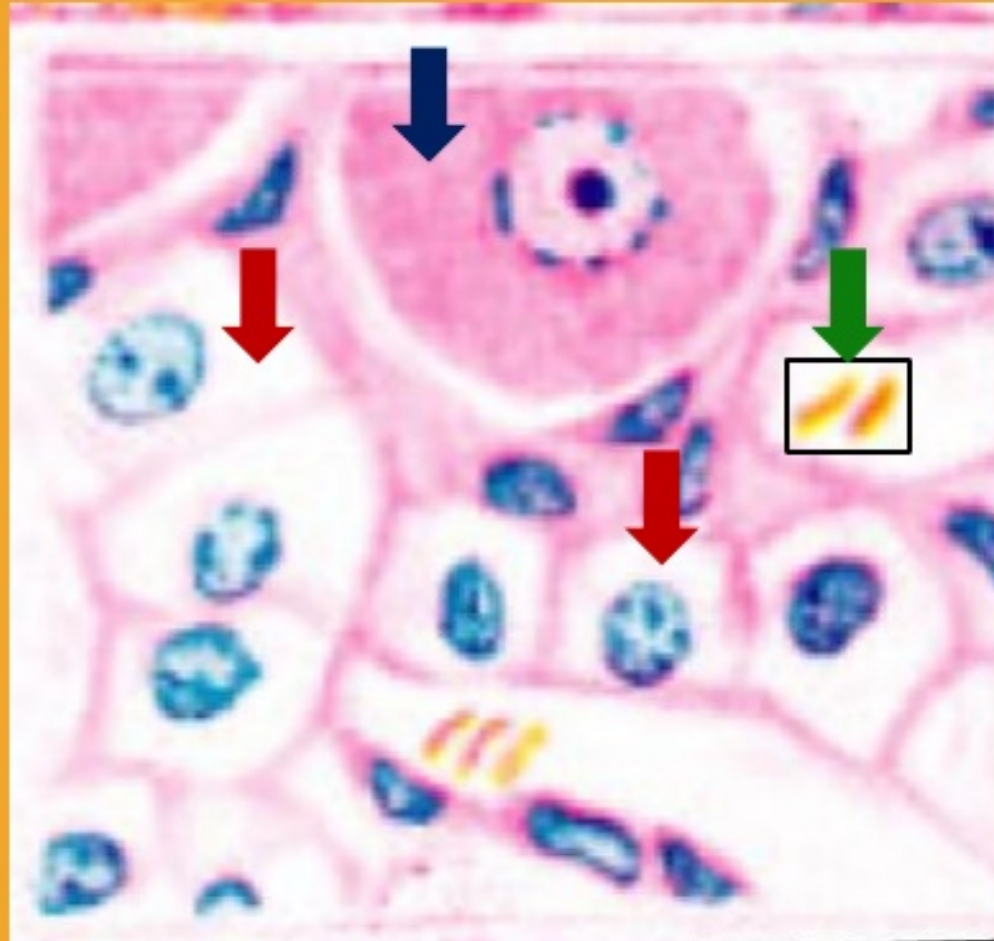


RED – Cells of the medulla

BLUE – Cells of the zona reticularis

GREEN – Sympathetic ganglion cells

MEDULLA



RED – Cells of the medulla

BLUE – Sympathetic ganglion cells

GREEN – Brown granules

CHROMAFFIN CELLS



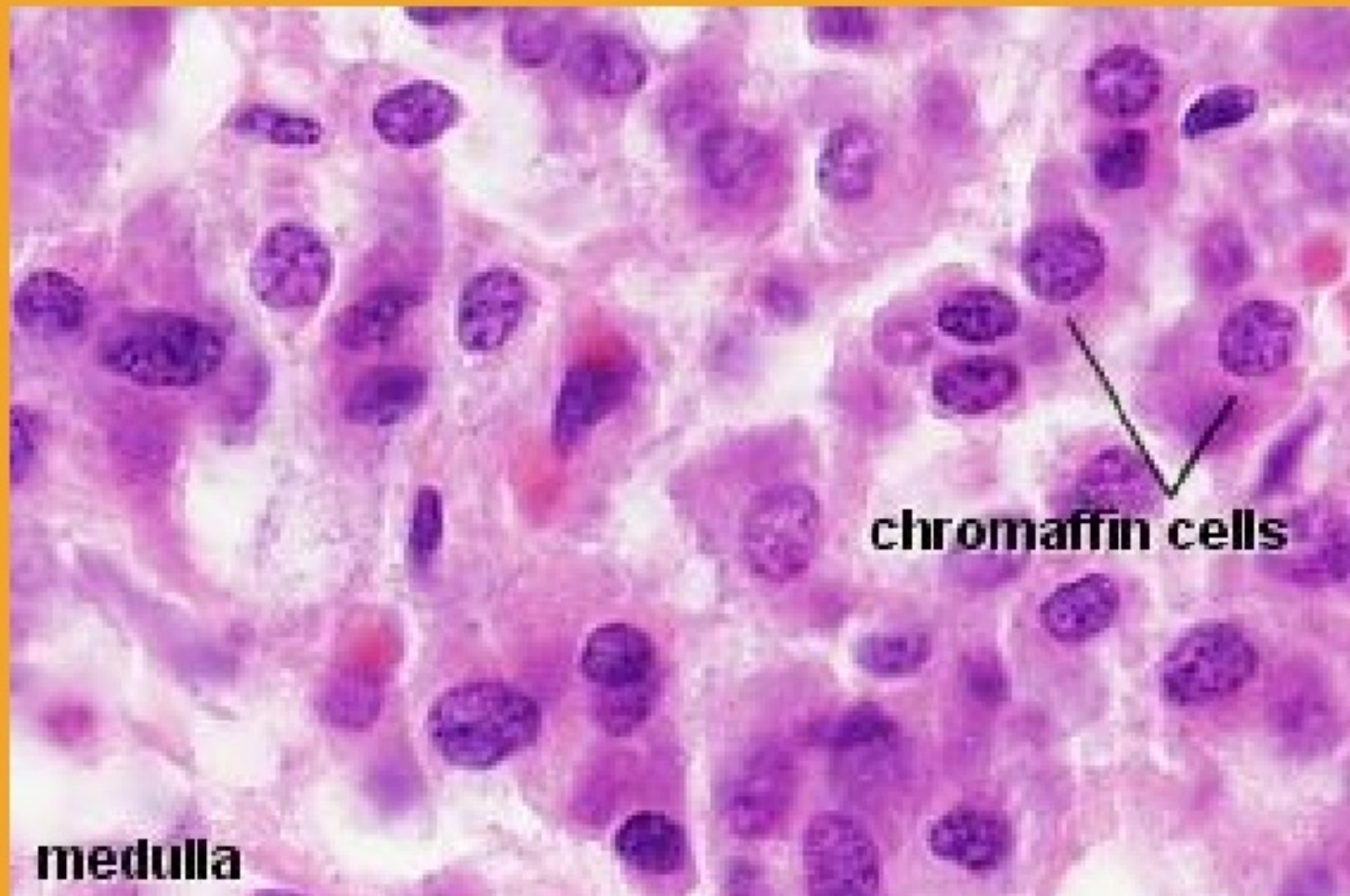
- A neuroendocrine cell
- Release neurotransmitter into systemic circulation for systemic effects on multiple organs
- Contains **N** and **E** cells
 - Secretes **Norepinephrine** and **Epinephrine** respectively

E - CELLS



- Characterized by containing small granules
- Store **epinephrine**

CHROMAFFIN CELLS



medulla

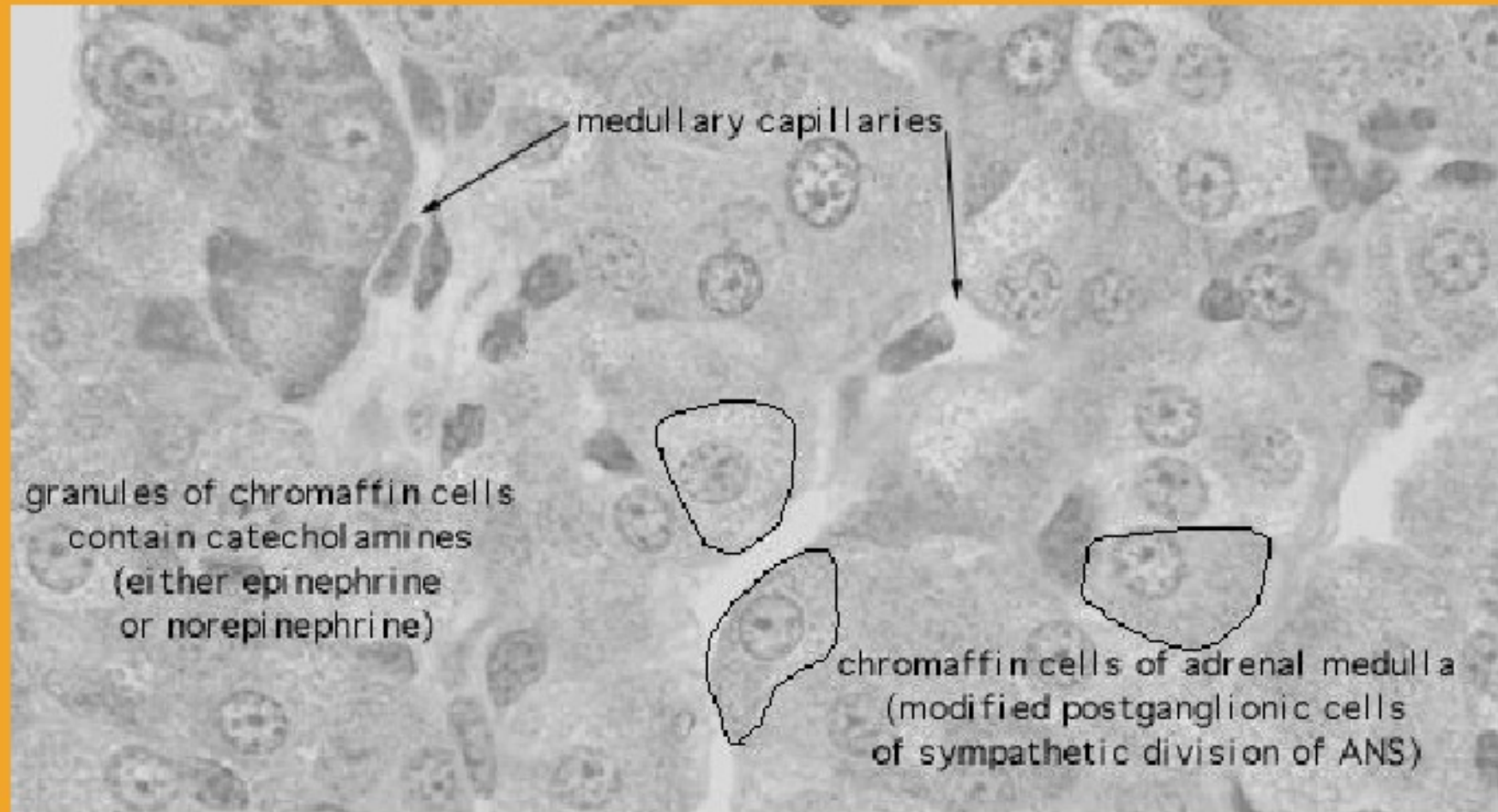
chromaffin cells

NE - CELLS



- Characterized by larger granules
 - Contains **dense cores** giving an appearance of eccentric “bulls - eyes”
- More intense chromaffin reaction
- Store **norepinephrine**

CHROMAFFIN CELLS



HORMONES (MEDULLA)



- Catecholamines
 - Epinephrine
 - Norepinephrine

EPINEPHRINE



- Prepares the body for “fright, fight, or flight”
- Increased heart action
- Vasoconstriction in most systemic arteries and veins
- Rate and depth of breathing increases
- Force of muscular contraction is increased

NOREPINEPHRINE



- Increases blood pressure
- Stimulates respiration and gastrointestinal contractions
- Triggering release of glucose
- Suppress neuroinflammation
- Increases blood pressure by increasing tension of muscles