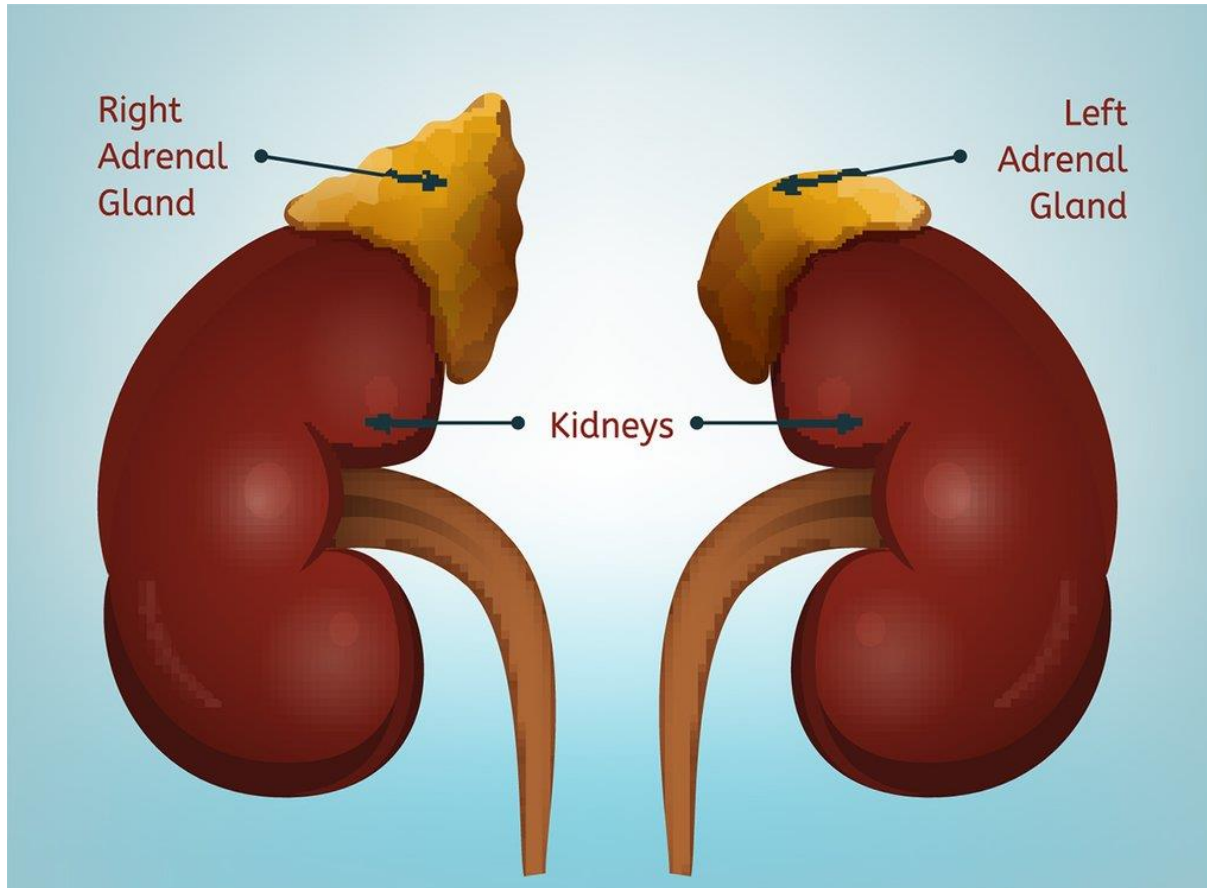


Adrenal glands



Dr Pramod Kumar

Asstt. Professor

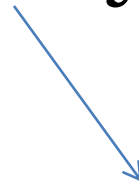
Dept. of Vety. Physiology

Bihar Veterinary College, Patna

ADRENAL GLANDS

- Paired organs
- Flattened structure with half – moon shape
- Surrounded by reticular fibers for support
- Embedded in adipose tissue

Concentric layers



Adrenal cortex

Adrenal medulla

➤ Location - Lie near superior poles of kidneys

Capsule – red

Cortex - blue

Medulla – pink

Cortex

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

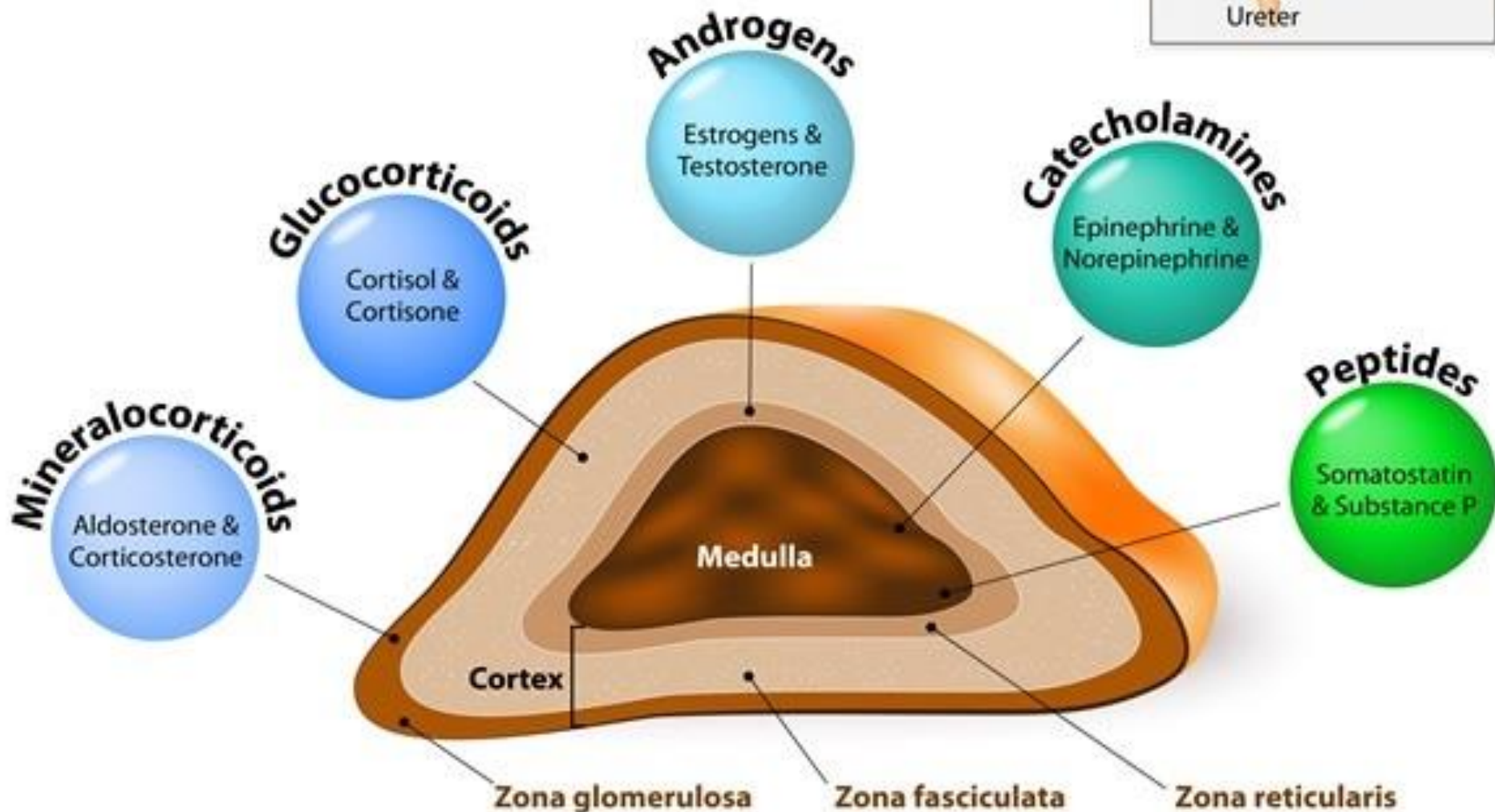
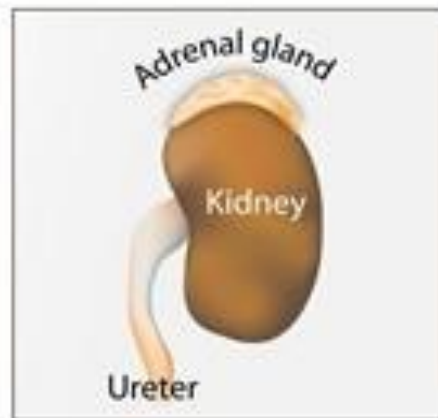
Cortex (Endocrine)

Concentric layers - Zona glomerulosa

- Occupy 15% of the cortex
- beneath the capsule or pyramidal cells
- Arranged closely packed, round, arched cords or small clumps
- Red – Cells of zona glomerulosa
- Blue – sinusoidal capillaries and endothelial cells

ADRENAL GLAND

(hormones)



Zona Fasciculata

- Occupy 65% of the cortex
- Intermediate zone
- Polyhedral and binucleated cells with lipid droplets in their cytoplasm
- Cells are spongyocytes (vacuolization)
- Arranged in one or two – cell thick straight cords
- Red – Cells of zona fasciculata
- Blue – sinusoidal capillaries

Zona Reticularis

- occupy 7% of the cortex
- Innermost layer – lies between zona fasciculata and medulla
- Smaller cells forming anastomosing network
- Presence of lipofuscin pigment granules
- Concentric layers - Irregular shaped cells with pyknotic nuclei, suggesting cell death
- Red – Cells of zona reticularis
- Blue – Pigmented cells

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
- 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
- Controlling secretion of cytokines
- Promotes maturation of lung and production of surfactant in fetal development

Androgen

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

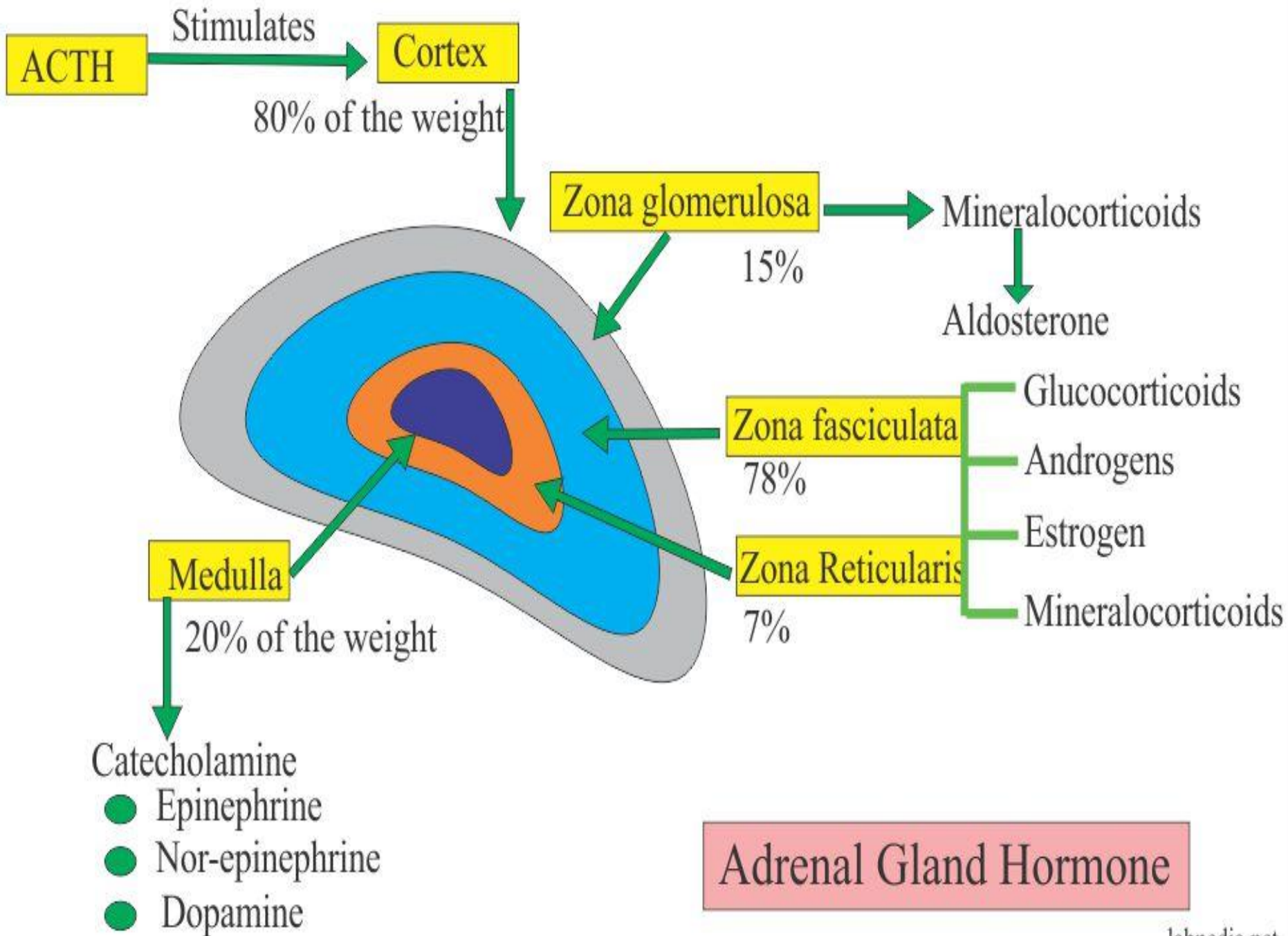
Medulla (Neurocrine)

- 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

Chromaffin cells

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

- E cells - Characterized by small granules, store epinephrine
- NE cells - Characterized by larger granules, contains dense cores giving an appearance of eccentric “bulls - eyes”
- More intense chromaffin reaction, store norepinephrine



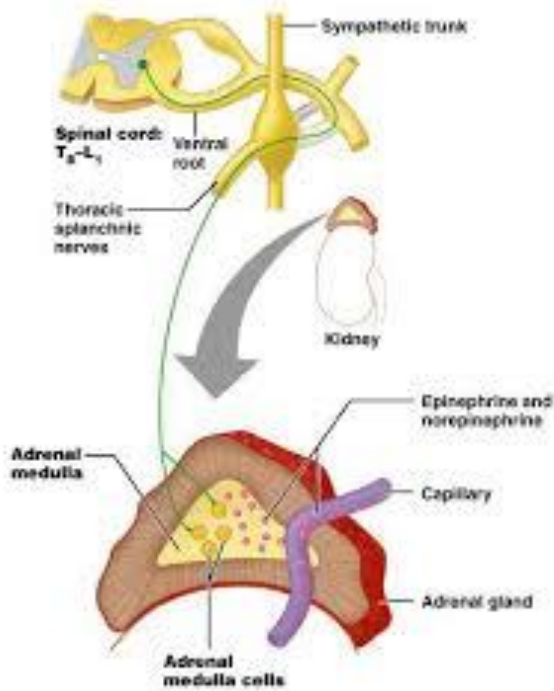
Hormones (medulla)- Catecholamines

Epinephrine:

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

Short-Term Stress Response

Hypothalamus sends nerve signals via the spinal cord.



Adrenal medulla

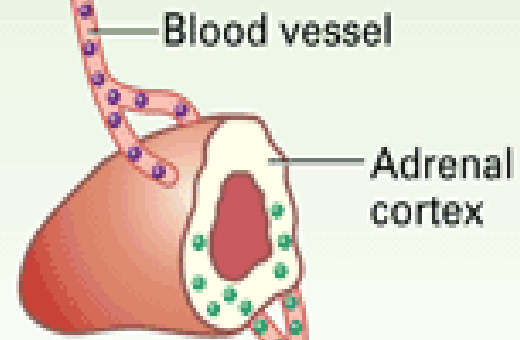
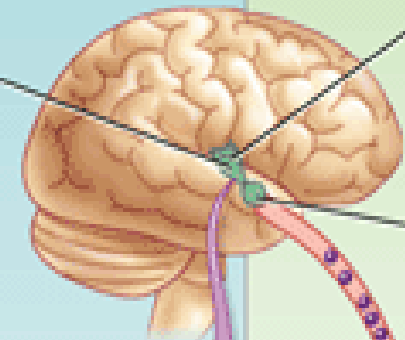


Epinephrine and norepinephrine

Long-Term Stress Response

Hypothalamus stimulates anterior pituitary with releasing hormone.

Anterior pituitary releases ACTH into blood.



Corticosteroids

Norepinephrine:

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