# 15

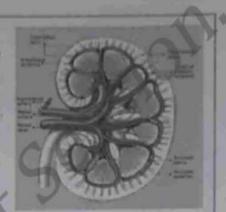
# Excretion and Osmoregulation

# Subtopics

- 15.1 Excretion and Excretory Products
- 15.2 Excretory System in Human being
- 15.3 Urine Formation
- 15.4 Concentration of Urine
- 15.5 Composition of Urine
- 15.6 Role of Other Organs in Excretion
- 15.7 Disorders and Diseases

#### Kidneys

Kicheys are bean-shaped organs that maintain a constant internal environment. They help in elimination of nitrogenous waste products from the body and regulate the acid base balance.



# (0)

### Quick Review

### Regulation of Kidney Function

- Renin (proteolytic enzyme) → Converts Angiotensinogen to Angiotensin.
- Angiotensin II → Stimulates PCT to reabsorb more Na<sup>+</sup> and H<sub>2</sub>O.

Stimulates adrenal cortex to release Aldosterone.

- Aldosterone → Stimulates DCT to reabsorb more Na\* and H-O.
- Antidiuretic Hormone (ADH) → Facilitates reabsorption of water from renal tubules.
- Atrial Natriuretic Factor (ANF) → Promotes salt and water excretion in urine.

### Kidney Disorders

- Renal failure → Inability of kidney to filter toxic substances from blood.
- Uremia → Increased levels of urea (> 0.05%) in blood
- Nephritis → Inflammation of glomeruli of both kidneys.
- Kidney stones → Blockage of kidney tubules and urinary passage due to renal calculi (insoluble mass of crystallized salts).

#### EXCRETION AND OSMOREGULATION

- Excretion → Elimination of nitrogenous waste products from the body.
- Osmoregulation → Maintenance of optimal concentration of water and salts in tissues and body fluids.

#### Modes of Excretion

#### Ammonotelism

- · Excretion of Ammonia.
- Very toxic and requires plenty of water for excretion.
  - eg. Bony fishes, aquatic invertebrates, etc.

#### Ureotelism

- \* Excretion of urea.
- Less toxic and needs moderate amount of water for excretion.
  - eg. Frogs, mammals, marine fishes, etc.

#### Uricotelism

- · Excretion of uric acid.
- Least toxic and requires negligible amount of water.
- eg. Reptiles, birds and insects.

#### Guanotelism

- · Excretion of mostly guanine.
- These organisms are known as guanotelic.
- eg. Arachids (spiders, scorpions), penguins.

# Human Excretory System

# Kidneys

- Dark, bean-shaped, retroperitoneal, mesodermal organs.
- Renal Cortex → Dark, outer peripheral region of kidney.
- Renal Medulla → Light, inner central part of kidney consisting of renal pyramids.

### Ureter

- Thin, narrow muscular duct arising from hilum of kidney.
- Carry urine from kidneys upto urinary bladder.

# Urinary Bladder

- Thick walled, highly muscular structure.
- Temporary storage of urine.

# Urethra

- Single tube-like structure arising from urinary bladder
- bladder

  Carries urine from urinary
  bladder to the exterior of
  the body.

# Nephron

Structural and functional unit of kidney

# Malpighian Body

- Malpighian Body → Bowman's capsule + Glomerulus.
- Bowman's Capsule → Double walled, cup-shaped structure enclosing the glomerulus.
- Glomerulus → Tuft of 6-8 renal blood capillaries consisting of afferent and efferent renal arterioles.
- Bowman's Capsule + Glomerulus (Filtering apparatus) → Ultrafiltration of blood.

# **Proximal Convoluted Tubule**

- Situated in the cortex of kidney.
- Lined by cuboidal epithelium with microvilli.
- Helps in the reabsorption of useful substances from the filtrate

# Loop of Henle

- Located in the medullary region of kidney.
- Ascending limb → Impermeable to water.
- Descending limb → Permeable to water.
- · Regulation of salt-water balance.

#### Distal Convoluted Tubule

- \* Present in cortex of kidney.
- Lined by simple cuboidal epithelium.
- Helps in reabsorption of water and regulation of pH.

# Collecting Tubule (CT)

- · Distal terminal part of nephron.
- Lined by brush bordered cuboidal epithelium.
- Helps in reabsorption of water from filtrate.