

Chapter 8: Excretory System

1. Introduction:

The excretory system helps eliminate metabolic wastes from the body to maintain homeostasis. The main excretory organs are the **kidneys, skin, lungs, and liver**.

2. Excretory Organs in Humans:

- **Kidneys:** Filter blood to produce urine.
 - **Skin:** Removes waste through sweat.
 - **Lungs:** Expel carbon dioxide and water vapor.
 - **Liver:** Detoxifies substances and forms urea.
 - **Intestines:** Excrete undigested food as feces.
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3. The Urinary System:

The urinary system mainly consists of:

- **Kidneys (2):** Filter blood and produce urine.
- **Ureters (2):** Transport urine from the kidneys to the bladder.
- **Urinary Bladder:** Stores urine temporarily.
- **Urethra:** Carries urine from the bladder to the outside.

Blood Vessels Associated with Kidneys:

- **Renal Artery:** Brings oxygenated blood to the kidneys.
 - **Renal Vein:** Carries deoxygenated, filtered blood away from the kidneys.
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4. Structure and Function of the Kidneys:

- **External Structure:**
 - Bean-shaped, located on either side of the spine.
 - Protected by the rib cage and back muscles.
- **Internal Structure:**
 - **Cortex:** Outer part, contains nephrons.

- **Medulla:** Inner part, contains renal pyramids.
 - **Pelvis:** Funnel-shaped cavity leading to the ureter.
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5. Nephron - The Functional Unit of Kidney:

- **Structure:**
 - **Bowman's Capsule:** Cup-shaped structure containing the glomerulus.
 - **Glomerulus:** Network of capillaries for filtration.
 - **Renal Tubule:** Includes Proximal Convolute Tubule (PCT), Loop of Henle, Distal Convolute Tubule (DCT), and Collecting Duct.
 - **Functions:**
 - **Ultrafiltration:**
 - Occurs in Bowman's capsule.
 - Filters blood to remove waste and excess substances.
 - **Selective Reabsorption:**
 - Occurs in the renal tubules (mainly PCT).
 - Essential nutrients, water, and salts are reabsorbed into the blood.
 - **Tubular Secretion:**
 - Unwanted substances like urea and potassium are secreted into the tubules.
 - **Urine Formation:**
 - Result of filtration, reabsorption, and secretion.
 - Collected in the renal pelvis and sent to the bladder via the ureter.
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6. Mechanism of Urine Formation:

- **Glomerular Filtration:**
 - High blood pressure in glomerulus forces filtrate out.
 - Filtrate contains water, glucose, salts, urea.
 - **Reabsorption:**
 - Useful substances like glucose and water are reabsorbed in the PCT.
 - **Secretion:**
 - Additional wastes are added to the tubular fluid.
 - **Excretion:**
 - Urine flows from the collecting duct to the renal pelvis and through the ureter to the bladder.
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7. Significance:

- Helps maintain **water and electrolyte balance**.
 - Removes **metabolic waste and toxic substances**.
 - Maintains **pH balance** and **osmoregulation**.
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