



Urinary system

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Urinary system

Excretion is the process by which the body eliminates unwanted substances and metabolic wastes. Although organs such as the gastrointestinal (GI) tract, liver, skin, and lungs help remove some wastes, but their capacity is limited. The urinary (renal) system has the greatest ability.

The urinary system consists of:

- Two Kidneys: Produce urine.
- Ureters: Transport urine to the urinary bladder.
- Urinary bladder: Stores urine until it is released.
- Urethra: Carries urine out of the body.

The Kidney

- The kidney is a compound tubular gland surrounded by a connective tissue capsule. It has a hilum on its medial side where the renal artery, renal vein, nerves, and ureter enter or exit. Besides producing urine, the kidneys perform several functions essential for maintaining body balance (homeostasis).
- **Kidneys have important regulate body processes such as:**
 1. Excretion of Waste Products
 - The kidneys remove harmful and unnecessary substances produced during metabolism, including:
 - Urea: From amino acid breakdown
 - Uric acid: From nucleic acid metabolism
 - Creatinine: From muscle metabolism
 - Bilirubin: From hemoglobin breakdown
 - Harmful substances: Toxins, drugs, heavy metals, etc.

Kidneys maintain the water balance in the body

3. Maintenance of Electrolyte Balance

4. Maintenance of Acid–Base Balance

5. Hemopoietin Function

- The kidneys produce erythropoietin, which stimulates bone marrow stem cells to make red blood cells.

- They also secrete thrombopoietin, which helps in the production of platelets.

6. Endocrine Function

7. Regulation of Blood Pressure

- The kidneys control long-term blood pressure by adjusting how much sodium and water they excrete.

- They also help regulate short-term blood pressure by releasing hormones.

8. Regulation Calcium Level

- The kidneys activate vitamin D.

- Calcium absorption in the intestines (Proper calcium deposition in bones)

The kidney components are arranged in layers

- 1. Outer Cortex
- 2. Inner Medulla
- 3. Renal Sinus
- 4. Renal capsule

Nephron

- Nephron is defined as the structural and functional unit of kidney. Each kidney consists of 1
- to 1.3 million of nephrons.
- Each nephron is form by two parts:
 - 1. Renal corpuscle.
 - It is a spherical and flattened structure; the function of the renal corpuscle is the
 - filtration of blood, which forms the first phase of urine formation.
 - Based on the situation of renal corpuscle, the nephrons are classified into two types:
 - 1. Cortical Nephrons or superficial nephrons 2. Juxtamedullary Nephrons.

Structure of renal corpuscle

Glomerulus: It is a cluster of branching capillaries enclosed by Bowman's capsule.

2. Renal tubule.

- The proximal convoluted tubule.
- The distal convoluted tubule.
- Loop of Henle.

Collecting duct

which is in cortex. The lower part of the collecting duct lies in medulla. Seven to ten initial collecting ducts unite to form the straight collecting duct, which passes through medulla.