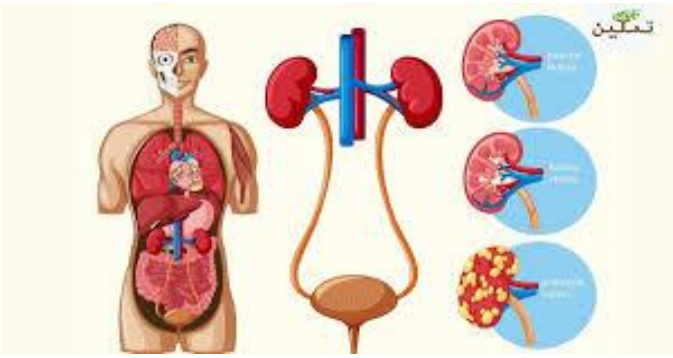
Physiology

2 stage

LEC 9

the Urinary System



By

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the Urinary System of the Human Body

The urinary system is a vital organ system responsible for the regulation of fluids, the removal of waste products, and the maintenance of electrolyte balance in the human body. This lecture will cover the anatomy, physiology, functions, and clinical significance of the urinary system.

The urinary system is crucial for maintaining the body's internal environment by regulating fluids, electrolytes, and waste products. Understanding its anatomy and functions is essential for recognizing the importance of kidney health and the impact of disorders.

Anatomy of the Urinary System

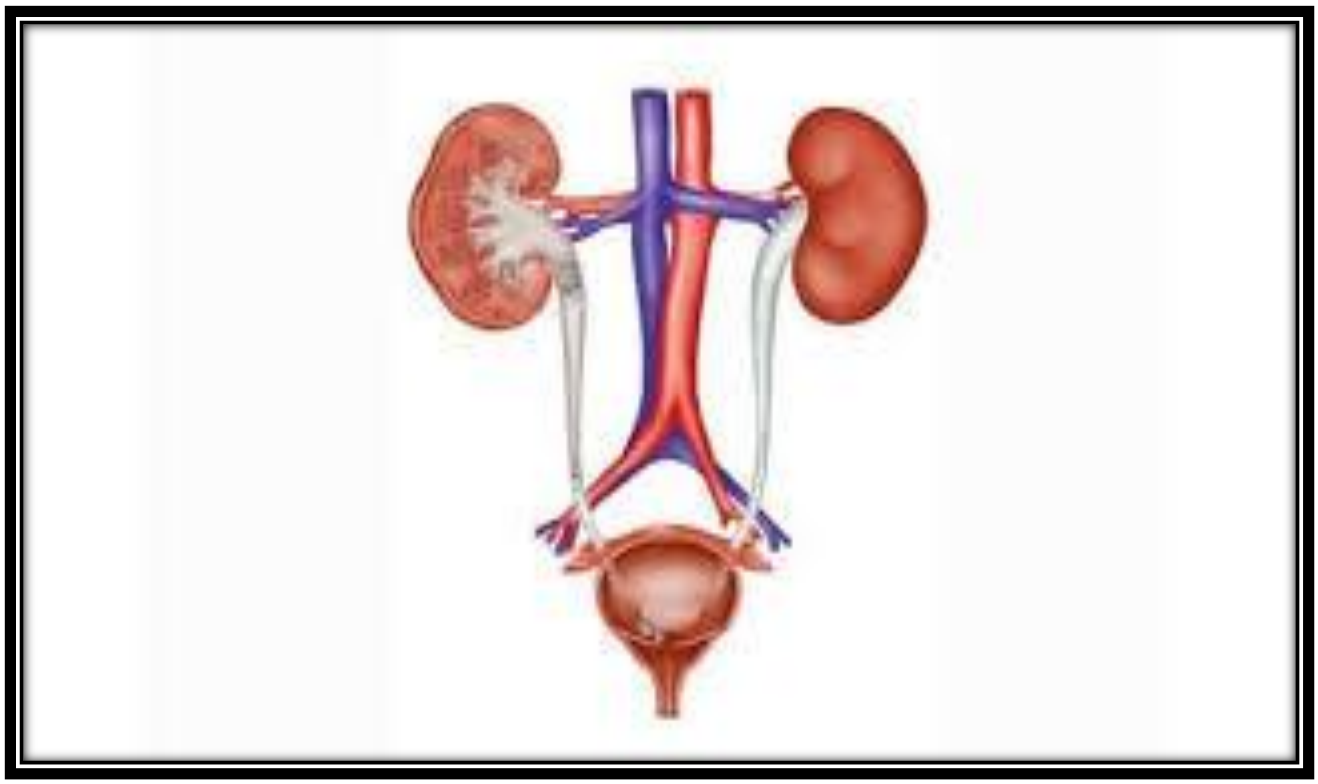
1 Kidneys
- Location: The kidneys are two bean-shaped organs located in the retroperitoneal space, one on each side of the spine.
- Structure: Each kidney consists of an outer cortex and an inner medulla, containing functional units called nephrons.

2 Ureters
- Description: Ureters are muscular tubes that transport urine from the kidneys to the bladder.
- Function: Peristaltic contractions help move the urine downward.

3 Urinary Bladder

- Structure: A hollow, muscular organ that stores urine until it is excreted.
- Capacity: The bladder can hold approximately 400-600 mL of urine.

4 Urethra
- Function: The urethra is a tube that carries urine from the bladder to the outside of the body.
- Differences: The male urethra is longer than the female urethra and also carries semen.



Physiology of the Urinary System

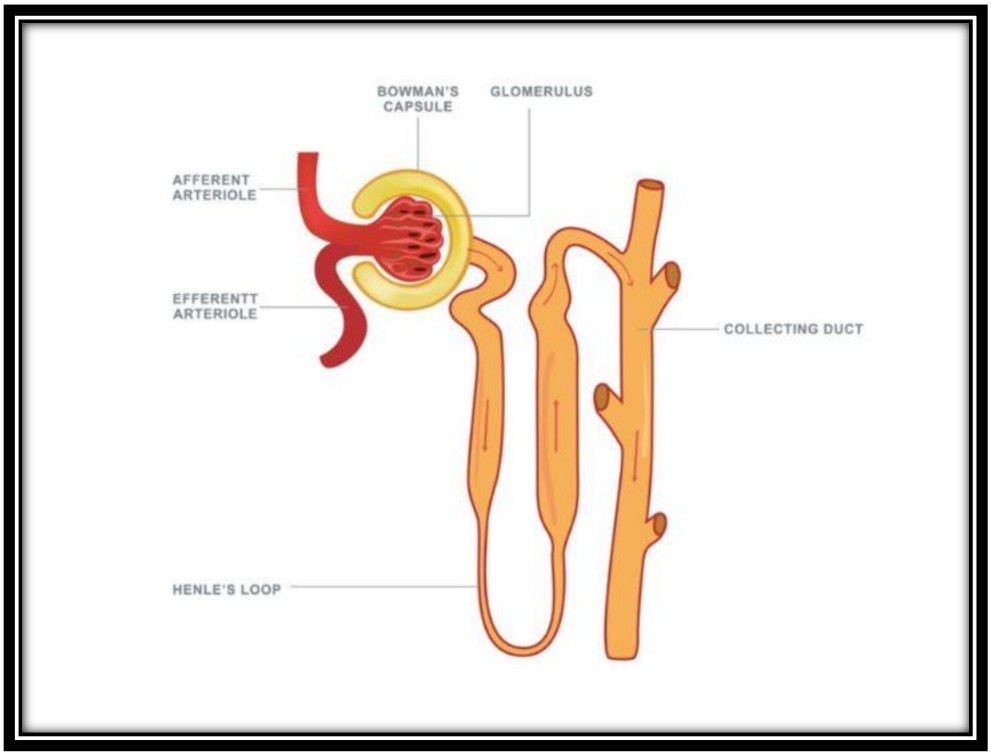
1- Formation of Urine

Urine formation occurs through three main processes:

a- Filtration
- Process: Blood is filtered in the glomeruli, allowing water, ions, and small molecules to pass while retaining larger molecules like proteins.

b- Reabsorption
- Mechanism: Essential substances such as glucose, amino acids, and most water are reabsorbed back into the bloodstream through the renal tubules.

c- Secretion
- Role: Additional waste products and excess ions are secreted into the tubular fluid, which ultimately becomes urine.



2- Regulation of Body Fluids

- Homeostasis: The kidneys help maintain homeostasis by regulating the volume and composition of body fluids.
- Hormonal Control: Hormones like aldosterone and antidiuretic hormone (ADH) play significant roles in fluid balance.

3- Functions of the Urinary System

a- Waste Elimination
The urinary system removes metabolic waste, including urea, creatinine, and uric acid, from the bloodstream.

b- Electrolyte Balance
The kidneys regulate the levels of key electrolytes, including sodium, potassium, and calcium, maintaining their balance in the body.

c- Acid-Base Balance
By excreting hydrogen ions and reabsorbing bicarbonate, the kidneys help regulate the blood's pH, contributing to acid-base homeostasis.

d- Blood Pressure Regulation
The kidneys play a critical role in regulating blood pressure through the renin-angiotensin-aldosterone system (RAAS).

4- Clinical Significance

a- Common Disorders
- Urinary Tract Infections (UTIs): Infections that can affect any part of the urinary system, causing pain and frequent urination.
- Kidney Stones: Hard deposits made of minerals and salts that form in the kidneys and can cause severe pain.

b-Kidney Disease
- Chronic Kidney Disease: A gradual loss of kidney function that can lead to kidney failure.
- Acute Kidney Injury: Sudden impairment of kidney function, often reversible with prompt treatment.

c- Diagnostic Tests
- Urinalysis: A common test analyzing urine for signs of disease.
- Blood Tests: Tests like serum creatinine and blood urea nitrogen (BUN) assess kidney function.