



**AL-Mustaqbal University College**

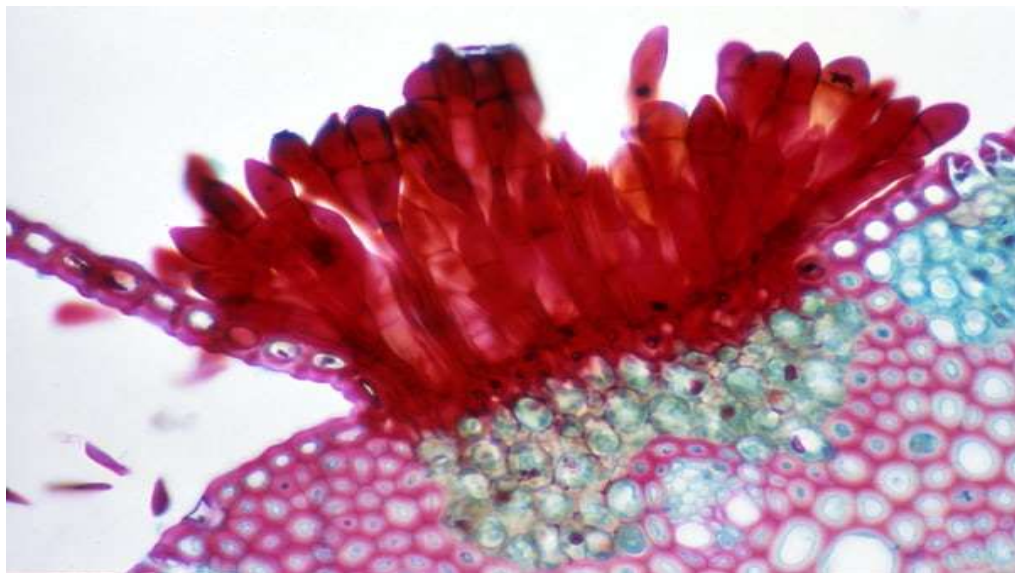
**Pharmacy Department**

**First stage**

**Practical Histology**

**(Urinary System)**

**Lab 9**



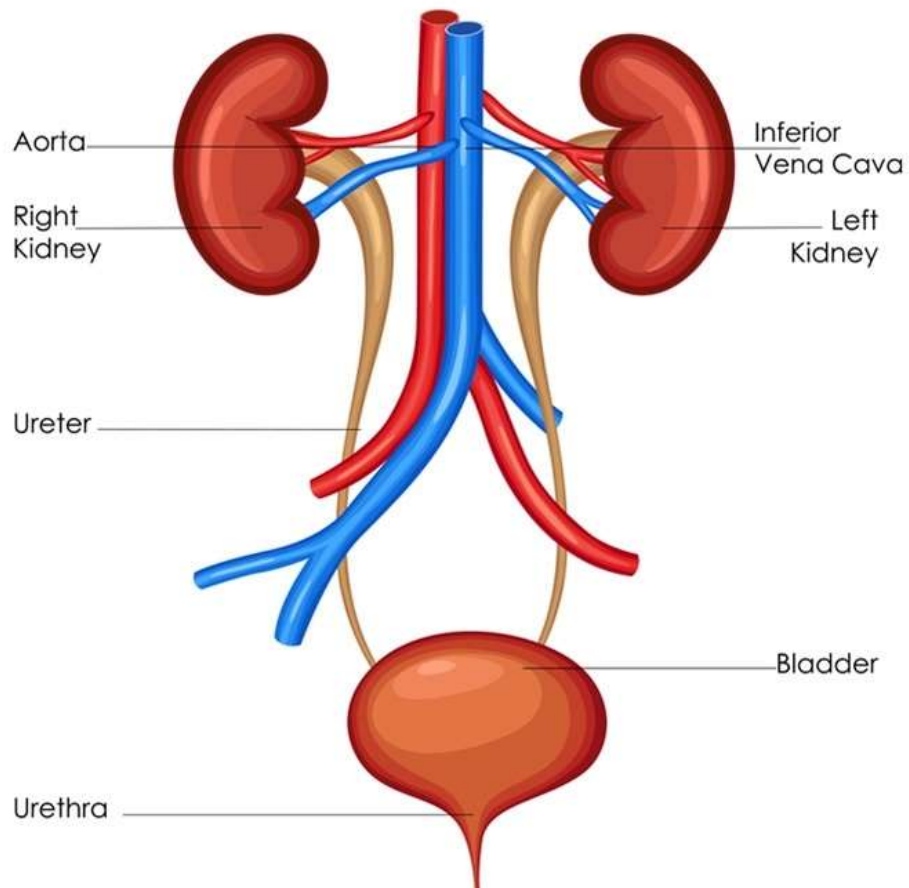
**Lecturer: M.Sc. Noor Muhsen AL-Ammary**

# Urinary System

**Urinary system:** also known as the renal system or urinary tract, consists of the **kidneys, ureters, bladder, and the urethra.**

The purpose of the urinary system is to eliminate waste from the body, regulate blood volume and blood pressure, control levels of electrolytes and metabolites, and regulate blood pH. The urinary tract is the body's drainage system for the eventual removal of urine.

Urinary System Diagram



**Kidneys:** are two bean-shaped organs in the renal system. They help the body pass waste as urine. They also help filter blood before sending it back to the heart.

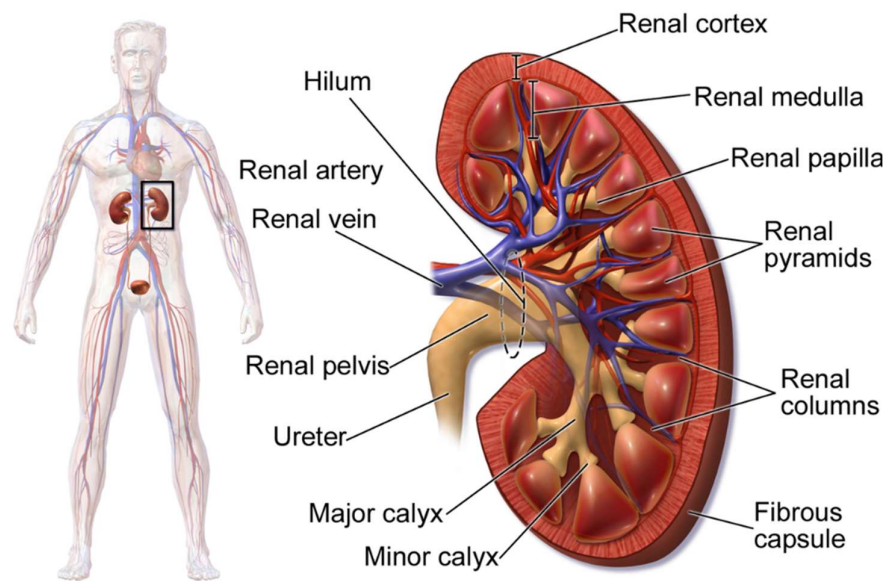
**The kidneys perform many crucial functions, including:**

- Maintaining overall fluid balance
- Regulating and filtering minerals from blood
- Filtering waste materials from food, medications, and toxic substances
- Creating hormones that help produce red blood cells.

## Structure

The functional tissue of the kidney, or parenchyma, has an outer renal **cortex** and inner renal **medulla**. The medulla is organized into cone-like structures called **renal pyramids** and **renal columns** in between the pyramids, which are extensions of the renal cortex.

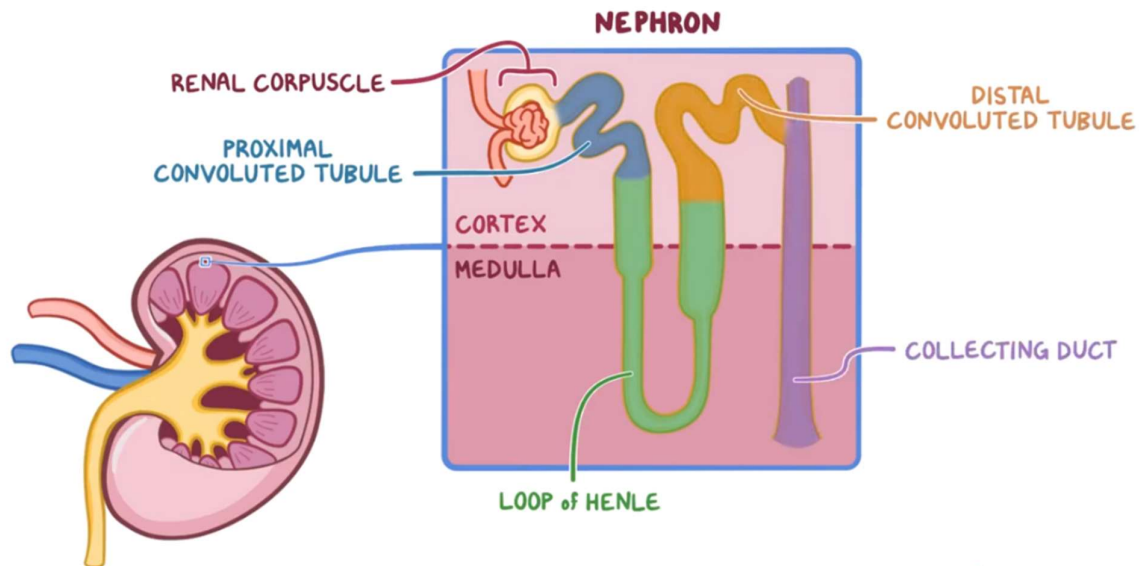
At the junction between the cortex and medulla are millions of functional units called **nephrons**.



**Kidney Anatomy**

## Nephrons

**Nephrons** are the most important part of each kidney. They take in blood, metabolize nutrients, and help pass out waste products from filtered blood. Each kidney has about 1 million nephrons. Each has its own internal set of structures.

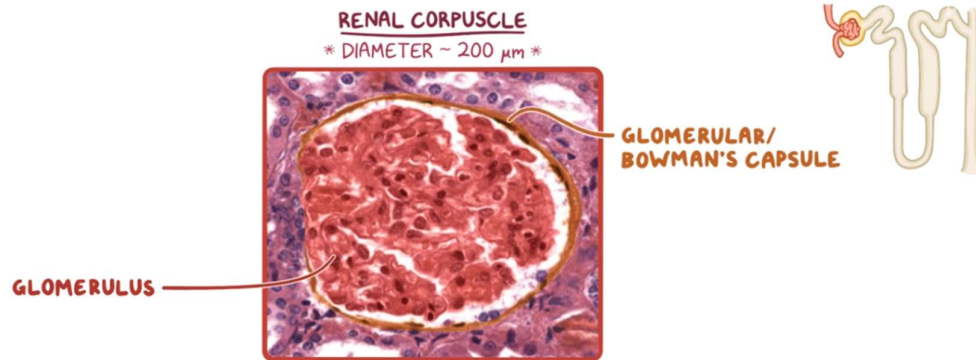


## Renal corpuscle

After blood enters a nephron, it goes into the renal corpuscle, also called a **Malpighian body**. The renal corpuscle contains two additional structures:

**The glomerulus.** This is a cluster of capillaries that absorb protein from blood traveling through the renal corpuscle.

**The Bowman capsule.** The remaining fluid, called capsular urine, passes through the Bowman capsule into the renal tubules.



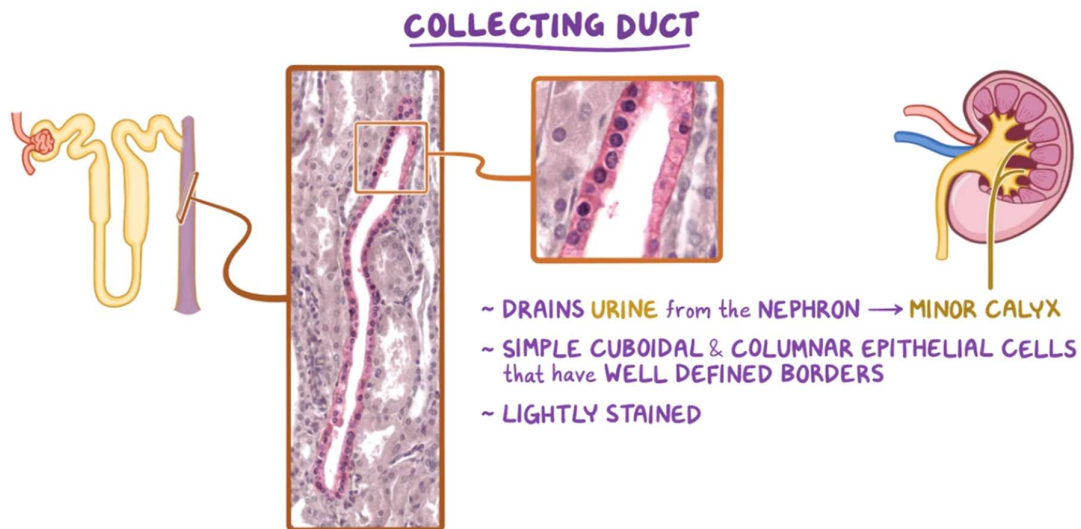
## Renal tubules

The renal tubules are a series of tubes that begin after the **Bowman capsule** and end at collecting ducts. Each tubule has several parts:

- **Proximal convoluted tubule.** This section absorbs water, sodium, and glucose back into the blood. The walls of this tubule consist of simple cuboidal or columnar epithelial cells with long microvilli.
- **Loop of Henle.** This section further absorbs potassium, chloride, and sodium into the blood. The cells of this portion have very similar morphology to the previous section of the nephron, with simple cuboidal or columnar epithelial cells that have long microvilli and a dark pink or eosinophilic cytoplasm.
- **Distal convoluted tubule.** This section absorbs more sodium into the blood and takes in potassium and acid. In the cross section and longitudinal section of the tubule, we can see that the walls consist of simple cuboidal epithelial cells.

## Collecting ducts

There's a collecting duct at the end of each nephron in the renal medulla. This is where filtered fluids exit the nephrons. Once in the collecting duct, the fluid moves on to its final stops in the renal pelvis.



## Renal pelvis

The renal pelvis is a funnel-shaped space in the innermost part of the kidney. It functions as a pathway for fluid on its way to the bladder

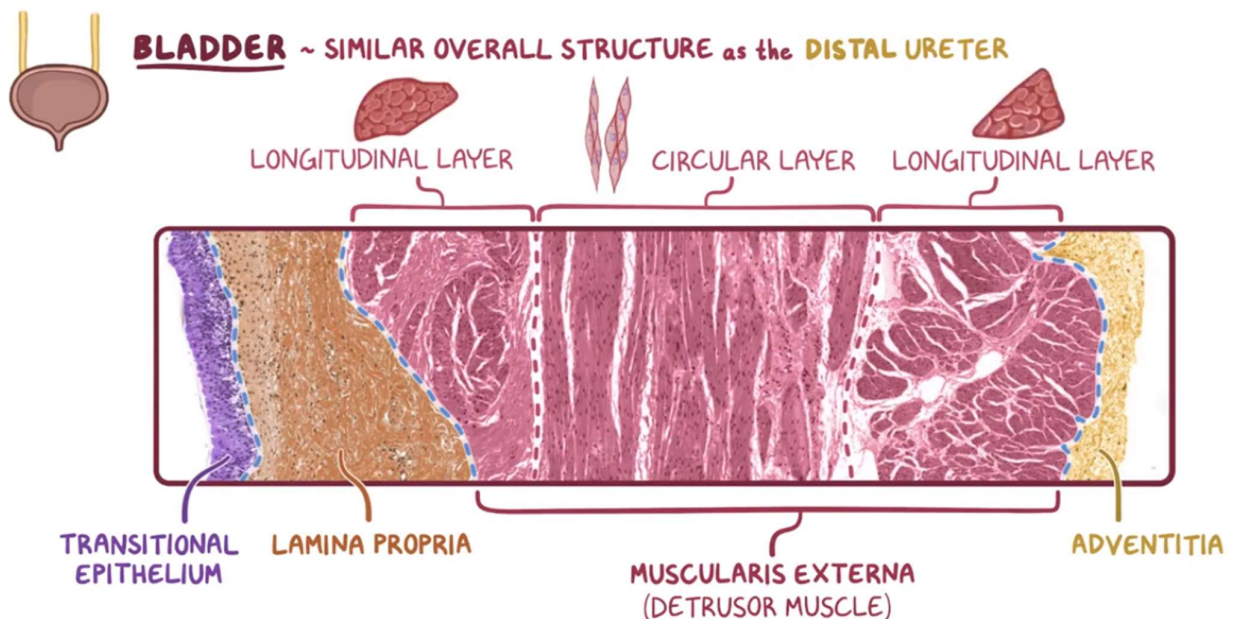
## Urinary bladder

**The Urinary bladder:** Is a round, bag-like organ that stores urine. It is located in the pelvic area, just below the kidneys and right behind the pelvic bone. While it is basically a fleshy storage tank, it is very complex in its design.

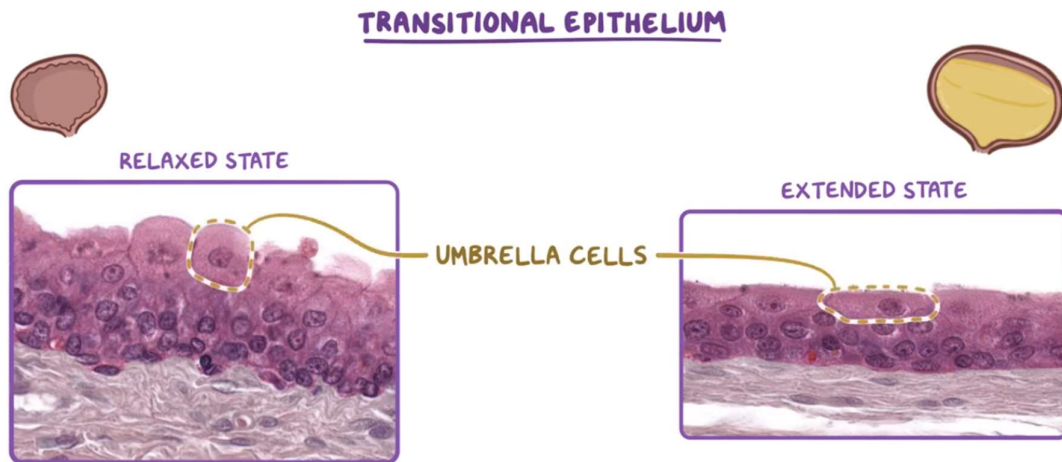
The size and shape of the urinary bladder varies with the amount of urine it contains and with the pressure it receives from surrounding organs.

**The microscopic structure of the urinary bladder wall organizes into the following layers from inside out.**

- ✚ Lining epithelium
- ✚ Lamina propria
- ✚ Muscularis externa
- ✚ Serosa/Adventitia



**Lining epithelium:** The urinary bladder lining is a specialized stratified epithelium (transitional epithelium), which is also called urothelium. The urothelium is exclusively in urinary structures such as the ureter, urinary bladder, and proximal urethra. The urothelium is composed of three layers:



- **Apical layer** - The innermost layer serves as a barrier between the bladder lumen and the underlying tissue. It is a single layer of umbrella-shaped cells (i.e., umbrella cells) that are frequently binucleated.
- **Intermediate layer** - Formed from two to three layers of polygonal cells.
- **Basal layer** - Formed from two to three layers of small cuboidal cells.

**The muscularis externa** of the bladder have an inner longitudinal layer and a circular outer layer of smooth muscle, and an additional outer layer of longitudinal smooth muscle.

**The adventitia:** The outermost layer of the bladder, which is composed of loose connective tissue, blood vessels, adipocytes, and nerves.