

Urinary System

Structure of renal corpuscle

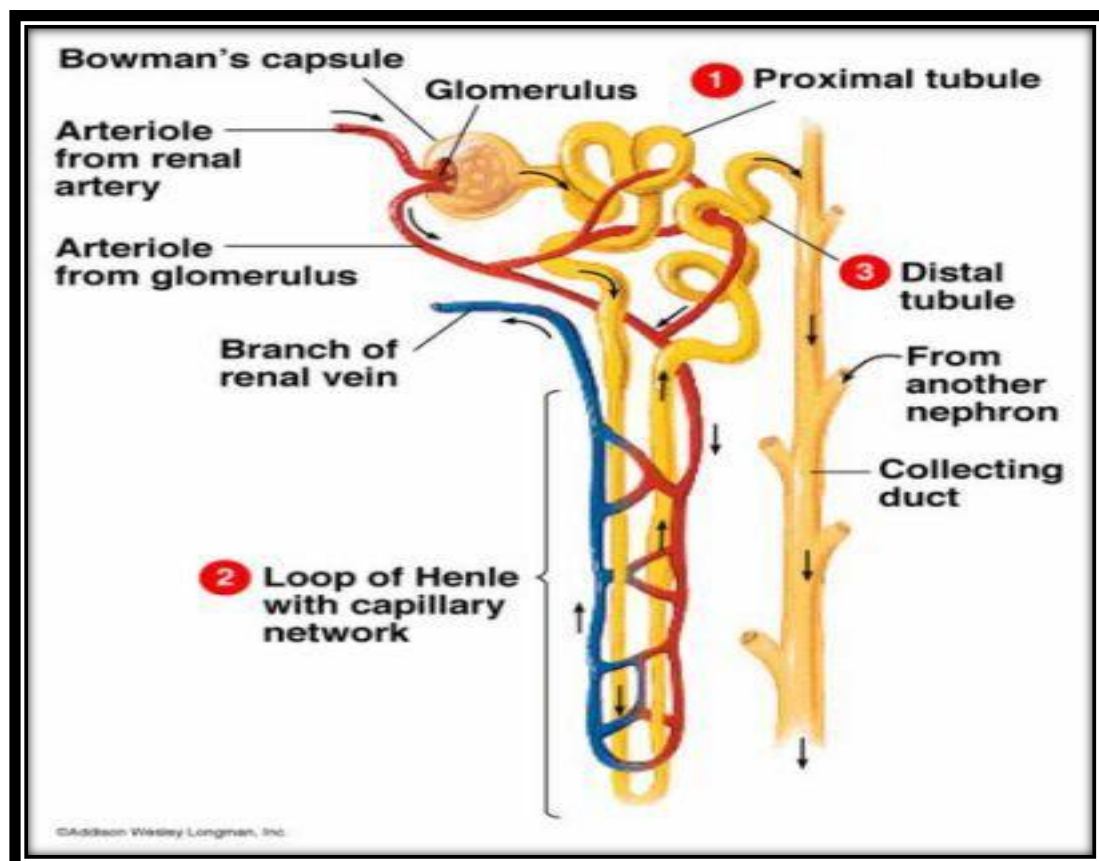
The renal corpuscle is formed by two portions:

1. Glomerulus

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

2. Bowman's Capsule

Bowman's capsule encloses the glomerulus. The structure of Bowman's capsule is like a funnel with filter paper.



Tubular portion of nephron

The tubular portion of nephron is the continuation of Bowman's capsule. It is made up of three parts

1. The proximal convoluted tubule

It is the coiled portion arising from Bowman's capsule. It is situated in the cortex. It is continued as descending limb of loop of Henle.

2. Loop of Henle

Loop of Henle consists of :

- **Descending Limb**

Descending limb of loop of Henle is made up of thick descending segment and thin descending segment. The thick descending segment is the direct continuation of the proximal convoluted tubule. It descends down into medulla. The thick descending segment is continued as thin descending segment.

- **Hairpin Bend**

The thin descending segment is continued as hairpin bend of the loop. The hairpin bend is continued as the ascending segment of loop of Henle.

- **Ascending Limb**

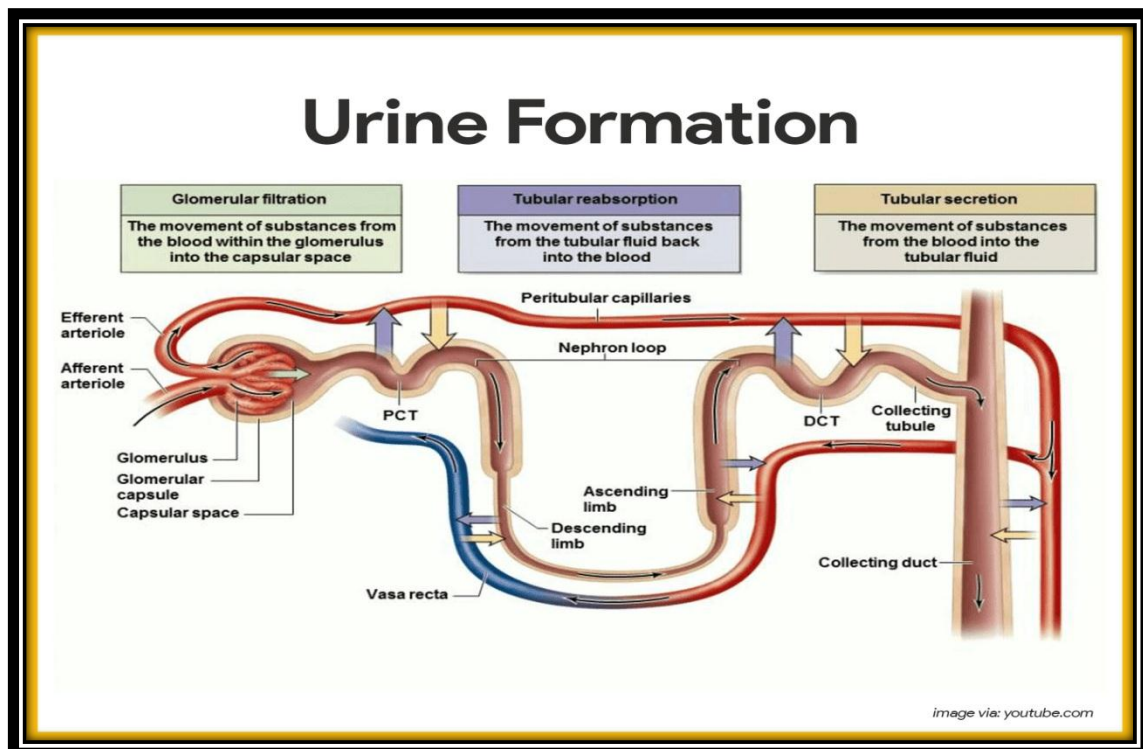
Ascending limb of Henle's loop has two parts, thin ascending segment and thick ascending segment. Thin ascending segment is the continuation of hairpin bend. The thin ascending segment is continued as thick ascending segment. Thick ascending segment ascends to the cortex and continues as distal convoluted tubule.

3. The distal convoluted tubule

The distal convoluted tubule continues as the initial or arched 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.

Urine formation

Urine formation is a blood cleansing function. Normally, about 26 % of cardiac output enters the kidneys to get rid of unwanted substances. Kidneys excrete the unwanted substances in urine. Normally, about 1 to 1.5 L of urine is formed every day.



The mechanism of urine formation includes the following processes:

- 1. Glomerulus filtration.**
- 2. Tubular reabsorption.**
- 3. Tubular secretion.**

Then water conservation and finally Excretion.

1-Glomerular Filtration

A process by which the blood passes through the glomerular capillaries, much of its fluid, containing both useful chemicals and dissolve waste materials, filtered through the filtration membrane where it is filtered and then flows into Bowman's capsule.

Glomerular Filtration Rate: It is the amount of fluid filtered from the blood into the capsule each minute.

Factors governing the filtration rate at the capillary beds are:

1. Total surface area available for filtration.
2. Filtration membrane permeability
3. Net filtration pressure.

Pressure determining filtration

The pressures, which determine the glomerular filtration rate (GFR), are

1. Glomerular capillary pressure.
2. Colloidal osmotic pressure in the glomeruli.
3. Hydrostatic pressure in the Bowman's capsule.

1. Glomerular Capillary Pressure

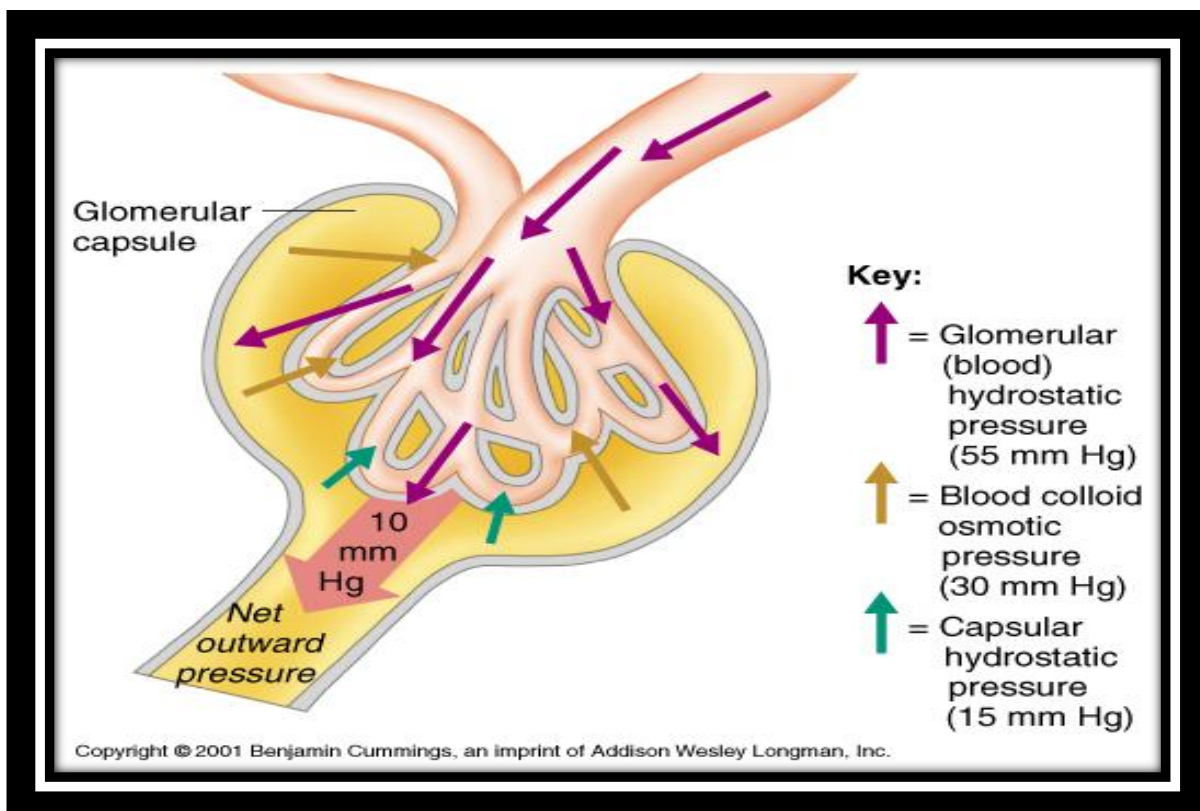
It is the pressure exerted by the blood in glomerular capillaries. It is about 60 mm Hg and, varies between 45 and 70 mm Hg. Glomerular capillary pressure is the highest capillary pressure in the body

2. Colloidal Osmotic Pressure

It is exerted by plasma proteins in the glomeruli. The plasma proteins are not filtered through the glomerular capillaries and remain in the glomerular capillaries. These proteins develop the colloidal osmotic pressure which is about 25 mm Hg. It opposes glomerular filtration.

3. Hydrostatic Pressure in Bowman's capsule

It is the pressure exerted by the filtrate in Bowman's capsule. It is also called capsular pressure. It is about 15 mm Hg. It also opposes glomerular filtration.



2. Tubular Reabsorption

It is the process by which water and other substances are transported from renal tubules back to the blood. Large quantity of water (more than 99 %), electrolytes and other substances are reabsorbed by the tubular epithelial cells. The reabsorbed substances move into the interstitial fluid of renal medulla, then move into the blood in peritubular capillaries. Tubular reabsorption mainly occurs in the proximal tubule and the Loop of Henele.