

## The Urinary System

The urinary system is responsible for filtering blood and removing metabolic wastes through urine. It also regulates blood volume and blood pressure, plasma concentrations of electrolytes and minerals, and blood pH. The system helps conserve valuable nutrients and stabilize blood pH levels. The main organs of the urinary system are the kidneys, ureters, bladder, and urethra.

## The Kidneys

The kidneys are two reddish-brown organs located on either side of the spine, partially covered by the ribcage. They filter blood and produce urine. The renal cortex is the outer part of the kidney, while the renal medulla is deeper. The medulla contains triangular-shaped renal pyramids. The minor calyces collect urine from the pyramids and lead to the major calyces. The renal pelvis is the collecting area, and the hilum is the exit region through which the renal pelvis empties into the ureters.

## Blood Flow to the Kidneys

Over one liter of blood flows through the kidneys each minute, which is incredible considering the average person has about five liters of blood in their body. The kidneys receive blood through renal arteries, and blood leaves through renal veins. The afferent arterioles lead to the capillary bundles called glomeruli, where the filtering of blood and production of urine occur. Blood flow is regulated by renal nerves.

## Nephrons

Nephrons are microscopic tubular structures responsible for filtering blood and producing urine. They are located in the cortex of the kidneys and vary in arrangement.

## Overview of Kidney Function

The kidney contains approximately 1.25 million nephrons per kidney, which are responsible for filtering blood and producing urine. The renal corpuscle consists of the glomerulus and Bowman's capsule, which filter fluid and ions. The proximal convoluted tubule (PCT) reabsorbs important nutrients, while the loop of Henle concentrates urine through active transport. The distal convoluted tubule (DCT) selectively reabsorbs ions and water and actively secretes toxins. Finally, the collecting system filters, secretes, and reabsorbs urine before passing it through the minor and major calyces and out through the ureters.

## The Glomerulus

The glomerulus is a bundle of capillaries that filter blood and ions through fenestrated capillaries. The Bowman's capsule surrounds the glomerulus and leads to the PCT.

## The Proximal Convoluted Tubule (PCT)

The PCT reabsorbs important nutrients like water, ions, and plasma proteins through passive processes of osmosis and diffusion. These nutrients are released into the peritubular fluid.

## The Loop of Henle

The loop of Henle concentrates urine through active transport by pumping out sodium and chloride ions, which moves water out of the tubules and makes urine more concentrated.

## The Distal Convoluted Tubule (DCT)