RANIGANJ GIRLS' COLLEGE

DEPT OF ZOOLOGY

2ND SEM / CC- IV /unit – 5/ (ANIMAL PHYSIOLOGY)

DR. CHINMOY CHATTERJEE

Kidney Structure

- Kidneys filter the blood, producing urine that is stored in the bladder prior to elimination through the urethra.
- The **kidneys** are a pair of bean-shaped structures that are located just below and posterior to the liver in the peritoneal cavity.
- The blood in the human body is filtered by the kidneys.The filtrate coming out of the kidneys is called **urine**.
- **Externally,** the kidneys are surrounded by three layers-
- The outermost layer is a tough connective tissue layer called the **renal fascia**.
- The second layer is called the **perirenal fat capsule**, which helps anchor the kidneys in place.
- The third and innermost layer is the **renal capsule**.
- **Internally,** the kidney has three regions—
- outer **cortex-** The renal cortex is granular due to the presence of **nephrons**—the functional unit of the kidney.
- middle, **medulla** - The medulla consists of multiple pyramidal tissue masses, called the **renal pyramids**. In between the pyramids are spaces called **renal columns** through which the blood vessels pass. The tips of the pyramids, called renal papillae, point toward the renal pelvis. There are, on average, eight renal pyramids in each kidney. The renal pyramids along with the adjoining cortical region are called the **lobes of the kidney**.
- **The hilum** is the concave part of the bean-shape where blood vessels and nerves enter and exit the kidney; it is also the point of exit for the ureters
- **The renal pelvis** lies in the region called the **hilum** of the kidney. It leads to the **ureter** on the outside of the kidney. On the inside of the kidney, the renal pelvis branches out into two or three extensions called the major **calyces**, which further branch into the minor calyces.
- **The ureters** are urine-bearing tubes that exit the kidney and empty into the **urinary bladder**.

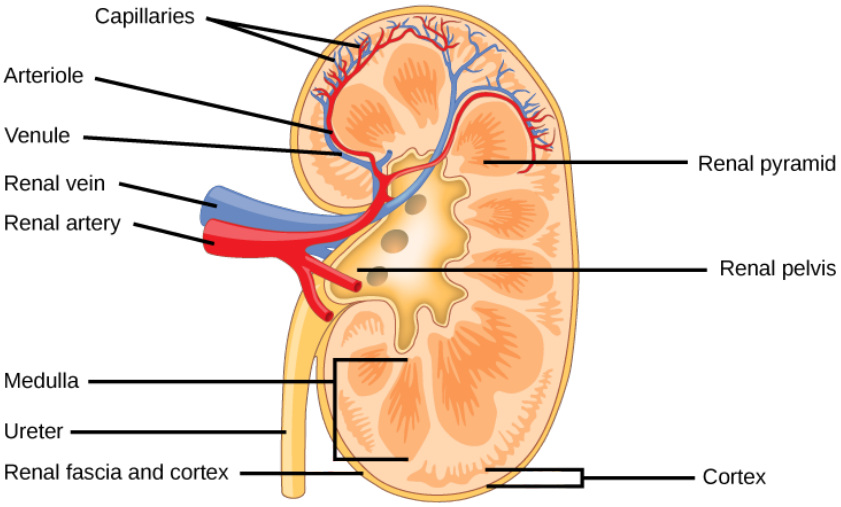

Figure : The internal structure of the kidney .

Blood vessels

Because the kidney filters blood, its network of blood vessels is an important component of its structure and function. The arteries, veins enter and exit at the renal hilum. Renal blood supply starts with the branching of the aorta into the **renal arteries** and ends with the exiting of the **renal veins** to join the **inferior vena cava**. The renal arteries split into several **segmental arteries** upon entering the kidneys. Each segmental artery splits further into several **interlobar arteries** and enters the renal columns, which supply the renal lobes.

Nephrons:

Each kidney is made up of over one million nephrons. There are two types of nephrons—**cortical nephrons** (85 percent), which are deep in the renal cortex, and **juxtamedullary nephrons** (15 percent), which lie in the renal cortex close to the renal medulla. A nephron consists of three parts—a **renal corpuscle**, a **renal tubule**, and the associated capillary network, which originates from the cortical radiate arteries.

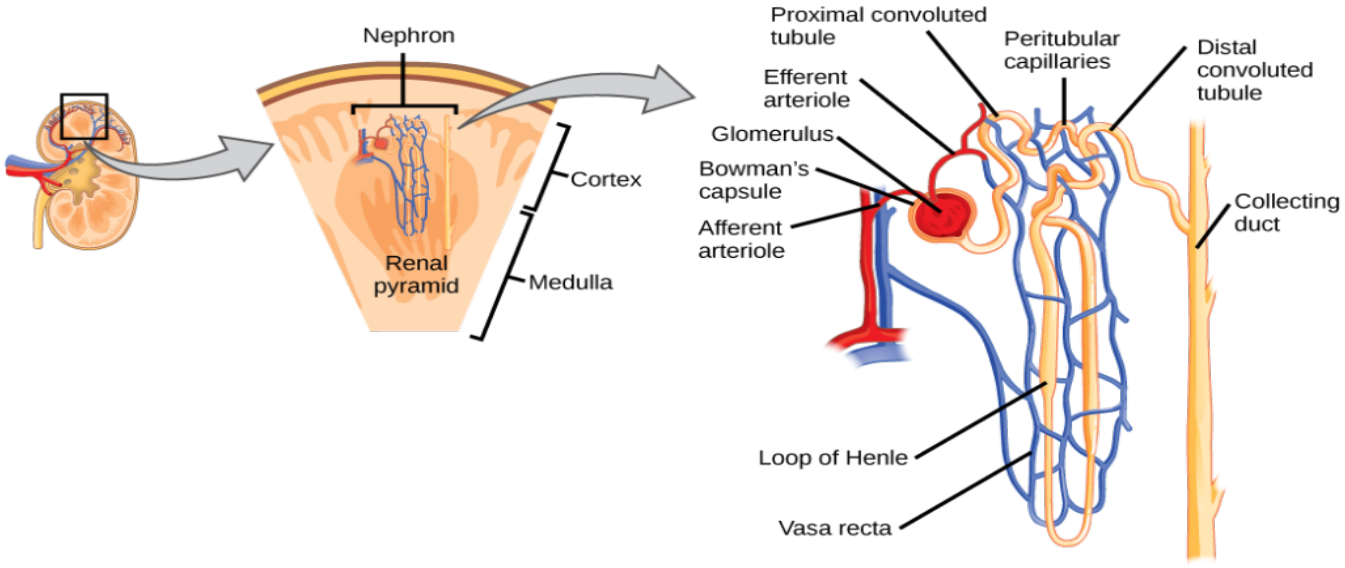

Figure.: The nephron is the functional unit of the kidney. The glomerulus and convoluted tubules are located in the kidney cortex, while collecting ducts are located in the pyramids of the medulla.

Renal Corpuscle

The renal corpuscle, located in the renal cortex, is made up of a network of capillaries known as the **glomerulus** and the capsule, a cup-shaped chamber that surrounds it, called the glomerular or **Bowman's capsule**.

Renal Tubule

The renal tubule is a long and convoluted structure that emerges from the glomerulus and can be divided into three parts based on function. The first part is called the **proximal convoluted tubule (PCT)** due to its proximity to the glomerulus; it stays in the renal cortex. The second part is called the **loop of Henle**, or nephritic loop, because it forms a loop (with **descending** and **ascending limbs**) that goes through the renal medulla. The third part of the renal tubule is called the **distal convoluted tubule (DCT)** and this part is also restricted to the renal cortex. The DCT, which is the last part of the nephron, connects and empties its contents into collecting ducts that line the medullary pyramids. The collecting ducts amass contents from multiple nephrons and fuse together as they enter the papillae of the renal medulla.

Capillary Network within the Nephron

The capillary network that originates from the renal arteries supplies the nephron with blood that needs to be filtered. The branch that enters the glomerulus is called the **afferent arteriole**. The branch that exits the glomerulus is called the **efferent arteriole**. Within the glomerulus, the network of capillaries is called the glomerular capillary bed. Once the efferent arteriole exits the glomerulus, it forms the **peritubular capillary network**, which surrounds and interacts with parts of the renal tubule. In cortical nephrons, the peritubular capillary network surrounds the PCT and DCT. In juxtamedullary nephrons, the peritubular capillary network forms a network around the loop of Henle and is called the **vasa recta**.