RANIGANJ GIRLS' COLLEGE

DEPT OF ZOOLOGY

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

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Structure of Nephron: The Functional Unit of the Kidney

Key Points

- Kidneys contain two types of nephrons, each located in different parts of the renal cortex: cortical nephrons and juxtamedullary nephrons.
- A nephron comprises a renal corpuscle, a renal tubule, and the associated capillary network.
- Internally, kidneys are mainly composed of over one million nephrons and an extensive network of blood vessels and capillaries.

Key Terms

- **glomerulus**: A small intertwined group of capillaries within a kidney's nephron that filters the blood to make urine.
- **loop of Henle**: A structure in a kidney's nephron that connects the proximal convoluted tubule to the distal convoluted tubule.

Nephron is the functional unit of the <u>kidney</u> that produces <u>urine</u> in the process of removing waste and excess substances from the <u>blood</u>. There are about 1,000,000 nephrons in each human kidney. The most primitive nephrons are found in the kidneys (<u>pronephros</u>) of primitive fish, amphibian larvae, and embryos of more advanced vertebrates. The nephrons found in the kidneys (<u>mesonephros</u>) of amphibians and most fish, and in the late embryonic development of more advanced vertebrates, are only slightly more advanced in structure. The most advanced nephrons occur in the adult kidneys, or <u>metanephros</u>, of land vertebrates, such as reptiles, birds, and mammals.

Each nephron in the mammalian kidney is a long tubule, or extremely fine tube, about 30–55 mm long. At one end this tube is closed, expanded, and folded into a double-walled cuplike structure. This structure, called the <u>Bowman's capsule</u>, encloses a cluster of microscopic blood vessels—capillaries—called the <u>glomerulus</u>. The capsule and glomerulus together <u>constitute</u> the <u>renal corpuscle</u>. The glomerulus and convoluted tubules of the nephron are located in the cortex of the kidney, while the collecting ducts are located in the pyramids of the kidney's medulla.

Eighty-five percent of nephrons are cortical nephrons, deep in the renal cortex; the remaining 15 percent are juxtamedullary nephrons, which lie in the renal cortex close to the renal medulla.

The renal tubule is a long, convoluted structure that emerges from the glomerulus. It 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. 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); this part is also restricted to the renal cortex. This last part of the nephron connects with and empties its filtrate into collecting ducts that line the medullary pyramids. The collecting ducts amass contents from multiple nephrons, fusing together as they enter the papillae of the renal medulla.

Physiology

Blood flows into and away from the glomerulus through tiny arteries called arterioles, which reach and leave the glomerulus through the open end of the capsule. In the renal corpuscle, fluid filters out of the blood in the glomerulus through the inner wall of the capsule and into the nephron tubule. As this filtrate passes through the tubule, it passes by the medullary interstitium, which has a high sodium concentration as a result of the loop of Henle's countercurrent multiplier system. Its <u>composition</u> is altered by the secretion of certain substances into it and by the selective reabsorption of <u>water</u> and other <u>constituents</u> from it. The final product is urine, which is conveyed through the collecting tubules into the <u>renal pelvis</u> and finally into the bladder via the ureter.

