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Excretory System: A System of Our Body

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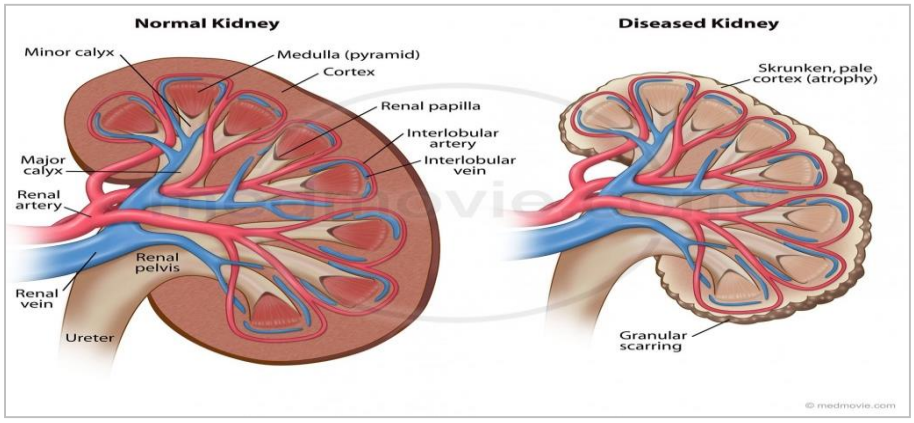
Abstract
Many unwanted products are produced in the body during its activities. Such waste products must be flushed out otherwise they harm the body. The functions of flushing out the wastes are carried out by four widely separated organs such as Kidney, sweat glands, lungs and liver.

Keywords: Excretory System, Removing Wastes, Nephrons.

Introduction
There should be no confusion to see the lungs and liver a part of excretory system instead of respiratory and digestive systems. It is true that these organs are part of their system i.e. respiratory and digestive but they also play an important role in excretory system as the lungs eliminate carbon dioxide which is a waste product. Similarly, the liver helps in the process of removing wastes from the bloodstream. Water Salts and small amount of other wastes are eliminated by the sweat glands. Our description in the excretory system would mainly be around kidneys or urinary process.

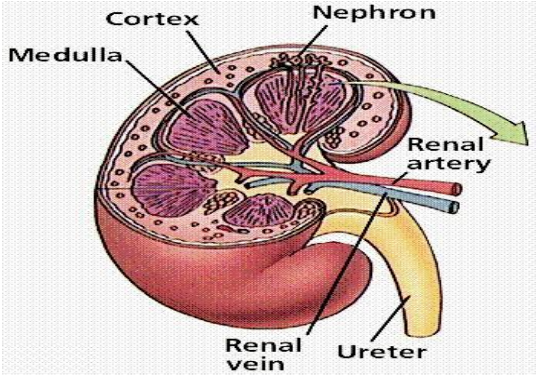


Organs of Excretory System, Their Structure and Functions

The Main Organs of Excretory System

Name of Organs	Number of Organs
Kidneys	Two
Urethras	Two
Urinary Bladder	One
Urethra	One

Kidneys
The kidneys are the waste filtering and disposal system of the body. As much as 1/3 of all blood leaving the heart passes into the kidneys to be filtered before flowing to the rest of the body's tissues. While a person could live with only one functioning kidney, our kidneys are vital organs; the loss of both kidneys would lead to a rapid accumulation of wastes and death within a few days time.



Location

The kidneys are a pair of organs found along the posterior muscular wall of the abdominal cavity. The left kidney is located slightly more superior than the right kidney due to the larger size of the liver on the right side of the body. Unlike the other abdominal organs, the kidneys lie behind the peritoneum that lines the abdominal cavity and are thus considered to be retroperitoneal organs. The ribs and muscles of the back protect the kidneys from external damage. Adipose tissue known as *perirenal fat* surrounds the kidneys and acts as protective padding.

Structure

The kidneys are bean-shaped with the convex side of each organ located laterally and the concave side medial. The indentation on the concave side of the kidney, known as the renal hilus, provides a space for the renal artery, renal vein, and ureter to enter the kidney.

A thin layer of fibrous connective tissue forms the renal capsule surrounding each kidney. The renal capsule provides a stiff outer shell to maintain the shape of the soft inner tissues.

Deep to the renal capsule is the soft, dense, vascular renal cortex. Seven cone-shaped renal pyramids form the renal medulla deep to the renal cortex. The renal pyramids are aligned with their bases facing outward toward the renal cortex and their apexes point inward toward the center of the kidney.

Each apex connects to a minor calyx, a small hollow tube that collects urine. The minor calyces merge to form 3 larger major calyces, which further merge to form the hollow renal pelvis at the center of the kidney. The renal pelvis exits the kidney at the renal hilus, where urine drains into the ureter.

Blood Supply

1. The renal arteries branch directly from the abdominal aorta and enter the kidneys through the renal hilus.
2. Inside our kidneys, the renal arteries diverge into the smaller afferent arterioles of the kidneys.
3. Each afferent arteriole carries blood into the renal cortex, where it separates into a bundle of capillaries known as a glomerulus.
4. From the glomerulus, the blood recollects into smaller efferent arterioles that descend into the renal medulla.
5. The efferent arterioles separate into the peritubular capillaries that surround the renal tubules.
6. Next, the peritubular capillaries merge to form veins that merge again to form the large renal-vein.
7. Finally, the renal vein exits the kidney and joins with the inferior vena cava, which carries blood back to the heart.

Nephron

Each kidney contains around 1 million individual nephrons, the kidneys' microscopic functional units that filter blood to produce urine. The nephron is made of 2 main parts: the renal corpuscle and the renal tubule.

Responsible for filtering the blood, our renal corpuscle is formed by the capillaries of the glomerulus and the glomerular capsule (also known as Bowman's capsule). The glomerulus is a bundled network of capillaries that increases the surface area of blood in contact the blood vessel walls. Surrounding the glomerulus is the glomerular capsule, a cup-shaped double layer of simple squamous epithelium with a hollow space between the layers. Special epithelial cells known as podocytes form the layer of the glomerular capsule surrounding the capillaries of the glomerulus. Podocytes work with the endothelium of the capillaries to form a thin filter to separate urine from blood passing through the glomerulus. The outer layer of the glomerular capsule holds the urine separated from the blood within the capsule. At the far end of the glomerular capsule, opposite the glomerulus, is the mouth of the renal tubule.

A series of tubes called the renal tubule concentrate urine and recover non-waste solutes from the urine. The renal tubule carries urine from the glomerular capsule to the renal pelvis.

1. The curvy first section of the renal tubule is known as the proximal convoluted tubule. The tubule cells that line the proximal convoluted tubule reabsorb much of the water and nutrients initially filtered into the urine.
2. Urine next passes through the loop of Henle, a long straight tubule that carries urine into the renal medulla before making a hairpin turn and returning to the renal cortex.
3. Following the loop of Henle is the distal convoluted tubule.
4. Finally, urine from the distal convoluted tubules of several nephrons enters the collecting duct, which carries the concentrated urine through the renal medulla and into the renal pelvis.
5. From the renal pelvis urine from many collecting ducts combines and flows out of the kidneys and into the ureters.

Ureters

The ureters are paired muscular ducts with narrow lumina that carry urine from the kidneys to the bladder.

An understanding of the anatomic relations of the ureters is critical to the practice of urology, as well as to the disciplines of gynecologic, vascular, and general surgery. The ureter serves as a critical landmark and is intimately involved with other vessels and organs, making accidental ureteral injury a dreaded consequence of surgery (see the image below). Knowledge of the microscopic anatomy and vascular supply of the ureter are essential during manipulation of the ureter.

The ureter is subject to natural variation such as duplication. Pathologic variants of the ureter are also prevalent and can manifest as urinary obstruction, renal failure, and infection. Increasingly, aberrant ureteral anatomy can be identified on antenatal ultrasonography, enabling early medical and surgical intervention.

The two ureters are tubes of 10 to 12 inches in length and of less than 1/2 inch in diameter. They connect the kidneys with back surface of the bladder.

Functions
Ureters collect urine as it forms and drain it into the bladder.

Urinary Bladder
The urinary bladder is a collapsible bag located in the pelvic cavity just behind the pubic bones. It is folded when it is empty and stretched as the bladder fills with urine. It is bounded (form the boundary) by the openings form the ureters at the back and the opening into the urethra in front.

Functions
1. It serves as a store for urine before it leaves the body.
2. It expels urine from body by way of urethra called urination.

Urethra
Urethra is duct that transmits urine from the bladder to the exterior of the body during urination. The urethra is held closed by the urethral sphincter, a muscular structure that helps keep Urine in the bladder until voiding can occur.
Because the urethra is anatomically linked with the reproductive structures, its characteristics in males are quite different from those in females. The male's urethra is about 18 to 20 cm (7 to 8 inches) long and passes along the length of the penis before emptying. At its emergence from the bladder, the urethra passes through the prostate-gland, and seminal ducts from the testis enter the urethra at each side, making it the pathway for the transmission of semen as well as for the discharge of urine. The male urethra can be divided into three sections: the prostatic urethra (the uppermost segment within the prostate), the membranous urethra (the segment within the urethral sphincter), and the spongy urethra (the lowermost and longest section within the penis). Additional sections may be recognized, including the preprostatic urethra (at the neck of the bladder) and the fossa navicularis, pendulous urethra, and bulbous urethra, all subdivisions of the spongy urethra. In addition, the male urethra may be described in terms of a posterior region (prostatic and membranous urethras) and an anterior region (spongy urethra).
The female urethra is embedded within the vaginal wall, and its opening is situated between the labia. The female urethra is much shorter than that of the male, being only 4 cm (1.5 inches) long. It begins at the bladder neck and opens to the outside just after passing through the urethral sphincter.
The urethra can be affected by any of various conditions. In hypospadias, a congenital-disorder, the urethra opens on the underside of the penis. Both the male and female urethra are subject to urethritis, an inflammatory condition often brought on by infection. Urethral stricture, or narrowing of the urethra, also can be caused by developmental conditions as well as by inflammation, infection, or injury. Urethral cancer-disease is a rare condition, more common in women than men; risk is influenced by a history of bladder cancer, as well as by conditions associated with chronic inflammation of the urethra (e.g., frequent urinary tract-infection). Common symptoms of inflammation or infection include difficulty urinating, frequent urination, dysuria (pain with urination), and bleeding or discharge from the urethral opening. An obscure condition known as urethral syndrome may be diagnosed when symptoms indicative of urethral infection are present but demonstrable infection is absent.

Functions
1. In female it is passageway for passing out urine from blood
2. In male it is passageway for passing out urine as well as reproductive fluid (semen).

The kidneys must function properly to keep the body healthy. An examination of the urine tells lot about whether various organs in the body are functioning normally. The doctor, therefore, uses the urines to diagnose disease in the body. If there is excess sugar, enzymes or other materials in the urine it dictates that some other organs may not be functioning properly.

Sweat Glands
Sweat glands are found in skin all over the body but are most numerous in the palms of the hands, soles of the feet and forehead. For example a single square inch of skin on the palms of the hands contains about 3000 sweat glands.
Sweat secretion helps in maintaining the fluid balance and regulating body temperature. Sweat glands also function as excretory organs as it eliminates nitrogenous wastes from the body through sweat.

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