Chapter 9-21: The Urinary System

Excretion refers to the elimination of the waste products of cellular metabolism and undigested food from the body. It also refers to the removal of surplus materials from tissues. Excretions help to regulate the water and salt content of the body. These regulatory functions are performed by the kidneys and their accessory structures in the urinary system. In this plate, we present an overview of the urinary system in two views. We point out the major organs of the system and describe their structure.

Looking over the plate, you will notice that it shows the organs of the urinary system in two views. In the front and back views, the organs are shown relative to each other and nearby structures. As you read the text, locate the structures and color them.

The main organs of waste filtration in the body are the **kidneys (A_1 and A_2)**. A medium color is recommended for both kidneys; red or purple would be suitable.

The kidneys are bean-shaped organs that are roughly the size of the fist. They are located on each side of the vertebral column, and as the posterior view shows, the twelfth rib partially protects them. It should be colored in a light color.

Leading from the kidneys are tubes called **ureters (B)**. These tubes carry urine away from the kidney after it has been formed (this topic is discussed in depth in the next plate), and the ureters lead to the main storage organ, the **urinary bladder (C)**. This hollow muscular sac is located at the floor of the pelvic cavity.

The tube that leads from the bladder to the exterior of the body is the **urethra (D)**. This tube of smooth muscle is about one-and-a-half inches long in the female and about eight inches long in the male; in the male, the urethra passes through the penis.

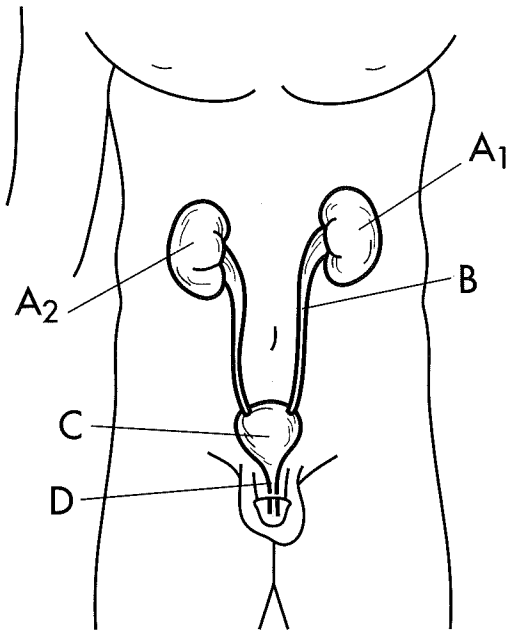
We will now discuss the blood supply to the kidney. The passageways for blood were mentioned previously in the discussion of the circulatory system, and we will review them here. As you encounter the structures in the reading, color them in the anterior and posterior views.

The main circulatory vessel that transports blood to the kidney is the **renal artery (E)**, seen in the posterior view. The **renal vein (F)** lies behind the renal artery in the posterior view and is difficult to see. A light color is recommended for this structure. The renal vein transports blood away from the kidney after it has been cleansed. The renal artery is supplied with blood by the **abdominal aorta (G)**, while the renal vein empties its blood into the **inferior vena cava (H)**.

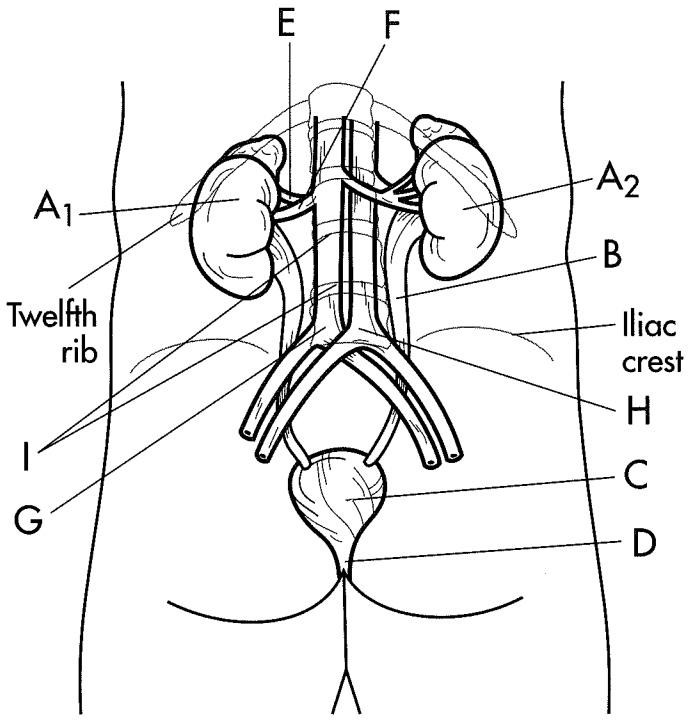
We close the plate with a transverse section through the body. We are looking down from above at a level of the stomach, transverse colon, pancreas, and other organs of the abdominal cavity.

The view in the plate on the bottom shows structures of several systems. For example, we see an outline of the **lumbar vertebra (I)**, and the spinal cord is visible. Sections are also shown through the kidneys (A_1 and A_2). Note the renal arteries (E) which arise from the abdominal aorta (G). Also note the renal veins (F), which lead on both sides to the inferior vena cava (H).

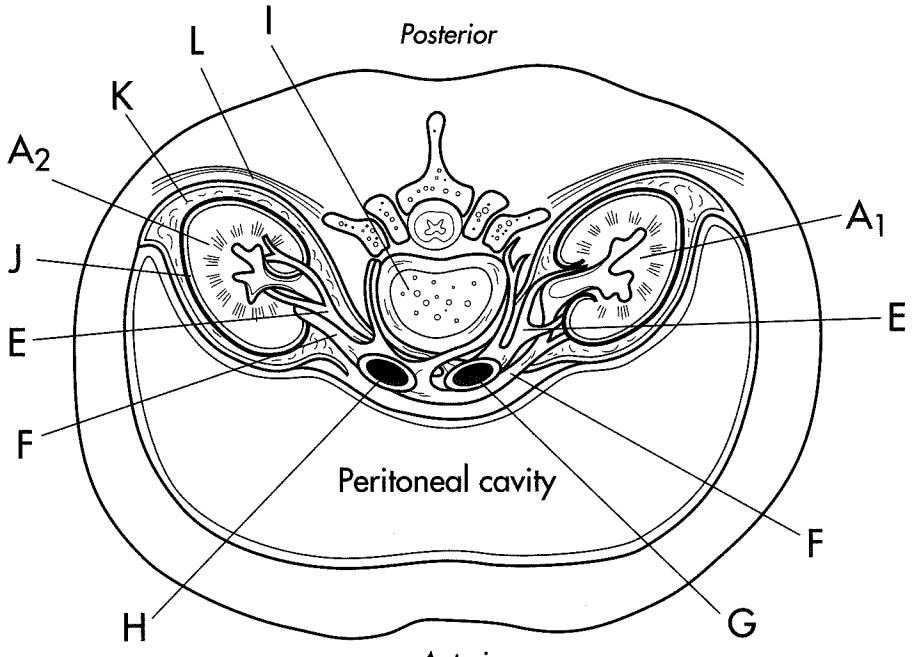
The kidney is surrounded by three layers of supportive tissue. Immediately adhering to the kidney surface is the **renal capsule (J)**, which provides an impenetrable barrier to infection of the kidney surface; a dark color may be used to highlight this layer. Outside the renal capsule is a layer of fat called the **adipose capsule (K)**. The fat tissue helps cushion the kidney against blows. Outside the adipose capsule is the **renal fascia (L)**, which is composed of fibrous connective tissue. It helps anchor the kidneys to nearby tissues.



Anterior view



Posterior view



Anterior

Inferior view of transverse section

The Urinary System

- ○ Left Kidney .....A_1
- ○ Right Kidney.....A_2
- ○ Ureter .....B
- ○ Urinary Bladder.....C
- ○ Urethra.....D
- ○ Renal Artery .....E
- ○ Renal Vein .....F
- ○ Abdominal Aorta.....G
- ○ Inferior Vena Cava ....H
- ○ Lumbar Vertebra.....I
- ○ Renal Capsule .....J
- ○ Adipose Capsule.....K
- ○ Renal Fascia L