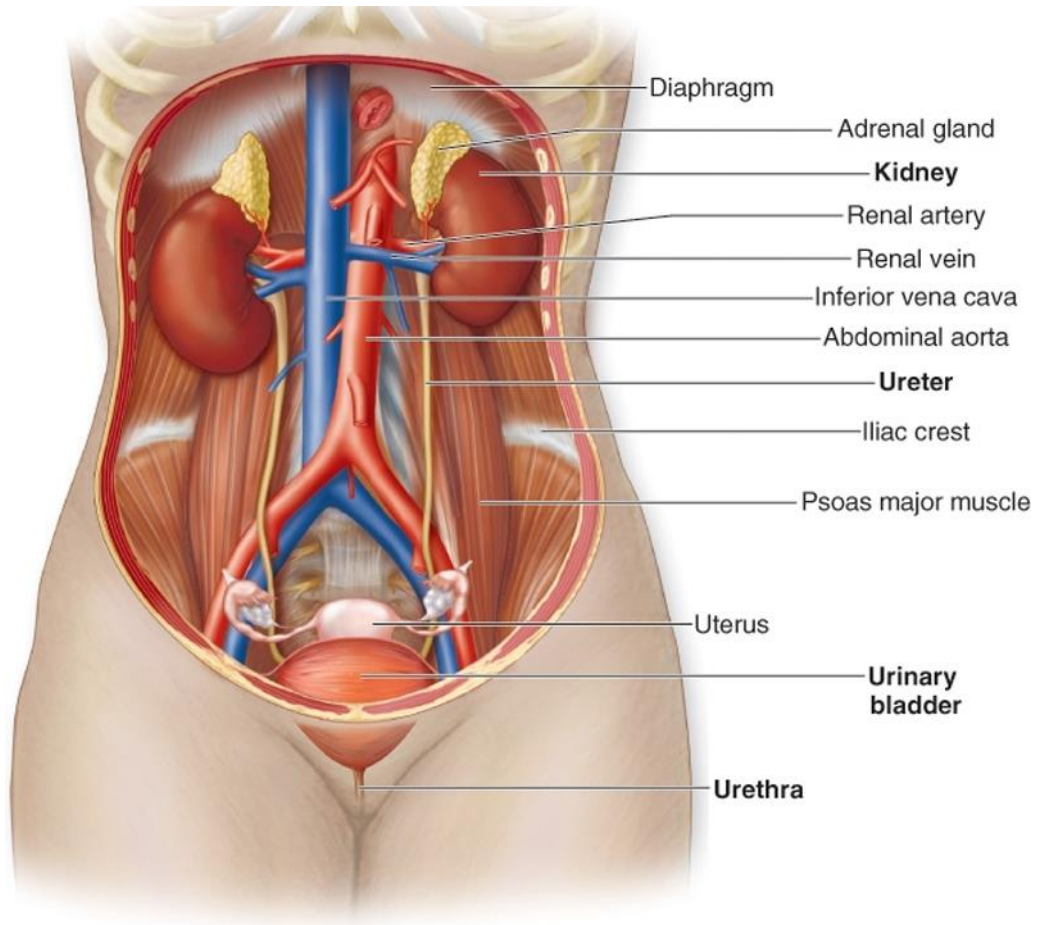


# ANATOMY OF THE EXCRETORY SYSTEM

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## 1. KIDNEYS

The kidneys are ovoid. They remove excess water, salts, and wastes of protein metabolism from the blood. They also return nutrients and chemicals to the blood.

The kidneys lie retroperitoneally on the posterior abdominal wall. They are one on each side of the vertebral column. The right kidney is between the last thoracic vertebra and the third lumbar vertebra. The left kidney is between T11-L2. The levels of the kidneys change during respiration and with changes in posture. The kidneys form urine of 1.5-2 lt. from 1100-2000 lt. of coming blood. As they are the organs of filtration, via the two renal arteries on both sides, they receive the 20-25% of the entire blood pumped by the heart.

Each kidney has a smooth anterior and posterior surface covered by a fibrous capsule. This capsule is easily removable except during disease.

On the medial margin of each kidney is the **hilum of kidney**. It is a deep vertical slit. Through the renal hilum renal vessels, lymphatics, and nerves enter and leave the kidney. Internally, the hilum is continuous with the renal sinus. Perinephric fat continues into the hilum and sinus and surrounds all structures.

Each kidney consists of an outer **renal cortex** and an inner **renal medulla**. The renal cortex is a continuous band of pale tissue. It completely surrounds the renal medulla. Renal cortex extends into the inner aspect of the kidney. They are called as **renal columns**. They divide the renal medulla into triangular-shaped tissue (**renal pyramids**). The bases of the renal pyramids are directed outward, toward the renal cortex. The apex of each renal pyramid projects inward, toward the renal sinus. The apical projection (renal papilla) is surrounded by a minor calyx.

The minor calices receive urine and represent the proximal parts of the tube that will eventually form the ureter. In the renal sinus, several minor calices unite to form a major calyx, and two or three major calices unite to form the renal pelvis, which is the funnel-shaped superior end of the ureters.

Each kidney has anterior and posterior surfaces. Each kidney has medial and lateral margins. It also has superior and inferior poles. The **renal pelvis** is the flattened, funnel-shaped expansion of the superior end of the ureter. The apex of the renal pelvis is continuous with the ureter. The renal pelvis receives two or three **major calices** (calyces). Each major calyx divides into two or three **minor calices**. Each minor calyx is indented by a **renal papilla at the apex of the renal pyramid**. The urine is excreted through the renal papilla. The pyramids and their associated cortex form the lobes of the kidney.

## SUPRARENAL GLANDS

The [suprarenal \(adrenal\) glands](#) are yellowish in living persons. They are located between the superomedial aspects of the kidneys and the diaphragm. The two glands are surrounded by connective tissue. This tissue contains considerable perinephric fat.

The **suprarenal cortex** secretes corticosteroids and androgens. These hormones cause the kidneys to retain sodium and water in response to stress, increasing the blood volume and blood pressure. They also affect muscles and organs such as the heart and lungs.

The **suprarenal medulla** is a mass of nervous tissue associated with the sympathetic nervous system. The chromaffin cells of the medulla secrete catecholamines (mostly epinephrine) into the bloodstream in response to signals from presynaptic neurons. The powerful medullary hormones epinephrine (adrenaline) and norepinephrine (noradrenaline) activate the body to a flight-or-fight status in response to traumatic stress. They also increase heart rate and blood pressure, dilate the bronchioles, and change blood flow patterns, preparing for physical exertion.

## PELVIC VISCERA

The pelvic viscera include the distal parts of the urinary system and digestive tract, and the reproductive system. Although the sigmoid colon and parts of the small bowel extend into the pelvic cavity, they are abdominal rather than pelvic viscera. The bladder and rectum—**true pelvic viscera**—are inferior continuations of systems encountered in the abdomen. There are few differences between male and female pelvic urinary and digestive organs. The male urethra is shared by the excretory and reproductive tracts in males. The physical relationships of the reproductive organs in the pelvis are different between the two sexes.

The [pelvic urinary organs](#) are the:

- Pelvic portions of the ureters, which carry urine from the kidneys.
- Urinary bladder, which temporarily stores urine.
- Urethra, which conducts urine from the bladder to the exterior.

### 2. URETERS

The ureters are muscular ducts (25-30 cm long) with narrow lumina that carry urine from the kidneys to the urinary bladder. They run inferiorly from the apices of the renal pelves at the hila of the kidneys. They then run along the lateral wall of the pelvis and enter the urinary bladder.

### 3. URINARY BLADDER

The **urinary bladder**, a hollow viscus with strong muscular walls, is characterized by its distensibility. The urinary bladder is a temporary reservoir for urine and varies in size, shape, position, and relationships according to its content and the state of neighboring viscera. When empty, the adult urinary bladder lies on the pubic bones and pubic symphysis anteriorly and the prostate (males) or anterior wall of the vagina posteriorly.

The urinary bladder has an apex, fundus, body and cervix (neck).

Toward the neck of the male bladder, the muscle fibers form the involuntary **internal urethral sphincter**. This sphincter contracts during ejaculation to prevent retrograde ejaculation (ejaculatory reflux) of semen into the bladder.

### 4. MALE URETHRA

The male urethra is a muscular tube that conveys urine from the internal urethral orifice of the urinary bladder to the external urethral orifice, located at the tip of the glans penis in males. The urethra also provides an exit for semen (sperms and glandular secretions). The urethra has three parts. They are 1) Abdominal part, 2) Pelvic part, 3) Intramural part.

### 5. FEMALE URETHRA

The female urethra passes anteroinferiorly from the internal urethral orifice of the urinary bladder, posterior and then inferior to the pubic symphysis, to the external urethral orifice. The musculature surrounding the internal urethral orifice of the female bladder is not organized into an internal sphincter. In females, the external urethral orifice is located in the vestibule. The vestibule is the cleft between the labia minora of the external genitalia. It is directly anterior to the vaginal orifice. The urethra lies anterior to the vagina. It forms an elevation in the anterior vaginal wall.