

JSR IAS ACADEMY

GENERAL SCIENCE

BIOLOGY

Physiology

Human Excretory System

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Urethra:

The human excretory system **consists of a pair of kidney,**

Some of the excretory organs other than kidneys are

- **skin** (removes small amounts of water, urea and salts in the form of sweat)
- **lungs** (eliminate carbon-dioxide and water vapour through exhaling).

Skin

- ❖ It **accounts for 15% of an adult's human body weight.**
- ❖ It eliminates metabolic wastes through **perspiration.**
- ❖ The human body functions normally at a **temperature of about 37° C.**
- ❖ When it **gets hot sweat glands start secreting sweat,**
- ❖ which contains water with small amounts of other chemicals like **ammonia, urea, lactic acid and salts (mainly sodium chloride).**

Kidneys

- ❖ Kidneys are **bean-shaped organs reddish brown in colour.**
- ❖ The **right kidney is placed lower** than the left kidney as the liver takes up much space on the right side.
- ❖ Each kidney is **about 11 cm long, 5 cm wide and 3 cm thick.**

Internally the kidney consists of an outer dark region, **the cortex** and an inner lighter region, **the medulla.**

The medulla **consists of multitubular conical masses** called the **medullary pyramids or renal pyramids**

On the inner concave side of each kidney, a notch called **hilum** is present through which blood vessels and nerves enter in and the urine leaves out.

Urinary bladder:

- ❖ which lies in the **pelvic cavity** of the abdomen.
- ❖ It stores urine temporarily.

- ❖ Urethra is a membranous tube, which conducts urine to the exterior.
- ❖ The urethral sphincters keep the urethra closed and opens only at the time of micturition (urination)

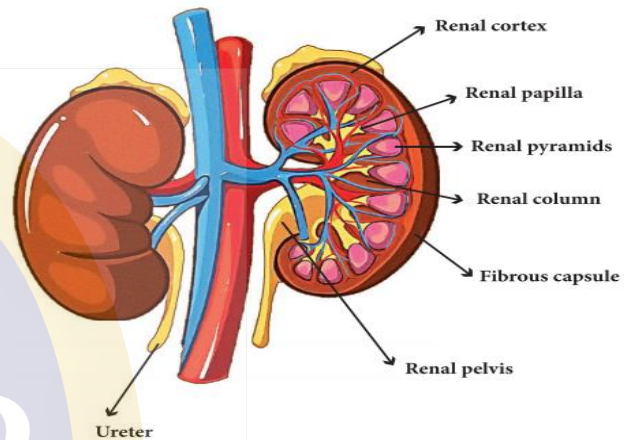


Figure 20.6 Longitudinal section of human kidney

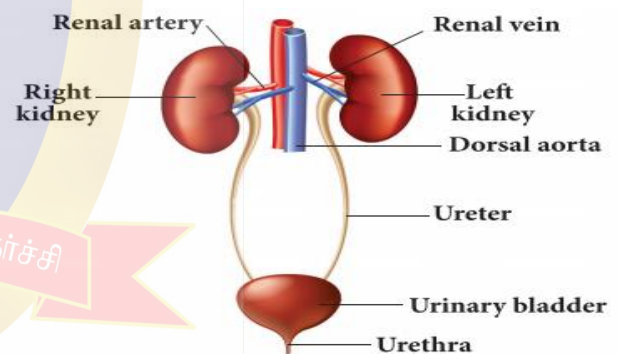


Figure 20.5 Excretory system

Functions of kidney

1. Maintains the fluid and electrolytes balance in our body.
2. Regulates acid-base balance of blood.
3. Maintains the osmotic pressure in blood and tissues.
4. Helps to retain the important plasma constituents like glucose and amino acids.

Structure of Nephron

- Each kidney consists of more than one million **nephrons.**
- Nephrons or uriniferous tubules are structural and **functional units of the kidneys.**

Each nephron consists of

1. Renal corpuscle or Malpighian corpuscle
2. renal tubule.

The renal corpuscle consists of a cup-shaped structure called **Bowman's capsule** containing a bunch of capillaries called **glomerulus**.

The Bowman's capsule consists of three regions

1. proximal convoluted tubule,
2. U-shaped hair pin loop, the loop of Henle
3. the distal convoluted tubule.

The nitrogenous wastes are **drained into renal pelvis**

DO YOU KNOW? Two healthy kidneys contain a total of about 2 million nephrons, which filter about 1700-1800 litres of blood. The kidneys reabsorb and redistribute 99% of the blood volume and only 1% of the blood filtered becomes urine.

Mechanism of Urine Formation

The process of urine formation includes the following three stages. „

1. Glomerular filtration „
2. Tubular reabsorption „
3. Tubular secretion

Glomerular filtration:

Urine formation **begins with the filtration of blood through epithelial walls** of the glomerulus and Bowman's capsule.

Tubular reabsorption:

1. The filtrate in the proximal tubule consists of essential substances such as **glucose, amino acids, vitamins, sodium, potassium, bicarbonates and water**
2. that are reabsorbed into the blood by a process of selective reabsorption.

Tubular secretion:

- ❖ Substances such as H⁺ or K⁺ ions are secreted into the tubule.
- ❖ This tubular filtrate is finally known as urine, which is **hypertonic in man**.
- ❖ When the urinary bladder is full the urine is expelled out through the urethra. This process is called **micturition**.
- ❖ A healthy person excretes **one to two litres of urine per day**.

Dialysis or Artificial kidney :

The patient is said to be put on dialysis and the process of purifying blood by an artificial kidney is called **haemodialysis**.

DO YOU KNOW? **First kidney transplant**
In 1954, Joseph E. Murray and his colleagues at Peter Bent Brigham Hospital in Boston, USA performed first successful kidney transplant between Ronald and Richard Herrick who were identical twins. The recipient Richard Herrick died after 8 years of transplantation

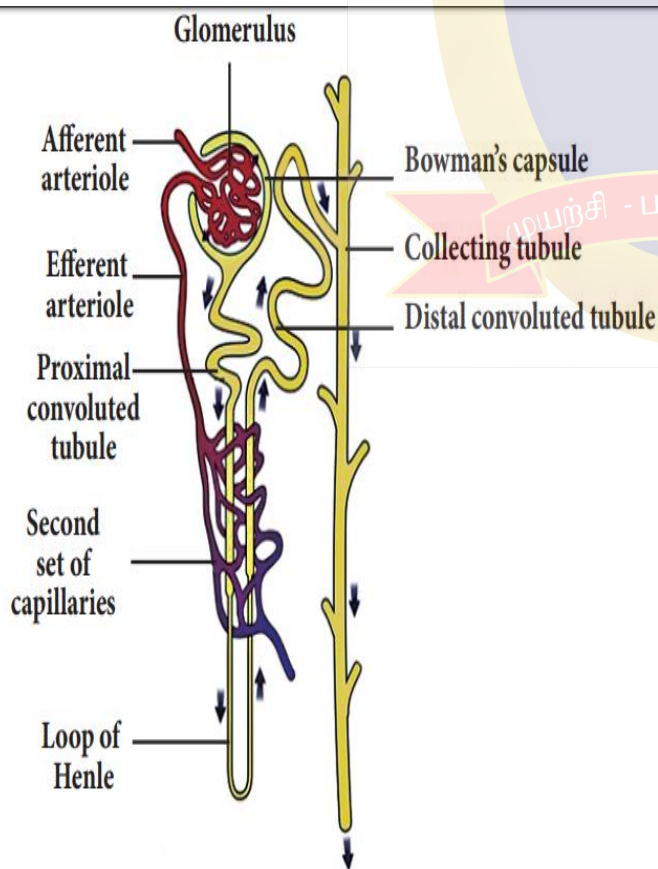


Figure 20.7 Structure of Nephron

Route of urine flow

