

Excretory System

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Organs that play role in excretion:

Lungs

Skin

Liver

Kidney

The Lungs

- It helps in gaseous exchange.
- Inhale of O₂ and exhale of Co₂



Excretion through skin

- Sweat, which is excreted through the skin, contains water, salts and some urea. As the water in the sweat is excreted, heat is lost and the body is cooled.
- Sweat is a form of excretion as it rids the body of waste, as well as a form of secretion as it maintains the body temperature through sebaceous glands or sweat glands.
- The Excretory systems maintain homeostasis with respect to water, salt and metabolite concentrations within the blood.



The liver

- The liver removes metabolic wastes.
- Makes ureas from N_2 to NH_3 and then Urea through ornithine cycle.



Excretion through kidney

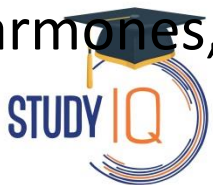
- When proteins are broken down in humans, a compound called ammonia (NH_3) is formed. Ammonia is highly toxic, so it is converted into urea by the liver, and this urea is the primary nitrogenous waste found in urine.
- Other waste products excreted in the urine include Uric acid (from breakdown of DNA and RNA) and Creatinine (from muscle action).



Excretion through kidney

The following substances are made in the liver and excreted by the kidneys:

- Urea, the main nitrogenous waste compound secreted. It is formed by the breakdown of excess amino acids in the process of deamination.
- Uric acid, the nitrogenous end product of nucleic acid metabolism. Creatinine is formed from creatinine phosphate, found in the muscle cells.
- Non- nitrogenous waste, Eg: CO_2 , Excess water, ions, hormones, poisons and drugs.



The Urinary System

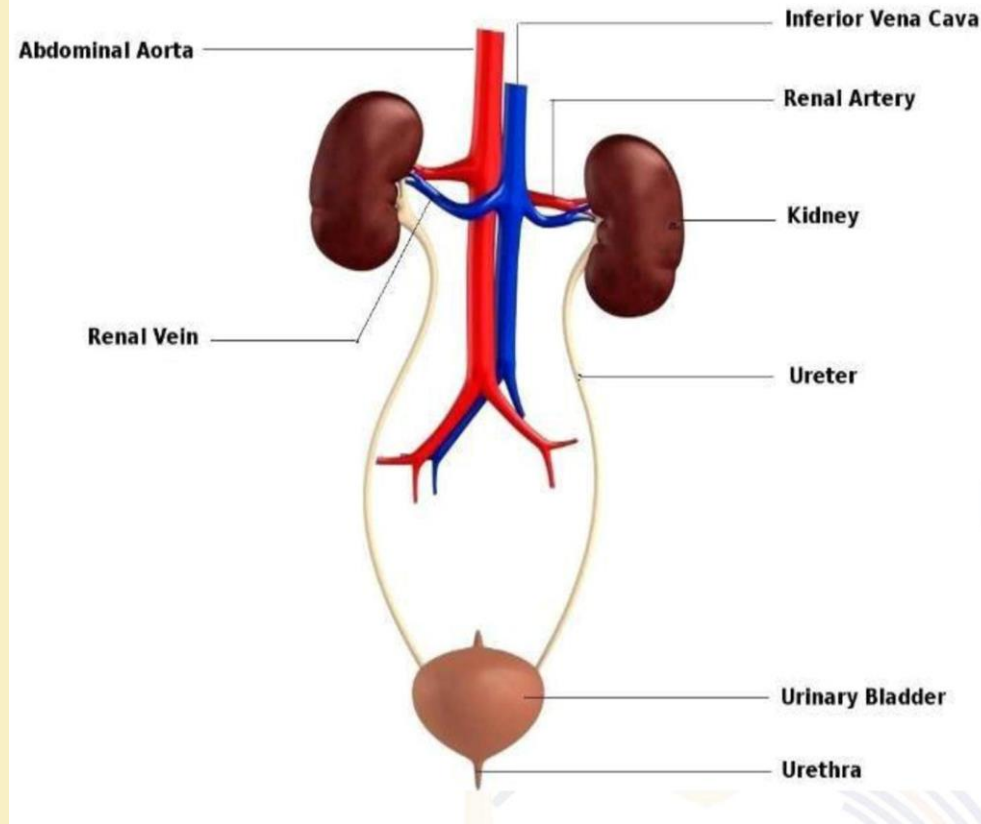


The main function of the urinary system is to maintain homeostasis by regulating the volume and concentration of body fluids.

It filters and reabsorbs certain materials from the blood.

The urinary system is made up of the following parts:

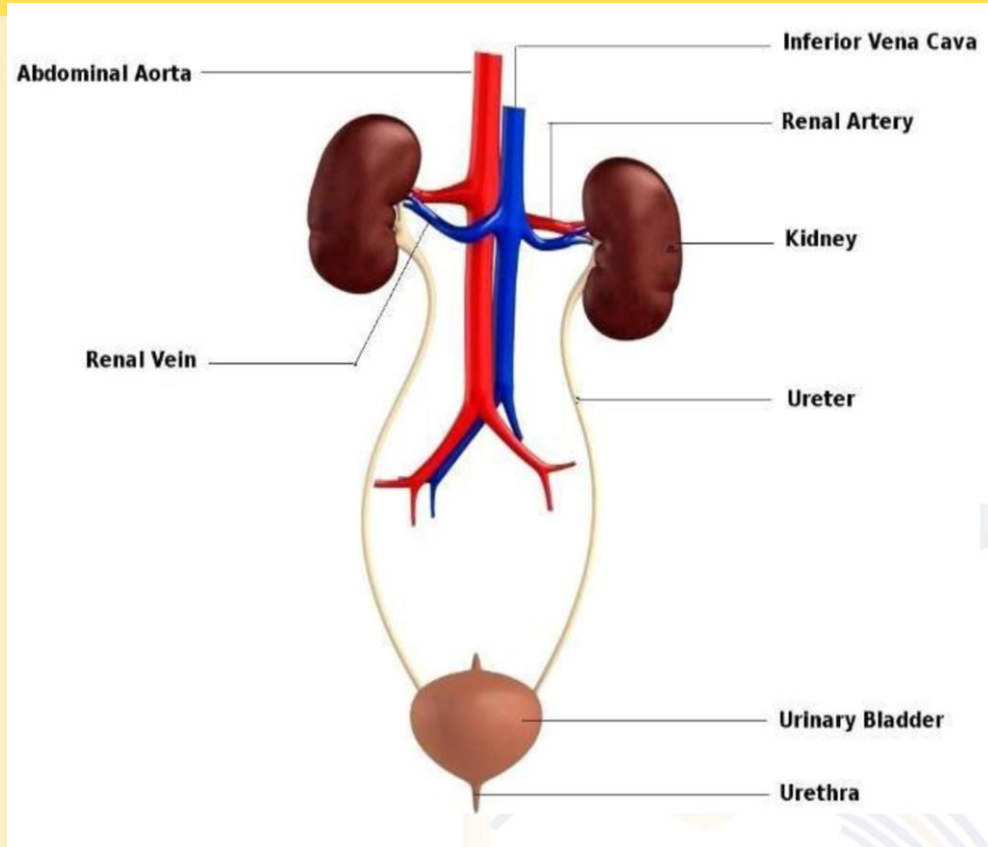
Kidneys: Two organs that filter blood to remove waste (which is excreted in urine) and adjust the concentration of salts in the blood.



Ureters: Either of a pair of ducts that carry urine from the kidneys to the bladder.

Urinary bladder: Stores urine until it can be excreted.

Urethra: The tube through which urine exits the bladder.

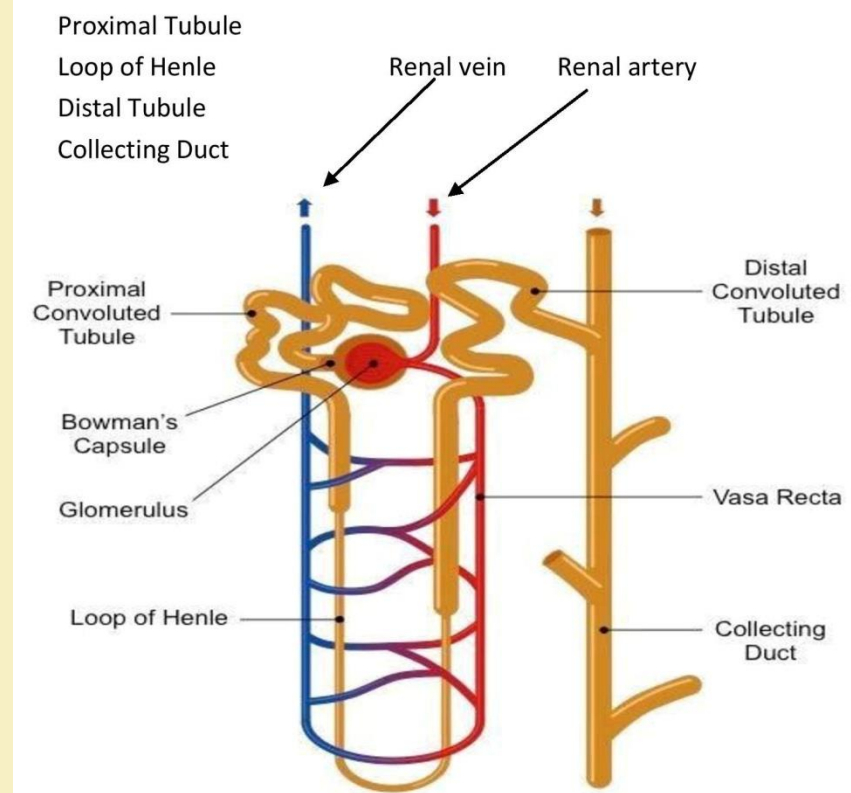


Nephron

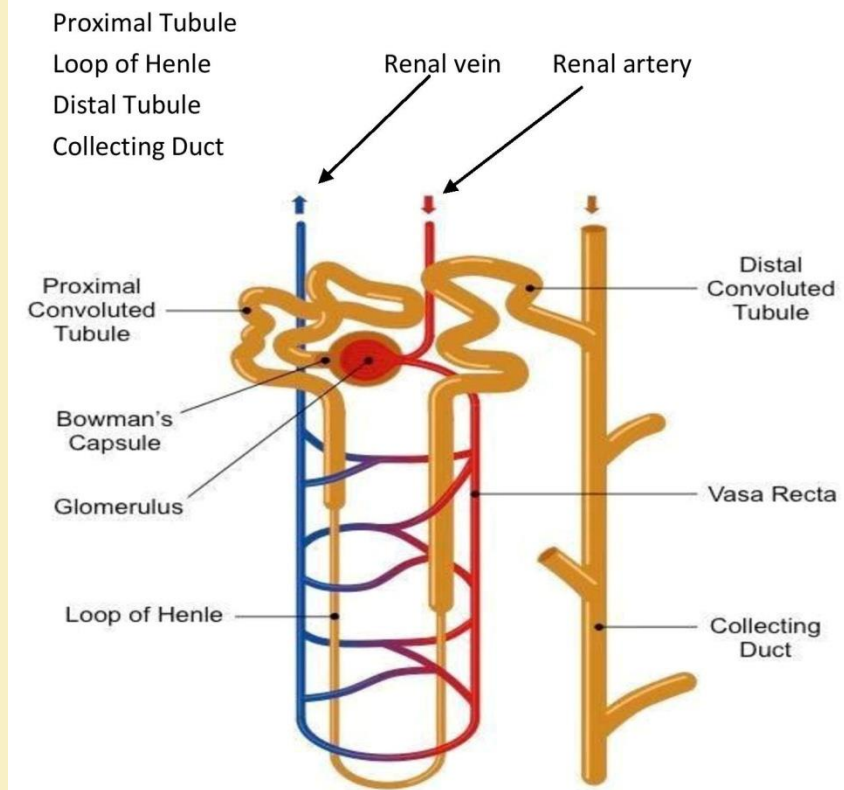
The functional unit of the kidney is the **Nephron**. Each kidney contains about 1 million or so Nephrons.

The Parts of the Nephron

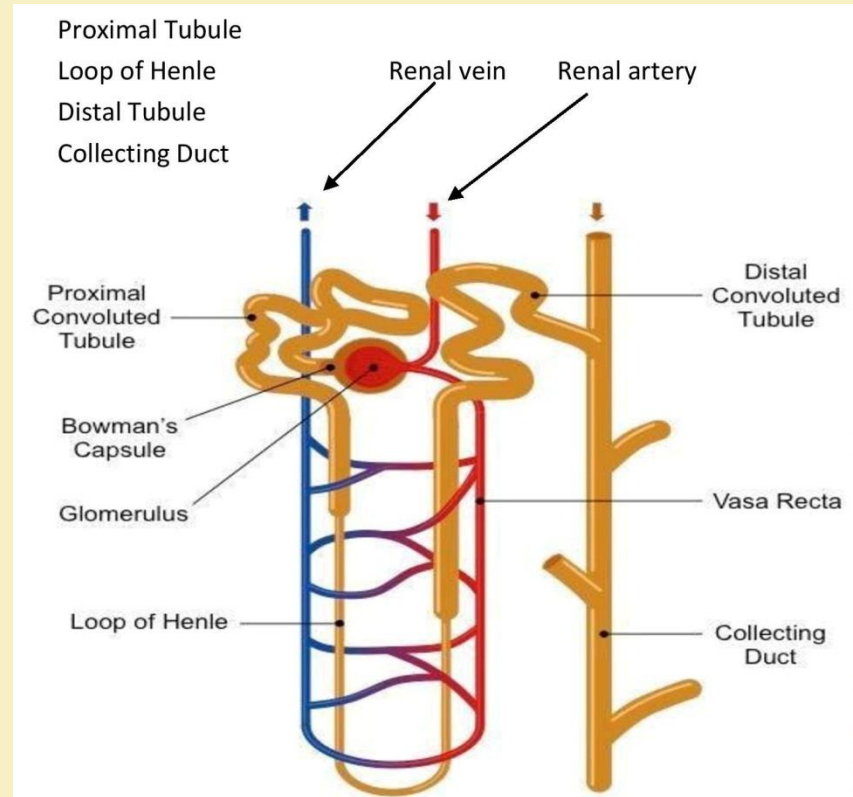
- Glomerulus
- Bowman's Capsule
- Proximal Tubule
- Loop of Henle
- Distal Tubule
- Collecting Duct



- **Glomerulus:** The blood vessel inside the Bowman's capsule from which water, salts, nutrient molecules, and waste molecules leave the blood to be filtered by the kidney.
- **Bowman's capsule:** The receiving end of a renal (kidney) tubule at which water and small solutes from the blood enter the proximal tubule from the glomerulus.
- **Proximal tubule:** The tube between the Bowman's capsule and the loop of Henle. Reabsorption of important nutrients like water, glucose, and amino acids begins here.



- **loop of Henle:** The long loop of the nephron that extends into the medulla of the kidney between the proximal tubule and the distal tubule. The main function of the loop of Henle is to remove water from the filtrate.
- **Distal tubule:** The tube that connects the loop of Henle to the collecting duct. The main job of the distal tubule is to secrete material like hydrogen ions, creatinine, and drugs out of the blood into the filtrate.
- **Collecting ducts:** Carries urine to renal pelvis.



- **WATER and OTHER COMPONENTS IN URINE**

- About 96% of urine is water, 1.5% is salts, mainly sodium chloride, urea makes up to 2%. Small quantities of drugs, hormones and preservatives. About 1.5 litres of urine is produced daily.
- The amount of water found in urine depends on the permeability of the distal tubule and the collecting duct. This permeability is controlled by a hormone (chemical messenger) called **anti- diuretic hormone** (ADH). ADH increases permeability, which allows the body to reabsorb water so it doesn't go out in urine.
- If you drink a lot of fluid, ADH is not produced so the kidneys do not reabsorb the water. As well, certain drugs like alcohol and caffeine block the release of ADH and increase urine volume.
- Chemicals in urine precipitate and form crystals, mostly **calcium oxalate**.



ANIMALS AND EXCRETORY PARTS

- Unicellular Animals / Ameoba – by diffusion through surface of the body.
- Platyhelminthes/ Flatworms – by Flame cells
- Round worms/Earthworms – by Nephridia
- Arthropods/ Cockroaches – by Malphigian tubules
- Crustaceans / Prawns - Antennal glands / Green Glands
- Vertebrates –kidney



- **Kidney stone**
- More common in men than women.
- Factors that cause stones include urinary tract infections, insufficient water intake, low. activity level, and/or too much vitamin C or D.
- Symptoms include severe pain, blood in the urine, nausea.



Artificial kidney (Hemodialysis)

- Kidneys are vital organs for survival. Several factors like infections, injury or restricted blood flow to kidneys reduce the activity of kidneys. This leads to accumulation of poisonous wastes in the body, which can even lead to death.
- In case of kidney failure, an artificial kidney can be used. An artificial kidney is a device to remove nitrogenous waste products from the blood through dialysis.
- Artificial kidneys contain a number of tubes with a semi-permeable lining, suspended in a tank filled with dialysing fluid. This fluid has the same osmotic pressure as blood, except that it is devoid of nitrogenous wastes. The patient's blood is passed through these tubes.
- During this passage, the waste products from the blood pass into dialysing fluid by diffusion. The purified blood is pumped back into the patient. This is similar to the function of the kidney, but it is different since there is no reabsorption involved.
- Normally, in a healthy adult, the initial filtrate in the kidneys is about 180 L daily. However, the volume actually excreted is only a litre or two a day, because the remaining filtrate is reabsorbed in the kidney tubules.



Thank You

