

Excretion by the Lungs, Skin and Kidneys

Introduction:



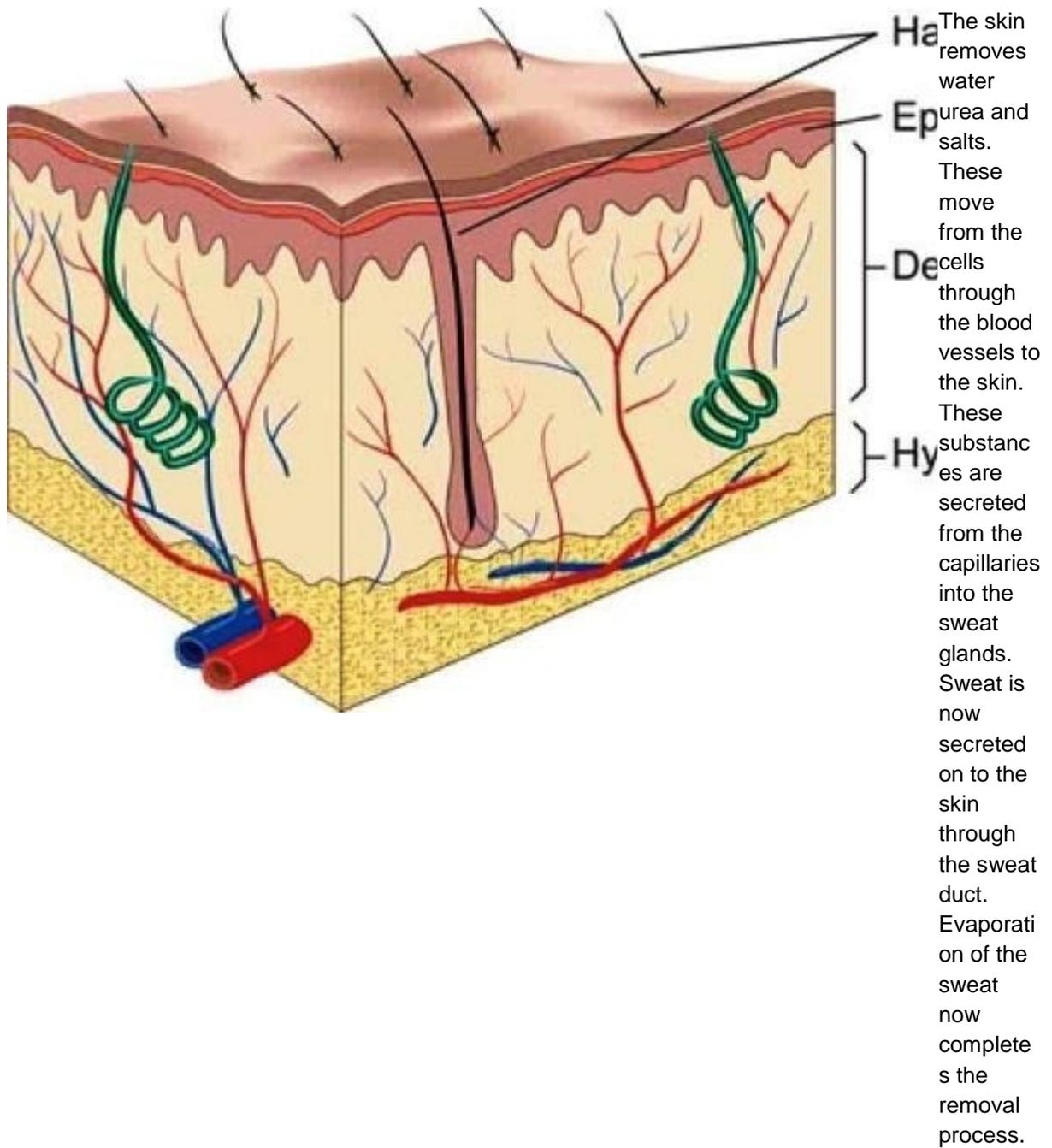
The organs involved in the removal of wastes are referred to as excretory organs. The most important of these are the skin, the lungs and the kidneys.

THE LUNGS

The lungs remove carbon dioxide and water. The air we breathe enters our trachea and then the two bronchi and finally end up in the lungs.

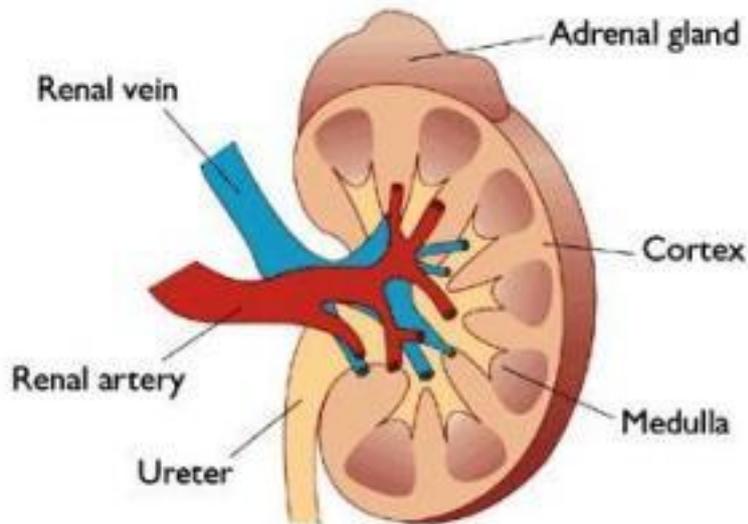
Each bronchus divides and subdivides thousands of times finally ending as tiny narrow bronchioles. Each bronchiole leads to an alveolus. The air we breathe ends in the alveoli and diffusion of gases takes place through the walls of the alveoli and capillaries. Oxygen diffuses across the walls of the alveoli into the blood. Oxygen combines with haemoglobin of the red blood cells to form oxyhaemoglobin. The oxygenated blood is then pumped back to the heart, from where it is pumped to the rest of the body. Carbon dioxide which was dissolved in the blood diffuses into the alveoli. The exhaled air is filled with carbon dioxide and little oxygen along with water vapour.

THE SKIN



THE KIDNEYS

Diagram of Kidney



The kidney is the organ in which most waste substances from the body are separated from the blood and passed out of the body. The kidney removes water, salts and urea. As blood from the renal artery containing these compounds as well as glucose passes through the cortex region of the kidney, it is channeled into clusters of capillaries (**glomeruli**). Each glomerulus is in close contact with tiny nephrons, the filtering units of the kidney.

Each glomerulus is in a **Bowman's Capsule**, the head of a tiny nephron. Each kidney has many thousands of nephrons. The aorta from the heart leads to the renal arteries which lead to the kidneys. The renal artery branches into smaller vessels to get blood to the glomeruli. The blood vessel bringing blood to each glomerulus is wider than that leading the blood away. This means that a constant high blood pressure is maintained within the glomerulus even though there may be changes in blood pressure elsewhere in the body.

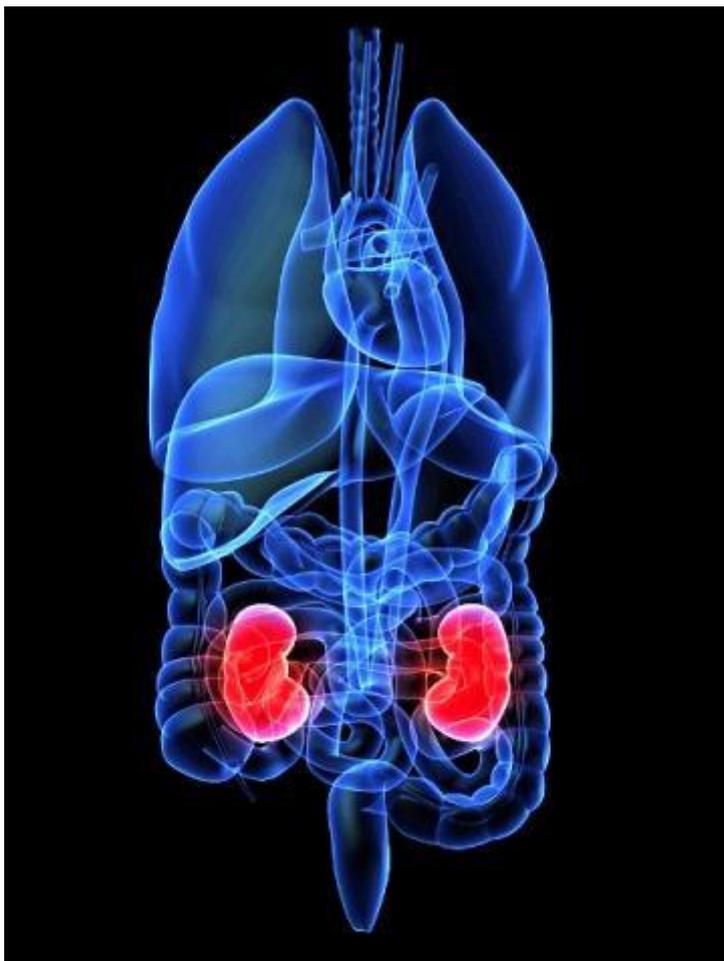
As the blood is forced into each glomerulus all the dissolved small particles filter out through the walls of the glomerulus and the walls of the Bowman's Capsule. These small particles include water, salts, glucose and urea. Most protein molecules are too big so they remain in the blood. As the filtrate flows along the nephron useful substances are reabsorbed into the blood stream. These useful substances are all of the glucose, some of the water and some of the salts.

The remainder of the filtrate, now called urine, travels from the nephron into the collecting duct which leads into the ureter. The ureters empty their contents into the urinary bladder where temporary storage takes place before urine leaves the body via the urethra.

The kidneys work continually filtering and reabsorbing material. The net effect is the concentration and disposal of chemical waste, water, urea and salts but retention of nutrients including some salts. The kidneys maintain a healthy balance of salts and water between uptake from food and respiration and loss in excretion.

This is achieved under the influence of the hormone **Anti-Diuretic Hormone (ADH)** or vasopressin which controls the amount of water reabsorbed in the distal tubule and collect duct. The hormone is produced in the hypothalamus of the pituitary gland. This maintenance of a steady state in the body fluids is called osmoregulation

Sometimes the kidneys become diseased or damaged. This is serious because the metabolic wastes can build up and cause malfunctions of the cells. It is possible to survive with only one functioning kidney, since they are such efficient organs. However, when both fail to function, an artificial kidney (**dialysis**) machine is used. Blood circulates repeatedly out of the body and through the machine where urea and other wastes are removed, before the blood is pumped back into the body.



Kidneys in the body