



Renal System

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The Kidneys

- The kidneys are a pair of bean-shaped organs just above the waist.
- They are important organs with many functions in the body, including producing hormones, absorbing minerals, and filtering blood and producing urine.





Kidneys and Homeostasis

The kidneys are essential for cleansing the blood and eliminating urine waste from the body.

They also have other important functions that maintain homeostasis in the body including regulating

- ❖ Acid-base balance
- ❖ The concentration of electrolytes
- ❖ Controlling blood pressure
- ❖ Secreting hormones.



Kidney failure causes a very serious and possibly fatal disruption of homeostasis in the body. Complications include;

- ❖ Weakness
- ❖ Shortness of breath
- ❖ Widespread swelling (edema)
- ❖ Metabolic acidosis
- ❖ And heart arrhythmias.





Acid-Base Balance

Along with the lungs, the kidneys are the main organs for regulation of pH in the body.

They do this by recovering and regenerating bicarbonate (HCO_3^-) from urine and excreting hydrogen ions (H^+) into the urine.

Electrolyte Concentrations

Some of the electrolytes, the kidney helps to keep in homeostasis are sodium, potassium chloride, bicarbonate, magnesium, copper and phosphate.

For example, the hormones aldosterone (**It helps control the balance of water and salts in the kidney**) and angiotensin II regulate the reabsorption of sodium from the renal filtrate and the excretion of sodium into the renal collecting tubule, respectively.



Blood Pressure- Extracellular Fluid Volume

The kidneys don't directly sense blood pressure, but they act to regulate blood pressure over the long term.

They do this via the renin-angiotensin system that regulates the amount of extracellular fluid in the body, which, in turn, is regulated by the levels of sodium in the blood plasma.





Hormone Secretion

The kidneys synthesize two important hormones that help support homeostasis—erythropoietin and renin.

Erythropoietin stimulates the production of red blood cells in the bone marrow.

Renin is both a hormone and an enzyme, also known as angiotensinogenase.



Functions of ureters

- Ureters are the tubes that transport urine from the kidneys to the bladder.
- There are two ureters in the human body, one connected to each kidney.
- Ureteral tubes are made of smooth muscle that contracts to push urine from the kidneys to the bladder.
- The ureters work constantly, emptying urine into the bladder about every 10 to 15 seconds.





The **bladder** is an organ of the urinary system. It plays two main roles;

Temporary storage of urine – the bladder is a hollow organ with distensible walls.

It has a folded internal lining (known as rugae), which allows it to accommodate up to 400-600ml of urine in healthy adults.

Assists in the expulsion of urine – the musculature of the bladder contracts during micturition, with concomitant relaxation of the sphincters.



Functions of urethra

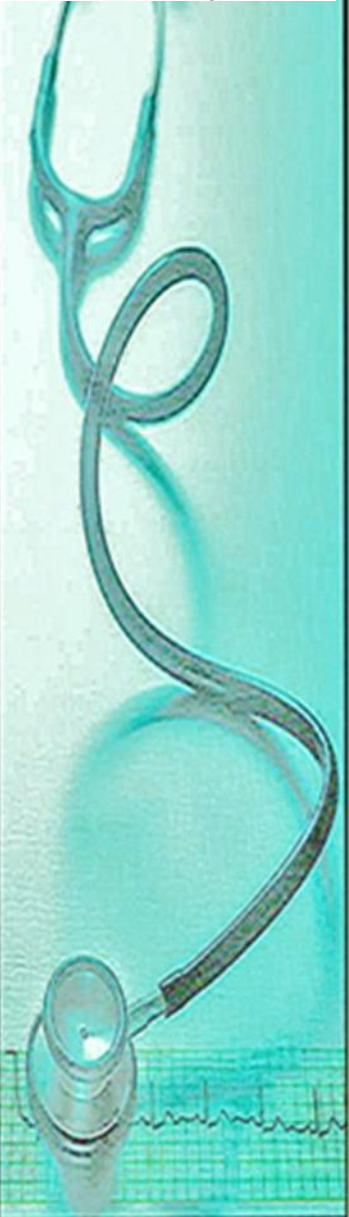
This tube allows urine to pass outside the body.

In females, the main urethra functions are the;

- ❖ Transportation of urine out of the body
- ❖ Prevention of urine reflux
- ❖ And protection against pathogenic bacteria.

In males, the urethra has four functions –

- ❖ The expulsion of urine
- ❖ The expulsion of sperm
- ❖ The prevention of either of these fluids from traveling back into the lower urinary tract
- ❖ And protection against bacteria entering from outside of the body.





Micturition - The Process Of Urination

“Micturition is the process of discharging urine from the urinary bladder.”

Micturition is a process where urine is expelled from the body.

The micturition reflex requires a complex network of signals between the nervous system and the urinary tract system. Urine storage and emptying are highly dependent on these pathways.





Function

- Urination or micturition primarily functions in the excretion of metabolic products and toxic wastes.
- The urinary tract also serves as a storage vessel of the waste filtered from the kidneys.
- Urine stored in the bladder is released from the bladder through the urethra upon a complex network of neurological function.





Glomerular Filtration Rate

A glomerular filtration rate (GFR) is a **blood test that checks how well your kidneys are working.**

Specifically, it estimates how much blood passes through the glomeruli each minute. Glomeruli are the tiny filters in the kidneys that filter waste from the blood.

Glomeruli are the small filters inside your kidneys. If your kidneys aren't working properly, your glomeruli won't filter as efficiently.

