

NEW CHALLENGE TUITION CENTRE**11TH BIO-ZOOLOGY****2018-19****UNIT- 3 EXCRETION****Definition:**

Excretion is a process by which the unwanted nitrogenous waste materials are collected and eliminated from the body.

Modes of excretion:

Excretion is the most of collecting nitrogenous wastes and eliminate in the environment.

❖ **Ammonoteles:**

The animals that excrete most of the ammonia is called ammonoteles.

Eg. Aquatic animals (fish, shark etc....)

❖ **Uricoteles:**

The animals that excrete the uric acid of crystals loss of water is called uricoteles.

Eg. Reptiles, birds, insects and land snails.

❖ **Ureoteles:**

In the animals that excrete of only the urea is called ureoteles.

Eg. Mammals, most of the amphibians and terrestrial invertebrates.

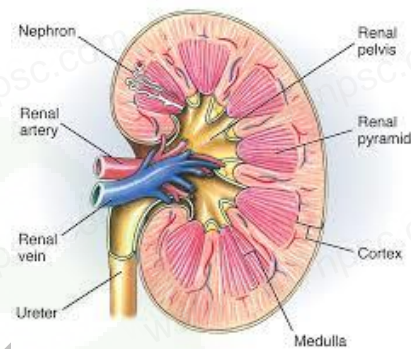
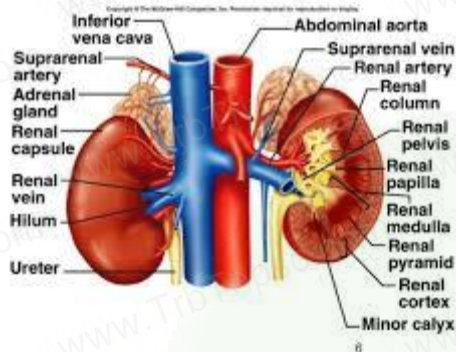
Name of the phylum	Excretory system (organ)
Protozoa	Simple diffusion from the body surface into the surrounding water
Porifera and coelenterates	Water bathes almost all their cells (Sponges- Porifera, hydra – coelenterates)
Platyhelminthes and Nematoda	Flame cells and rennette cells (nematodes)
Annelids	Nephridia (earthworms)
Arthropoda	Green glands and Malpighian tubules (cockroach)
Mollusca	Metanephridia
Echinodermata	Water vascular system (starfish)
Reptiles, birds, and mammals	Kidneys

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Structure of kidney: (Human)

- The excretory system in human consists of a pair of kidneys, a pair of ureters, urinary bladder and urethra.
- Kidneys are a reddish brown color and bean-shaped structure.
- The right kidney is placed slightly lower than the left kidney.
- Each kidney weights an average of 120-170 grams.

- The **outer layer** of the kidney is covered by three layers of supportive tissue namely,
 - 1) Renal fascia
 - 2) Perirenal fat capsule and
 - 3) Fibrous capsule
- The longitudinal section of kidney shows, an **outer cortex**, **inner medulla** and **pelvis**



- The medulla is divided into a few conical tissue masses called **medullary pyramids** or **renal pyramids**.

Bertini and hilum:

- Bertini is a part of cortex in the kidney
- It is also called renal column or column of Bertini

The center of the inner concave surface of the kidney has a notch called the **hilum** or **renal hilum**

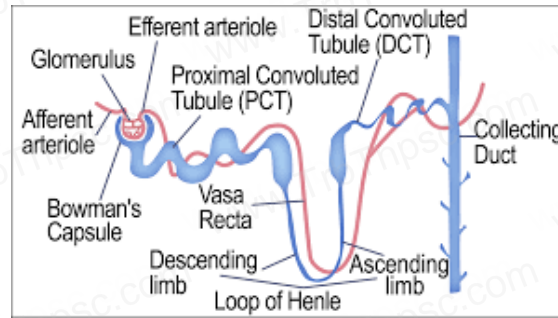
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Structure of Nephron:

- Nephron is the microscopic structural and **functional unit** of kidney.
- It is composed of a **renal corpuscle** and a **renal tubule**.
- The nephron is also called **uriniferous tubules**.
- Each kidney of man has formed about 1 million nephrons.

Structure:

- Coiled type
- Length 3cm

**Henle's loop:**

- The 'U' Shaped portion is called a **loop of Henle's** or **Henle's loop**.
- The Henle's loop contains 3 regions. They are
 1. Ascending Limb
 2. Thin segment and
 3. Descending limb

Bowman's capsule:

- The nephron contains a double walled **cup-shaped** structure called Bowman's capsule.
- The cavity of Bowman's capsule contains network capillaries called '**Glomerulus**'

Glomerulus contains two vessels

- a) Afferent vessels – this arteriole used to receive the blood
- b) Efferent vessels - this arteriole used to eject the blood

Malpighian corpuscle:

- The glomerulus and Bowman's capsule are together called '**malpighian corpuscle**'

Collecting duct or collecting tubule

- Many nephrons join together to form a common tubule called '**Collecting duct**'

Or

- The renal tubule opened into a longer tubule is called '**collecting duct**'

Podocytes:

The visceral layer is made of epithelium cells called **podocytes**

Or

The glomerulus membrane consist of octopus-like cells called '**podocytes**'

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Mechanism of urine formation (human)

- Urine formation occurs in the liver
- Urine formation is one of the protein catabolism processes

Protein → Amino acid → Ammonia → Urea

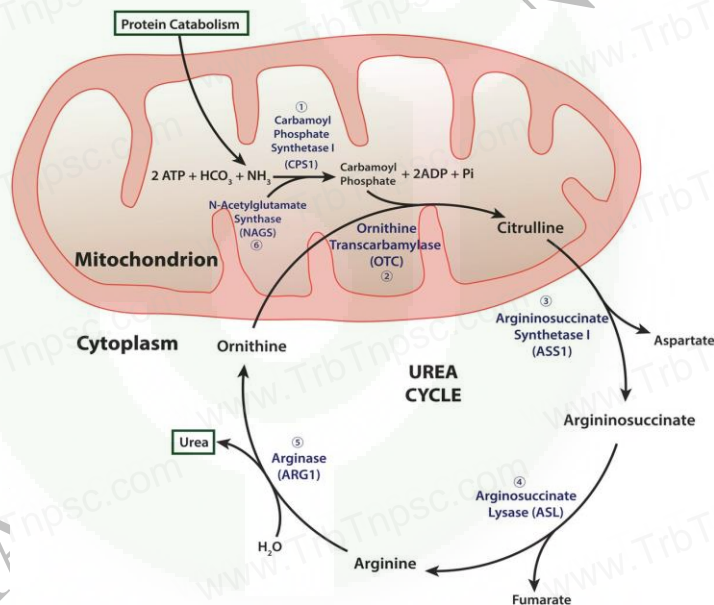
- Urine is the excretory fluid eliminated by the kidney
- Formation of urine is a highly sensitive and complex process

Mechanism of urine formation involves 3 steps. They are

1. Glomerular filtration or Ultrafiltration
2. Tubular reabsorption
3. Tubular secretion.

1. Ultra-filtration

This straining of blood by the malpighian corpuscle is called ultra-filtration



Ornithine Cycle

2. Tubular - reabsorption

The intake of useful substances into the blood from the glomerular filtrate is called tubular reabsorption

3. Tubular - secretion

The release of unwanted materials from the blood into the nephron is called tubular reabsorption

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Regulation of kidney function:**1. Anti-diuretic hormone (ADH)**

- ADH is regulating the various kidney functions
- ADH is also called 'vasopressin'
- The deficiency of ADH hormone is caused by **diabetes insipides** disorder in the human

2. Renin-angiotensin

- Renin-angiotensin is a hormone
- It regulates blood pressure (BP)

JG-Cells

It is the specialized smooth muscle cells present in the kidney is called **JG cells** or **Juxta Glomerular cells**

Juxta Medullary nephron (JMN)

Some nephron have a very long loop of Henle's in the medulla are called **juxta medullary nephron**

3. Atrial natriuretic factor (or peptide) ANP or ANF

- ANF or ANP is a peptide hormone.
- ANP acts on the kidney to increase sodium (Na^+) and Excretion (natriuresis).

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Micturition or Urination:

- Micturition is a process of filling of urine in the urinary bladder and the process of urination.
- The entire process of micturition controlled by the central nervous system (CNS)

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Roll of other organs in excretion

- Lungs- Carbon dioxide CO_2 during expiration (Respiration)
- Liver – Bile, steroid hormone and drugs cholesterol
- Skin – Sweat and sebaceous gland

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Disorder related to the excretory system: (UTI)**1. Urinary tract infection:**

A urinary tract infection tract is an infection that affects part of the urinary tract.

Symptoms:

- Painful urination (Dysuria)
- Urinary urgency
- Fever
- Cloudy or blood tinged urine.

Treatment:

UTI can be treated by antibiotics.

2. Uremia:

- Uremia is the conditioning of having `urea` in the blood.
- Normal urea level in human blood is about 17-30gms / 100ml.

Diagnosis:

- Blood test

Treatment:

- consulting to the doctor

3. Renal calculi or Urinary calculi:

- Renal calculi is a disorder of the human excretory system.
- It is also called a renal stone, kidney stone or nephrolithiasis.

Symptoms:

- Stomach pain

Treatment:

- A kidney stone can be removed by techniques like

1. Phyleothotomy
2. Lithotripsy.

4. Glomerulonephritis:

- It is characterized by inflammation of the glomeruli of both kidneys.
- It is also called Bright's disease.

Symptoms:

- Haematuria
- Proteinuria
- Salt and water retention
- Oligouria
- Hypertension and
- Pulmonary oedema.

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Counter current theory (multiplier):

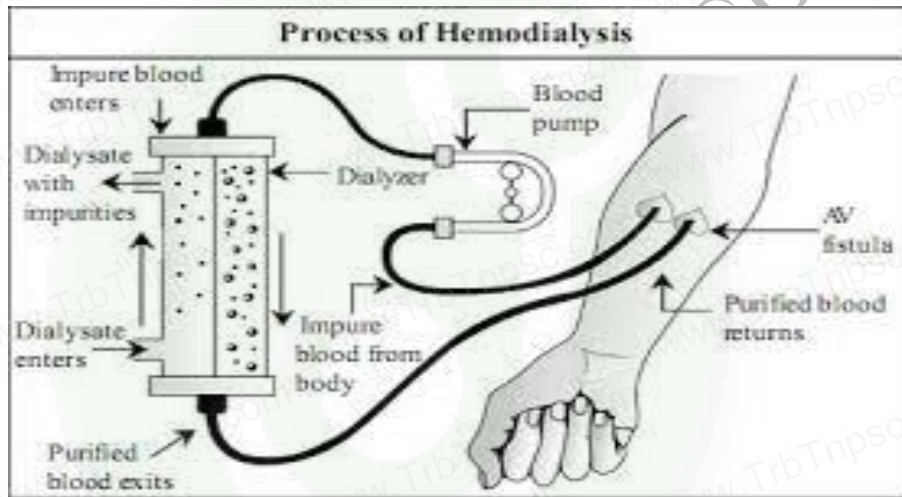
- This theory was proposed by Wirz (1951) and Bray (1960).
- It explains the formation of concentrated urine.
- The system operates in the hairpin-like loop of Henle.
- Ascending and descending limbs of Henle, create a type of current is called counter current multiplier.

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Haemodialysis:

Haem - blood

Dialysis - artificial purify method



- Filtration of urine artificially other than kidney is called 'haemodialysis'
- In the case of kidney failure, an artificially can be used.
- Per day 180 – liter blood purified by the kidney.

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The functions of the kidney:

- Maintenance of minerals such as Na⁺, mg, ca, and K etc....
- Maintenance of Bp (during the action of renin-angiotensin enzyme)
- Maintenance of blood calcium level (hormone calcitriol).

Fistula:

- ❖ The fistula is a surgical method.
- ❖ It is used to taking of blood in a large level.

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Kidney transplantation: (renal transplantation)

- ✚ Kidney transplantation is the organ transplant of the kidney into a patient with end-stage of renal disease.
- ✚ It is also called renal transplantation.

Type of kidney donors:

- Living Donors
- Deceased donors (This type of donors have died)

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