

PHYSIOLOGY EXCRETION

19) excretion, patterns of excretion, organs of excretion, Physiology of urine formation.

⇒ Excretion

Excretion is a process which nitrogenous waste products removed from the body. It means separation and elimination of the unwanted waste material from the body. Excretion plays an important role in maintaining homeostatic condition of the body. Failure of excretory system results in accumulation of waste products. Results the disturbances in osmoregulation, ionic regulation, acid base balance and ultimately to death. Excretory products are carbon dioxide, nitrogenous compound, like urea, ammonia, uric acid, creatine and some few excess water, in unicellular animal. Excretory products are expelled through general body surface but in multicellular animal have excretory system for this purpose. (वद्वैत)

Patterns of excretion

There are three patterns of excretion:

- 1) Ammonotelic: when nitrogen is excreted predominantly in the form of NH_3 . Most of aquatic animal, protozoans, polychaete, annelids, crustaceans, among molluscs, amphibians, crocodiles etc

include this patterns.
(b) Ureotelic : → when nitrogen is excreted predominantly in the form of urea, Amphibian and mammals include in this patterns.

(c) Ureotelic : → when nitrogen is excreted in the form of uric acid, insects, gastropods, lizard, snake and birds are in this book.

organs of excretion ?

Following organs are in different groups of animals:-

(i) Protozoa : → contractile vacuoles play for excretion.

(ii) Porifera and Coelenterata : → Direct diffusion from the body cells into the external medium.

(iii) Platyhelminthes : → Flame cells are excretory organs.

(iv) Nematoda : → Longitudinal tubes with Flame cells in excretory organ.

(v) Annelida : → Nephridia is excretory organ.

(vi) Arthropoda : → Malpighian tubules are the excretory organs.

(vii) Mollusca : → Nephridia the organ of excretion.

(viii) Echinodermata : → Amoebocytes found in the coelomic fluid effects the excretion.

(ix) in vertebrates : → kidney is main excretory organs. It is three types - Pro, meso and metanephros kidney.

Physiology of Urineformation : —

only source for the urine formation is blood plasma. The formation of urine takes place along three steps: —

- 1) Glomerular filtration.
- 2) Reabsorption of solutes.
- 3) Active excretion of material or urine.

1) Glomerular filtration :

Glomerular filtration occurs in Malpighian capsule of the nephron. It has a network of several ~~parallel~~ parallel capillaries in which blood come through afferent arteries and release through efferent arteries. The fluid of plasma filtering out from the glomerular capillaries into Bowman's capsule. The visceral layer of Bowman's capsule is made of a large number of pedicels. The cells have 100 Å slit pores. Ultrafiltration is a passive process here in Bowman's capsule. All constituents of plasma excepting protein and lipid are filtered. The diameter of afferent arteriole is more than efferent

arteriole. The hydrostatic pressure glomeruli is about 75 mm Hg. The plasma protein exert a colloid osmotic pressure of 30 mm Hg. The colloid osmotic pressure and hydrostatic pressure in the Bowman's capsule oppose the filtration process.

The effective filtration is about 25 mm Hg ($75 - 30 = 20$) due to this process.

Ultrafiltration take place in the Bowman's capsule.

The nephric filtrate contains glucose, water, urea, crystalloids, Na^+ , K^+ , Cl^- , PO_4^{3-} etc except proteins and blood cells.

2) Reabsorption :

Glomerular filtrate contains both useful and excretory substance.

Useful substance like glucose, protein

amino acid, ketone body, uric acid,

chloride, phosphate, sodium, potassium

reabsorbed through proximal convoluted

tubules. Reabsorption involves both passive

transport by diffusion and osmosis

and active transport across the tubular

epithelium.

Water, uric acid, urea and some

salt remain in kidney tubules. The

solution is isotonic to the plasma.

In proximal tubules about 80% of

fluid is reabsorbed. The fluid entering

the descending limb of the loop, of Henle is isotonic and the surrounding interstitial fluid is hypertonic. The ascending and descending limb constitute a counter current flow system and the active and passive movements of NaCl establish an osmotic gradient in the interstitial fluid.

3) Active excretion of material or urine : —

From the distal convoluted tubules the hypotonic filtrate flows into collecting duct. It contains water, urea, uric acid, creatinine etc. Certain dyes and drugs like phenacetate, penicillin, hippuric acid are excreted by the cells of proximal tubules into filtrate. This all together forms urine.

Normal urine contains about 95% water, 2% salts (chlorides and sulphates of sodium, potassium, magnesium etc) in ionic form, 2.6% urea, 0.3% uric acid and traces of creatinine, ammonia, creatine etc. It is pale yellow in colour due to the presence of a trace of urochrome pigment. The latter is a byproduct of haemoglobin degradation found in blood and ~~filtered~~ filtered into glomerular filtrate. Normal urine is slightly acidic with a pH of 6.00.