

4 - AFTER METABOLISM

SUMMARY

The accumulation of metabolic waste byproducts excess in our body, adversely affect homeostasis. In all organisms waste materials are removed through certain excretory systems.

The kidneys, lungs, liver, large intestine and skin perform as human excretory organs. They expel wastes like water, urea, uric acid, CO_2 , salts etc.

Ammonia, a harmful waste formed due to the break down of amino acids in the cells, is converted to urea with in the liver. Urea is eliminated from the blood through urine, by the micro filters (Nephrons) seen inside our kidneys. The formation of urine is influenced by the hormone, ADH.

When both kidneys fail to function, we under go dialysis or kidney transplantation.

1. Excretory Organ

- Kidneys
- Lungs
- Skin

Expelling waste materials

Urine [water, urea, uric acid, salts]
 CO_2 , water
Sweat [water, urea, uric acid, salts]

2. The chief waste material, formed from proteins? How is this waste material removed?

Ammonia is the harmful waste material formed from amino acids of protein. When ammonia reaches to the liver, it is converted in to a less harmful waste, -urea. $[\text{NH}_2\text{-CO-NH}_2]$.

Urea Cycle - $[\text{NH}_3 + \text{CO}_2 + \text{H}_2\text{O}]$

Urea is soluble in water and is filtered from blood by the ultra filtration of kidneys. Urea is removed through urine.

3. Urine is formed from ----- ?

blood

4. About ---- ml. of blood passes through the kidneys, per minute.

1100 ml.

5. Components of urine,

Water (96%), Urea (2%), others(2%) [NaCl, KCl, Salts of P and Ca, Uric acid, Creatinine, other excess materials]

6. Give reason for the pale yellow colour of urine?

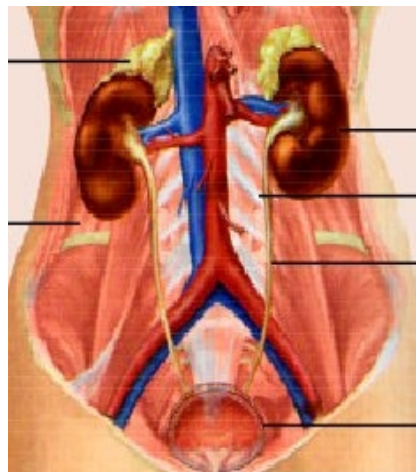
The pigment Urochrome, formed as a result of the break down of haemoglobin, with in the liver gives a pale yellow color to the urine.

7. An average of ----- litres urine forms per day.

1.5 litres.

8. Kidneys and associated parts.

Adrenal gland



Kidney

Ureter

Urinary bladder

Urethra

9. Quantity of urine decreases in summer. Give reason.

During summer season, secretion of ADH (vasopresin) increases.

10. What will be the change if phenolphthalein followed by the enzyme urease, added to urine? Why?

Phenolphthalein converts urea contained urine to milk colour. When urease is added to this, the solution turns to red due to the formation of an alkali – Ammonium carbonate.

11. Functions of kidney?

- Purification of blood by eliminating impurities in the form of urine.
- Removal of excess amount of materials taken in to the body.
- Maintenance of salt-water balance .

12. Precautions taken for the healthy functioning of kidneys?

Drink 2-3 litres water per day . Time to time urination. Control the use of antibiotics. Personal Cleanliness

13 Internal structure of human kidney.

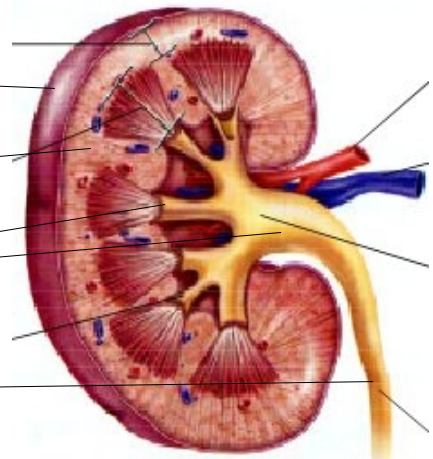
The outer region – **cortex**, is dark red in colour and contain 12 lakhs of micro filters [nephrons].

The inner region, where long tubes (renal tubules) of nephrons seen, is the **medulla**.

The collecting ducts of nephrons are open to an area – **pyramids**, which inturn reaches to the branches of **pelvis**.

Urine, reached in the pelvis is carried to urinary bladder through the **ureter**.

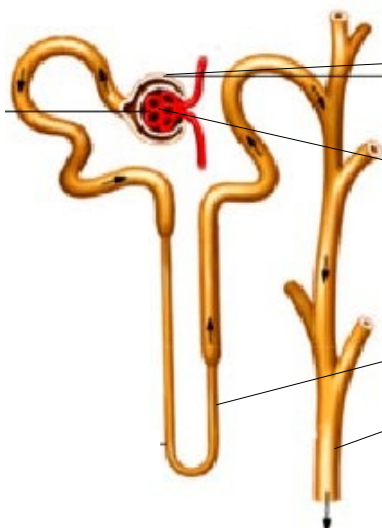
Renal artery carries blood to the kidney and the **renal vein** carries blood from the kidney.



14. The basic functional units of kidney?

Nephrons.

15. Structure of nephron



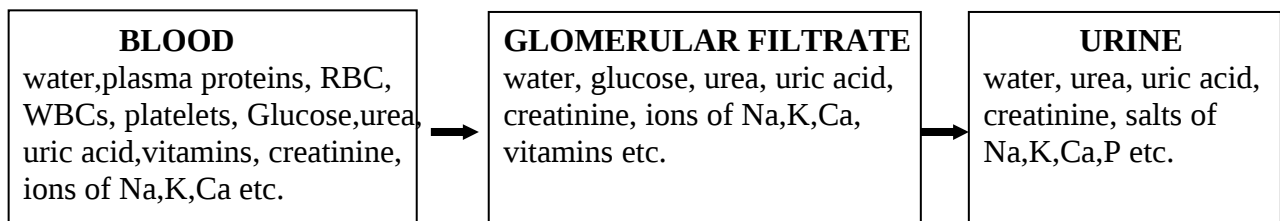
- Bowman's capsule** [double-walled cuplike part]
- Afferent vessel** [branch of renal artery which carries blood to the Bowman's capsule]
- Efferent vessel** [carries blood from the capsule]
- Glomerulus** [bundle of minute capillary networks inside the Bowman's capsule]
- Renal tubule** [elongated vessel, where reabsorption takes place]
- Collecting duct** [collects urine from nephron]

Rasheed Odakkal
9846626323

16. Formation of glomerular filtrate.

Glomerular filtrate is the fluid collected inside the Bowman's capsule through the ultra filtration of blood. Both the walls of glomerulus and the Bowman's capsule help for filtration.

After reabsorption of essential substances , the remaining glomerular filtrate becomes urine.



17. The size of afferent vessel is some what larger than efferent vessel. Reason?

After the formation of glomerular filtrate through ultra filtration, the quantity as well as the pressure of blood decreases. However reduced size of blood vessel helps to sustain blood pressure to some extent.

18. Though 127 ml. of glomerular filtrate is formed every minute, only an average of 1.5 litre urine [1%] will be formed per day. Why ?

While glomerular filtrate flows through the renal tube, 99% of the fluid will be reabsorbed by the blood vessels around the tube. Only the remaining 1% forms as urine.

19. If the size of afferent vessels of a man is same as efferent vessels, what can be concluded?
No pressure difference in him for the formation of glomerular filtrate.
20. When both kidneys are not functioning in a man, what method should he adopt?
Purify blood through dialysis or kidney transplantation.
21. Dialysis or kidney transplantation is not done when only one kidney fail to function. Why?
Single kidney can perform blood purification.
22. Disease/disorders that affect our kidneys.

NEPHRITIS	Swelling, backpain and fever due to streptococcus bacterial infection, urinary tract infection or auto immune deficiency syndrome. Urine appears dark and turbid.
CHRONIC RENAL FAILURE	Kidneys fail to function due to renal diseases, diabetes or hypertension. Anaemia, loss of weight, giddiness, vomiting are common.
KIDNEY STONE	Grains formation due to sedimentation of calcium oxalate or phosphate crystals. Pain, urinary block, back pain, giddiness, vomiting are symptoms.

23. During dialysis, blood is taken to the unit not from the vein but from the artery. Why?
To remove impurities, blood is taken from artery because, the flow of blood due to heart beat impose a pressure outwardly. The purified blood travels through the vein towards the heart due to the presence of valves at intervals.
24. Heparin like anticoagulant uses during dialysis or when blood is collected at blood bank. Why?
To prevent coagulation [clotting of blood]
25. What is common in a donor and in the recipient in kidney transplantation?
Same blood group.
26. Prepare a speech about kidney donation and transplantation.
27. Excretion in other animals

Amoeba	No excretory organ. Contractile vacuoles performs expelling wastes through water
Earthworm	Special ducts, called Nephridia, collect nitrogenous wastes from body cavity and expel them through water, through the pores on the body surface.
Insects	Malpighian tubules nitrogenous wastes from the body fluid and carry them to the alimentary canal.
Fish, Frog	Ammonia, the major waste material in fish and tadpoles and urea, the waste in frog are excreted through the kidneys.
Reptiles, Birds	The major waste material – uric acid, is excreted through the kidneys.

28. Instead of urea, uric acid is the major nitrogenous waste in reptiles and birds. Is this helpful?
No water is needed to eliminate uric acid, because, it is solid or semi solid. This minimises the loss of water through excretion. Urea is water soluble and hence excret through water.
29. Way of excretion in plants.
- O₂ and CO₂ are eliminated through stomata.
 - Water is expelled through stomata and hydathodes [pores at the tips of leaves of grass species]
 - Wastes are deposited in the vacuoles and older xylem vessels [heart wood formation]
 - Waste materials are eliminated by the shedding of leaves.
30. For the wellbeing of organisms, we should keep the external environment free from wastes. Suggests methods to keep our environment free from all impurities.