Chapter

4

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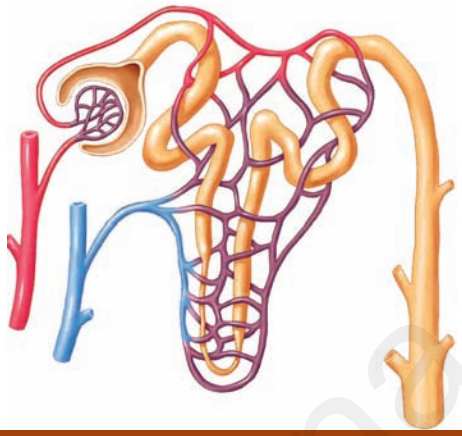

Excretion

There is no factory which can manufacture a product without generating any waste. This is true to our body which is a living cellular factory and for other organisms as well. Wastes are generated at regular intervals from the bodies of many organisms. This raise questions like.

- *Where are the wastes produced?*
- *How are they produced?*
- *What are the substances present in them?*
- *Does the composition vary in the same organism in different situations?*

Let us understand such kind of questions.

Living beings need energy for their survival and to perform activities either building up of body material (anabolism) or its breakdown (catabolism), collectively called metabolic activities. Organisms use different substances for metabolic activities. Different products are generated as a result of these metabolic activities. Can you name different products generated by the following life processes?

Table-1

Life processes	Products
Photosynthesis	
Respiration	
Digestion	

- *What products would the organism be able to take up for other activities?*
- *What are the products which would cause harm to the body, if they are not removed?*
- *What happens if harmful products are not removed from our body every day?*

We have already learnt that different kinds of materials are produced out of various metabolic activities. Some of these may be harmful for the organism are removed from their body or packed and stored in some other forms. These are all wastes produced in the body of an organism. We have already discussed how organisms get rid of gaseous wastes generated during photosynthesis or respiration. Other metabolic activities generate nitrogenous wastes that have to be removed along with salts, excess water and several other materials. Excretion is the term coined for all the biological process involved in separation and removal of wastes or non useful products from the body. (In latin ex means out, crenere means shift.) Now let us study how excretion takes place in human being.

Excretion in Human Beings

A number of reactions take place during various metabolic activities. Many useful substances and energy are produced. At the same time many other things happen such as, toxic wastes may be produced, water content may increase, ionic balance (homeostasis) in the body may be disturbed. The waste products include carbon dioxide, water, nitrogenous compounds like ammonia, urea, uric acid, bile pigments, excess salts etc. The most poisonous of all waste products of metabolism is ammonia.

Where are these waste materials produced? How does the body manage them. Is there a way to detect their presence in our body?

Now let us observe the test reports of Blood and Urine of a person given in tables-2 and 3. Find out the components present in both Blood and Urine. (For 24 hours urine test urine is collected for 24 hours. From that, 100-150 ml sample will be tested.) observe the reports in the next page and answer the following questions.

- *What are the substances present in blood?*
- *What are the substances present in urine?*
- *What are the substances present both in blood and urine?*
- *Which substances are present above the normal limits both in the blood and urine?*
- *What do you think a reading above normal limits indicates?*

Table-2: DEPARTMENT OF BIOCHEMISTRY

REPORT ON PLASMA/SERUM (BLOOD) ANALYSIS OF A PATIENT

TEST NAME	RESULT	UNITS	RANGE
GLUCOSE FASTING	82	mg/dl	60-100
SODIUM	137	mmoles/L	135-145
POTASSIUM	4.10	mmoles/L	3.5-5.0
CHLORIDES	101	mmoles/L	95-106
UREA	29	mg/dl	15-40
CREATININE	2.8.	mg/dl	0.6-1.5
URIC ACID	7.50	mg/dl	3.0-5.0
TOTAL CHOLESTEROL	221	mg/dl	150-200
TRIGLYCERIDES	167	mg/dl	60-200
CALCIUM	9.40	mg/dl	8.0-10.5
PHOSPHORUS	4.50	mg/dl	3-4.5
BILIRUBIN (TOTAL)	0.70	mg/dl	0.1-0.8
TOTAL PROTEINS	7.20	g/dl	6.0-7.5
ALBUMIN	4.60	g/dl	3.0-5.0

Table-3: DEPARTMENT OF BIOCHEMISTRY

REPORT ON URINE ANALYSIS OF THE SAME PATIENT

TEST/METHOD	RESULT	UNITS	RANGE
24 hrs.Protein	90	mg/day	<100 mg
24 hrs Creatinine	2.7	mg/day	1-2
24 hrs.Calcium	305	mg/day	Up to 200
24hrs.phosphorous	0.8	mg/day	upto 1g
24hrs.uric Acid	800	mg/day	upto 600
ELECTROLYTES :			
Sodium	140	mmoles/L	125-250
potassium	50	mmoles/L	25-100
Osmolality (calculated)	180	mmoles/L	100-600
Glucose	65	mg/dl	50-80
Chlorides	128	mmoles/L	120-130
Urea	35	gm/day	20-30

m moles / L means millimoles per litre, mg/dl means milligram per deci litre.

- *What are the materials needed to be removed from our body?*
- *Where are these materials removed from?*
- *Why do you think the body must remove waste substances?*

Studying the structure and function of our excretory system will help us to understand this better.

Excretory System in Human being

In human beings excretion mainly occurs through a urinary or excretory system it consists of a pair of kidneys, a pair of ureters, urinary bladder and urethra, as shown in the fig-4. Now let us observe external and internal features of a kidney in goat / sheep, which is similar to Human kidney in function.

Aim: Studying the external and internal features of a kidney

Lab Activity

Materials required: Freshly collected specimen of sheep/goat's kidney from the butcher or 3D Model of a kidney, sharp blade/scalpel, tray and a jug of water.

Procedure for observation: Before bringing the kidney to the lab wash it thoroughly so that, blood is completely drained from it. Put the kidney in the tray and observe it carefully. Note your observations in the observation book. With the help of sharp blade take a longitudinal section here you are advised to do this activity under the guidance of your teacher and observe the internal structure.

Fig-1: Kidney of goat

Draw what you have observed and compare it with Fig-1 and 2.

- *What is the shape of kidney?*
- *What is the colour of kidney?*
- *Do you find any attachments on upper portion of kidney?*
- *Is the Internal structures similar to fig-2*
- *What is the colour of the outer part in L.S of kidney?*
- *In L.S of kidney where do you find dark brown colour portion?*
- *How many tubes are coming out from kidney fissure?*

Don't forget to wash your hands with antibacterial lotion after completing dissection.

Fig-2: LS of Kidney of goat

Now let us know the structure of human excretory system and its functions.

1. Kidneys

In Human beings there is a pair of bean shaped, reddish brown structures in the abdominal cavity attached to dorsal body wall (Fig-3) one on either side of the back bone. These are kidneys. The right kidney is placed slightly lower than the left kidney. Think why it is so?

The size of the kidney is 10 cm in length, 5-6 cm in breadth, and 4 cm in thickness. Each kidney is convex on the outer side and concave on the inner side. The position of the right kidney is lower than the left kidney due to the presence of liver above.

Let us recall the last question in your lab activity. The inner side of each kidney has a fissure or hilum for the entry of a ***renal artery***, exit of a ***renal vein*** and an ***ureter***. Renal artery brings oxygenated blood loaded with waste products and renal vein carries deoxygenated blood. The waste products generated in various organs of the body are filtered and removed by the kidneys.

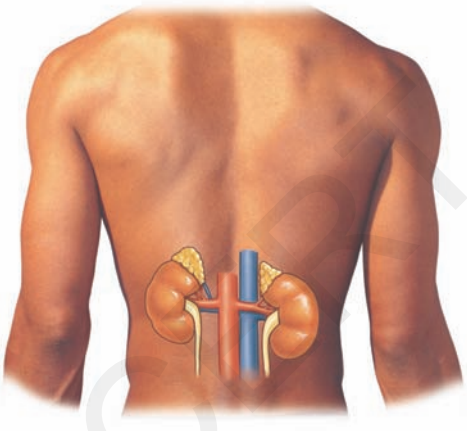

Fig-3: Location of kidneys

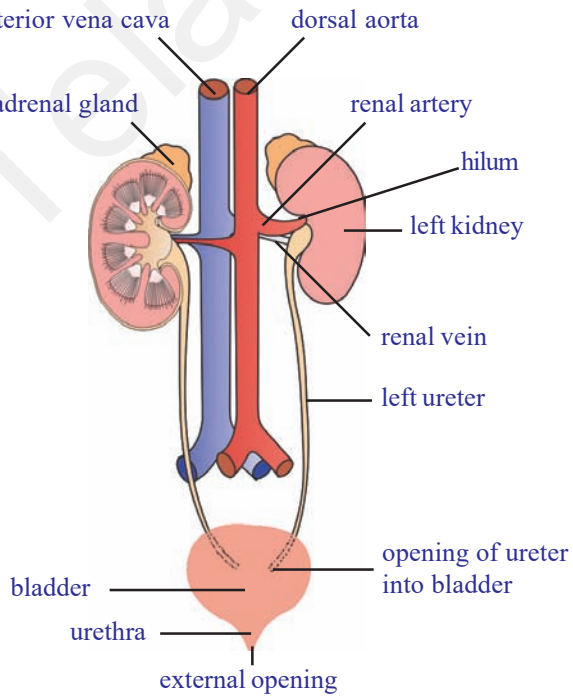

Fig-4: Excretory system

Internal structure of the kidney:

Let us observe L.S of the kidney to know more about internal structure. It shows two distinct regions. Dark coloured outer zone called the cortex and pale inner zone called medulla. Each kidney is made up of approximately more than one million (1.3 to 1.8 million) microscopic and thin tubular functional units called nephrons or uriniferous tubules.

Structure of nephron

Each nephron has the following parts.

Malpighian body: It consists of a blind cup shaped broader end of nephron called Bowman's capsule and bunch of fine blood capillaries called glomerulus. The afferent arteriole (arteriole is the finer branch of an artery) enters into the Bowman's capsule and divides into a network of capillaries and comes out of the capsule as efferent arteriole with lesser diameter. The bunch of capillaries is called glomerulus.

- *Think why the diameter of the efferent arteriole is smaller than that of afferent arteriole?*

Because of the narrower outlet (efferent arteriole) pressure exerts in the glomerulus.It functions as a filtration unit. Bowman's capsule which accommodates one glomerulus,is lined by a single layer of squamous epithelial cells called podocyte cells. There are fine pores between podocyte cells to allow passage of materials filtered out of glomerulus.

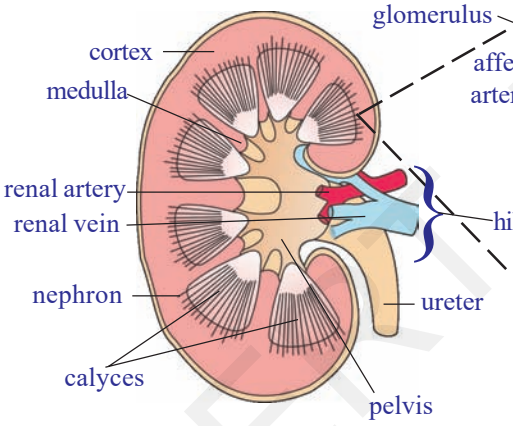

Fig-5: Internal structure of kidney

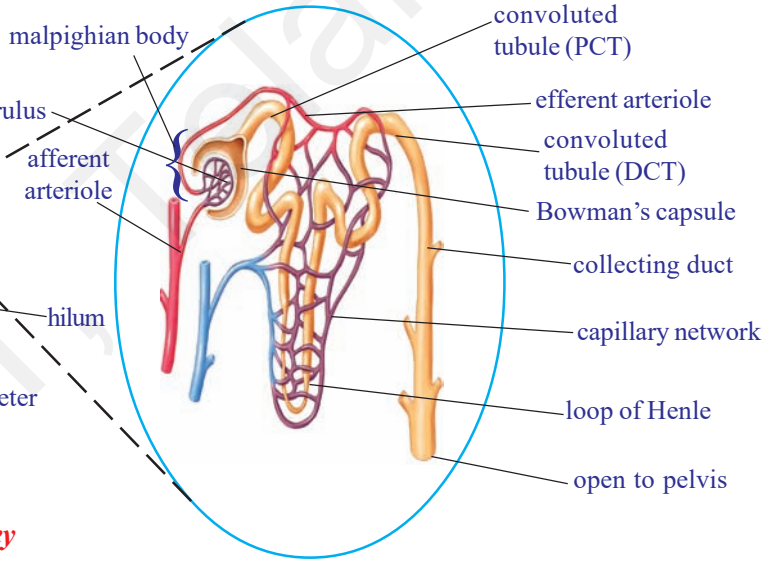

Fig-6: Structure of a nephron

Renal tubule: It has three parts. First or proximal convoluted tubule (PCT), loop of Henle, which is U shaped, second or distal convoluted tubule (DCT).

Distal convoluted tubules open into a collecting tube. Collecting tubules form pyramids and calyces which open into the pelvis. Pelvis leads into the ureter. All the parts of the renal tubule are surrounded by a network of peritubular (around tube) capillaries formed from efferent arteriole. The peritubular capillaries join to form renal venule, which joins the other venules to form finally the renal vein.

- *Why the nephron is considered to be the structural and functional unit of the kidney?*

Mechanism of urine formation

Formation of urine involves different stages. They are :

1. Glomerular filtration
2. Tubular Re-absorption
3. Tubular secretion and
4. Formation of concentrated urine.

1. Glomerular filtration : The which blood flows into glomerulus, it is filtered under high pressure. As a result waste materials along with some water and useful substances are filtered out. They enter into the Bowman's capsule. This is called glomular filtration. This filterate is also called as 'primary urine'.

2. Tubular Re-absorption : Primary urine which is in glomerulus is almost equal to blood in chemical composition except the presence of blood cells. Peritubular capillaries present around the Henle's loop reabsorb essential substances and excess water present in the primary urine.

3. Tubular secretion : After reabsorption of essential substances and water urine travels through the loop of Henle. From peritubular capillaries, present around the loop of Henle, waste materials left unfiltered in the blood during glomerulus filteration are secreted into the loop of Henle.

4. Formation of concentrated Urine : Urine that reaches into the collecting tubule, from the loop of Henle is further concentrated in the presence of hormone vasopressin. Deficiency of vasopressin causes excessive dilute urination called 'diabetes insipidus'.

Do you know?

After the age of 40 years the number of functioning nephrons usually decreases by about 10% in every 10 years.

- *Why more urine is produced in winter?*
- *What happens if reabsorption of water does not takes place?*

Now let us discuss remaining parts of excretory system.

2. Ureters

There are a pair of whitish, narrow distensible and muscular tubes of 30cm length. Each ureter arises from hilus of the kidney. It moves

downward and obliquely opens into the urinary bladder. Ureter carries urine from the kidney to the urinary bladder. The movement of urine in the ureter is through peristalysis.

3. Urinary bladder

It is a median, pear shaped and distensible sac. It is situated in the pelvic region on the ventral side of the rectum in the abdomen. It stores urine brought by two ureters. The storage capacity of urinary bladder is 300 - 800ml.

4. Urethra

It is a tube that takes urine from urinary bladder to outside. The opening of urinary bladder into urethra is guarded by a ring of muscles or sphincter. Urethra is 4 cm long in females open to vestibule and in males it is about 20cm long. Its opening is separate in females but is in common with the reproductive tract in males (urino-genital duct).

Micturition

The urine is temporarily stored in the bladder. There are two sets of circular sphincter muscles in the bladder. When the bladder is filling up both these sets of muscles are constricted, so the exit is closed. However as the pressure of the urine increases the walls of the bladder are stretched and this triggers off an automatic reflex action which causes the upper sphincter to relax. But the lower sphincter is under the control of brain. So urine can still be retained until this muscle is relaxed too. Control of urination is not possessed by very young children but is gradually learned.

Urge for micturition occurs when urinary bladder is filled with 300 - 400 ml of urine. The stretched bladder stimulates nerve endings to develop the reflex. However, urine can be retained in the urinary bladder till it gets filled up to the maximum capacity of 700 - 800 ml. At this time the urge becomes painful and leads to voluntary micturition (release of urine from urinary bladder). Total amount of urine excreted per day is about 1.6-1.8 litres. Its quantity increases with larger intake of fluids like water, fruit juices and decreases with lesser intake.

Think and discuss

- Do cells need excretion?
- Why are we advised to take sufficient water?
- Why do some children pass urine during sleep at night until 15 or 16 years of age?

Composition of urine

It is a transparent fluid produced by urinary system. Composition of normal urine varies considerably depending on several factors for instance taking a protein rich diet will result in more formation of urea in the urine. This is because the proteins get de-aminated in the liver with subsequent formation of urea. Even sugar can appear in a normal person after a heavy intake. If other conditions are constant, a large intake of liquids or water - rich food increases the volume of water in the blood, hence more urine is excreted.

Urine contains 96% of water 2.5% of organic substances (urea, uric acid, creatine, creatinine, water soluble vitamins, hormones, and oxalates etc) and 1.5% of inorganic solutes (sodium, chloride, phosphate, sulphate, magnesium, calcium, iodine). It is acidic (pH=6.0)in the beginning but becomes alkaline on standing due to decomposition of urea to form ammonia.

- *What happens if both kidneys fail completely?*

Complete and irreversible kidney failure is called End Stage Renal Disease (ESRD). If kidneys stop working completely, our body is filled with extra water and waste products. This condition is called uremia. Our hands or feet may swell. You feel tired and weak because your body needs clean blood to function properly. Is there any solution to this problem? Let us know about artificial kidney.

Dialysis Machine (Artificial kidney)

Kidneys are vital organs for survival. Several factors like infections, injury, very high blood pressure, very high blood sugar or restricted blood flow to kidneys. This leads to accumulation of poisonous wastes in the body and leads to death. Dialysis machine is used to filter the blood of a person when both kidneys are damaged. The process is called 'haemodialysis'. In this process blood is taken out from the main artery, mixed with an anticoagulant, such as heparin, and then pumped into the apparatus called dialyzer. In this apparatus blood flows through channels or tubes which are madeup of cellophane. These tubes are embedded in the dialyzing fluid. The membrane separates the blood flowing inside the tube and dialyzing fluid (dialysis), which has the

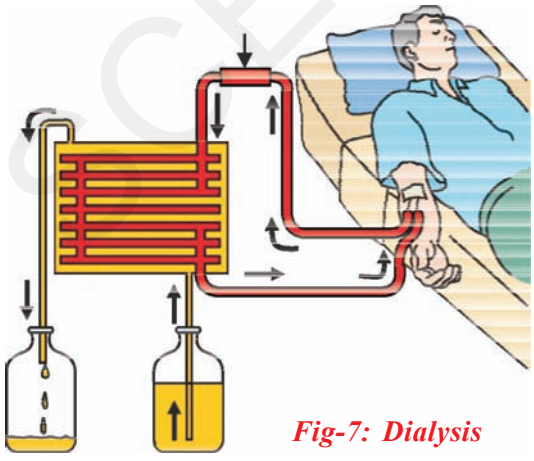

Fig-7: Dialysis

same composition as that of plasma, except the nitrogenous wastes.

As nitrogenous wastes are absent in dialyzing fluids, these substances from the blood move out freely, there by cleaning the blood of its wastes. This process is called dialysis. This is similar to function of the kidney but is different as there is no reabsorption involved .The cleaned blood is pumped back to the body through a vein after adding anti-coagulant (heparin). Each dialysis session lasts for 3 to 6 hours. This method has been using for thousands of uremic / kidney failure patients all over the world.

- *Is there any long term solution for kidney failure patients?*

Kidney transplantation

The best long term solution for kidney failure (acute renal failure) is Kidney transplantation. A functioning kidney is used in transplantation from a donor preferably a close relative. The kidney that is received by a recipient must be a good match to his body, to minimize the chances of rejection of transplanted kidney by the immune system of the recipient. Modern clinical procedures have increased the success rate of such complicated technique.

- *Where is the transplanted kidney fixed in the body of a kidney failure patient?*
- *What about the failed kidneys?*
- *Can donor lead normal life with a single kidney without any complications?*

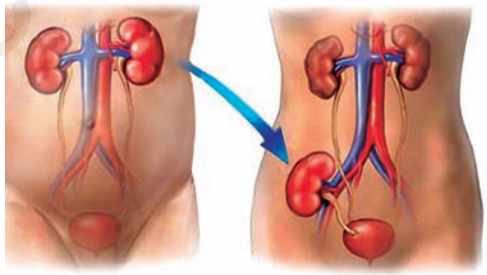

Fig-8: Kidney transplantation

Now a days the process of organ donation helps a lot for kidney failure patients. Organs are collected from brain dead patients, then transplanted to the recepient. To know more about organ donation see in annexure.

Other pathways of excretion (*accessory excretory organs*)

You have learnt about kidney, chief excretory organ of our body.

- *What are the other excretory organs of human body?*

Lungs, skin, liver and large intestine have their own specific functions but carry out excretion as a secondary function.

Lungs: In respiratory process lungs remove carbon dioxide and water.

Skin: It consists of large number of sweat glands

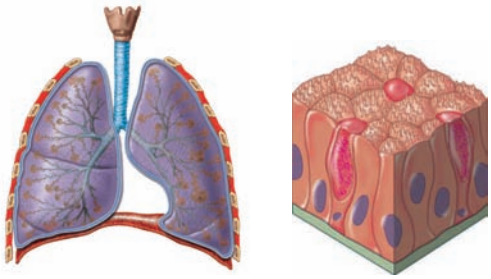

Fig-9 : Lung, Skin

richly supplied with blood capillaries, from which they extract sweat and some metabolic wastes. Since the skin sends out plenty of water and small amount of salts, it serves as an excretory organ. Sebaceous glands in skin eliminate sebum which contains waxes, sterols, hydrocarbons and fatty acids.

- *Collect information on sebum and prepare a news bulletin, display it on bulletin board?*
- *People in cold countries get very less/no sweat. What changes occur in their skin and in other excretory organs?*

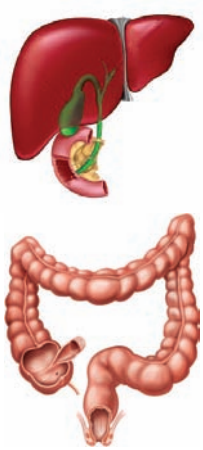

Fig-10: Liver, intestine

Liver: It produces bile pigments (bilirubin ,biliverdin and urochrome) which are metabolic wastes of haemoglobin of dead R.B.Cs. The life span of RBC is 120 days. They are destroyed in the liver. Urochrome is eliminated through urine. Biliverdin and bilirubin are excreted through bile along with cholesterol and derivatives of steroid hormones, extra drug, vitamins and alkaline salts. Liver is involved in urea formation.

Large intestine: Excess salts of calcium, magnesium and iron are excreted by epithelial cells of colon (large intestine) for elimination along with the faeces.

Small amount of nitrogenous wastes are also eliminated through saliva and tears.

Excretion in other organisms

Different organisms use varied strategies in excretion. Specific excretory organs are absent in unicellular organisms. These organisms remove waste products by simple diffusion from the body surface into the surrounding water. Fresh water organisms like *Amoeba, Paramoecium* possess osmoregulatory organelle called contractile vacuole. It collects water and waste from the body, swells up, reaches the surface and bursts to release its content to outside. The main excretion takes place through body surface (Diffusion).

Table-4

Name of the phylum/ organism	Excretory system/ organ
Protozoa	Simple diffusion from the body surface in to the surrounding water
Porifera and coelenterates	Water bathes almost all their cells
Platyhelminthes	Flame cells
Nematoda	Renette cells
Annelids	Nephridia
Arthropoda	Green glands, Malpighian tubules
Mollusca	Meta nephridia
Echinodermata	Water vascular system
Reptiles, Aves and Mammals	Kidneys

Multicellular organisms possess different excretory organs for removal of waste materials from the body. Structural and functional complexity of excretory organs increases from sponges to humans. Sponges and Coelenterates do not have specific excretory organs as water bathes almost all their cells. Excretory structures appear for the first time in Flatworms (Platyhelminthes) are known as flame cells.

Now let us see how this vital process takes place in plants

Excretion and release of substances in plants

Do plants excrete like animals?

We are amazed to answer such type of questions. You are aware that a variety of end products are formed during metabolism and these nitrogenous wastes are important. Plants does not have specific organs to excrete these wastes. Plants break down waste substances at much slower rate than in animals. Hence accumulation of waste is also much slower. Green plants in darkness and plants that do not possess chlorophyll produce carbon dioxide and water as respiratory waste products. Oxygen itself can be considered as a waste product generated during photosynthesis, that exits out side through stomata of leaves and lenticels of stem.

- *How do the plants manage or send out waste products from its body?*

Plants can get rid of excess water by a process like transpiration and guttation. Waste products may be stored in leaves, bark, and fruits. When these dead leaves, bark, and ripe fruits fall off from the tree then waste products in them are get rid off. Waste gets stored in the fruits in the form of solid bodies called Raphides. However several compounds are synthesized by the plants for their own use especially for defence. Many plants synthesize chemicals and store them in roots, leaves, seeds, etc., for protection against herbivores. Most of the chemicals are unpleasant to taste. Hence, herbivores usually do not prefer to eat such plants. Some of the chemicals are toxic and may even kill the animal that eats them.

Think and discuss

- Why are weeds and wild plants not affected by insects and pests?

Some of the plants secrete chemicals when injured. These chemicals seal the wound and help the plant to recover from an injury. Some of the plants release attractants for other organisms which will help the plants for pollination, seed dispersal or even in their nutrition. For example, plants

having root nodules secrete chemicals to attract Rhizobia into the surroundings of the roots and form a symbiotic relationship with the rhizobium. These compounds are called secondary metabolites.

- *Why plants shed their leaves and bark periodically?*

The biochemical substances produced in plants are of two types, primary metabolites and secondary metabolites. The materials like carbohydrates, fats and proteins are primary metabolites. The materials which do not require for normal growth and development are secondary metabolites. e.g.: Alkaloids, Tannins, Resins, Gums, and Latex etc. Though plants produce these chemical for their own use. Man found the usage of these chemicals for own benefits. They are generally coloured and fragrant.

Alkaloids:

These are nitrogenous byproducts and poisonous. These are stored in different parts of the plants. Common alkaloids in plants and their uses are given below.

Table-5

ALKALOID	PLANT	PART	USES
Quinine	*Cinchona officinalis* (Cinchona)	Bark	Antimalarial drug
Nicotine	*Nicotiana tobacum* (Tobacco)	Leaves	Insecticide, stimulant
Morphine, Cocaine	*Papaver somniferum* (Opium)	Fruit	Pain killer
Reserpine	*Rauwolfia serpentina* (Snake root)	Root	Medicine for Snake bite,High BP
Caffeine	*Coffea arabica* (Coffee plant)	Seed	Central nervous system Stimulant
Nimbin	*Azadirachta indica*(neem)	Seeds, Barks, Leaves.	Antiseptic
Scopolamine	*Datura stramonium*	Fruit, flower	Sedative
Pyrethroids	*Chrysanthemum sps*	Flower	Insecticides


Papaver


Rauwolfia


Coffea arabica


Tobacco


Datura

Fig-11: Plants which produce Alkaloids

- *Name the alkaloids which are harmful to us?*

Tannins: Tannins are carbon compounds. These are stored in different parts of the plant and are deep brown in colour. Tannins are used in tanning of leather and in medicines e.g. *Cassia*, *Acacia*.

Resin: Occur mostly in Gymnosperms in specialized passages called resin passages. These are used in varnishes- e.g.Pinus.

Fig-12(a): Cassia

Fig-12(b): Acacia

Fig-12(c): Pinus

Gums: Plants like Neem, Acacia oozes out a sticky substance called gum when branches are cut. The gum swells by absorbing water and helps in the healing of damaged parts of a plant. Gums are economically valuable and used as adhesives and binding agents, in the preparation of the medicines, food, etc.

Latex: Latex is a sticky, milky white substance secreted by plants. Latex is stored in latex cells or latex vessels. From the latex of *Hevea brasiliensis* (Rubber plant) rubber is prepared. Latex from *Jatropha* is the source of bio-diesel. Do you know which part of jatropha used in production of bio-diesel.

Fig-13(a): Neem

Fig-13(b): Jatropha

Fig-13(c): Rubber plant

Do you know?

Chewing gum is a type of sticky for chewing made dates back 5000 years. Modern chewing gum originally made of natural latex from plants like chicle, sapota etc. Whenever pollen grains enter in our body they cause allergy due to the presence of nitrogenous substances. These allergens cause skin allergy and asthma. Ex: *Parthenium*.

- *Do roots secrete?*

'Brugman' a botanist proved from his experiments that the roots not only absorb fluid from soil, but returns a portion of their peculiar secretions back into it. We can see such instances in plants like apple where a single apple crop for 4 or 5 years continuously in the same soil, that fail to produce fruits. It will not give proper yield even if you use lot of fertilizers.

- *Do you think there is any relation between reduction in yielding and root secretions?*
- *Why do we get peculiar smell when you shift the potted plants?*

Excretion Vs Secretion

Excretion and secretion are the same in nature. Since both are involved in passage or movement of materials. Both processes move and eliminate unwanted components from the body. Excretion is the removal of materials from a living being, while secretion is movement of material from one point to other point. So secretion is active while excretion is passive in nature. Humans excrete materials such as tears, urine, Carbon dioxide, and sweat while secretion on other hand, includes enzymes, hormones, and saliva. In plants too we find excretion through roots into its surroundings and falling off leaves and bark. Secretions occur in the plant body in form of latex, resins, gums etc.

Key words

Creatinine, tubular fluid, peritubular network, podocyte, glomerulus, PCT, DCT, afferent arteriole, efferent arteriole, calyces, micturition, urochrome, dialyser, heamodialysis, anticoagulant, alkaloids, biodiesel, loop of Henle.

What we have learnt

- Due to metabolism several harmful excretory products are formed and process of removing toxic waste from the body is called execretion.
- The human excretory system comprises a pair of kidneys, a pair of ureters, urinary bladder, urethra.
- Each kidney is composed of approximately 1.3 to 1.8 millions of uriniferous tubules or nephrons, which are structural and functional units of kidney.
- A nephron comprises glomerulus,bowman's capsule, proximal convoluted tubule (PCT), Henle's loop, Distal convoluted tubule (DCT) and collecting tubule.

- Formation of urine involves four stages. 1) Glomerular filteration, 2) Tubular Reabsorption, 3) Tubular Secretion, 4) Formation of concentrated Urine.
- Kidneys remove nitrogenous waste from body, maintains water balance (osmoregulation), salt content, pH, and blood pressure in human body.
- Dialysis machine is an artificial kidney which filters the blood to remove the metabolic wastes out side the body.
- Kidney transplantation is a permanent solution to renal failure patients.
- Different animals have different excretory organs e.g. amoeba-contractile vacuole, platyhelminthes- flame cells, annelida-nephridia, arthropoda-malpighian tubule, reptiles, birds and mammals-kidney.
- There are no special organs for excretion in plants. Plants store different waste materials in leaves, bark, roots, seeds which fall of from the plants.
- Plant metabolites are two types i) primary metabolites eg: proteins carbohydrates and fats. ii) secondary metabolites eg: alkaloids, gums, tannins, latex and resins. These are economically important to us.
- Excretion is the removal of material from living beings where as secretion is movement of materials from one point to other.

Improve your learning

Z2V9H4

1. What is meant by excretion? Explain the process of formation of urine. (AS1)
2. How are waste products excreted in amoeba?(AS1)
3. Name different excretory organs in human body and excretory material generated by them?(AS1)
4. Deepak said that 'Nephrons are functional and structural units of kidneys' how will you support him?(AS1)
5. How plants manage the waste materials?(AS1)
6. Why do some people need to use a dialysis machine? Explain the principle involved in it.(AS1)
7. What is meant by osmoregulation? How is it maintained in human body?(AS1)
8. Do you find any relationship between circulatory system and excretory system? What are they?(AS1)
9. Give reasons(AS1)

   A. Always vasopressin is not secreted.

   B. When urine is discharged, in beginning it is acidic in nature later it become alkaline.

C. Diameter of afferent arteriole is bigger than efferent arteriole.

D. Urine is slightly thicker in summer than in winter?

10. Write differences(AS1)

A. Functions of PCT and DCT

B. Kidney and artificial kidney

C. Excretion and secretion

D. Primary metabolites and secondary metabolites

11. There is a pair of bean-shaped organs 'P' in the human body towards the back, just above the waist. A waste product 'Q' formed by the decomposition of unused proteins in liver is brought into organ 'P' through blood by an artery 'R'. The numerous tiny filters 'S' present in organ 'P' clean the dirty blood goes into circulation through a vein 'T'. The waste substance 'Q' and other waste salts and excess water form a yellowish liquid 'U' which goes from organ 'P' into a bag like structure 'V' through two tubes 'W'. This liquid is then thrown out of the body through a tube 'X'.(AS1)

(a) What is (i) organ P and (ii) waste substance Q.

(b) Name (i) artery R and (ii) vein T

(c) What are tiny filters S known as?

(d) Name (i) liquid U (ii) structure V (iii) tubes W (iv) tube X.

12. The organ 'A' of a person has been damaged completely due to a poisonous waste material 'B' has started accumulation in his blood, making it dirty. In order to save this person's life, the blood from an artery in the person's arm is made to flow into long tubes made of substance 'E' which are kept in coiled form in a tank containing solution 'F'. This solution contains three materials 'G', 'H' and 'I' similar proportions to those in normal blood. As the person's blood passes through long tubes of substance 'E', most if the wastes present in it go into solution 'F'. The clean blood is then put back into a vein in the person for circulation. (AS1)

(a) What is organ A?

(b) Name the wastes substance B.

(c) What are (i) E, and (ii) F?

(d) What are G, H and I?

(e) What is the process described above known as?

13. Imagine what happens if waste materials are not sent out of the body from time to time?(AS2)

14. To keep your kidneys healthy for long period what questions will you ask a nephrologist/ urologist?(AS2)

15. What are the gum yielding trees in your surroundings? What procedure you should follow to collect gum from trees?(AS3)

16. Collect the information about uses of different kinds alkaloids, take help of Library or internet?(AS4)
17. Draw a neat labeled diagram of L.S of kidney?(AS5)
18. Describe the structure of nephron with the help of a daigram. (AS5)
19. Draw a block daigram showing the path way of excretory system in human beings. (AS5)
20. If you want to explain the process of filtration in kidney what diagram you need to draw.(AS5)
21. List out the things that makes you amazing in excretory system of human being.(AS6)
22. You read about 'Brain dead' in this chapter. What discussions would you like to have why you think so?(AS6)
23. We people have very less awareness about organ donation, to motivate people write slogans about organ donation?(AS7)
24. After learning this chapter what habits you would like to change or follow for proper functioning of kidneys?(AS7)

Fill in the blanks

1. Earthworm excretes it's waste material through _____.
2. The dark coloured outer zone of kidney is called _____.
3. The process of control of water balance and ion concentration with in organism is called_____.
4. Reabsorption of useful product takes place in _____ part of nephron.
5. Gums and resins are the _____ products of the plants.
6. Bowman's capsule and glomerulus taken together make a _____.
7. The alkaloid used for malaria treatment is _____.
8. The principle involved in dialysis is _____.
9. Rubber is produced from _____ of Heavea braziliensis of rubber plants.
10. _____ performed first Kidney Transplantation.

Choose the correct answer

1. The structural and functional unit of human kidney is called ( )
   (A) Neuron (B)nephron (C)nephridia (D)flame cell
2. The excretory organ in cockroch ( )
   (A) malpighian tubules (B) raphids (C) ureters (D) nephridia

3. Which of the following is the correct path taken by urine in our body? ( )

(i) Kidneys (ii) Ureters (iii) Urethra (iv) Urinary bladder

(A) i, ii, iv, iii (B) i, ii, iii, iv

(c) iv, iii, i, ii (D) ii, iii, i, iv

4. Malpighian tubes are excretory organs in ( )

(A) earth worm (B) house fly (C) flat worm (D) hen

5. Major component of urine is ( )

(A) urea (B) sodium (C) water (D) creatine

6. Special excretory organs are absent in ( )

(A) birds (B) amoeba (C) sponges (D) a and b

7. Which of the following hormone has direct impact on urination? ( )

(A) adrenal (B) vasopressin (C) testosterone (D) Oestrogen

8. Amber colour to urine due to ( )

(A) urochrome (B) bilirubin (C) biliverdin (D) chlorides

9. Sequence of urine formation in nephron is ( )

(A) Glomerular filtration → Tubular reabsorption → Tubular secretion

(B) Tubular reabsorption → Tubular secretion → Glomerular filtration

(C) Tubular secretion → Glomerular filtration → Tubular reabsorption

(D) Tubular reabsorption → concentration of urine → Tubular secretion

10. Part of the nephron that exists in outer zone of kidney. ( )

A) Loop of the henle B) PCT C) DCT D) Bowman's capsule

11. After having lunch or dinner one can feel to pass urine, because of a ( )

A) stomach pressures on bladder B) solids become liquids

C) water content in food material D) spincter relaxation

Annexure

Organ donation - A gift for life

So many patients are waiting for suitable organ due to failure of vital organs. In Hyderabad where there are kidney transplantation facilities minimum 25 patients per hospital are waiting for kidney donors. Daily 10 - 100 people met with accident in our State. Out of them some people get brain dead. If we collect organs from brain dead patients in time, we can save minimum 5 peoples' life. But lack of awareness on organ donation those who are willing to donate organs and those who need organs do not get proper information even facilities are there. Medical personnels from government and private hospitals are not informing about brain dead Patients. If they inform in appropriate time it will be very useful to patients those who are waiting for organ donation. In Hyderabad, organ Transplantation facility is available only in two government hospitals (NIMS and Osmania) and in more than 10 corporate hospitals. Other organs like cornea, kidney, liver, heart, lungs, skin, bone, intestines and pancreas can be transplanted from brain dead patients.The process of transplantation of organs from brain dead patients to another is called cadaver transplantation. If any person is willing to donate organs or in needy get organs. They must register their names in transplantation facility hospitals.

Collect information about a voluntary organisation working on organ donation and make a report.

There is very less awareness among people about organ donation. Society needs much awareness in organ donation, so that we can save many lives who are in need of different organs from donars for their survival. Instead of living in their memories, let us give them a chance to live in others for one more life.

We can live even after death

Five organs of 18 year old youth donated

DC correspondent, Hyderabad, 20 June 2013

Five organs of 18 year old H.S. YASWANTH KUMAR were donated by his father H V Shiva Kumar to the organ donation wing of Jeevandan scheme on Thursday. Yaswanth had met an accident on June 15 while he was travelling in a shared autorikshaw from Jagadgirigutta. He was rushed to Nizam Institute of Medical Sciences (NIMS).The Neuro surgeons at NIMS declared him brain dead. Jeevandan counsellors obtained the consent of Mr. Shiva Kumar,who agreed to donate Yaswanth's kidneys, two heart valves and liver. These organs were retrieved and sent to various hospitals for transplantaion. Dr. Swarnalatha in-charge of Jeevandan scheme, said in a statement. Think how great Yaswanth's parents are?