UNIT 2 : THE RESPIRATORY SYSTEM, DIGESTIVE SYSTEM, CIRCULATORY SYSTEM AND THE EXERETORY SYSTEM

UNIT STRUCTURE

2.1 Learning Objectives

2.2 Introduction

2.3 Respiratory System

2.4 Digestive System

2.5 Circulatory System

2.6 Excretory System

2.7 Let Us Sum Up

2.8 Further Readings

2.9 Answers To Check Your Progress

2.10 Model Questions

2.1 LEARNING OBJECTIVES

After going through this unit, you will able to know about-

- the respiratory system of human body
- the digestive system of human body
- the circulatory system of human body
- the excretory system of human body.

2.2 INTRODUCTION

You have already studied about the skeletal muscle system and sensory organs in the earlier unit. We will discuss about some very important systems with their function in this unit. At the bigining of the unit we will discuss about the most important respiratory system of human being. There after we will discuss about the digestive system. To the end you will be able to know the circulatory and exeretory system.

2.3 RESPIRATORY SYSTEM

Respiration is the process by which human body gets energy and produce Co_2 from oxidation of food. The organ system that carries out the process of respiration is termed as respiratory system. There are two types of respiration. Aerobic respiration that occurs in presence of oxygen and anaerobic respiration which occurs in absence of oxygen. During heavy physical activity such as exercise, running, playing etc, anaerobic respiration produce lactic acid in muscle tissue. Very less amount of energy is produced during anaerobic respiration. Aerobic respiration takes place in presence of environmental oxygen. Aerobic respiration consist of four major processes–

1. **External respiration :** This step is also termed as breathing. We exchange environmental oxygen with the Carbon dioxide (Co_2) produced in cell through this process.
2. Transportation of gases to the tissues.
3. **Internal respiration :** Exchange of oxygen and Co_2 between blood and tissnes.

   A) Cellular respiration : Cellular respiration is the process of oxidation of nutrients inside the cell. The body gets energy through this process.

   The organs of the respiratory system are–

   (1) Nasopharynx (2) Epiglotties (3) Voice bose (larynx) (4) Trachea (5) Bronchus (6) Bronchiole (7) Alveoli.

   The Branching network of bronchus, bronchiole and alveoli form the lung.

Mechanism of breathing : Breathing completes through two stages–

(1) Inspiration : The process that draws atmospheric air into our body.

(2) Expiration : Release of deoxygenated air from alveoli to the atmosphere.

The movement of air into and out of the lungs is carried out by creating a pressure gradient between chest and stomach. When the intercostal muscle of ribs get contracted, volume of chest cauity increases creating a lower pressure inside the lungs than the atmospheric pressure. Due to this pressure gradiation atmospheric air rush inside the lung (Inspiration). Refaxation of the diaphram and intercostal muscles of ribs decrease the

volume of chest cavity resulting higher air pressure in the lungs. Then deoxygenated air from the alveoli is expelled out to the atmosphere.

A healthy man can inspire or expire approximately 6000 – 8000ml of air per minute which, in terms of science, is called tidal volumn (TV). The total volume of air accomodated in the lungs at the end of forced inspiration is called total lung capacity of lung. In a gas-composition the pressure exerted by the individual gases is called partial pressure. In case of such pressure exerted by oxygen and Co_2 are written as Partial pressure of oxygen (Po_2) and Partial pressure of Carbon dioxide (PCo_2) respectively. The unit of such pressure is mm Hg (millimetre marcury).

Exchange of gases between alveoli and alveolar capillaries :

The pertial pressure of oxygen Po_2 inside alveolies is 104 mm Hg and the same for Co_2 is 40 mm Hg. PCo_2 of blood of the pulnonary capillarissnear alveolies is 45 mm Hg which is higher than the same of alveolie. Hence Co_2 from the deoxygenated blood of capillaries easily diffuses towards the alveolies. On the other hand, alveolar Po_2 (104 mm Hg) is higher than the same of the blood capillacies (40 mm Hg). Hence O_2 duffuses to the blood inside the capillaries and purify the blood with Po_2 95 mm Hg.

Exchange of gases between blood and tixue : Po_2 of tissue (40 mm Hg) is less than the Po_2 of pure blood (95 mm hg) and hence O_2 transfase from blood to tissue which again turn the blood in a state of Po_2 with 40 mm Hg.

Transport of gases : About 97% of O_2 is transported by RBCA in the blood. The remaining 3% is carried in a dissolved state through the plasma. O_2 can bind with haemoglobin to form oxyhaemoglobin. Formation of any haemoglobin become higher when Po_2 is higher than PCo_2. Thus much oxyhaemoglobin is formed in the blood capillaries of alveoli.

Since pCo_2 is higher than pO_2 in tissue, oxyhaemoglobin breakdown to release O_2 which are used in metabolic functions and Co_2 bind up with the free haemoglobins. Nearly 20–25% Co_2 bind up with the free haemoglobins. Nearly 20 –25% Co_2 is transported by RBC as carboxyhaemoglobin and 70% of it is carried out as carbonate ion

(bicarbonate). When pCo_2 is higher Co_2 bind with H_2O to form bicarbonate ion (at tissue) when pCo_2 is less than pO_2 as in alveoli, bicarbonate ion again dissociate to Co_2 and H_2o. The enzyme responsible for this reaction is carbonic anhydrase.

Regulation of respiration : A specialised centre present in the medula region of the brain called respiratory rhythmic centre, control the process of respiration. Respiratory rhythmic centre is again under the control of another centre present in the pons region of brain called pneumotaxic centre. Increase in Co_2 and H^+ ion in the body can activate a chemosensitive area, situated adjacent to the rhythmic centre which in turn stimulate the rhythmic centre to adjust the respiratory process.

Disorders of Repiratory System : Various disorders of respiratory system are – Asthma, Emphysema, Pulmonary Hamartoma, Pneumothorax, Tuberculosis. Pulmonary edema etc.

2.4 DIGESTIVE SYSTEM

The process of conversion of complex food substances such as - carbohydrate, proteen, fats etc. to simple absorbable forms is called digestion. The human digestive system consists of the alimentary canal and the associated digestive glands. The associated glands or organs of alimentary canal are–

1) Oral cavity, 2) Pharyrx, 3) Oesophagus, 4) Stomach, 5) Small intestine, 6) Liver and 7) Pancrease.

1. **Oral cavity :** The mouth with teeth, muscular tongue and salivary gland is known as oral cavity.
   - **(a) Teeth :** There are four types of dentition– (i) Thecodont (ii) Diphyodont (iii) Heterodont (iv) Monophyodont.
     Pattern of human teeth falls under thecodont and Heterodont. In human being first temporary or milk teeth are replaced by a set of parmanent adult teeth.
   - **(b) Tongue :** The upper surface of tongue has some small projections called papillae. Some papillae bear taste buds.
   - **(c) Salivary gland :** Salivary gland is consisted of two types of

epethelial tissue. There are two types of cells in salivary gland. One is serous the other one is mucous cell.

(i) Serous cell : The serous cells secret a lequid substance mixed with mucous.

(ii) Mucous cell : Mucous cells secrete better quality mucous. These two substances form saliva.

2. **Pharynx :** The pharynx is divided into three sections– These three sections are Nasopharynx, Oropharynx and Laryngopharynx. The Pharynx has another three small organe, namely glottis, gullet and epiglottis.

3. **Oesophagus :** It is a 25cm long slender tube extends posteriorly from the mouth ending to the first part of stomach called cardiac orifice. Oesophagus consist of three perpendicular constrictions which are 15cm, 23cm and 40cm from the two incisor teeth. Measurements of these parts are very essential for the treatment of aesophagus. Oesophagus of human being starts generally at the region of 6^{th} vertibrae of neck and extends to the 10^{th} vertebrac near diaphram between chest and abdomen. The wall of the alimentary canal has four layers – (i) Mucosa, (ii) Sub-mucosa, (iii) Muscularies externa, (iv) Adventicia or Serosa.

(i) Mucosa : This layer consist of three sublayers, viz., – Squamous tissue layer, leminar process that protect squamous tissue and muscularies mucosa. that is formed of two layers of smooth tissue.

(ii) Sub-mucosa : This layer is comparatively thicker than the others and consist of dense irregular connective tissue. It provide nerve impulse and circulation to the oesophagus.

(iii) Muscularies externa : This layer is consist of numerous layers of tissue. Food passes through oesophagus due to the contraction of these layers. Contraction of this layer causes peristalsis movement of the alimentory canal which provide definite movement to the food inside the food pipe.

(iv) Adventicia or Serosa : The outesmost layer of the alimentory

canal is adventicia or serosa.

4. **Stomach :** Stomach is located on the upper left portion of the abdominal cavity between liver and spleen. Its main function is to store and partially digest food. Some small folds in the empty stomach increases the volumn of it for food intake. These curves are called as rugac. Food remain in stomach for 3-5 hours before entering the other parts of the elimentery canal.

   An atomically stomach is devided into four (04) sections–

   (i) Cardiac orifice is the first part of stomach which recieves food directly from oesophagus. Lower oesophagal sphincter of this part connect oesophagus to stomach.

   (ii) Fundus is formed by the upper bow of stomach.

   (iii) The main and middle part of the stomach is called the Body.

   (iv) Last end of the stomach is called pylorus. It helps in the movement of food from stomach to intestine.

   The layers of the stomach wall are–

   Serosa, Mucosa, Sub-mucosa, Mascularies mucosa externa and some cells in the mucosa.

   The cells are– (i) Peptic cell - Release pepsin. (ii) Oxyntic cell - release Hcl. (iii) Mucous cell - release mucous.

5. **Intestine :** A nine (09) metre long part of alimentary canal extending from the sphincter of the sitomach to anus is termed as intestine. The intestine of human being is devided into two parts - the first part is the small intestine and the second part is the large intestine. Different parts of small intestine are- Duodenum, Jejunum and illium. Large intestine is devided into caecum, colon, rectum and anus.

   (a) Small intestine : Digestion and abserption get completed in the small intestine. The main parts of the small intestine are mentioned below –

   (i) Duodenum : The length of this first part of small intestine is 20-25cm. This part directly recieve the acidic food (chyme) from stomach. Digestive enzymes from pancrease and bile from gall bladder flow through the

hepatopancreatic duct and get mixed with the food at this region. Mucosa of Duodenum form some finger-like projections called villi whose upper parts are covered by a layer of epithelial tissue. Goblet cells present in of this layer secrete mucus. Sub-mucosa is filled with numerous coiled lubular glands called Brunars gland. Mascularis externa and serosa over the sub-mucosa gradually cover the duodenum.

(ii) **Jejunum :** The sub-mucosal layer of jejunum is embedded with numerous large-sized circular foldings. These are called plysi-circularis. Plysi-circularies increase the surface area of jejunum to become more abrorbable.

(iii) **Ilium :** It is not easy to distinguish ilium from jejunum. The lymphatic system called as payers-petoses found in the lamina propria of this part make it significant.

(b) **Large intestine :** Large intestine absorb water from faece and secrete mucous to lubricate the faccal matter. It ends up with a rectum where the faccal matters are stored and in time get discharged as stool excreta.

6. **Liver :** The largest internal part or gland of the human body is the liver. It performs various important function of digestive system. For example - formation of bile, performing metabolic activities of protein, fat and different producing/secreting starch and casbodyrales etc. Liver cells produce RBC and WBC during embryogenesis. Liver can be devided into three sections– liver lobe, liver lobule hepatocyte and sinusoid. Bile is produced by liver and get stored in gall bladder. The juice come to gall bladder through common bile duct. Bile nutralise the acidic food that comes from stomach and emulsify the fats. Liver is the main digestive organ. Moreover it has various specific functions. Hence, liver is an indespensable gland of the human body.

7. **Pancrease :** Another very important gland of the digestive system is pancrease. The pancrease is divided into two sections. The pancrease can secrete both digestive enzymes as well as hormones. The gland

is made up of two special tissues viz., exocrine tissues and endocrine tissues. As soon as food matonals from stomach reach the small intestine, the exocrine tissues send different kinds of alkaline enzymes to the deudonum through Hepeto-pancreatic ducts.

The enzymes secreted by pancrease are–

(i) Trypsin and chymotrypsin which degest protein.

(ii) Pancreatic amylase which digest starch or carbodydrate.

(iii) Lypase - Digest fats and transform then to simpler form, namely, fatty acid and cholesterol.

The endocrine cells of pancrease together are called as islets of langerhans. These cells secrete the hormones called insulin and glucagon. These two hormones control the blood sugar level. Diabetes occure in human body due to malfunctioning of this organ. Regular exercise or yoga along with healthy food habit keep the pancrease in a healthy condition and help it to work properly.

'Process of digestion' : Salivary glands in the buccal cavity secrete saliva which help in digestion. Enzyme amylase present in salivary juice partialy digest carbohydrate and glycogen to dextrin and di-saccharide. These partialy digested food get completely digested in the small intestine. The enzymes present in the pancrease and small intestine breaks/digest the left out starch and de-saccharides and transform them to small particle of uniccharides like glucose, fructose, galactose etc.

Another complex element of food is protien. Digestion of protien starts at stomach and get completed in small intestine. In the presence of Hcl, pepsin convert protien to protiose pepton at stomach. Semi digested protiens are converted to small polypeptide and amino - acid by pancreatic juice and intestinal juice in small intestine.

Another complex food element is fats. Digestion of fats also starts at stomach and get completed in small intestine. Digestion process of fat is not much in the stomach. Lingual lipase starts the digestive process of fats. The process is completed in the small intestine only. The main digestive juice to digest fat comes from the liver. The digestive juice (bile) secreted from the liver is stored in the gall blader. The Bile coming out from the gall

bladder digest and convert fat to some small particles, which are further digested by another digestive juice called lipase, secreted from pancrease. In the small intestine, lipase convests fat to fatty acid and monoglyceride.

Absoption of digested food : Absorption is the process by which the simple, small food particles cross the intestinal mucosa of villi into lymph and blood. Absorption is carried out by osmosis or passive-transport, active and facilitated transport mechanism. Along with small intestine, absorption of water takes place at large intestine also. It is carried out by the process of osmosis. Absorption of glocose or di-saccaride are carried out by active and facilitated transport mechanism. Epithelial cells of villi have some carrier protein which draw the food particles along with Na^+ to the inner side of the cell. When this process require energy, it is termed as active transport and its is termed as passive transport when energy is not required. Like glucose absorption of amino-acid and di-peptides are also carried out by active or facilitated transport.

Absorption of fat particle require the help of bile salts. The particle get united with the bile salts and flow to the internal tissue with the help of some special cell of the villi walls.

Assimitation : The process in which absorbed foods take part in various complex metabolic functions of tissue is called assimilation. This means that the digested food reach various organs of our body and keep it active.

Disorders of digeslive system :

(i) Intestinal inflammation
(ii) Jaundice
(iii) Vomitting
(iv) Diorrhoea
(v) Constipation
(vi) Indigestion etc.

Over and above these, there are various other disorders of digestive system. Among them, Acidity, gastric ulcer indigestion are other general disorders of the digestive system. Gas is produced when food is not properly digested.

2.5 CIRCULATORY SYSTEM

Blood is the principal connective tissue of human being. Blood transport the matters from one place to another in the human body. The system which runs the procese of circulating or transportation in human body is called circulatory system. The circulatory system of human body consists of blood, heart and blood capillaries. Blood is a liquid connective tissue and it is composed of two parts– plasma and blood corpuscles. Plasma is a straw coloured, viscous fluid having various dissolved ion in it.

Nearly 55% volume of blood is formed by glucose, amino acid, proteins, hormones, urea etc. Plasma without the clotting factor is called serum.

Blood corpuscles are of three types–

(i) R. B. C., (ii) W. B. C., (iii) Blood platlets.

(i) R.B.C. (Red blood corpuscle) : R.B.C. of human being lack nucleus. RBC are formed in the bone arrow in adults and at the liver and spleen in embryonic stage. They are destroyed in spleen after a definle life span. An average life span of human R.B.C. is 120 days. R.B.Cs are red due to the presence of hacmoglobin. Haemoglobin is the main factor, which provides red colour to blood. It is mixture of iron and a protein named as globin. Haemoglobin transport O_2 and Co_2 in blood. Another chemical reactions called antigen antibody take place on the RBC surfaces. Different individuals have different antigens on their RBCs. Blood group is determined by the antigens.

(ii) W.B.C. (White blood corpuscles) : WBCs are the nucleated cells of blood. They may be granulated or non-granulated. Granulocytes are of three types–

(a) Neutrophil : Neutrophils cover 60 - 65y. of WBC. They are phagocytic cells which destroy, the foreign organism entering the body. Their nucleus are multilobed.

(b) Eosinophils : The nuclie of eosinophils are bilobed. They resist infection and desthroy the allergic matter.

(c) Basophils : Nuclei of basophils are 'S' shaped. Basophils secrete

histamine, heparin, serotonin etc.

Agranulocyties are of two types – (a) Monocyte (b) Lynyphocyte. Monocyted are dense round shaped nucleated, large WBC. They also perform phagocytosis like neutrophils. Lymphocytes are responsible for immune response of the body.

(iii) Blood platlets : Platlets are also called thrombocytes. Various substances are release by platlets which coagulate or clot blood at the areas of injury.

Blood groups of human : There are four blood groups of human being - A, B, Ab and O. Determination of blood group depends on the definite antigen present in blood. Blood coagulate due to the reaction between antigen and antibody. Thus a blood group never posses, same antigen and antibody. Different blood groups along with their antigen and antibody are given in the following chart.

Blood gr.	Antigen on RBC	Antibody on plasma	Blood group of donor
A			
	A	Anti - b	A, O
B			
	B	Anti - a	B, O
AB	A, B	Nol	A, B, AB & O
O	Nil	Anti a, b	'O'

Blood group is also determined by the presence or obsence of another antigen 'RH'. Blood gr. is said to be '+ve' in presence of Rh antigen or '-ve' in absence of the same. The disease 'erythroblastosis foetalis' is related to the antigen – 'Rh'. When 'Rh – ve' mother gives birth to 'Rh + ve' baby then subsequent baby may be affected from this disease.

Blood coagulation : When fibrinogen; dissolvies in blood, it is converted to undissoved fibrin at the area of injury as cut then coagulation inhibit bleeding. This process is carried out by an enzyme called thrombokinase.

$$\text{Prothrombin} \xrightarrow{\text{Thromboplastin}} \text{Thrombin}$$

$$\text{Fibrinogen} \xrightarrow{\text{Thrombin}} \text{Fibrin}$$

Lymph : Lymph is a tissue fluid. It is also termed as intercellular fluid. Lymph is the fluid that present in the lymphocytes. The fluid is responsible for the immune response of our body. It also function as a carrier of substances between blood and tissue.

The Heart of human being : Human heart is the main organ of blood circulatory system. It is composed of two auricle and two ventricles. Another additional chamber called sinus venosus present on the right auricle as SA node. Chonas arteriosus devided into pulmonary artery and aorta. Right auricle recieve deoxygenated blood from the upper and lower part of the body and the wall of the heart through the superior and inferior venacava and coronary sinus. When auricle contracts deoxygenated blood pass through tricaspide value to right ventricle. The impure blood from right ventricle is carried out to lung by pulmonary artery and gaseous exchange takes place in lung. Oxygenated blood from the lung is carried out to left auricel by pulmonary vain. Pure blood passes to right ventricle through mitral value or bicaspid value. Oxygenated pure blood spread over the whole body through systemic aorta from left ventricle.

SA node on right aurcle generates action potential which stimulates both the atria to undergo contraction simultaneouly. Same action potential is conducted to the ventricles by AV node and AV bundle which causes the contraction of ventricles. This a cardia cycle or a heart beat consist of a simullaneous systol (contractions of heart) and a diastole (relaxation of heart). The longer heart seunel LUB (0.14 sec) is associated with the clossure of AV paths (Tricaspid and bicaspid) during systolic pressure of ventricle which resist the back flow of blood. As the ventricles get relaxed, the pressure in the ventricles falls down. Now pressure in the aorta and pulmonary artery become higher, due to which aortic and plalmonery values slam shut, creating a short but clear sound DUP (o'll sec). ECG is the graphical representation of the electrical activity of the heart during a cardiac cycle.

The systolic and diastolic pressure of a healthy person is 120 mm Hg and 80 mm Hg respectively ie 120/80 mm Hg.

Diserders of human heart and circulatory system are–

(i) Coronary artery disease (Clogging of arteries which supply blood to the heart).

(ii) Heart attack.

(iii) Hypertension.

(iv) Aneurysm.

(v) Cardio myopathy.

(vi) Cardiac dysrythmia.

(vii) Heart value disease etc.



CHECK YOUR PROGRESS

Q 1: Define aerobic and anackobic respiration.

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Q 2: What is inspiration and expiration volume rate of a healthy individual?

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Q 3: Which part of the brain control the respiratory process?

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Q 4: What is oesophagus.

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Q 5: What is the length of dusdenum ?

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2.6 EXCRETORY SYSTEM

The process by which our body eliminate the metabolic waste products is called excretion. The system which completes the excretory

function is called excretory system. Most of the waste products are eleminated in the form of urine from human body. A little bit of waste is released in the form of sweat by the skin. Co_2 in eleminated during expiration. Urinary system is assumed to be the principal excretory system, as major part of the waste-products are excreted as urine. The excretory system consists of a pair of kidney, one pair of ureters, an urinary bladder and one urethra, kidneys of human body are reddish brown and bean shaped. They are situated at the two sides of vertebra in lower abdomen. Structure of human kidneys are described below–

Hilum : Hilum is the concave side of the bean shaped kidney towards the centre where blood vessels and nerves enter and also the point of exit for the ureters.

Renal pelvis : The broad funnel-shaped space in the inner part of the hilam is called renal pelvis.

Calyces : The projections of the renal petvis are called calyces.

Medullary pyramids : A few conical shaped masses are there in the medulla. These masses are called medullary pyramids.

Columns of Bertini : The renal colums spreading between the medullary pyramids are Bertini's column.

Nephron : The functional and structural unit of kidney is nephron. Each kidney contain nearly 1 (one) million nephrons. The two principal divisions of nephrons are–

(a) Glomerulus (b) Renal tubule

(a) Glomerulus : It is a tuft of capillaries formed by the afferent arteriole, a fine branch of renal artery. Glomerulus is enclosed by a double-walled cup like structure called 'Bowman's capsule'. Renal tubule begins here.

(b) Renal tubule : Renal tubule starts from the 'Bawman's capsule and consists of proximal convoluted tubule (PCT), descending and ascending limb of Henle's loop and distal convoluted tubule (DCT).

Collecting duct : The DCTs of many nephrons come and join with a straight tube. This tube is called collecting duct or tube is called collecting duct or tuble.

Peritubular capillaries and vasa recta : The efferent arteriole emerging from the glomerulus forms a fine capillary network around the renal tuble called the peritubular capillaries. A vessel of this network runs purallel to the Henles loop forming 'U' shape capillary called Vasa-reeta, The total length of all the capillaries of the two kidneys together is nearly 110 km. Each glomerulus is constituted of nearly 50 efferent and afferent capillary tubes.

Urine formation : The first step in urine formation is the filtration of blood, carried out by glomerulus. A pair of human kidneys filter nearly 1100-1200 ml blood per minute. The pressure of glomerular capillaries filtrate blood through the slit pore created by the podocytes of Bowman;s caprule. The filtration slits are so minute and hence the fittration through these slits are called ultrafiltration. Both kidneys can produce 180 litre of filtrate per day. This amount is called glomekular filtration rate (GFR). About 99% of the filtrate is reabsorbed from the renal lubules. This is because the filtrate contain excess water, glucose, amino acid, sodium etc. along with the wastes substances. The epithelial cell of the tubule reabsorbs the particle by active or passinve transport mechanism. The cells of the renal tubule secretes H^+, K^+ & ammonia etc. to the filtrate. This process is called secretion of tubule. The process also maintain the acid-base balance of body fluid. PCT, DCT and Henle's loop of renal tubule differently involve in reabsorption and secretion. PCT reabsorbs glucose, amino-acid, essential nutrients, carbonate ion, various electrolytes water etc and secretes H^+, NH^3, K etc. Henle's loop reabserbs Sodium, Potasium, Chlorin etc. and DCT reabsorbs water, bicarbonate ion and secretes Na, K and H. Collecting tubute reabsorbs water and secretes H^+ & K^+.

Kidneys produce concentrated urine by the process of filtrate concentration/counter current mechanism. This complex mechanism takes place by the exchange of ion and water between Henle's loop and vasa recta. At the end of this reactions concentrated urine passes through the collecting duct and stored in urinary bladder. Urine releases from the urinary bladder through the urinary duct as soon as CNS transmit motor massages to urinary bladder. This process is known as micturition. Urine filled stretched

bladder transmit a signal to CNS which in turn send an impulse to contract the blodder resulting micturition. On an average 25-30g of ureas is excreted per day. An adult human excretes nearly 1–1.5 litre of urine per day. Analysis of urine helps in clinical diagnosis of many disorders. Such as presence of sugar in urine confirm diabetes.

Regulation of kidney function : Kidneys' function is monitored by hormonal feedback mechanism, JGA (Juxta Glometrulas Apparatus) and to some extend the heart. Excessive loss of fluid from the body activate the osmoreceptors of the body which stimulate the hypothalamus to release ADH (Anti diuratic hormone) from pituitary. This hormone induce the later part of the tubules and the collecting duct to reabsorb excess amount of water. Due to lack of these hormone, excess water will release out with urine which is a symptom of the disease diabetes insipedus. As a result of secretion of Anti-duratic Hormore pressure of blood also increases which in turn, controls concentration of urine by increating glomerular. Filtration Rate (GFR).

A fall in glomerular blood pressure and glomerular filtration rate (GFR) activate the JG cells of DCT to release renin. Renin activate an inactive vessoconstrictor enzyme angiotensinogen to angiotensin I and II. The active enzyme increase the blood pressure of glomerulus and hence the GFR increases. This complex mechanism is called Renin - Angiotensin Mechanism.

In order to inhebit/obstruct the Renin-Angiotensim mechanism the ahricles of heart secrete Auricular Netriuretic factor (ANF). This factor relaxes/expands the blood vassels which reduce the pressure of blood in the rassals and GFR become normal. In this way, the functions of the kidneys are controlled by different hormones and factors.

Disorders of Urinary System : Out of the various disorders of the Urinary system Uremia is the most dangerous one. Without proper treatment, patients suffering from this disorder may die within a few days. In this disease kidney malfunctioning lead to accumulation of urea in blood. In such patients a special treatment is done called heamodialysis where urea can be removed from blood. Kidney stone or accumulation of mass of

crystallised salts within the kidney is another disorder. Other disorders of kidneys are - Cencer of kidney or urinary bladder, cystisis, nephritis, urethritis, urinary tract infaction, ostomy, prostatities, protienurea etc.



CHECK YOUR PROGRESS

Q 6: What is R.B.C. ?

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Q 7: How many types of blood group are there in human being ?

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Q 8: What is E. C. G. ?

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Q 9: What are the main organs of excretory system ?

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2.7 LET US SUM UP

- Respiration is the process where the food particles are oxidised through some physical or chemical reactions to release energy & Co_2.
- External respiration (inhalation - exhalation) takes place due to the pressure gradiation between the chest cavity and atmosphere.
- Respiration is regulated by a rhythmic centre situated in the medulla region of brain.
- The function of the rhythmic centre is controlled by a pneumotaxic centre situated in the pons area of brain. Increase in H^+ & Co_2 stimulate a chemosensitive area near the rhythmic centre which send the signal to the same for regulating the respiratory process.

- The process of conversion of complex food substances such as carbohydrate, protein and fats to simple absorbable substances is called digestion. Human digestive system is composed of the alimentary canal and the associated glands.
- The stomach located in the upper left portion of the abdominal cavity between liver and spleen. The main function of it is to store and partial digestion of the food.
- Different layers of the stomach wall are - Serosa, Mucosa, sub-mucosa, mascularies, Mucosa extesna & some cells on mucosa. The different cells of the stomach wall are–
  (i) Peptic cell - Releases the exzyme pepsin.
  (ii) Ozyntic cell - Release Hel.
  (iii) Mucous cell - Release mucus.
- The largest organ or gland of human body is liver. Liver performs various important functions of digestive system. Such as - Synthesis of bile, metaboliom of fat, protein and polusaccharides.
- Another complex food element is protein. Digestion of protein starts at stomach and ends atxssmall intistine. In presence of Hcl, pepsin converts protein get converted to small polypeptide and amino acid in small intestine by the action of pancrentic and intestinal juices.
- Assimilation is the process where absorbed food particles get engaged in the metabolic reaction of tissues. This means that digested food reach various organs of our body and keep it active.
- Blood is the main circulatory tissue of human body. Substances are transported from one site to another by blood in our body. The system which perform the function of circulation or transportation is called circulatory system.
- Heart is the main blood circulatory organ. Human heart is consist of two atria & tain ventricles.
- The process by which our body eliminate the metabolic waste product is called excretion. The system which perform the excretory function is called excretory system.
- A fall in glomerular blood pressure and glomerular filtration rate (GFR)

activate the JG cells of DCT to release renin. Renin activate the vessoconstrictor angiotensinogen to angiotensin. The vessoconstrictor increase the blood pressure of glomerulus & GFR. The complex reaction is termed as renin-angiotensin mechanism.



2.8 FURTHER READINGS

1) 'Nesvous System - Human body. Pegasus.

2) 'Glenco Science - Human body System, Mc Graw-Hill/Glenco.



2.9 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1: Respiration which occure in presence of oxygen is called aerobic and in absence of oxygen it is called anaerobic.

Ans to Q No 2: 5000 – 8000 ml.

Ans to Q No 3: Respiratory rythmic centre near medulla of brain.

Ans to Q No 4: A 25 cm long slender tube that extends from the mouthending to the first part of stomach is known as oesophagus.

Ans to Q No 5: 20 – 25 cm.

Ans to Q No 6: R. B. C. (Red Blood Corpuscles)

Ans to Q No 7: It is of 4 types.

Ans to Q No 8: The graphical representation of systol & diastole of heart in medical science is termed as ECG.

Ans to Q No 9: One pair of kidney, Ureter, an urinary bladder and an urethra.



2.10 MODEL QUESTIONS

A. Objective type question :

Q 1: What is respiratory system ?

Q 2: What do you mean by gascous exchange ?

Q 3: What is any haemoglobin ?

Q 4: What is digestive system ?

Q 5: Write the name of the parts of digestive system.

Q 6: What do you mean by excretory system ?

Q 7: What is kidney ?

B. Short question :

Q 1: What is the difference between internal and external respiration ?

Q 2: What is the function of lung ?

Q 3: What is the function of stomach ?

Q 4: Write the function of liver.

Q 5: Write short note on–

(a) Nephron, (b) Bowman's capsule,

(c) Kidney tubles, (d) Urinary bladder.

C. Objective type question :

Q 1: Describe the function of lung in respiratory system.

Q 2: Describe the different parts of small and large intestine.

Q 3: Discuss about the three types of blood corpuseles.

Q 4: Describe the various parts of human kidney.

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