System of the Human Body

(a) Digestive System

The complete process of nutritioin is divided into five stages :

1. Ingestion
2. Digestion
3. Absorption
4. Assimilation
5. Defecation

1. Ingestion : Taking the food into the mouth is called Inge ti

2. Digestion : Conversion of nonabsorbable food into ab orbable f m. The digestion of the food is started from the mouth.

1. Saliva is secreted by salivary gland in mouth in w ch two types of enzymes are found, ptyalin and maltase. They conve t starc into mple sugar and make it digestible.

2. In human secretion of saliva is approxim ely 1 5 litre per day.

3. The nature of saliva is acidi (pH 6.

4. From the mouth the fo reach in stomach through food pipe.

5. No digestion takes place in ood pipe.

Digestion in Stomach

1. The ods ies approximately for four hours in stomach.

2. Af r reac ing the food in stomach gastric glands secretes the gastric juice. This is a ght ye w acidic liquid.

3. Hydrochlo ic acid secreted from the Oxyntic cells of the stomach kills all the bacteria coming with food and accelerates the reaction of enzymes. Hydrochloric acid makes the food acidic by which ptyalin reaction of the saliva end.

4. The enzymes in the gastric juice of stomach are – Pepsin and Renin.

5. Pepsin breaks down the protein into peptones.

6. Renin breaks down the Caseinogen into Casein.

Digestion in Duodenum

1. As soon as the food reaches the duodenum bile juice from liver combines with it. Bile juice is an alkaline and it turns the acidic medium of food into alkaline.

2. Here, pancreatic juice from pancreas combines with food. It contains three types of enzymes :

(i) Trypsin : It converts the protein and peptone into polypeptides nd am no acid.

(ii) Amylase : It converts the starch into soluble sugar.

(iii) Lipase : It converts the emulsified fats into glycerol and fatty a ids.

Small Intestine

3. Here, the process of digestion completed nd bsorp on of digested foods start.

4. From the wall of small intestine, int stinal uices s cretes. The following enzymes contain :

(i) Erepsin : It converts the r mai ng pro ein and peptone into amino acids.

(ii) Maltase : It converts the maltose in glucose.

(iii) Sucrase : It co erts the suc ose into glucose and fructose.

(iv) Lactase : I con rts the actose into glucose and galactose.

(v) ipase It onverts the emulsified fats into glycerol and fatty acids. Intestinal juice is alkal in nature.

In a health peop e approximately 2 litres of intestinal juice secretes every day.

3. Absorption Reaching of digested foods into blood is called absorption.

1. The absorption of digested foods takes place through small intestinal villi.

4. Assimilation : Use of absorbed food in the body is called assimilation.

5. Defecation : Undigested food reaches into large intestine where bacteria turns it into faeces, which is excreted through anus.

The main organs participating in digestion :

Liver : This is the largest gland of the human body. Its weight is approximately 1.5 – 2 kilogram.

1. Bile is secreted through liver only. This bile accelerate the reaction of enzymes present in the intestine.

2. Liver convert excess of amino acid into ammonia by deamina on Thes ammonia are further converted into urea by ornithine cycle Urea comes ou from body through kidney.

3. Liver converts some quantity of protein into gluc se d ing deficiency of carbohydrate.

4. In carbohydrates metabolism liver conv ts th exc s of glucose found in blood into glycogen and stores it into hepa c Cell as eserve nutrients. If the necessity of glucose arises the liver conve reserve ycogen into glucose. Thus, it regulates the quantity of glucose in he blo d

5. In case of decrease of fat in food li er converts some of the parts of the carbohydrates into fat.

6. The production of fibrino en protein takes place by liver which helps in clotting of blood.

7. The production of Hepari protein takes place in liver which prohibit the clotting of bloo insid the body.

8. The d d BC is destroyed by the liver only.

9. The iver re erve some quantity of iron, copper and vitamin.

10. It helps regulating the body temperature.

11. Liver is an important clue in investigating a person's death that has been due to poison in food.

Gall Bladder : Gall bladder is a pear shaped sac, in which the bile coming out of liver is stored.

1. Bile comes into the duodenum from gall bladder through the bile duct.

2. Secretion of bile into the duodenum takes place by reflex action.

3. Bile is a yellowish-green coloured alkaline liquid, whose pH value is 7.7

4. The quantity of water is 85% and the quantity of bile pigment is 12% in water.

The Main functions of bile are as under :

(i) It makes the medium of food alkaline so that pancreatic juice c n worked.

(ii) It kills the harmful bacteria coming with food.

(iii) It emulsifies the fats.

(iv) It accelerates the bowel movement of intestine by which digestive juices in the food mix well.

(v) It is helpful in the absorption of vitamin K and ot r vitamins mixed in fats.

In case of obstruction in bile duct, live cells top tak ng bilirubin from blood. As a result, bilirubin spreads throughout t body. Th is called jaundice.

Pancreas : This is the econ larg st gla d of the human body. It acts as simultaneously endocrine nd exocri e type of gland.

1. Pancreatic juice se s ou of it in which 9.8% water and the remaining parts contain salt and enzymes. It is al line liquid, whose pH value is 7.5–8.3. It contains the enzym s which an digest all the three types of food materials (like carbohydrates fat and protei), therefore it is called complete digestive juice.

Isl ts of L ng rhans : This is a part of the Pancreas.

1. It wa discov red by the medical scientist Langerhans.

2. From its ß ell- insulin, from a cell-glucagons and from 8 cell-somatostaintin hormones are s creted :

Insulin : It is secreted by ß-Cell of islets of Langerhans which is a part of the pancreas.

1. It was discovered by Banting and Best in the year 1921.

2. It controls the process of making glycogen from glucose.

3. Diabetes is caused due to the deficiency of insulin.

4. Excessive flow of insulin causes Hypoglycemia in which one loses the reproducing capacity and vision deterioration.

Glucagon : It re-converts the glycogen into glucose.

Somatostatin : This is a polypeptide hormone which increases the ur ion of assimilation of food.

(b) Circulatory System

The discovery of blood circulation was done by William H rvey in e year 1628.

There are four parts under it -

(i) Heart

(ii) Arteries

(iii) Veins

(iv) Blood.

Heart : It remains safe in th pericardia membrane. Its weight is approximately 300 grams.

Heart of the human s made u of four chambers. In the anterior side there is a right auricle an a le auricle n the posterior side of the heart there is a right ventricl and a eft ventr l persist.

1. Between e right auricle and the right ventricle there is a tricuspid valve.

2. Betwe n the eft auricle and left ventricle there is a bicuspid valve.

3. The blood essels carrying the blood from the body towards the heart is called vein.

4. In the vein there is impure blood i.e. carbon dioxide mixed blood. Its exception is pulmonary vein, which always carry pure blood. Pulmonary vein carries the blood from lungs to left auricle. It has pure blood.

5. The blood vessels carrying the blood from the heart towards the body is called artery.

6. In artery there is pure blood i.e. oxygen mixed blood. Its exception is pulmonary artery.

7. Pulmonary artery carries the blood from right ventricle to lungs. It contains impure blood.

8. In the right part of the heart, there remains impure blood i.e. ca bon dioxide mixed blood and in the left part of the heart there remains pure bl od i.e oxygen mixed blood.

9. The artery carrying blood to the muscles of the heart re ca ed coronary arteries. Any type of hindrance in it causes heart attack

Course of circulation : Mammals have double cir ation. It mean blood have to cross two times from heart before circulating through t the body.

1. Right auricle recieve impure blood from he body hich goes into right ventricle. From here the blood went into pu monary a ery which send it to the lung for purification. After purification is co cted by pulmonary vein which bring it back to heart in left auricle. From a icle it went into left ventricle. Now this purified blood is went into aorta for diffe ent organ of body.

This circulation is done a cardia cycle.

2. Cardiac cycle : Rhythmic sy tole (Contraction) and diastole (relaxation) of auricle and ventricl constitutes a ardiac cycle.

3. Heart beat Heart eeps beating rhythmically throughout the life. There is a node fro wh h originate contraction of heart.

(i) Sin auric ar node (SA node) : It is a specialised area of cardiac muscle fiber in r ht aur le. SA node is also known as pace maker as it generates each wave of ca diac impulse.

(ii) Auriculo – ntricular node (AV node) : AV node is present close to the interatrial septum near the right AV aperture. Wave of contraction is picked up by AV node which spread through.

1. Wave of excitation is picked up by AV node which spread through AV bundle of muscles fibers present on inter artrial septum as well as inter-ventricular septum.

2. Artificial pace maker : When SA node becomes defective or damaged, the cardiac impulses do not generate. This can be cured by surgical grafting of an artificial pace maker an electric device in the chest of the patient. It stimulate the heart electrically at regular intervals.

3. Systole and diastole of the heart are collectively called heart beat. In the normal condition the heart of the human beats 72 times and in a single beat it pumps approximately 70 ml blood.

4. The blood pressure of a normal human is 120 / 80. (Systolic – 120 a d Diastolic – 80).

5. Blood pressure is measured by sphygmomanometer.

6. Thyroxin and adrenaline are the hormones which i d penden y controls the heart beat.

7. The CO2 present in the blood accelerates the he rt beat by reducing the pH.

(c) Lymph Circulatory System

1. The light yellow fluid found in the nter-c llular in ervals between different tissues and cells is called lymph.

2. Lymph is a fluid wh se c mpo ition i like blood plasma, in which nutrient, oxygen and various other stance are present.

3. The corpuscles f un in ly ph are called lymphocytes. In fact, these are White Blood Corpu cles (WBC).

4. Lymph flo s only in one direction from tissue towards heart.

Fu ctions of ph :

(i) The lymphoc tes present in lymph helps to prevents the body from diseases by killing th harmful bacteria.

(ii) Lymph form he lymphocytes.

(iii) The node found in lymph vessels are called lymph node works as a filter in the human body.

(iv) Lymph helps in healing the wounds.

(v) Lymph circulates different material from tissues to veins.

(d) Excretory System

Excretion : Removal of nitrogenous substances formed during metabolism from the body of human is called excretion. Normally excretion means the release of nitrogenous excretory substances like urea, ammonia, uric acid etc.

The main excretory organs of human are as follows —

(i) Kidneys, (ii) Skin, (iii) Liver and (iv) Lungs.

(i) Kidneys : The main excretory organ in human and other mamm s is a air of kidneys. Its weight is 140 grams. There are two parts of it Oute part is called cortex and the inner part is called medulla. Each kidney is made u of approximately 1,30,00000 kidney ducts which are ca ed n phrons. Nephron is the structural & functional unit of the kidney. There a cup lik structure in the every nephron called Bowman's capsule. Glomerulus f thin blood vessels are found in the Bowman's capsule which is ma e up f two ypes of arterioles.

(i) Afferent arteriole : Which carries the blo d to the g omerulus.

(ii) Efferent arteriole : By which the b od is taken out of the glomerulus.

1. The process of filtr ion liqu ds into he cavity of Bowman's capsule, is called ultra filtration.

2. The main functio of the k neys is purification of blood plasma i.e. to excrete the unwant d nitrogenou waste substances through urination.

3. The suppl of blo d to ki neys takes place in large quantity in comparison to other organs.

4. In the kid eys average 125 ml per minute blood is filtrated i.e. 180 liters per day. Out f it 1. 5 liters urine is formed daily and the remaining is absorbed back by the cells of nephron and mix into the blood.

5. In the norm l urine there is 95% water, 2% salt, 2.7% urea and 0.3% uric acid.

6. The colour of the urine is light yellow due to the presence of urochromes in it. Urochrome is formed by the dissotiation of haemoglobin.

7. Urine is acidic. Its pH value is 6.

8. The stone formed in the kidneys is made up of calcium oxalate.

(ii) Skin : Oil gland and sweat glands found in the skin respectively secretes sebum and sweat

(ii) Liver : Liver cells play the main role in excretion by converting more and more amino acids and ammonia of blood into urea.

(iii) Lungs : The lungs excretes two types of gaseous substances carbon dioxide and water vapour. The excretion of some substances like garlic, oni n a d some spices in which vapour component excreted by the lungs.

Hemodialysis : Process of removal of excess urea from the blood patient using artificial kidney.

(e) Nervous System

Under this system thin thread like nerves are spread roughout the body. After receiving the information of environmental chang from the sensitive organs, it spreads them speedly like electrical impul es and e ablishes working and coordination among different organs.

Nervous System of human is divided nto three parts :

(1) Centred Nervous Sy tem

(2) Peripheral Nervous Syst m

(3) Autonomic Nerv us System.

1. Central Nervous ystem Part of the nervous system which keeps control on the w ole b dy and on nervous system itself is called Central Nervous Sy em. T e C tral Nervous System of human is made up of two parts - Brain and Spinal C d.

Brain is co red by membrane called meninges. It is situated in a bony box called craninum which protect it from external injury.

(A) Fore Brain The weight of the brain of the human is 1350 grams.

(i) The function of the Cerebrum : This is the most developed part of the brain. This is the centre of wisdom, memory, will power, movements, knowledge and thinking. The analysis and coordination of muscular movement received from sense organs.

(ii) The function of thalamus : It is the centre of the pain, cold and heat.

(iii) The function of hypothalamus : It controls the hormonal secretion from endocrine glands. Hormones secreted from posterior pituitary gland secrete through it. This is the centre of hunger, thirst, temperature control, love, hate etc. Blood pressure, metabolism of water, sweat, anger, joy etc. are controlled by it.

(B) The function of Corpora quadrigemina : This is the centre of control on vision and hearing power.

(C) Hind Brain

(i) Function of cerebellum : It is some what at the back of h ad an consi t of two cerebellar hemisphere like cerebrum. It is large reflex centr for coordination of muscular body movements and maintenance of post

(ii) Pons : It act as bridge carrying ascending and scending tracts between brain and spinal cord.

(iii) Medulla : It is posterior most part of b in and c ntinuous into the spinal cord. It connect and communicate the brai with spin l cord. It contains the cardiac respiratory and vasomotor ce tres th t cont ol complex activity like heart action, respiration, coughing, sneezin etc.

1. The brain of the hum n is over d in th cranium which protects it from external injury. Brain is co e ed by m mbrane called meanings.

2. Spinal cord : The posterior r ion of the medulla oblongata forms the spinal cord. Its main funct ns are :

(a) Coordinati n and ontrol f reflex actions i.e. it works as the centre of the reflex ac ions.

(b) It c rries wave coming out of brain.

Note : Ref x action was first discovered by the scientist, Marshall Hall.

2. Peripheral N rvous System : Peripheral Nervous System is made up of the nerves arising from brain and spinal cord. These are called cranial and spinal nerves respectively. There are sensory, motor and mixed nerve. »- There are 12 pairs of cranial nerves and 31 pairs of spinal cord found in a human.

The unit of nervous tissues is called Neuron or nerve cell.

3. Autonomic Nervous System : Autonomic Nervous System is made up of some brain nerves and some spinal cord nerves. It supplies nerves to all the internal organs and blood vessel of the body. Langley, first presented the concept of Autonomic Nervous System in the year 1921. There are two parts of Autonomic Nervous System :

(i) Sympathetic Nervous System
(ii) Parasympathetic Nervous System.

Functions of Sympathetic Nervous System :

(i) It narrows the blood vessels in the skin.

(ii) By its action hair gets erected.

(iii) It reduces the secretion of salivary glands.

(iv) It increases the heart beat.

(v) It increase the secretion of sweat gland .

(vi) It stretches the pupil of eye ball.

(vii) It relax the muscles of urinary bladder.

(viii) It reduces the speed f contrac n & relaxation of intestine.

(ix) The rate of respir incr ase.

(x) It increases the lood pressure.

(xi) It in rease the sug evel in the blood.

(xii) It increa s the number of Red Blood Corpuscles in the blood.

(xiii) It helps in clotting of blood.

(xiv) Collective mpact of this affects fear, pain and anger.

Functions of Parasympathetic Nervous System :

The functions of this system is normally the opposite of Sympathetic Nervous System. For example :

(i) It widens the lumen of blood vessels but except the coronary blood vessels.

(ii) It increases the secretion of saliva and other digestive juices.

(iii) The contraction of pupil is caused by this.

(iv) It creates contraction in the other muscles of the urinary bladder.

(v) It creates contraction and motion in intestinal walls.

(vi) The effect of this nervous system collectively creates the occasion of rest and joy.

(f) Skeletal System

The skeletal system of human is made up of two arts

(a) Axial skeleton and

(b) Appendicular skeleton.

(a) Axial skeleton : The skeleton, wh ch m kes the main axis of the body is called axial skeleton. Skull, vertebra olumn an bones of chest comes under it. There are 80 bones in axial skeleton.

(i) Skull : There are 29 b es in it. O t of these, 8 bones jointly protect the brain of the human. The structure made up o these bones is called forehead. All the bones of the fore head main j ined strongly by the sutures. There are 14 bones in addition to this w ch form the ce. Six ear ossicles and one hyoid bone.

(ii) Vertebral Colum : The ertebral column of the human is made up of 33 vertebra All th vertebra e joined by intervertebral disc.

Vertebra is m e flexible by these intervertebral disc. We divide the whole vertebra colum into the following parts —

1. Its first ver bra which is called atlas vertebra holds the skull.

Functions of v rtebral column :

(i) Holds the head.

(ii) It provides the base to the neck and body.

(iii) It helps the human in standing, walking etc.

(iv) It provides flexibility to the neck and body by which a human can move its neck and body in any direction.

(v) It provides protection to spinal cord.

(b) Appendicular skeleton : The following are the parts of it -

(i) Foot bones – Both hands and feet have 118 bones.

(ii) To hold the fore limb and hind limb on the axial skeleton in hu an here re two girdles.

2. The girdle of fore limb is called pectoral girdle and gird of hind limb is called pelvic girdle.

3. Pectoral girdle joined with forelimb is called humer s and the bone from pelvic girdle join to hindlimb is called femur.

Functions of the skeletal system :

(i) To provide a definite shape to the body.

(ii) To provide protectio to s t pa ts of t body.

(iii) To provide a base to the muscles f joining.

(iv) To help in respi ation and nu ition.

(v) To form Re Blood Corpu cles.

4. The tot number of bones in a human's body - 206

5. The t tal number of bones during childhood - 300

The total number of bones of head
- 29 (fore head 8 facial-14, ear-6 ,hyoid -1)

The total number of bones in vertebral column,
initially-33

After development
- 26 (5 sacral fuse into 1 and 4 caudal fuse into 1)

The total number of bones of ribs
24

The largest bone of the body
Femur (bone of thigh)

The smallest bone of the body
Stapes (bone of ear)

The name and number of bones of some specific regions —

Note :

(i) The muscles and bones are join together by tendon.

(ii) The muscle which join bone to bone is called ligaments

(g) Endocrine System

(a) Exocrine glands : Gland which have duct are c lled exocrine gland. Secretion of enzymes pass through it. Example – La ic gland, Sweat gland, Mucous gland, Salivary gland etc.

(b) Endocrine gland : These are ductl ss gland. Hormones are secreted by these gland. Hormones are s nt t the di rent parts of the body through blood plasma. **Example –** Pituit y gland, yroid gland, Parathyroid gland etc.

Functions and effect t e ma endocrine system of the human body and hormone secreted by them —

1. Pituitary gl nd : I is situa ed in a depression of the sphenoid bone of the fore head. T is is c lled sella tunica.

1. Its weight approximately 0.6 grams.

2. This is a o known as master gland. Pitutary gland is controlled by hypothalenus

The functions f the hormones secreted by Pituitary gland :

(i) STH hormone (Somatotropic hormone) : It controls the growth of the body especially the growth of bones. By the excessiveness of STH gigantism and acromegaly ate caused, in which height of the human grows abnormally. Lack of STH causes dwarfism in human.

(ii) TSH hormone (Thyroid Stimulating Hormone) : It stimulates the thyroid gland to secrete hormone.

(iii) ACTH Hormone (Adrenocorticotropic Hormone) : It controls the secretion of adrenal cortex.

iv) GTH Hormone (Growth Hormone) : It controls the functions of gonads. This is of two types :

(a) FSH Hormone (Follicle - Stimulating Hormone) : In male it stimula es spermatogenesis in the seminiferous tubules of the testis. In fema e, it st mulates the Graffian follicles of the ovary to secret the hormone Oestroge

(b) LH Hormone (Luteiniging Hormone) : Interstitial cell stimu ting hormone – , secretion of testosterone hormone takes place in mal and in ca of female estrogen hormone secreted.

(v) LTH Hormone (Lactogenic Hormone) : Its main unction is to stimulate secretion of milk in breasts for infants.

(vi) ADH Hormone (Antidiuretic Hormon) : It cau es increase in blood pressure. It is helpful in maintaining the wate balan e in the body and reduce the volume of urine.

2. Thyroid gland : This is sit ated elow e larynx on both side of respiratory trachea in throat of human

The hormones secret d by it a Thyroxine and Triiodothyronine. Iodine is secretes in more quantity.

Functions of hyrox n :

(i) I increa es speed of cellular respiration.

(ii) It is n cessa y for the normal growth of the body particularly for the developme t of bones, hair etc.

(iii) The normal unctions of reproductive organs depend on the activeness of thyroid gland.

(iv) It controls the water balance of the body in coordination with the hormones of pituitary gland.

Diseases Caused by the Deficiency of Thyroxin :

(i) Cretinism : This disease affects the children. The mental and physical retardness of the child.

(ii) Myxedema : In this disease which normally attack during youth the metabolism does not take place properly which causes reduction in heart beat and blood pressure.

(iii) Hypothyroidism : This disease is caused due to a chronic deficiency of thyroxin hormone. Due to this diseases the normal reproduction is not possible. Sometimes due to this disease human becomes dumb and deaf.

(iv) Goitre : This disease is caused by the deficiency of iodine in od In th disease the shape of the thyroid gland enlarges abnormally

Diseases caused by the Excessiveness of Thyroxin

Exopthalmic Goitre : In this disease eyes get bulgi g out of he eye socket with increased metabolic rate.

3. Parathyroid gland : This is situated in t e right b ck of the thyroid gland of the throat. Two hormones are secreted by :

(i) Parathyroid hormone : This hormone is secreted when there is a deficiency of calcium in the blood.

(ii) Calcitonin : This horm ne is rele sed when there is excess of calcium in the blood is present.

Hence, hormone se reted by par hyroid gland controls the quantity of calcium in blood.

4. Adre al gland : There are two parts of this gland – (i) outer part is cortex and (ii) nner p t i dulla

Hormon s sec eted by cortex and their function –:

(i) Glucocort oids : This controls the metabolism of carbohydrate, protein and fat.

(ii) Mineralocorticoids : Its main function is reabsorption of ion by kidney ducts and to control the quantity of other on in the body.

(iii) Sex hormone : It controls the sexual behaviour and secondary sexual characters.

Note : (i) Cortex is e