Lectures .

Digestive system:

The organs of the digestive system are located within a tube called the gastrointestinal tract(GIT).

FUNCTION: To digest food into small molecules which can cross plasma membrane of cells as nutrients.

GIT: CONSISTSof the following organs: see page 21

Diagrammatic anatomy of the GIT.

1-Mouth: which contains:teeth,tongue and accessory glands e.g salivery glands.Teeth chew food and with the aid of the tongue and saliva(which contains digestive enzymes),make the food easy for digestion and swallowing.

2-PHARYNX: passage way for swallowed food.

3-ESOPHAGUS: also passage way of swallowed food to go to the stomach by peristalsis

4-STOMACH:secretes Hydrochloric acid(HCL) Which activates pepsin and by this way helps breakdown of the CT OF meat.Hcl also kills bacteria.Pepsin is an enzyme which digest protein.

Peristaltic movement of the stomach mixes food with secretions and make the ingested food a semifluid mass of partially digested food which passes from the stomach to the small intestine(duodenum),this is termed CHYME.

The junction between the stomach and the esophagus is called GASTRO-ESOPHAGEAL spincter which prevents food from reflux(to go back from the stomach to the esophagus).The mucosa of the stomach has got folds called rugae.

The passage of food from the stomach to the duodenum is regulated by a sphincter called the PYLORIC sphincter.

5-SMALL INTESTINE: its length is about 6m.the first part of the small intestine is called the duodenum.

Duodenum receives secretions(biliary-pancreatic),helping to digest food ,these are: 1-pancretic juice:contains digesive enzymes such as:a-lipase which digest fat b-amylase for digestion of carbohydrate c-trypsin for the digestion of proteins.

2-Bile: it is produced by the liver and stored in the gall bladder,it helps emulsification of fats.

6-LIVER:is a major metabolic organ.it processes and stores nutrients such as glycogen,and it makes bile.

The second part of the small intestine is called the jejunum ,the third part is the ileum .

The final products of digestion are:

1-Fatty acids and glycerol from fat.

2-Aminoacids from proteins.

3-Sugar from carbohydrates.

The wall of the small intestine has folds that bear finger like projections called villi.

A villus has an outer layer of columnar epithelial cells,and each of these cells has thousands of microscopic extensions called microvilli which bear the intestinal enzymes.The microvilli greatly increase the surface area of the villus for the absorption of nutrients.

Nutrients are absorbed in to the vessels of the villus,these vs. are blood capillaries and a small lymphatic capillary called a( lacteal)which drains into veins.see diagram on page 20.

The products of digestion are absorbed by microvilli into the blood capillaries and the lacteal of the villi.

7-LARGE INTESTINE: the large intestine is larger in diameter than the small intestine but shorter in length.It includes the following parts:

1-Cecum 2-colon 3-rectum 4-anal canal.

The colon includes four anatomic parts:

1-Ascending colon 2-Transverse 3-Descending

4-Sigmoid colon.

Rectum:is the last 20 cm of large intestine.

Function of large intestine:

1-absorption of water

2-absorbs vitamins produced by bacteria called the intestinal flora.

3-forms feces.

Lectures:

The Respiratory System:

Includes organs to insure that oxygen enters the body and CO2 leaves the body.

Breathing in is called inhalation or inspiration.

Breathing out is called exhalation or expiration.

During inspiration air(O2) enters the lungs from the atmosphere and during expiration CO2 is exhaled(expired)from the lung to the atmosphere.

Ventilation: includes inspiration and expiration.

The respiratory tract includes:

1-Upper respiratory tract(URT)

2-Lower respiratory tract.

URT: Includes:nasal cavities,pharynx and larynx.see diagram in page 23.

The nose: it opens at the nares(nostrils),that leads to the nasal cavities which warm and moisten air,which then goes to the nasopharynx(the upper part of the pharynx) in which the Eustachian tubes open.

Pharynx: it is funnel-shaped and connects the nasal and oral cavities to the larynx.

Larynx: is a cartilaginous structure that serves as a passageway for air between the pharynx and trachea.It has vocal cords which are mucosal folds supported by elastic ligaments. the slit between the vocal cords is called GLOTTIS.see diagram on page24.

When air is expelled through the glottis,the vocal cords vibrate,producing sound.

EPIGLOTTIS: A flap of tissue that prevents food from passing into the larynx.

The lower respiratory tract: includes:Trachea,Bronchi&lungs.

Trachea(wind pipes):a tube connecting the larynx to the primary bronchi.

Histology: the wall consists of CT and smooth muscles re-inforced by C-shaped cartilaginous

The m.m that lines the trachea is pseudo rings.it lies anterior to the esophagus.-stratified ciliated columnar epithelium.it also contains goblet cells which produce mucus.cigarette smoking try to destroy the cilia.

The bronchial tree: the main bronchi ,left and right,divides in to small bronchi and then also divides in to smaller ones ,until the air pipes become so small ended by a space called the alveoli.see the diagram on page25.the very small bronchus is called bronchioles which have no ringes of cartilage,so they narrow easily.

The lungs:

Right and left lungs:the right lung has three lobes,while the left has two lobes.

Each lobe is divided into lobules and each lobule has a bronchiole serving many alveoli.

Each lung is enclosed(enveloped) by two plurae,the outer one is called parietal pleura and the inner one is called visceral,they are seous membranes and produces serous fluid.

The alveoli:both lungs have about 300million alveoli,giving a surface area(cross-sectional area)of 50-70m2.see diagrams on page26.

Gas exchange:

Occurs between air in the alveoli and air in the VS.

O2&CO2 moves from the capillary wall to the alveolar space.

Mechanism of breathing(ventilation): it has two phases:1-inspiration(inhalation) moves air into the lungs. 2-expiration(exhalation) moves air outside the lungs.

Lectures:

Urinary System:

Includes the following organs:1-Kidneys 2-Ureters 3-Urinary bladder and 4-Urethra.

Kidneys:the two kidneys,lie on both sides of the vertebral column in the small back,and beneath(behind)the peritoneum.They are bean-shaped and reddish brown in color.They are covered by a capsule of fibrous connective tissue called renal capsule.Each kidney is covered by adipose tissue .Inthe concave site we find the renal artery,vein and the ureter.

Function of the kidney:

1-Excretionof metabolic wastes e.g nitrogenous wastes such as urea,ammonium,creatinine and uric acid .the metabolic breakdown of creatine phosphate results into creatinine.the metabolic breakdown of nucleotides is uric acid.

2-Maintenance of water-salt balance:the kidney maintains balance of water and ions like Na+,k+, Ca++,and bicarbonates(Hco-3).

3-Maintenance of acid-base balance,with a constant level a PH of 7.4.this occurs by excreting H+ and re-absorbing the bicarbonate ions (Hco3).

4-Secretion of hormones:like rennin which stimulates secretion of the hormone aldosteron from the adrenal gland. The other hormone secreted by by the kidney is erythropoietin which stimulates the formation of red blood cells.

The final step of vit.D metabolism occurs in the kidney called 1,25 Dihydrochole calceferol which regulate Ca++ absorption from the intestine.

Ureters:Conduct urine from the kidneys to the bladder.they are muscular tubes about 25 cm long and 5mm in diameter.the wall of the ureter has 3 layers,an inner mucosa(mucous membrane),smooth muscle layer and an outer fibrous coat of CT.

Urinary bladder:

It stores urine.it has three openings,two for the ureters and one for the urethra. The wall of the bladder consists of:

a-mucosa of transitional epithelium .

b-muscle layers

c-Outer layer of serosa(of CT).

Urethra: a tube which connects the bladder to an external opening.It is short in females(4cm) and longer in males(average 20cmm).As the urethra leaves the bladder,it is encircled by prostate in males.The urination is regulated by two sphincters:1-The internal sphincter at the beginning of the urethra and 2-The external sphincter at the end of the urethra.see diagrams on pages30&31.

Anatomy :Kidney structure:

Three main structures:

1-Renal cortex: the outer,granulated layer.

2-Renal medulla:consists of cone-shaped tissue masses.

3-Renal pelvis:space or cavity which is continous with the ureter.

Microscopically: the essential part of the kidney is the nephrone.each kidney contains about one million nephrone which produce urine.many nephrones excrete their urine in to the same collecting ducts and many collecting due goes to the renal pelvis.

Anatomy of the Nephrone:-

From the renal artery,an afferent arteriole leads to the glomerulus which is a knot of capillaries inside the glomerular capsule. Blood leaving the glomerulus enters the efferent arteriole.the glomerulus is covered by a capsule called Glomerular capsule(=Bowman,s capsule). The blood is filtered from the glomerulus going to the glomerular capsule, this is called glomerular filtration,then the filtrate passes to the proximal convoluted tubule which is lined by cuboidal epithelial cells, having numerous microvilli forming brush border helping re-absorption of the filtrate components.Then comes the U-shaped turn called the loop of the nephrone(loop of henle).this loop consists of descending limb and then ascending limb.This fascilitates the absorption of water by the nephrone.Then comes the distal convoluted tubule which is similar to the proximal except the absence of microvilli,and it allows secretion of molecules from the blood into the tubule. Several convoluted tubules of several nephrones enter one collecting duct .many collecting ducts carry urine to the renal pelvis.

The glomerular capsule and the convoluted tubules always lie within the renal cortex.The loop of henle and the collecting ducts are located in the renal medulla giving the appearance of pyramids.

Glomerular filtration:

Water,salts nutrients,and waste molecules move from the glomerulus to the inside of the glomerular capsule.these small molecules

are called the glomerular filtrate.

Tubular re-absorption:

Nutrients and salt molecules are actively re-absorbed from the convoluted tubules into the blood,and water flows passively.

Tubular secretion

Certain molecules e.g H+,and penicillin are actively secreted from the blood into the convoluted tubules.

Glomerular filtration:

Filtrable blood components: water, nitrogenous waste,nutrients and salt ions.

Non-filtrable blood components: formed elements(blood cells and platelets),plasma proteins.

Re-absorption from nephrones:

1-Water: the amount filtered per/day is 180L,the amount excreted is 1.8L.the amount re-absorbed is 99%.

2-Sodium: the amount filtered per/day is 630gm.the amount excreted is 3.2gm. the re-absorption is99.5%.

3-Glucose: the amount filtered per/day is 180gm.the amount excreted is 0.0(zero).re-absorption is 100%.

4-Urea:the amont filtered is 54gm per/day.the amount excreted is 30.0gm.,re-absorption of 44.0%

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Lectures

The cardio-vascular system(CVS): Consists of:

1-The Heart,which pumps blood.

2-The blood vessels(B.VS): through which the blood flows.the beating of the heart sends blood into the B.VS

Types of B.VS:

1-Arteries 2-Veins 3-Capillaries

Arteries:

Are thick and strong-walled and consists of three layers:1- The innermost layer is a thin layer of epithelium(=endothelium).

2-The middle layer is thick layer of smooth muscle and elastic tissue.

3-The outer layer is CT,see page 40.

Arterioles:are small arteries.

Capillaries: the arterioles branch into capillaries which are microscopic tubes composed of endothelium(a single layer of epithelial cells),with a basement membrane.the network of many capillaries is called capillary bed.

Veins

The walls have the same three layers as arteries but less smooth muscles in the middle layer and less CT in the outer layer.

Venules are small veins that drain blood from the capillaries and then join to form a vein.

Veins have valves which allow blood to flow only toward the heart when open and prevent the backward flow of blood when closed.valves are present mainly in the veins of the lower extremities.veins have thin-walled.Veins constitute about 70% of the blood in the body.

Anatomy of the heart:

See figs on page 38.

It is a cone-shaped,muscular organ located between the lungs,directly behind the sternum.the heart is pointed to the left.this is called the apex.

The major portion of the heart is called the myocardium(cardiac muscle).the myocardium is supplied by coronary arteries and veins(left and right coronaries).

Pericardium: is a thick membrane which surround the heart and protects it .

The inside of the heart: A septum seperates the heart into left and right sides.the heart has four chambers.the two upper,thin-walled atria(left&right).The two lower chambers are thick-walled,ventricles ,called the right&left ventricles.Between the atria and ventricles are openings regulated by valves.these valves are supported by strong fibrous strings called chordae tendinae which are attached to papillary muscles.

From the left ventricle the blood is ejected to the aorta through the aortic valve.From the right ventricle the blood is ejected to the lungs through the pulmonary valves to the pulmonary trunk.

The Aorta:

Gives three main branches as it leaves the heart:they are: left subclavian,left common carotid and brachiocephalic artery.

The venous blood from the head and upper limbs and neck is brought to the heart through the superior vena cava.The venous blood from the abdomen and the lower limbs is brought to the heart by the inferior vena cava.both venae cavae carry blood to the right atrium. From the right atrium the blood goes to the right ventrles.then to the lungs by the pulmonary trunk which is divided into left and right pulmonary arteries. They carry venous blood poor in O2.

The lungs supply O2 to the blood which is then carried to the heart by pulmonary veins(left&right) which contain oxygenated blood,and carry it to the left atrium.

The blood flows into two circuits:

1-the pulmonary circuit(exchange of gases).

2-The systemic circuit:exchange of gases wit+h tissue fluids.see page 39.

Lectures:

The Lymphatic System(L.S):

It consists of 1-Lymphatid VS 2-Lymphatic organs.This system helps and closely associated with the CVS.

Functions:

1-Lymphatic capillaries absorb excess tissue fluid

And return it to the blood stream.

2-Lymphatic capillaries in the small intestine called lacteals,absorb fats and transport them to the blood stream.

3-The L.S is responsible for production, maintenance,and distribution of lymphocytes.

4-Defence against pathogens.

Lymphatic Vessels:

Start with 1-Capillaries which drain fluid from tissues to 2-lymphatic VS and then to 3-Ducts.

Lymph: is the fluid inside lymphatic vessels.It is

Colourless liquid but after meals it becomes

Creamy.

The lymphatic system has two ducts:

1-Thoracic duct 2-Right lymphatic duct.

Thoracic duct: is larger, returns lymph collected

From the body below the thorax,left arm and left side of the head and neck into the left subclavian

Vein.

Right lymphatic duct: returns lymph from the right arm and right side of the head and neck into the right subclavian vein.

Lymphatic organs:

Are divided into two:

1-Primary: red bone marrow and thymus gland.

2-Secondary: lymph nodes and spleen,tonsils pyers patches and appendix.

There are two types of lymphocytes:

1-B-lymphocytes(B-cells).

2-T-Lymphocytes(T-cells).

B-cells mature in the bone marrow.

Lymphocytes that will become T-cells have to pass through the thymus and mature in it.

Red bone marrow,not only produce B-cells,but it also produce Neutrophils, eosinophils. Basophils,&

Red blood cells.

Thymus gland: is located in the thoracic cavity ,between the trachea and sternum, superior to the heart.It is big in childhood, but it becomes smaller as the person grows.

Function of thymus:

1-Produces thymosin(hormone) which is thought to aid in the maturation of T-lymphocytes.

2-Immature T-lymphocytes migrate from bone marrow through the blood stream to the thymus

Where they mature.

Secondary Lymphatic Organs:

Spleen: located in the left upper region of the abdominal cavity,posterior to the stomach and lie on ribs 9, 10, and 11.CT divides the spleen into whit&red pulp,and enveloped by a capsule.loss

Of the spleen makes the person susceptible to infection …see page 43.

Lymph Nodes(L.N):

They filter lymph.CT forms a capsule to the L.N and also divides them into compartments. They defence against pathogens by macrophages and lymphocytes present in the L.Ns.

L.Ns are named according to their sites e.g cervical L.Ns in the neck, inguinal L.Ns in the groins, axillary L.Ns in the armpits.

Lectures

Male Reproductive System:

The male reproductive organs are:

1-Testes: produce sperms and sex hormones.

2-Epididymides:ducts where sperms mature and stored.

3-Vasa deferentia:conduct and store sperms.

4-Seminal vesicles:store sperm and produce fluid and nutrients to sperms.

5-Prostate gland:secretes fluid to the semen.

6-Urethra: conduct sperms.

7-Bulbo-urethral glands(cowper,s glands):produce mucus-containing fluid to semen.

8-Penis: organ of sexual intercourse.

Testes:

Produce sperms and the male sex hormone, lie within the scrotum.Early in fetal life they lie in the abdominal cavity but in the late two months of fetal life they descend to the scrotum.The scrotum regulates the appropriate temperature for the testes.

A longitudinal section of the testes:shows the anatomy and histology of the testes and other organs.the section reveals that the testes is composed of lobules. Each lobule contains seminiferous tubules in which spermatogenesis occur.

Spermatogenesis(production of sperms)

The mother cell is called spermatogonium,divides by mitosis into primary spermatocytes and this divides by meiosis into secondary sprmatocytes,then into early and late spermatids, and finally into sperm which shows by microscope the following parts:1-the head covered by a cap called acrosome which contains an enzyme needed to penetrate the ovum 2- middle piece 3-tail.

Sertoli cells:

As seen in the cross section of seminiferous tubules :they support, nourish and regulate the process of spermatogenesis….

Interstitial cells:

Lie between the seminiferous tubules, they secrete the male sex hormone testosterone.

The epididymis:

Is a coiled duct lying just outside each testis. This organ stores and matures the sperms.

Vasdeference:

Duct which starts from the epididymis and ends into the seminal vesicle.it conducts and stores sperms.

Seminal vesicles:one on each side at the base of the bladder.they store sperms.It joins the vasdeference from above and by a duct it joins the urethra downwards.

Prostate:

A single gland that surrounds the upper portion of the urethra just below the bladder.It produces fluid to the semen.

Bulbo-urethral(Cowper,s) glands ,one on each side of the urethra lie posterior to the prostate,produces mucus fluid to the semen,the open to the urethra.

Penis:

Its parts:1- the shaft which ends in an enlarged tip called---2-glans penis and covered by a fore skin called 3-Prepuce in uncircumcised male.the penis contains erectile tissue surrounding the urethra……

The penis is supplied by artery,vein and nerve.

The artery when relaxes fill the erectile tissue with blood,this causes block to the veins and hence intensifies penile engorgement and erection.

Hormonal Control of Testes:

The hypothalamus secretes a hormone called

Gonadotropin-releasing hormone which stimulates the anterior pituitary to secrete two hormones(gonadotropic hormones) these are:

1-Follicle stimulating hormone(FSH) Which promotes the production of sperms in the seminiferous tubules.

2-Luteinizing hormone(LH):Both hormones are present in males and females.In males(LH) Controls the production of testosterone by the

Interstitial cells.When the level of testosterone falls(drops down) the hypothalamus starts to secrete gonadotropin releasing hormone, which stimulates the pituitary to secrete (L.H).L.H stimulates the interstitial cells to secrete testosterone. T he same is applied to the sperm production.This state is called FEED-BACK mechanism

The amount of semen per ejaculation is about 3.5ml and contains nearly 400,000,000 sperm.

For male to be fertile,the sperm count should be

60-120 million/ml although one sperm only is needed for fertilization of the ovum. After 48 hours of ejaculation the sperms will die in the female genital tract. The PH of the semen is alkaline(7.4).

Lectures:

Female Reproductive System:

The system includes: 1-Ovaries: produce eggs and sex hormones 2-Oviducts (fallopian tubes): conducts eggs,site of fertilization. They extend from the uterus to the ovaries.their end near the ovary is finger-like projection called fimbrae.

3-Uterus: site of developing fetus.it is a thic-walled muscular organ.the lining of the uterus is called the endometrium which helps formation of placenta which supplies nutrients to the fetus.

4-Cervix: contains opening to the uterus.

5-Vagina: the organ of sexual intercourse,birth canal and as an exit for menstrual flow.

When an egg bursts from an ovary during ovulation,it is thrown to the oviduct by the action of fimbrae and cilia of the oviduct epithelium. The egg is fertilized in the oviduct and forms a zygot which moves towards the uterus to form the embryo. In the uterus the embryo is embedded in the uterine wall.

External Genitalia of the female:

Called the vulva:it consists of two external skin folds called labia majora,inside them lie another two but thinner folds called labia minora which encircle the vaginal orifice and form the clitoris anteriorly.The urethral orifice lies between the vaginal orifice and the clitoris.

Ovarian cycle:

The ovary contains many follicles and each one contains an immature egg called an oocyte.The

Primary follicle contains a primary oocyte.The

Follicular stimulating hormone(FSH) is secreted

From the anterior pituitary by the effect of the

Hypothalamic Gonadotropic-Releasing Hormone(Gn RH).FSH stimulates the primary follicle to produce oestrogen and changing it into

SecondaryFollicle which contains secondary oocyte

By the process of meiosis,the oestrogen increases

Until the follicle matures and swollen up called the

Vesicular(graafian)Follicle----

When ovulation occurs the vesicular follicle bursts(ruptures) and the secondary oocyte is released and thrown in to the Fallopian tube

(oviduct).After rupture what remains is the Corpus Luteum which secretes Progesterone and some oestrogen.If fertilization occurs the corpus luteum remains secreting progesterone.If no fertilization,the corpus luteum degenerates and progesterone&oestrogen dropped down.

Uterine Cycle:

In a non-pregnant lady with a menstrual cycle of 28 days,menstruation occurs from day 1-5 with passage of degenerated uterine endothelium plus ruptured blood VS.,this occurs due to degeneration of Corpus Luteum with decreased secretion of progesterone.

Regeneration(re-building) of Uterine epithelium started again from days 6-13 this is called proliferation phase.At days 15-28 the endometrium thickens with secreting glands this phase is called secretary phase.

When fertilization occurs in the Oviduct the zygot(46 chromosome) is transmitted to the uterus and implanted in to its wall at the scretory phase.

Gradually the Placenta forms(it is a tissue which connects the embryo to the uterine wall.The placenta transmits nutrients from the mother to the embryo.Placenta produces a hormone called

Human chorionic Gonadotropin(HCG)Which secretes progesterone and some oestrogen.

Endocrine system:

Consists of the hormonal glands,which secrete chemicals massengers called hormones in to the blood stream.

Hormones:have a wide range of effects,including regulation of cellular metabolism,regulation of fluid and PH balance, and helping us responding to stress.The endocrine system also helps maintain the functioning of the male and female reproductive organs.see figs.in pages 15&16 about endocrine glands.

Notes about the diagrams(figures):

Hypothalamus:produces releasing hormones to the endocrine glands.

Pituitary gland:of two parts,posterior and anterior.

The posterior part releases Antidiuretic Hormone(ADH),Which regulates water reabsorption by kidneys.The other hormone is oxytocin,which stimulates uterine contraction and milk letdown.pituitary gland is located in an area called sella turcica.

Anterior pituitary:releases:1-thyroid stimulating

Hormone(TSH).Stimulates thyroid gland.2-Adreno-

Corticotropic Hormone(ACTH),Which stimulates the adrenal cortex 3-Gonadotropic hormones(FSH&LH),responsible for egg and sperm production and sex hormones.4-Prolactin(PL) For milk production. 5-Growth hormone(GH),For bone

Growth,protein synthesis and cell division.

Thyroid gland:Secretes thyroxine(T4) and Tri-iodothyronine(T3):these hormones increase metabolic rate and regulate growth&development.

Parathyroids: secrete parathyroid hormone(PH),Which raises blood calcium level.

Thymus:secretes thymosin which helps production and maturation of T lymphocytes.

Adrenal gland:consists of adrenal cortex and medulla.

Adrenal cortex:secretes 1- Glucocorticoid homone(cortisol),which raises blood glucose level

And stimulates breakdown of protein.2-Mineralcorticoids(Aldosterone):help reabsorption of Na and excretion of K ions 3-sex hormones:helps reproductive organs and bring about sex charachtaristics.

Adrenal Medulla:secretes adrenalin(epinephrine),and noradrenalin(norepinephrine),both are important and active in emergency by raising blood glucose level.

Pancreas:secretes insulin,which lowers blood glucose level,and secretion of glucagon

Gonads:1- Testes :produce androgen(testosterone) which is responsible for male sex charachteristics 2-Ovaries:secretes oestrogen and progesterone :for female sex charachteristics.

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