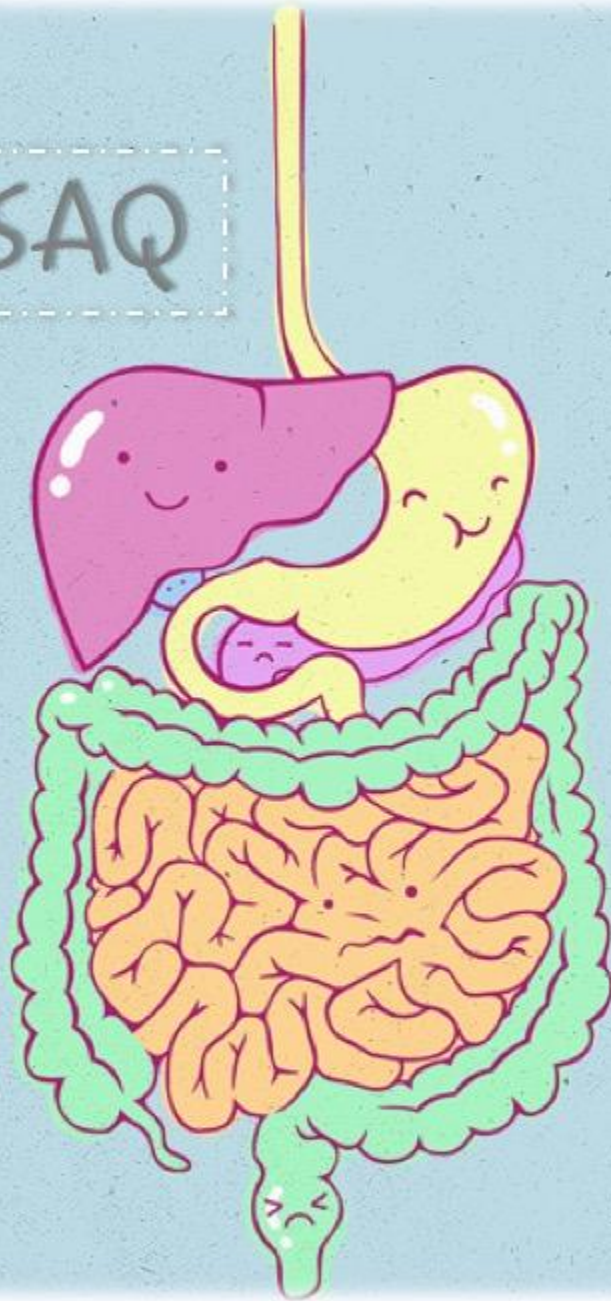




GIT SAQ



Physiology

Gastrointestinal Physiology



Differences Between the Myenteric and Submucosal Plexuses?

Submucosal (meissner's) plexus has mainly sensory functions and controls mainly gastrointestinal secretion and local blood flow, whereas the myenteric (Auerbach's) plexus has mainly motor functions (controls mainly the gastrointestinal movements). location wise, meissner's plexus are located in the sub mucosa, whereas the myenteric plexus are found in the muscularis propria.

Give examples of syncytial smooth muscles

bile ducts, ureters, uterus and blood vessels.

List the differences between smooth and skeletal muscles:

Skeletal muscles contract and relax rapidly, while smooth muscles contraction is slow, prolonged, and requires less energy.

Where is the inhibition of emptying of ileal contents reflex integrated and what is it called?

Sympathetic ganglia, Colonoileal reflex

Which hormone stimulates insulin release?

Gastric inhibitory peptide

Mention 3 functions of GIT?

- 1- Movement of the food
- 2- Digestion
- 3- absorption

Mention the structures that control GIT ?

- 1- Nervous control (enteric and autonomic nervous system)
- 2- hormones
- 3- muscle stretch

Mention 4 neurotransmitters that are secreted by ENS ?

- 1- Acetylcholine
- 2- substance P
- 3- dopamine
- 4- CCK

Mention the types of movement in the GIT ?

- 1- Propulsive movement
- 2- Mixing movement



List the 4 major activity of GIT? 1-Motility 2-Secretion 3-Digestion 4-Absorption

What is the aid of secretion ? Digestion & absorption

What is the definition of digestion?

Breaking down of large molecules into small molecules that enough to pass through the cell membrane

Chewing muscle are innervated by? (V) CN .. Trigeminal

The substrate of salivary amylase is?and the product is ? Starch/maltos, isomaltos

What type of acini is contain granules and secrete electrolytes, water and the enzyme ptyalin (amylase)? serous cells

What is the function of epithelial cell? It is responsible for active transport of electrolytes.

Where can we found the myoepithelial cell?&what its function?

Between the basement membrane and the cells lining the lumen of acini and intralobular ducts, they contract and increase salivary flow.

What is the function of Saliva?

- 1- Bicarbonate ions buffer acidic foods (pH 6.35-6.85) in mouth & esophagus.
- 2- Chemical digestion of starch begins with enzyme (salivary amylase).
- 3- —Mucus lubricates food & facilitate swallowing.
- 4- Facilitate speech.
- 5- By acting as a solvent, saliva is important for the sense of taste.
- 6- Enzyme (lysozyme) helps destroy bacteria.

What is the function of epidermal growth factor? healing of ulcers in the mucous membrane of oral cavity.

How the unconditioned reflex happen on salivation?

- The presence of food in the mouth stimulates general receptors and especially taste receptors.
- Impulses travel along afferent nerves to the **salivatory nuclei** in brain stem.
- Efferent impulses travel along **autonomic nerves** to salivary glands to stimulate salivary secretion.

This reflex is innate and is not acquired by learning.

Function of sympathetic innervate salivary gland?

- 1- Act on mucous cells and **produce small amount** of viscous secretion.
- 2- Cause **vasoconstriction**

Function of para-sympathatic innervate salivary gland?

- 1- Increase the synthesis and secretion of salivary **amylase** and **mucin** producing watery secretion (they act on serous cells).
- 2- Enhances the **transport activities** of ductal epithelium.
- 3- Increases blood flow due to marked **vasodilatation**
- 4- Stimulates **glandular growth** and metabolism.

What is the function of gastroesophageal sphincter? Helps to **prevent reflux** of gastric juice

**Q1: What is the function of HCL and ?**

- 1-kills bacteria (PH :2)
- 2-denatures proteins
- 3- activate the pepsin

Q2: What Are the Mediated Inhibitory enterogastricnervous reflexes ?

1. Direct from duodenum to stomach via enteric nervous system
2. Extrinsic nerves to sympathetic ganglia
3. Vagus nerves to the brain stem

Q3: What are the Pyloric glands and oxyntic cells secrete?

Pyloric glands secrete : Mucus-protection – Gastrin - Pepsinogen
oxyntic cells secrete: Hydrochloric acid - Pepsinogen -Intrinsic factor -Mucus

Q4: What are the Phases of gastric secretion?

- 1-cephalic phase
- 2-Gastric Phase
- 3-Intestinal Phase

Q5 : Mention the cells that are responsible for gastric secretion?

- 1- mucous cells
- 2- chief cells
- 3- parietal cells
- 4- enteroendocrine cells

Q6 :Mention the name of enzyme that can digest the protiens in stomach ?

pepsin

Q7:Mention two substances that can be absorbed by stomach ?

- 1- alcohol
- 2- Aspirin



What are the hormones secreted from Islet of Langerhans in the pancreas ?

1. Insulin (Beta cells; 60%).
2. Glucagon (Alpha cells; ~25%).

Also Somatostatin is secreted by delta cells (form ~10% of islets's cells)

What are the major functions of pancreatic secretion?

1. To neutralize the acids in the duodenal chyme to optimum range (pH= 7.0-8.0) for activity of pancreatic enzymes.
2. To prevent damage to duodenal mucosa by acid & pepsin
3. To produce enzymes involved in the digestion of dietary carbohydrate, fat, and protein

What are The most important pancreatic enzymes for digesting proteins are?

1. Trypsin.
2. Chymotrypsin.
3. Carboxypolypeptidase

When do they activate ? These enzymes become activated only after they are secreted into the intestinal tract.

Trypsinogen is activated by: ● Enteropeptidase (enterokinase) ● Trypsinogen

Chymotrypsinogen and procarboxypolypeptidase are activated by: trypsin

When does the Enteropeptidase secrete? when chyme comes in contact with the mucosa.

What is the benefit of Secretion of Trypsin Inhibitor ? Prevents Digestion of the Pancreas Itself.

Where does Trypsin Inhibitor formed? formed in the cytoplasm of the glandular cells.

What is The pancreatic enzyme for digesting carbohydrates? pancreatic amylase

What does pancreatic amylase hydrolyzes ?

starches, glycogen, and most other carbohydrates (except cellulose) to form mostly disaccharides and a few tri-saccharides

What are The main pancreatic enzymes for fat digestion?

- 1) Pancreatic lipase
- 2) Cholesterol esterase
- 3) Phospholipase

Which hormone is activated by the presence of protein in the intestine? CCK

What is the effect of CCK in the pancreas secretion? increase the enzymes secretion

What are the pancreatic enzymes involve in protein digestion? Trypsin ,Chymotrypsin, Carboxypeptidase

What is the type of transporter is found in the pancreatic ductal cells?

HCO₃ Cl⁻ exchanger (secondary active transport)

What is the mediators involve in the the increase the secretion of pancreas by gastric distention?

vago-vagal reflex

As the flow rate of pancreatic juice increases, what will happen to Chloride secretion? Decreased



The movements of the small intestine can be divided into:

- | | |
|--|-------------------------------------|
| 1- Propulsive contractions (Peristalsis) | 2- Segmenting (Mixing) contractions |
| 3- Migrating motor complex | 4-Antiperistalsis |
| | 5-Peristaltic rush |

What is the significance of Segmenting (Mixing) contractions ?

- Blend different juices with the chyme
- Bring products of digestion in contact with absorptive surfaces

What is the function of MMC ?

Is to sweep material (undigested food residues, dead mucosal cells and bacteria) into colon and keeping the small intestine clean that regulated by autonomic nerves and by release of motilin.

Antiperistalsis, Where it occur and why ?

- between Stomach and duodenum to allow more time for neutralization of chyme.
- between Ileum and caecum to allow time for absorption.

How does the movement of Villi initiate ?

Initiated by local nervous reflexes in response to chyme in small intestine.

The movement of Villi can Stimulated by what ?

Stimulated by villikin hormone released by intestinal mucosa when it comes in contact with digestive products

The intestinal motility can be controlled by two factors mention them and talk about that factors in brief

- 1- **Neuronal factor:** A- Vagal excitation increases intestinal and villous movements.
B- Sympathetic excitation decreases intestinal and villous movements.

2- Hormonal factors

- Gastrin, CCK, insulin and serotonin stimulate intestinal motility. Gastrin and CCK relax ileocaecal sphincter.
- Motilin secreted from duodenum stimulates intestinal motility and regulate MMC.
- Secretin and glucagons inhibits intestinal motility and contract ileocaecal sphincter.
- Villikin stimulates movement of the villi.

What is the role of Gastroileal reflex? is initiated by gastric distension. Impulses are conducted through myenteric plexus to initiate a fast peristaltic wave passing to the ileum.

The ileocaecal valve relaxes allowing chyme to pass into cecum.

This reflex is mediated by vagus nerve.

The intestinal secretion controlled by ?

1. Brunner's gland secretion is stimulated by secretin, tactile and vagal stimulation.
 2. Intestinal juice secretion is stimulated by:
 - a. Distension, tactile and vagal stimulation.
 - b. Hormones as gastrin, secretin, CCK, glucagons, enterocrinin.
- Sympathetic stimulation exerts an inhibitory effect.

What is the role in digestion the fat ?

- Bile salts and lecithin in the bile help fat digestion by make the fat globules readily fragmentable with the water in the small intestine (emulsification of fat).
- Bile salts break the fat globules into very small sizes, so that the water-soluble digestive enzymes can act on the globule surfaces.

Talk about the absorptive surface of the small intestine ?

- valvulae conniventes, well developed in the duodenum and jejunum. They increase the surface area of the absorptive mucosa about 3-fold.
- The presence of villi on the mucosal surface enhances the total absorptive area another 10-fold.
- The epithelial cell on each villus is characterized by a brush border, consisting of as many as 1000 microvilli (increases the surface area another 20-fold).

Absorption of Carbohydrates.

Glucose & galactose absorption occurs in a cotransport mode with **active** transport of Na^+ (2ry active transport) .

Fructose is independent on Na^+ but it transports in luminal membrane via **facilitated diffusion**.

Pentose is transported by **passive** diffusion

Absorption of Proteins.

- D- AA are transported by **passive** diffusion.
- L- AA are transported by **2ry active** transport.
- Di and tripeptides cross the brush border by **active transport** protein carrier.
- AA leaves the cell at the basolateral membrane by **facilitated** transport.



Aldosterone

- Greatly Enhances Na^+ Absorption
- stimulate K^+ secretion in the colon

What is the function of micelles?

The micelles act as a transport medium to carry the monoglycerides and free fatty acids to the brush borders of the intestinal epithelial cells.

Absorption of Vitamins.

- **Fat-soluble** vitamins (A, D, E, & K) are incorporated into **micelles** and absorbed along with other lipids
- Most **water-soluble** vitamins (C, B1, B2, B6, and folic acid) are absorbed by **Na^+ -dependent cotransport** mechanisms
- Vitamin **B12** is absorbed in the ileum and requires **intrinsic factor**

Absorption of Na^+ : Na^+ moves into the intestinal cells by the following mechanisms:

1-

- Passive diffusion 2- Na^+ -glucose or Na^+ -amino acid co-transport
 3- Na^+ - Cl^- exchange 4- Na^+ - H^+ exchange

Absorption of Cl^- : Cl^- absorption accompanies Na^+ absorption by the following mechanisms:

- 1- Passive diffusion 2- Na^+ - Cl^- cotransport 3- $\text{Cl}^-/\text{HCO}_3^-$ exchange

Absorption of K^+ : absorbed in the small intestine by passive diffusion Excessive loss \rightarrow hypokalemia

Absorption of Ca^{++} : **dec.in** Plasma $\text{Ca}^{++} \rightarrow$ inc.Parathyroid hormone convert (25-hydroxy-vitamin D3) into 1,25 dihydroxy-vitamin D3

1,25 dihydroxy-vitamin D3 stimulates synthesis of Ca-binding protein and Ca-ATPase in enterocytes

Physiology of the large intestine



The colon divided into three Regions::

- 1- Ascending colon.
- 2- Transverse colon.
- 3- descending colon.
- 4- sigmoid colon.

What are the functions of large intestine?

- 1- Reabsorb water and compact material into feces.
- 2- Absorb vitamins produced by bacteria.
- 3- Store fecal matter prior to defecation.

Absorption and storage of feces happen in which half of the colon?

Absorption occurs in the proximal one half of the colon and it is named

Absorbing colon while storage of feces occurs in the distal colon and it is named **Storage colon**.

How many liters can the large intestine absorb?

It can absorb a maximum of 5 to 8 liters of fluid and electrolytes each day

Reabsorption in the large intestine includes;

- 1- Water.
- 2- Vitamins K, Biotin and B5.
- 3- Organic waste.
- 4- Bile salts.
- 5- Toxins.

Each colon regions specialized in specific function:

- 1- The ascending is specialized for processing Chyme delivered from terminal ileum.
- 2- The transverse colon is specialized for storage and dehydration of feces.
- 3- The descending colon is a conduit between the transverse and sigmoid colon.

What are the capacity of the sigmoid and rectum?

They are reservoirs with a capacity of up to 500mL.

The movements of the colon divided into two Movements:

- 1- Mixing movements (Haustrations).
- 2- Propulsive movements (Mass Movements).

What is the defecation reflex?

- 1- Distension of rectum.
- 2- Stimulation of the stretch receptors.
- 3- Stimulation of myenteric plexus in sigmoid colon and rectum, stimulation of parasympathetic motor neurons in sacral spinal cord and stimulation of somatic motor neurons.
- 4- Increased local peristalsis, and relaxation of internal anal sphincter and contraction of external anal sphincter.



In brief explain the formation of bilirubin .

heme is split into iron & bile pigment , The 1 st pigment is biliverdin ,it is reduced by biliverdin reductase to free bilirubin which is released into the plasma.

What is the importance of bilirubin albumin binding ?

to increase bilirubin solubility and avoid its accumulation and damage of the other tissues

Mention the steps of hepatic phase of bilirubin metabolism and explain each one briefly.

Step1: Hepatic reuptake : by carrier protein ligation (Y & Z proteins)

Step 2: bilirubin Conjugation: 80% of bilirubin conjugates with glucuronic acid, 20% conjugate with sulphate or other sub

Step3: Secretion of conjugated bilirubin in the bile: by active secretion

What is the fate of Urobilinogen?

70% is excreted in feces as stercobilin

20% enters (enterohepatic circulation)

small amount excreted in urin as urobilin

What are the types of bilirubin in the serum ? list 4 differences between them

	Indirect bilirubin “Unconjugated”	”Direct bilirubin“Conjugated
N serum level	chief corn in blood	low conc. in blood
water solubility	Absent	present
Binding	to albumin	glucuronic acid
renal excretion	absent	present



What is the definition of mononuclear phagocyte system ?

It is a network of connective tissue fibers inhabited by phagocytic cells such as macrophages ready to attack and ingest microbes. And it has an essential component of the immune system.

List the cellular components of mononuclear phagocyte system ?

1-Monocytes

2- Macrophage Located in all tissues such as skin (**histiocytes**), liver (**kupffer**), brain “**Microglia**” spleen, bone marrow, lymph nodes, (**Reticular cell**), lung (**Alveolar cells**) 3-Endothelial cells: bone marrow, spleen, lymph node.

Describe the formation of Macrophages ?

1-Begin by Stem cell in Bone Marrow: monoblast maturing to promonocyte and mature monocytes released into blood.

2-Stay for 10-20 hours in circulation.

3-Then leave blood to tissues transforming into larger cells macrophage.

4-Macrophage life span is longer up to few months in tissues. ”**Note: Macrophages has different names in different tissue .**

What are the General Functions of RES ?

Phagocytosis: Bacterial, dead cells, foreign particles (direct).

Immune function: processing antigen and antibodies production (indirect).

Breakdown of aging RBC.

Storage and circulation of iron.

What are the Functions of Spleen ?

1. Haematopoiesis :during fetal life.

2. the main site for destruction of old RBCs and abnormal.

3-Blood is filtered through the spleen and Recycles of iron.

4. Reservoir of thrombocytes and immature erythrocytes.

What are indication of Splenectomy ?

1. Hypersplenism 2. Primary spleen cancers. 3. Haemolytic anaemias

4- Idiopathic thrombocytopenic purpura (ITP). 5. Trauma. 6. Hodgkin's disease.

7. Autoimmune hemolytic disorders.

Name two of the complication of splenectomy ?

1-Overwhelming bacterial infection or post splenectomy sepsis

2-Inflammation of the pancreas and collapse of the lungs



Mention the componets of Virchow Triads ?

any changes in 1- blood flow 2- endothelium 3- blood compositions

Mention the function of Tissue Plasminogen Activator (TPA) ?

Tissue Plasminogen Activator (TPA) used to activate plasminogen to dissolve coronary clots

How can blood clot ting prevent in normal vascular system ?

By Endothelial surface factors, Fibrin fibers, Antithrombin III and Heparin.

What will happen in these conditions ?

- 1) Excess clotting = blocking of Blood Vessels
- 2) Excess fibrinolysis lead to tendency for bleeding

Mention the 3 Procoagulants factors and 3 anticoagulants factors :

Procoagulants : clotting factors, platelets and phosphlipds

anticoagulants : natural inhibtors (protien C and S) and fibrionlysis

If There is disturbance between procoagulants and anticoagulants factors that may lead to :-

Bleeding or thrombosis

EXTRINSIC MECHNANISM FOR INITIATING CLOTTING

TF or tissue thromboplastin; includes phospholipids from the membranes of the tissue plus a lipoprotein complex that functions mainly as a proteolytic enzyme

INTRINSIC

Trauma to the blood itself or exposure

of the blood to collagen (from a traumatized blood vessel wall), foreign surface/glass)

NATURAL INTRAVASCULAR ANTICOAGULANTS

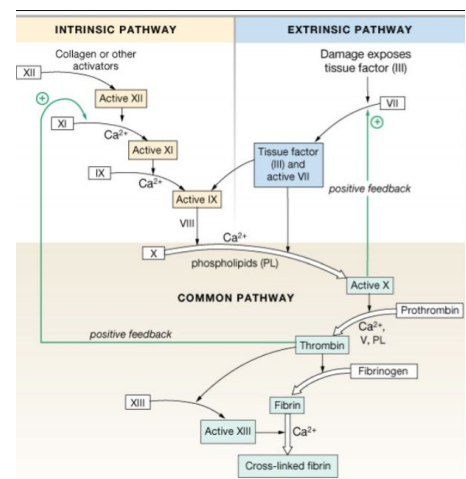
Endothelial Surface Factors

Antithrombin III

Protein C & S

Heparin

lpha2 – Macrogobulin





The formation of the platelets called Thrombopoiesis and it is regulated by Thrombopoietin (from the liver)
It is anuclear(no nucleus) ,Oval disc and discoid cell in when it isn't active spherical shape when it is activated

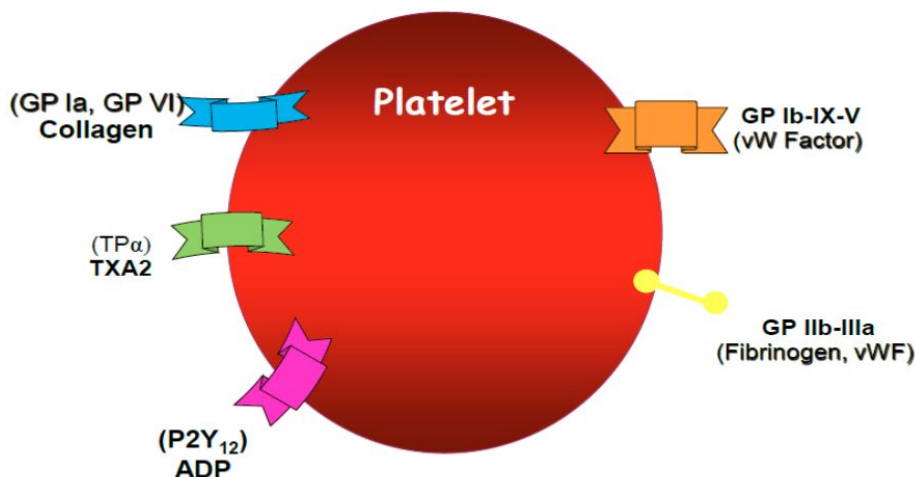
The function of platelet.

- 1- Initial arrest of bleeding by platelet plug formation (haemostasis)
- 2- Platelets and blood coagulation

Vascular phase (spasm)	Platelet plug	Coagulation phase	Fibrinolytic phase
-Immediately After injury there is localized Vasoconstriction - Causative Factors are three (3) 1. Nervous reflexes 2. Local myogenic spasm 3. Local humoral factors -For smaller vessels Platelets → Thromboxane A ₂ (Vasoconstrictor) Importance Crushing injuries → Intense spasm → No lethal loss of blood	Importance : small vascular damage -Intact endothelium secrete prostacyclin	-A series of biochemical reactions leading to the formation of a blood clot leads to the activation of thrombin enzyme from inactive form Prothrombin Thrombin will change fibrinogen (plasma protein) to fibrin (insoluble protein) formation of secondary haemostatic plug	-Break down of fibrin by naturally occurring enzyme plasmin therefore prevent intravascular blocking . -There is balance between clotting and fibrinolysis . *Excess clotting blocking of Blood Vessels *Excess fibrinolysis → tendency for bleeding

Activated Platelets Secrete:

- 1- 5HT → vasoconstriction
- 2- Platelet phospholipid (PF₃) → clot formation
- 3- Thromboxane A₂ (TXA₂) is a prostaglandin , Function: vasoconstriction , Platelet aggregation
4. ADP causes stickiness and enhances aggregation



Mention the organs that form, transport and store the bile?

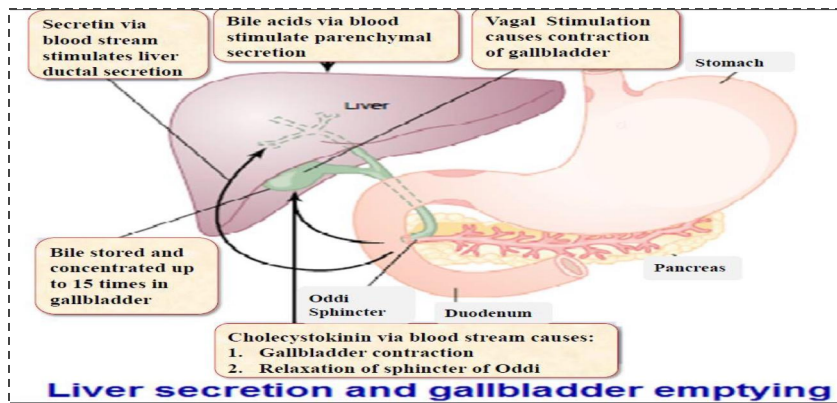
Liver forms, bile ducts transport and gallbladder stores the bile.

Mention some characteristics of bile ?

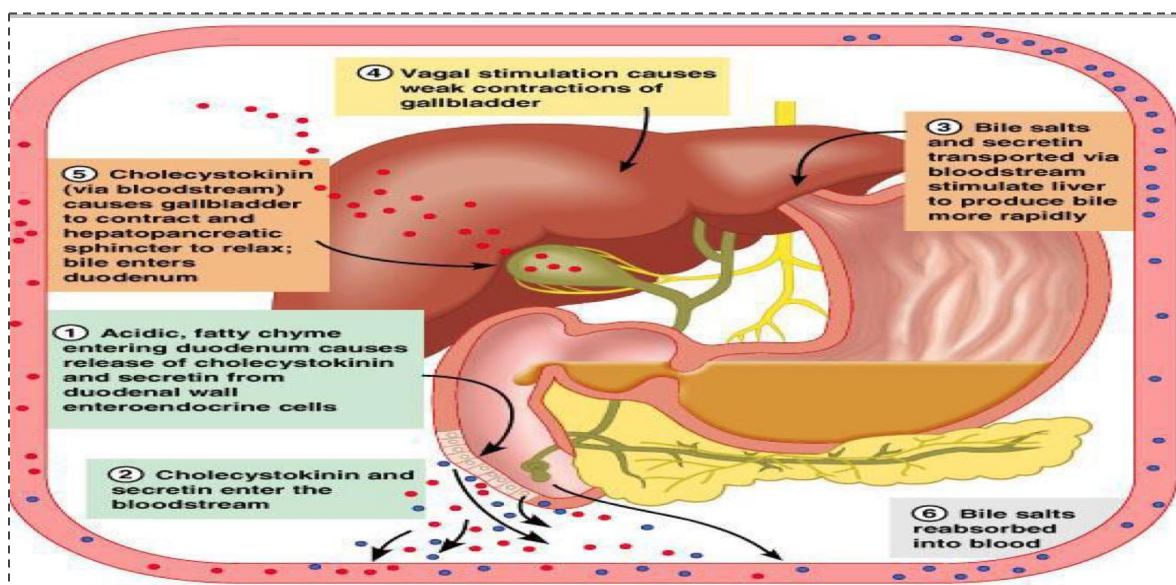
- 1-viscous golden yellow or greenish fluid with bitter taste
- 2-Isotonic with plasma and slightly alkaline (because of the presence of NaHCO_3)
- 3-Daily production from liver= 5 L /day ,only 700-1200 ml/day are released into duodenum

Mention 4 components in the bile ?

- 1-viscous golden yellow or greenish fluid with bitter taste
- 2-Isotonic with plasma and slightly alkaline (because of the presence of NaHCO_3)
- 3-Daily production from liver= 5 L /day ,only 700-1200 ml/day are released into duodenum
- 4- water

Talk briefly about liver secretion and gallbladder emptying ?**Mention two causes of the reduction of bile secretion ?**

- A. Vagotomy
- B. Stimulation of sympathetic nervous system relaxation of the gall bladder



Talk briefly about Bile?

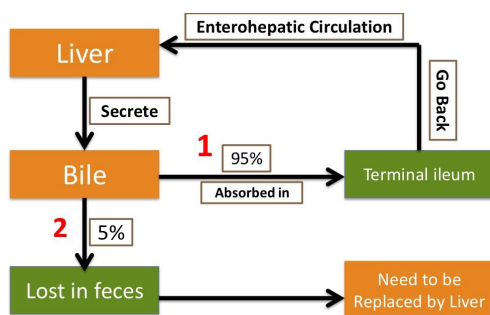
Bile: is a watery mixture of organic and inorganic compounds synthesized by liver .
Mainly consist of = bile acid + bile salt (conjugated bile acid)

How bile salts get conjugated ?

By adding glycin or taurine (to bile acid) to form glyco and taurocholic bile. So bile acid + glycin or taurine = bile salt

Why bile acid needs to get conjugated ?

1-Because cholesterol is insoluble in pure water. 2- Bile salts are much more polar than bile acids and have greater difficulty penetrating cell membranes . 3- they play an integral role in the intestinal absorption of lipid.

Talk briefly about enterohepatic circulation ?**Mention the 4 functions of bile acids ?**

1-Digestion of fats 2- absorbtion of fats 3- absorbtion of fat soluble vitamins
4-In the colon bile acids inhibit reabsorption of water & electrolytes, stimulate intestinal motility, prevent constipation & may cause diarrhea.

Mention the types of gall stones ?

1- Cholesterol stones 2- Calcium bilirubinate stones(pigmented)

Mention the 4 risk factors for gall stones ;

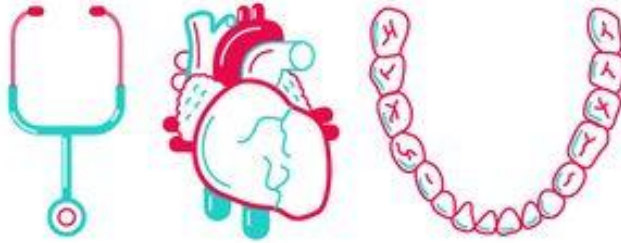
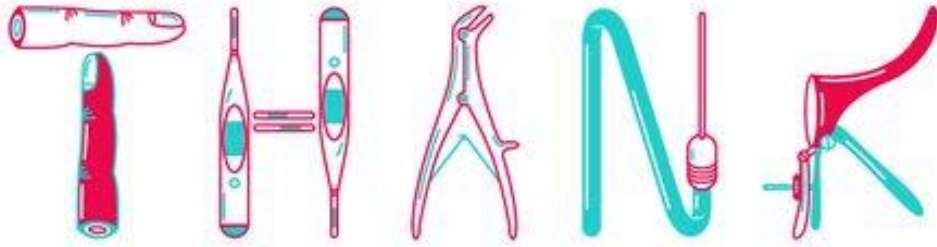
1- Female 2- obesity 3- Fatty diet 4- Forty

Why gallstones arise in the gall bladder or bile duct ?

Gallstones due to imbalance rendering cholesterol & calcium salts insoluble

Mention the effect of cholecystectomy ?

1-Bile (not the gall bladder) is essential for digestion.
2-After removal of the gall bladder bile empties slowly but continuously to the intestine allowing digestion of fats sufficient to maintain good health & nutrition.
3-Only high fat meals need to be avoided.



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