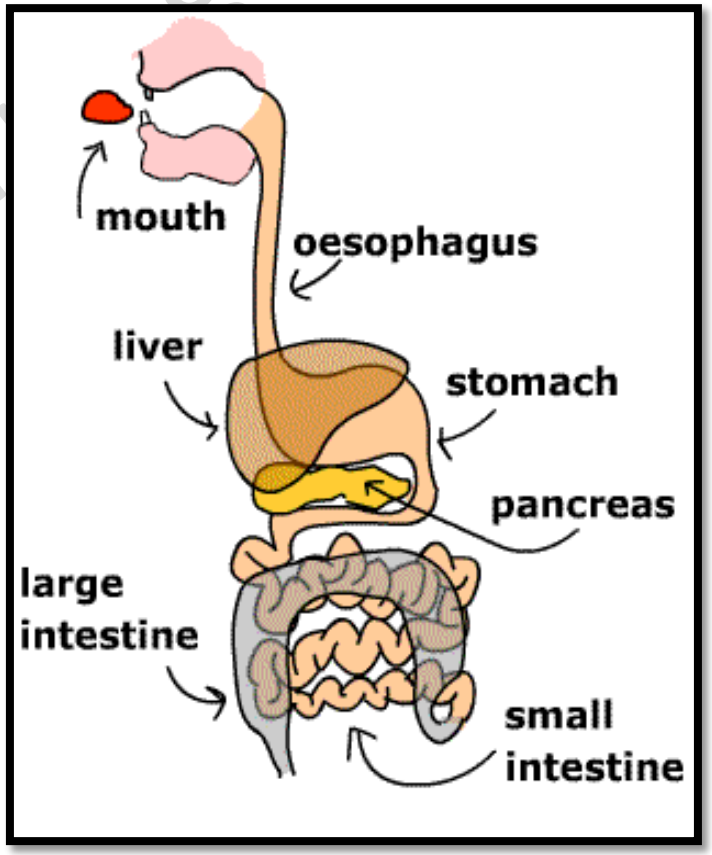
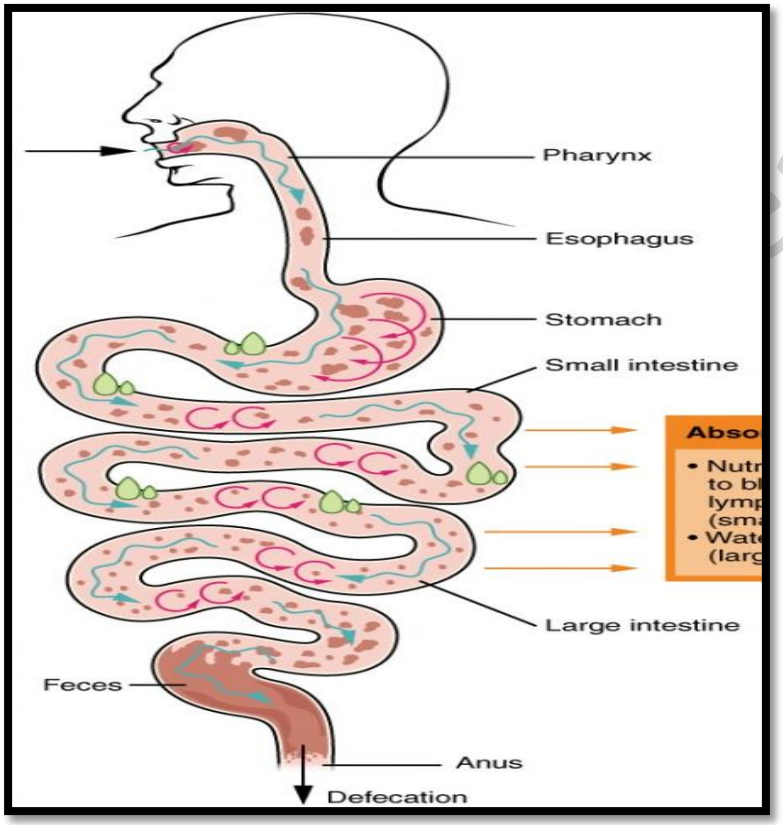
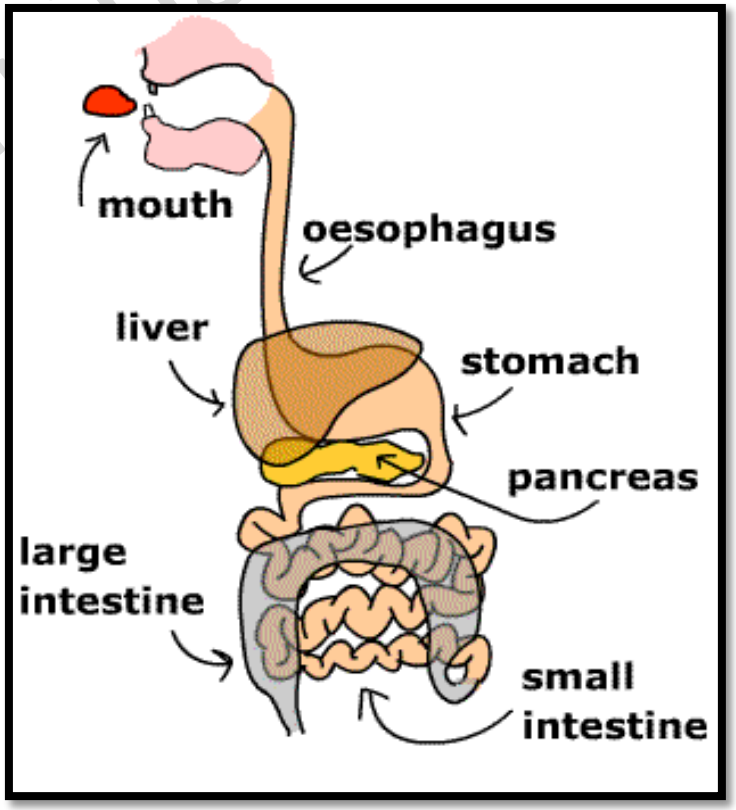
Gastro Intestinal Tract

- GIT is an organ system which takes in food, digests it, extracts energy from food and expels remaining waste as feces.



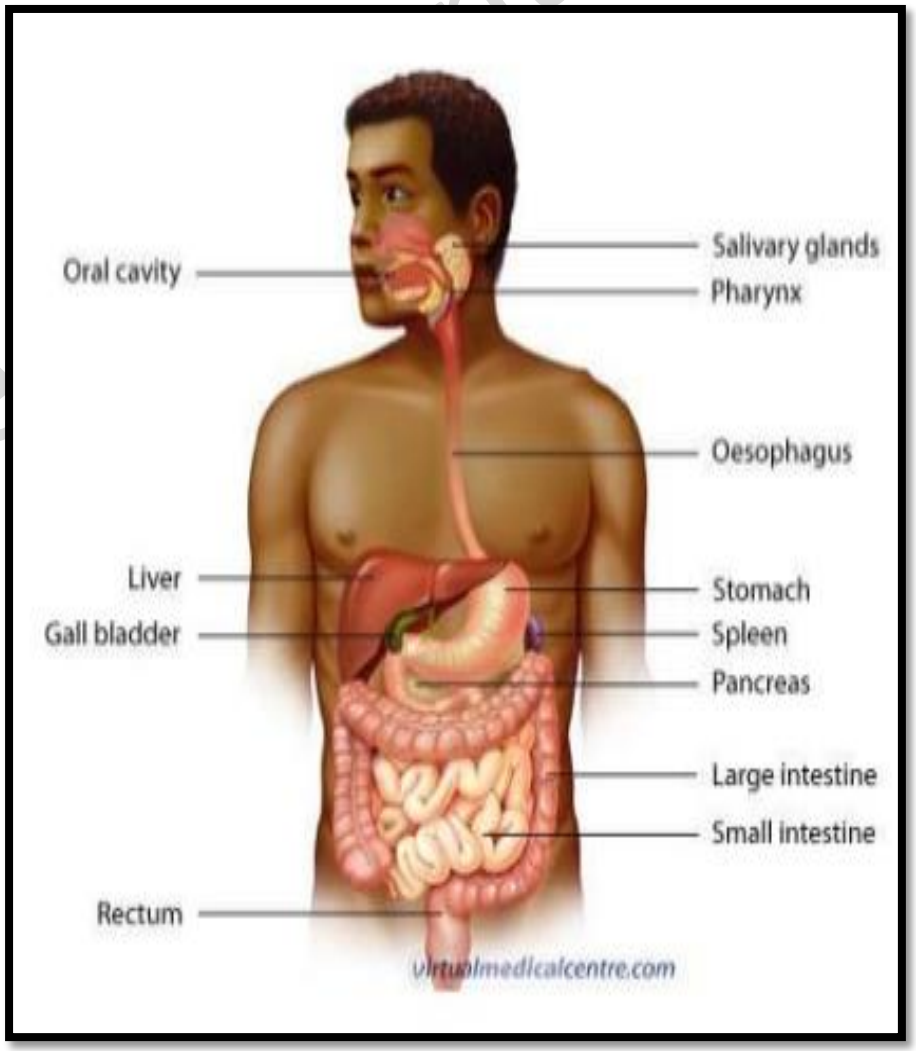
- **Digestion:**
- Process of breakdown of food macromolecules into smaller molecules with the help of enzymes.





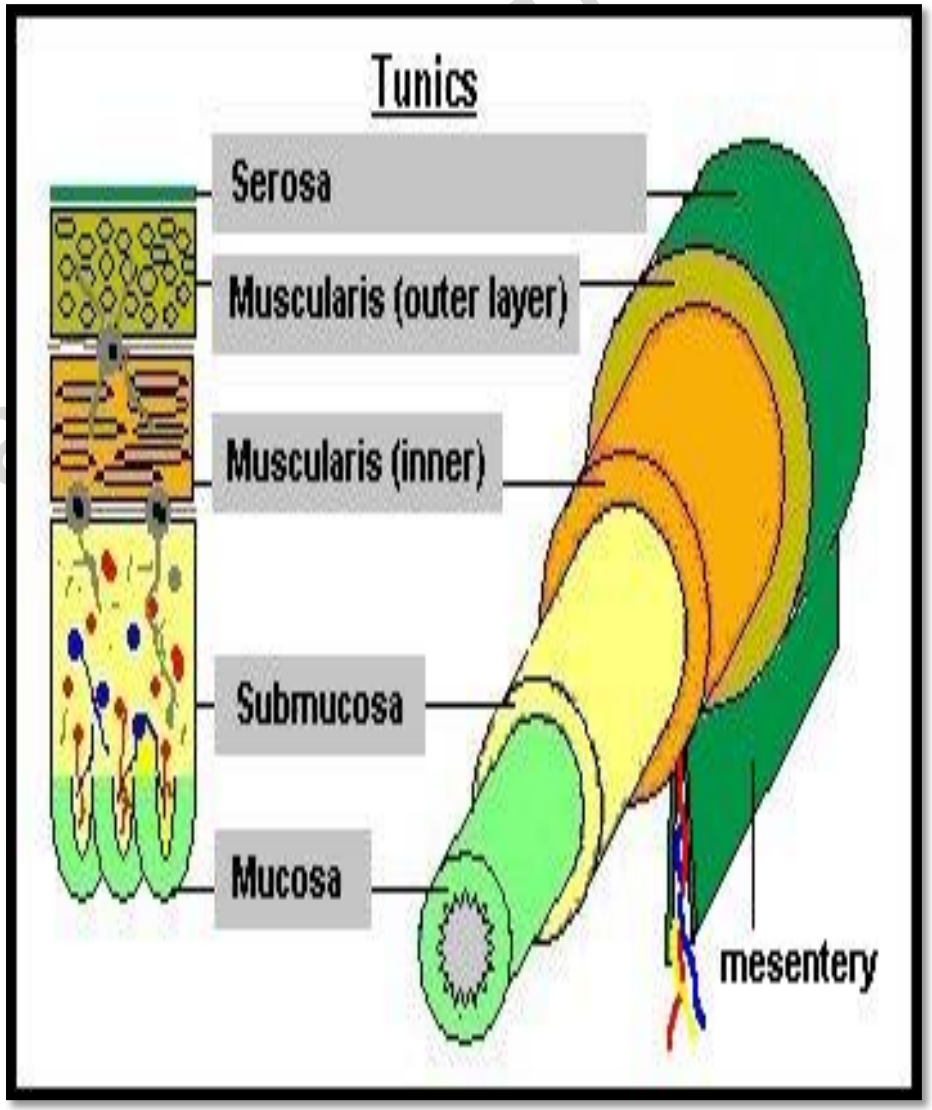
GASTROINTESTINAL SYSTEM

- **Parts:**
- *Mouth*
- *Salivary glands*
- *Esophagus*
- *Stomach*
- *Liver*
- *Pancreas*
- *Small & Large intestine*



Structure of GIT wall

1. Inner most – Mucosa
2. Submucosa
3. Muscular Layer
4. Outer most -- Serosa



Structure of GIT wall

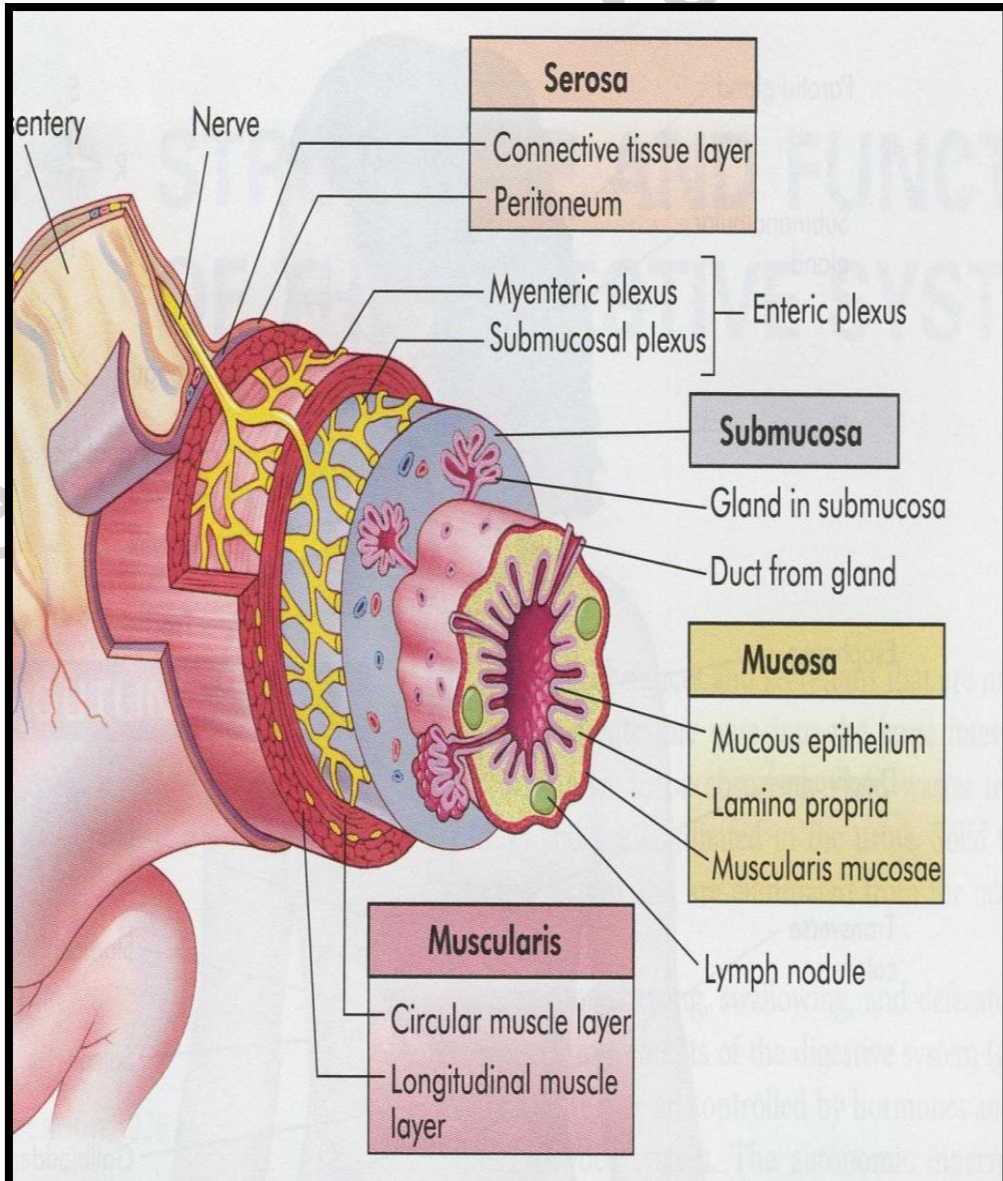
1. **Inner most – Mucosa**

- **Epithelial layer**
- **Lamina propria**

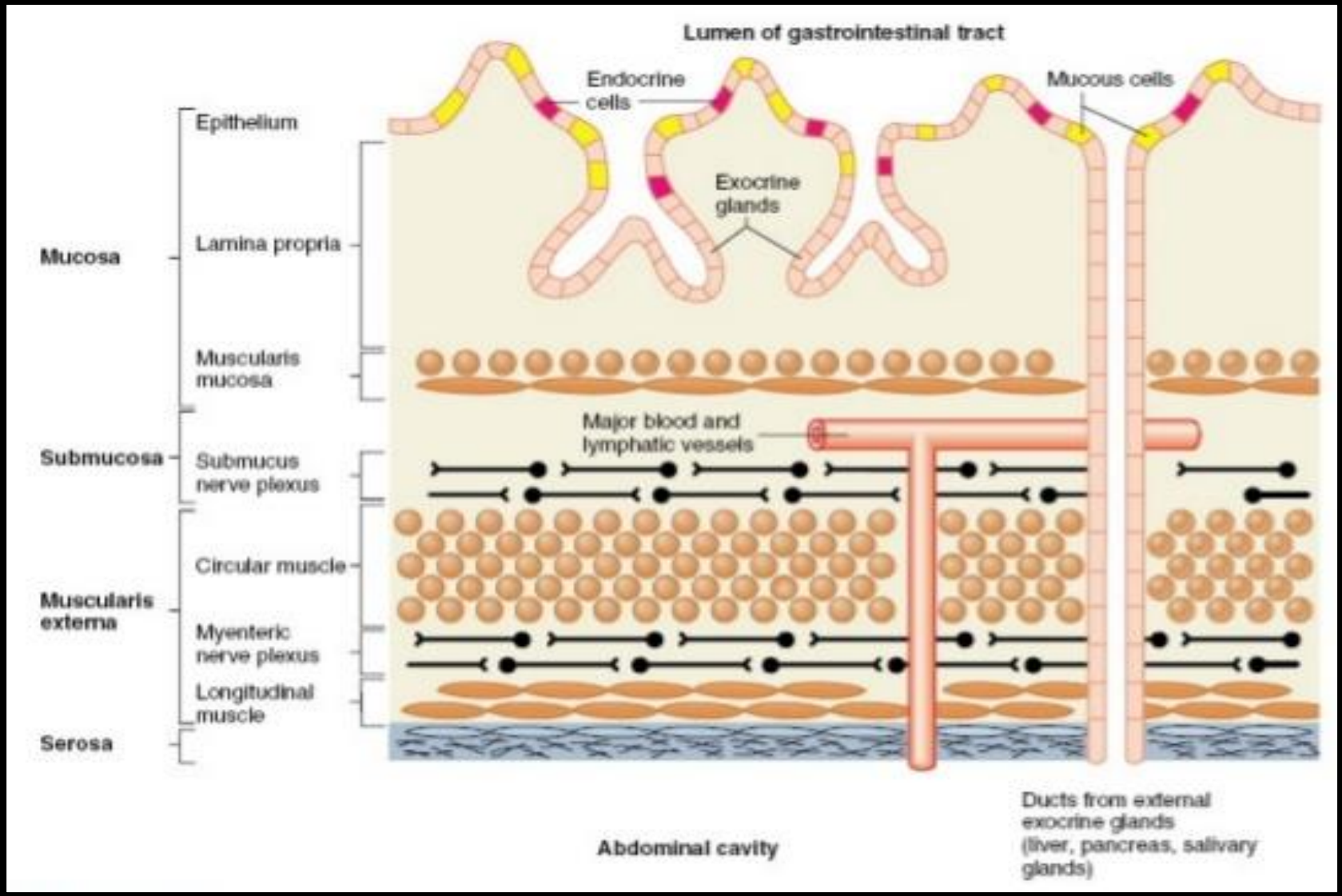
(glands, blood vessels, lymph nodes)

- **Muscularis mucosa**

(thin layer of smooth muscle fibers)



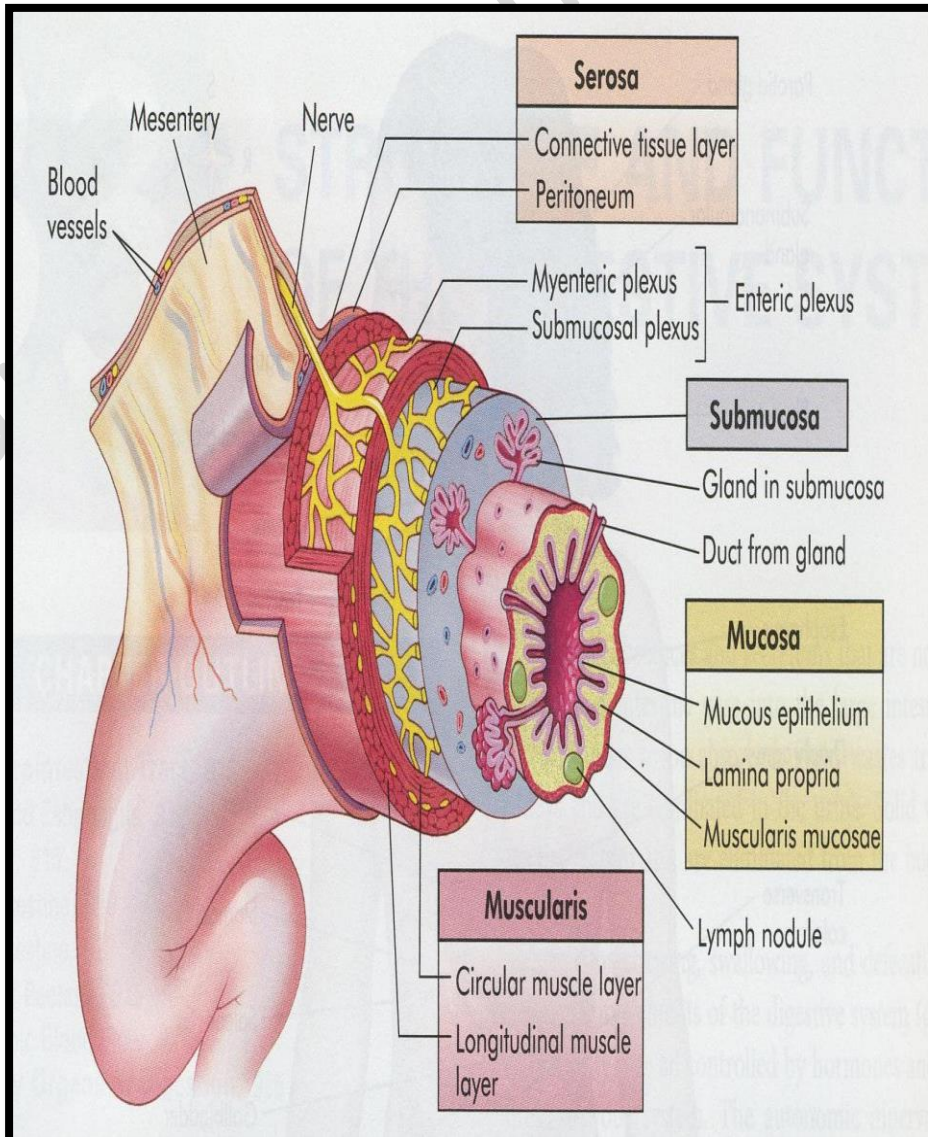
Structure of GIT wall



Structure of GIT wall

2. Submucosa

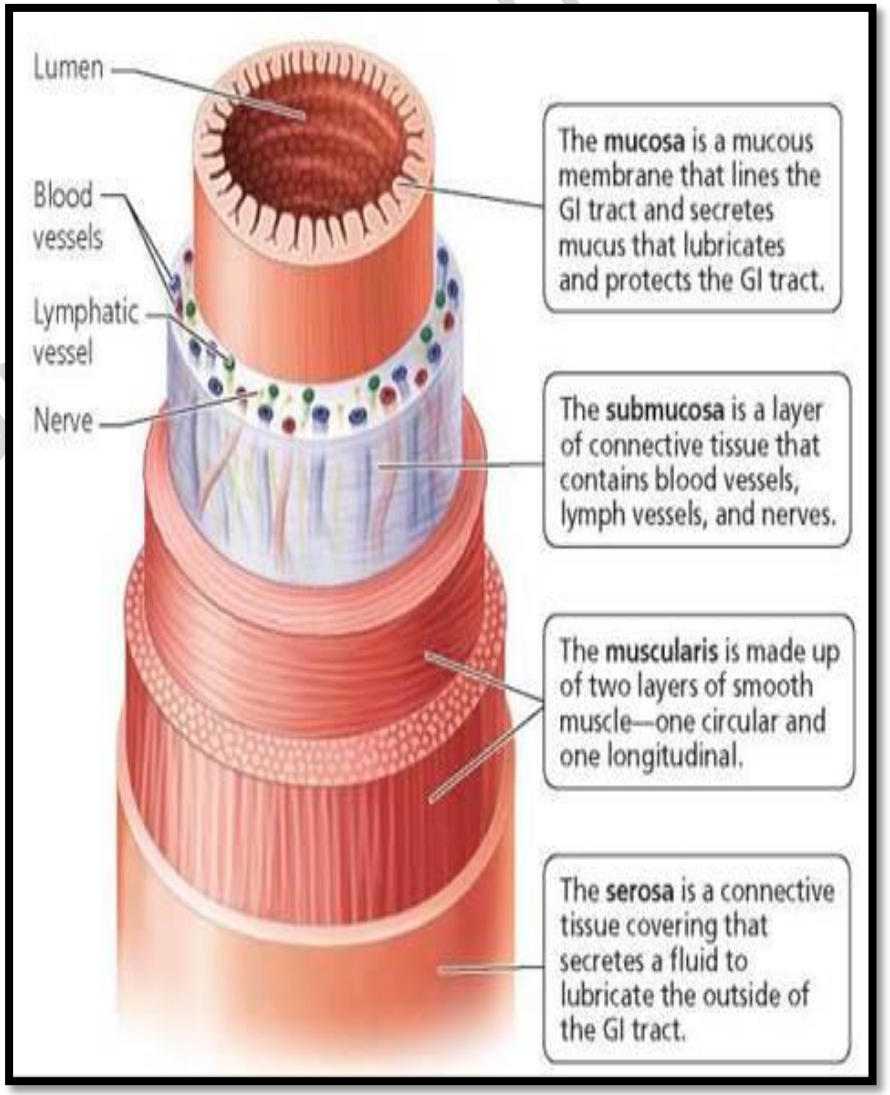
- glands,
- blood vessels
- Lymphatics
- **Meissner's nerve plexus**



Structure of GIT wall

3. Muscularis Layer

- Thick layer of smooth muscles.
- **Inner circular smooth muscle**
- **Outer Longitudinal smooth muscle**

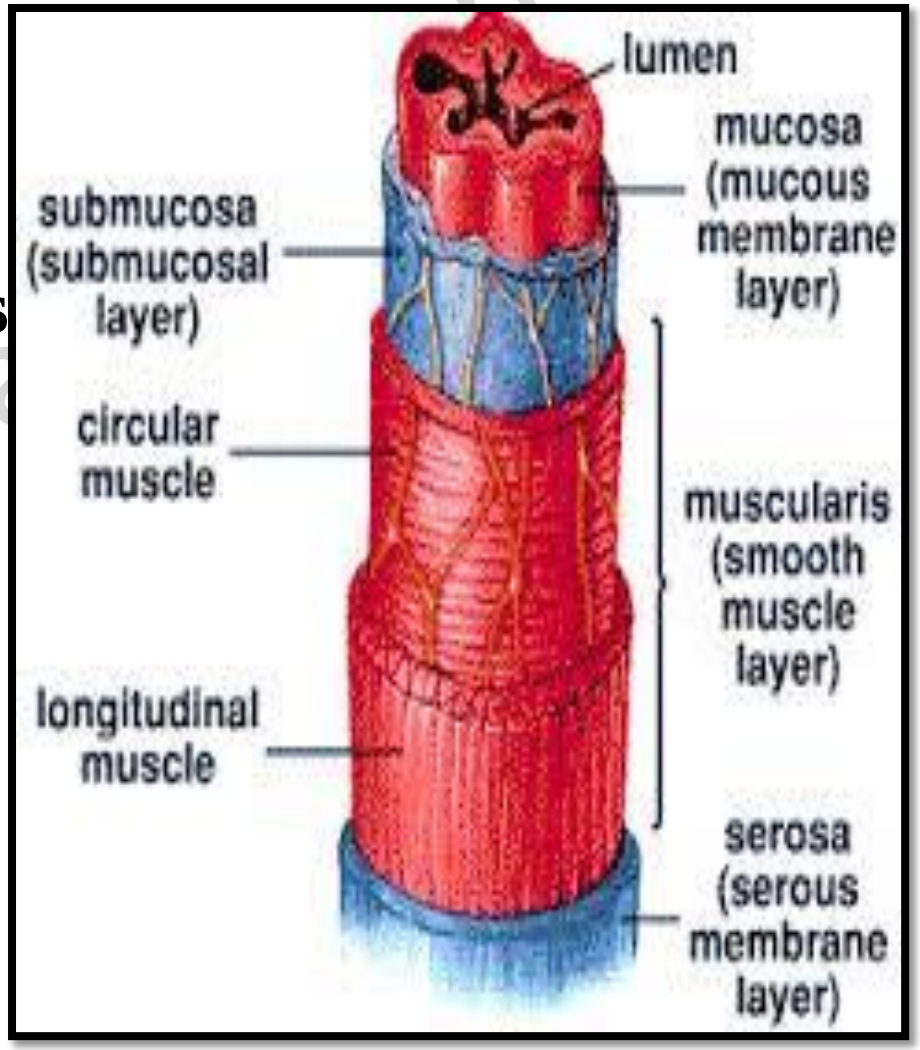


Structure of GIT wall

3. Muscularis Layer

- **Between two muscle layers.**
- **Is a network of nerve fibers**
- **Myentric plexus**

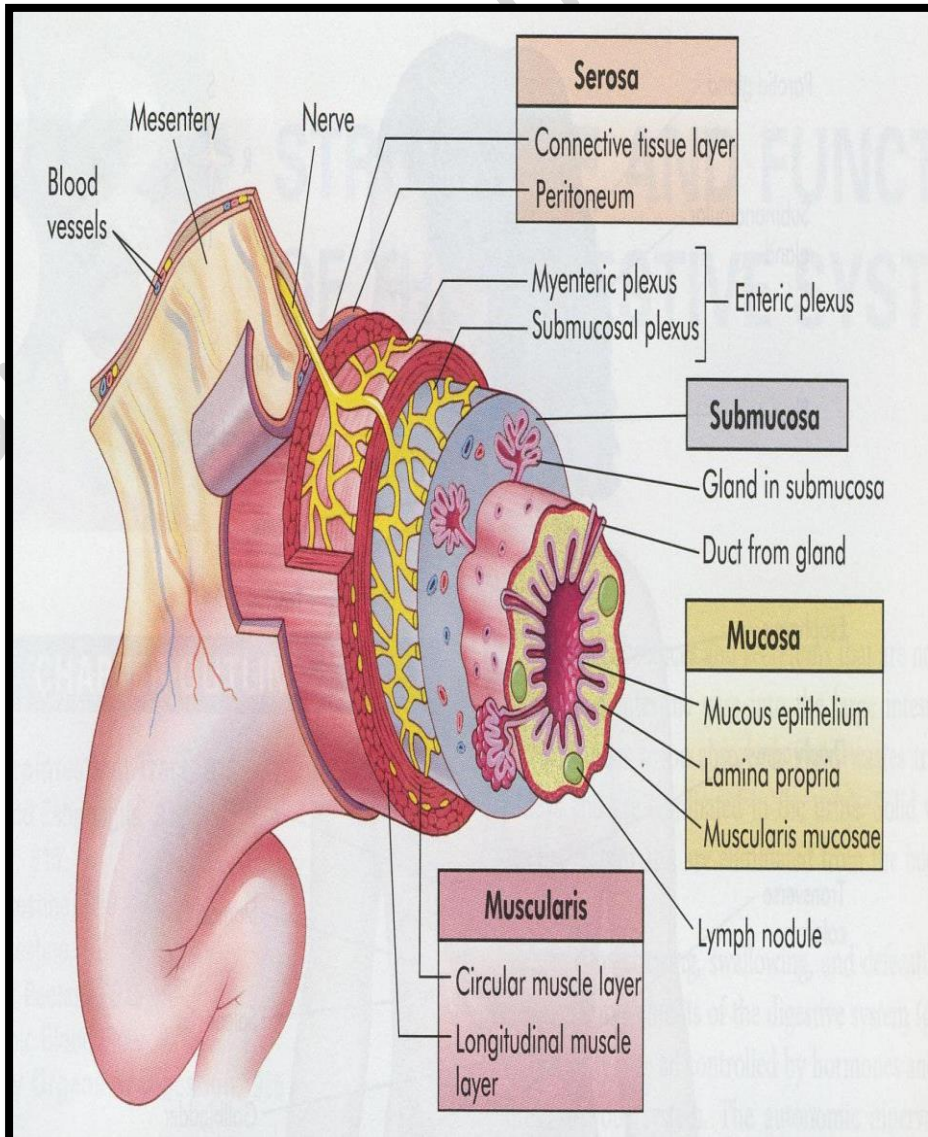
(Auerbach's Plexus)



Structure of GIT wall

4. Serosa

- Outermost layer
- **Connective tissue**
- Attaches gut to surrounding structures.



Nerve plexus with in the gut (intrinsic innervation)

- **Meissner's Plexus (Georg Meissner)**

  controls

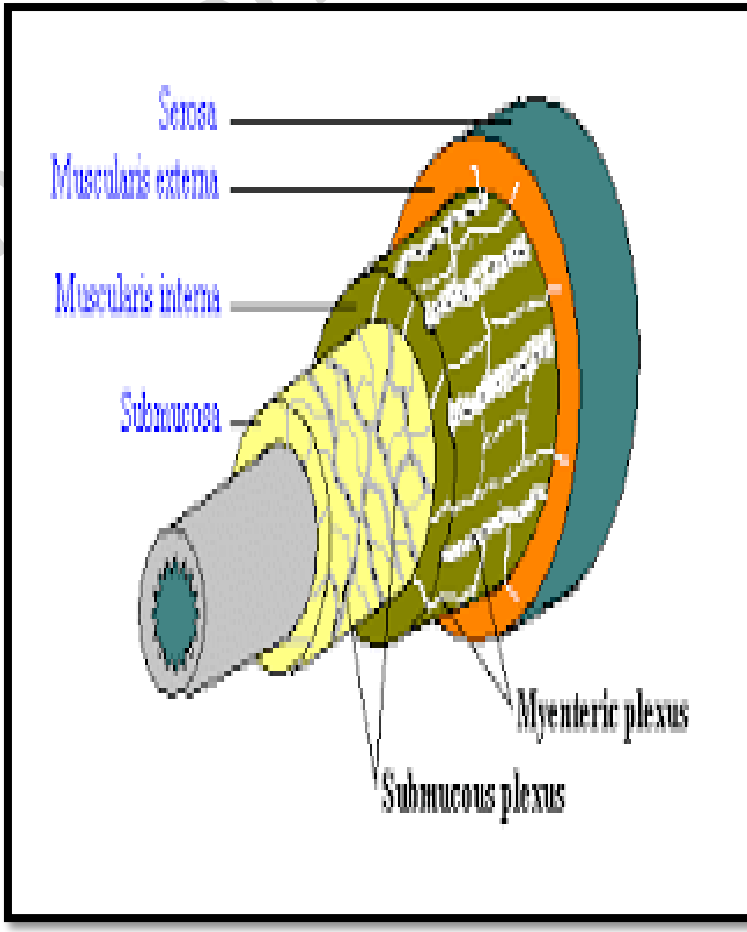
  - digestive secretions from glands

  - Blood flow to gut

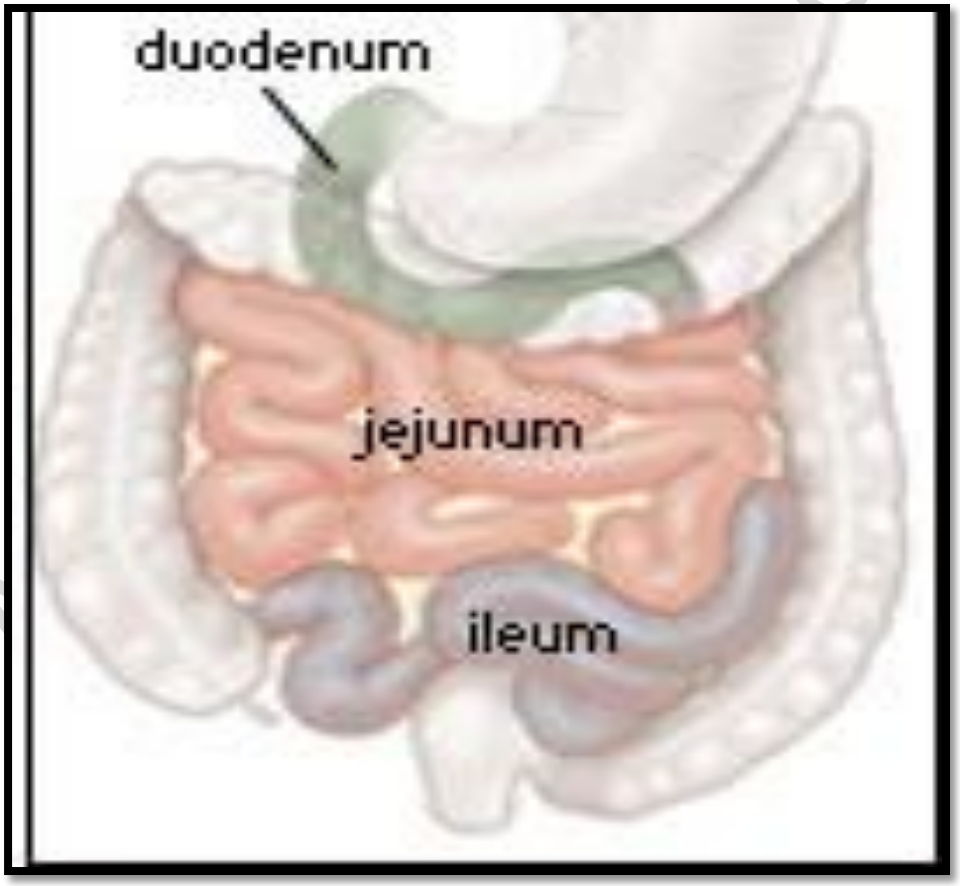
- **Myenteric Plexus (Auerbach)**

  controls

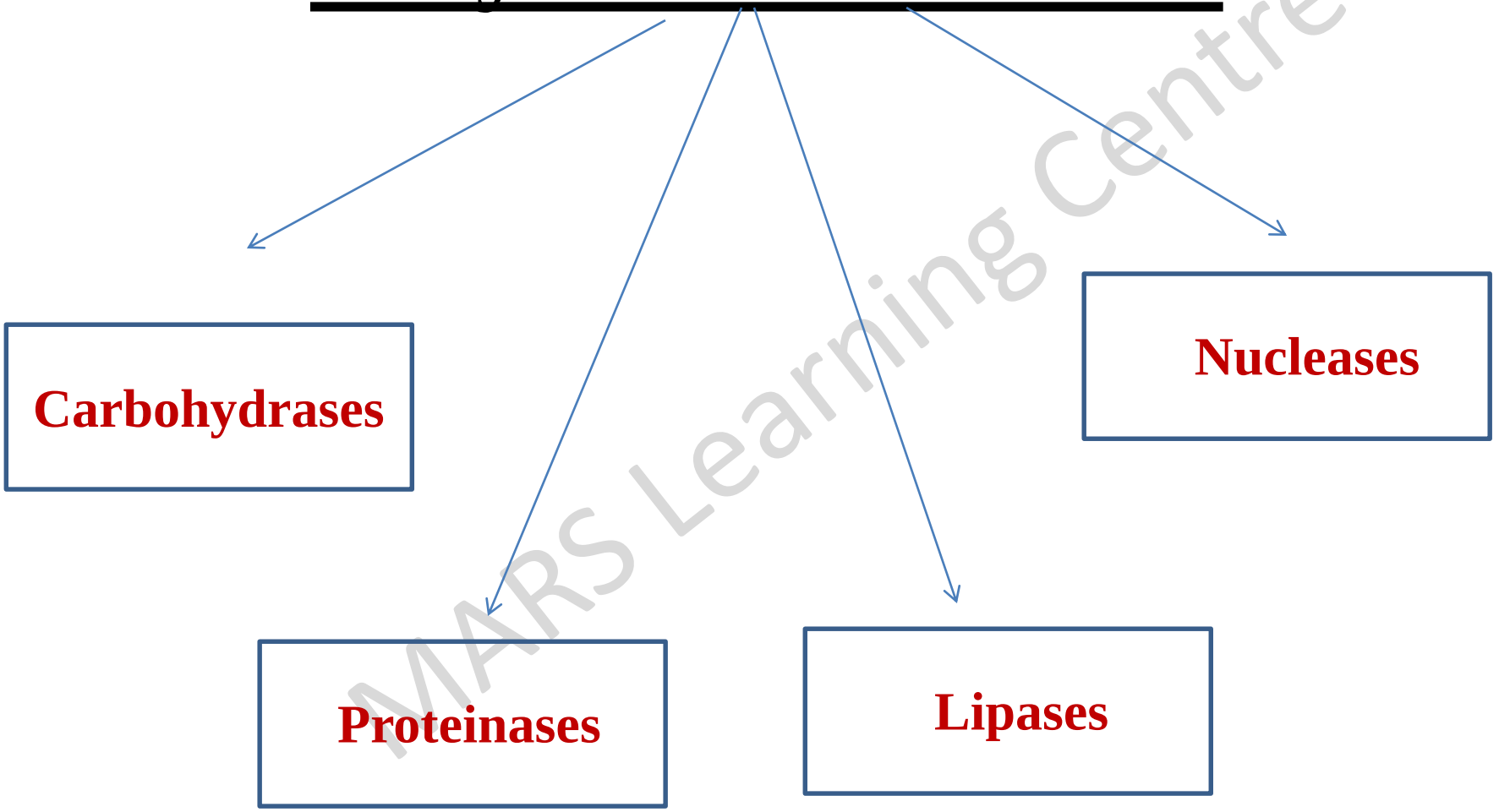
- **Contractions of smooth muscles**
- **Motility of gut**



Digestive system Functions



Enzyme classification



FUNCTIONS OF MOUTH

Ingestion of food

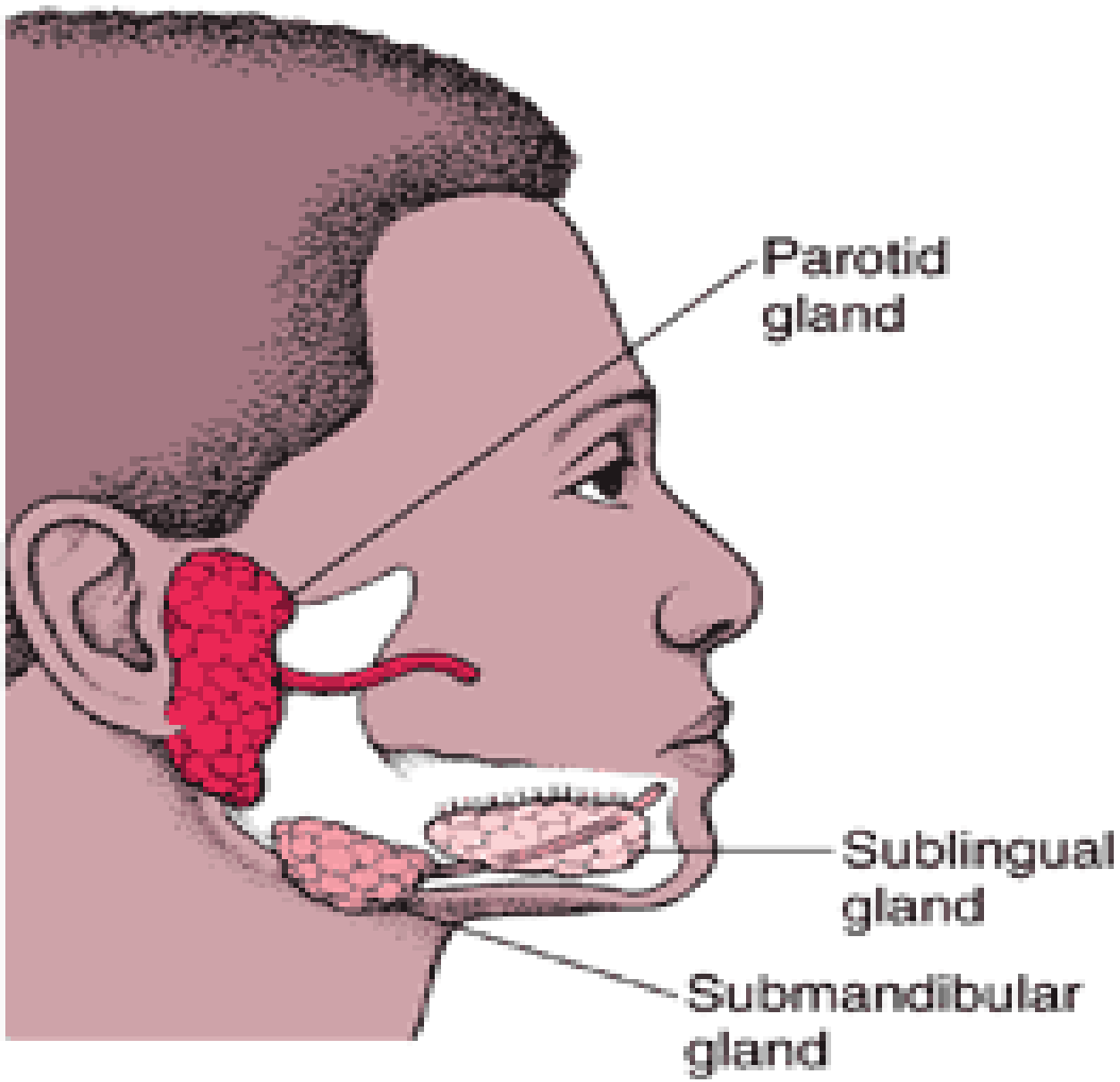
Chewing of food

Mixing the food with saliva

Appreciation of taste of food

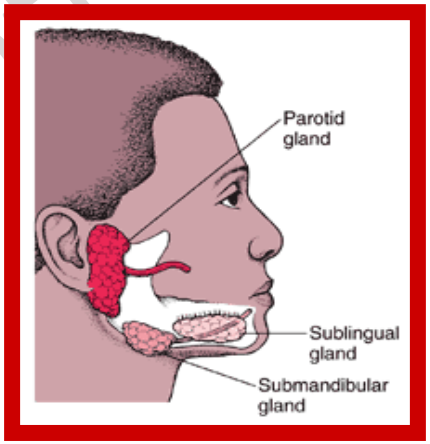
Transfer of food to the esophagus

MAJOR SALIVARY GLANDS



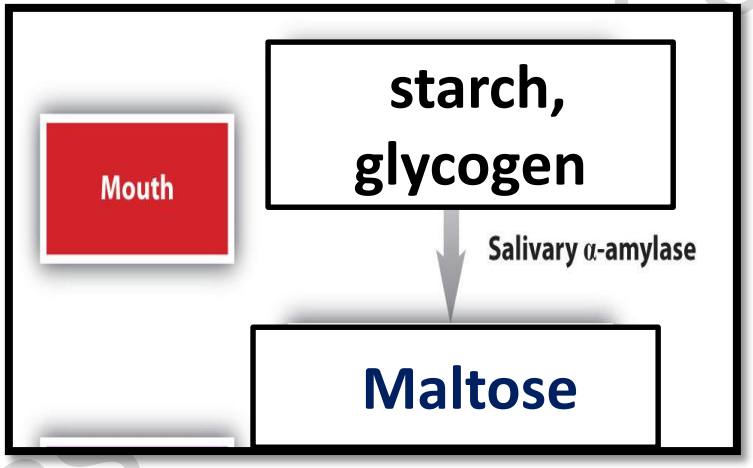
Composition of saliva

- 1000-1500 ml/day
- Water - 99.55%
- Solids- 0.5%
- Specific gravity: 1.002-1.012



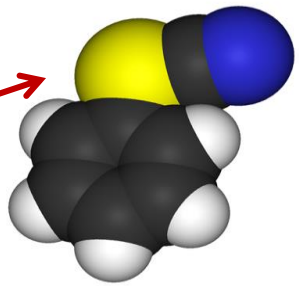
Inorganic substances	Organic substances
Sodium, potassium,	Ptyalin (Salivary amylase)
bicarbonate, chloride,	Lingual lipase by Ebner's glands
bromide, phosphate	Mucin, lysozymes, Thiocyanate ions

- Ptyalin function is pH specific
- Doesn't function in highly acidic medium



Functions at a Ph of 6.8

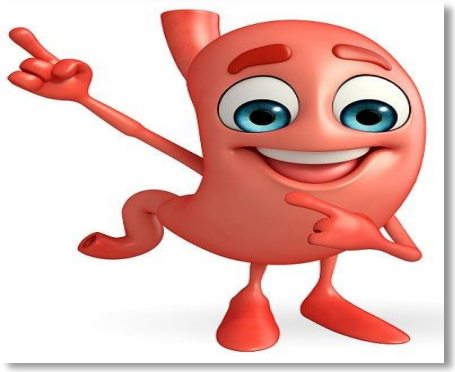
- Saliva contains – Lysozymes & Thiocyanate ions



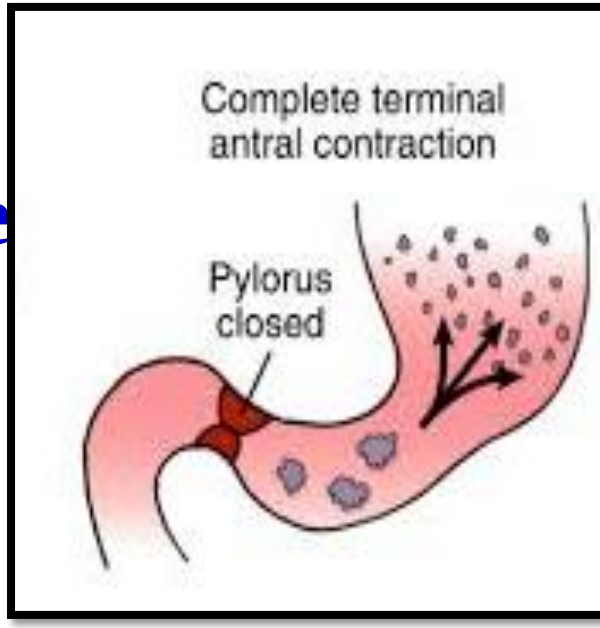
Thiocyanate

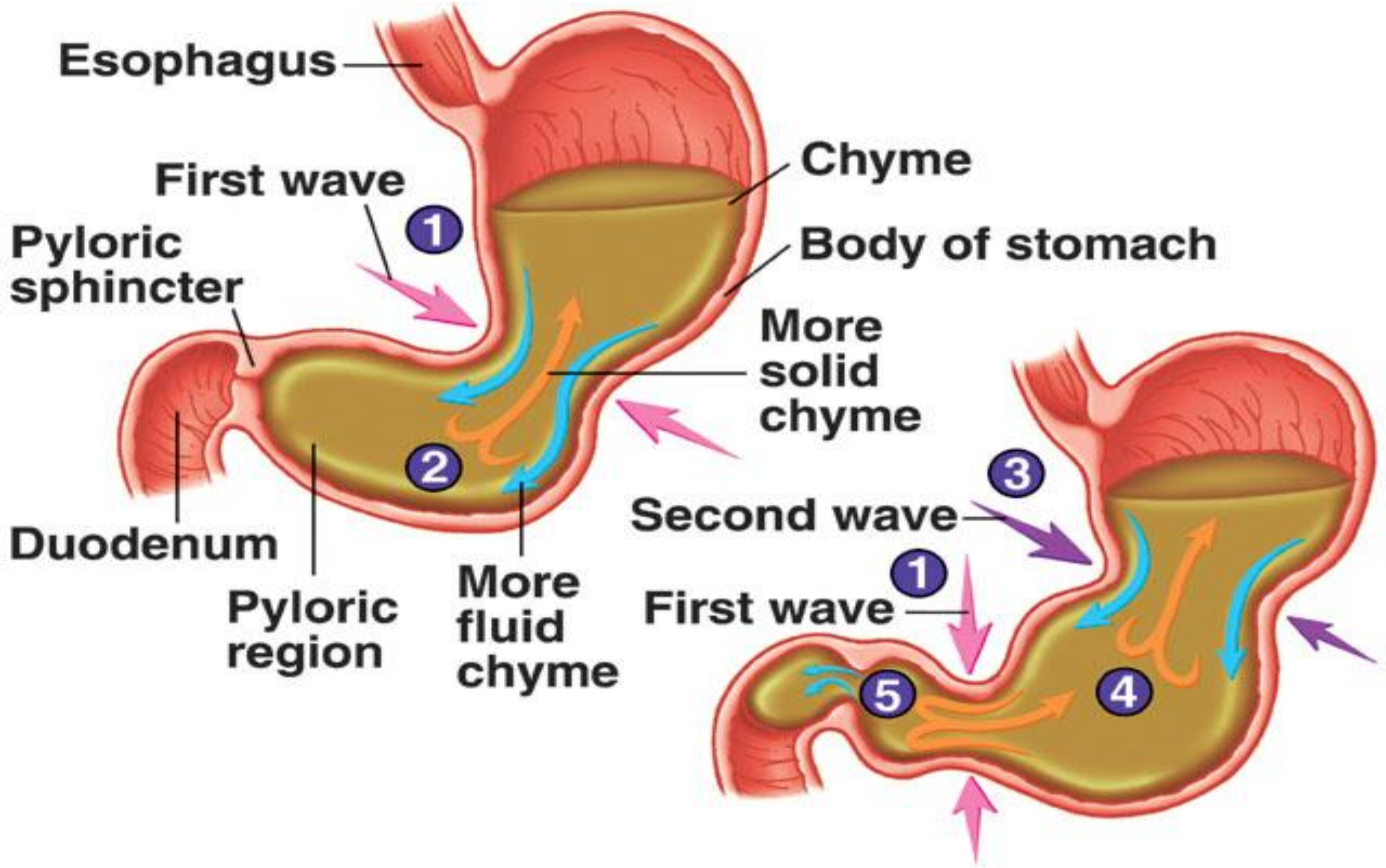
Bactericidal function

Digestion in stomach



- Bolus mixed with gastric juice.
- Remains for 3 -4 hours
- **Peristaltic contractions** of stomach.
- Converts bolus to **semi fliud chyme**





Digestion in stomach is by gastric juice secreted by gastric glands and aided by peristalsis

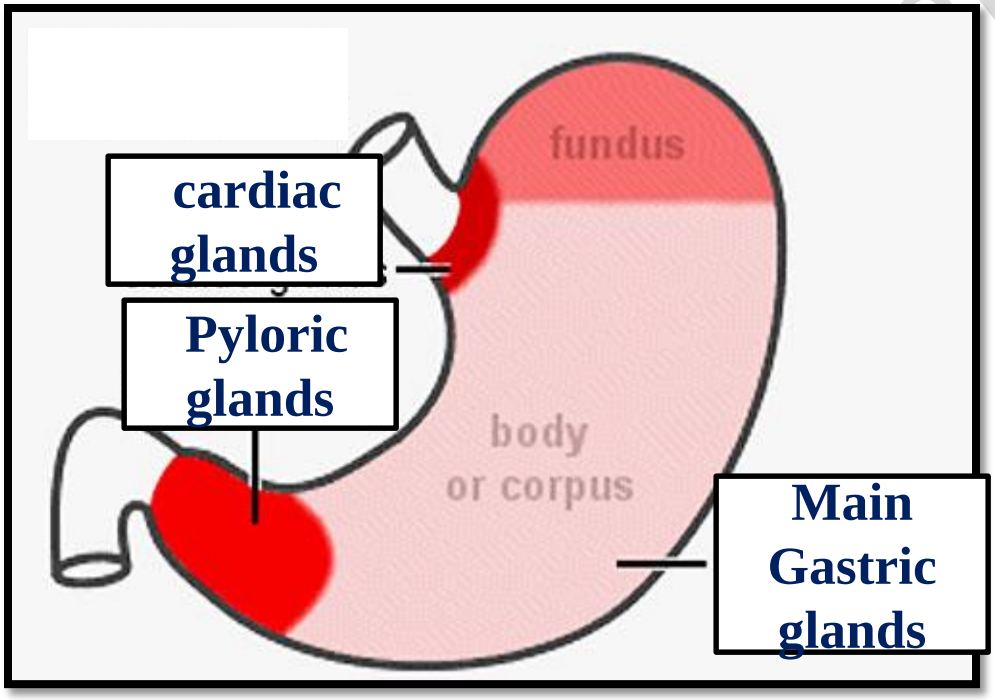
Gastric Mucosa

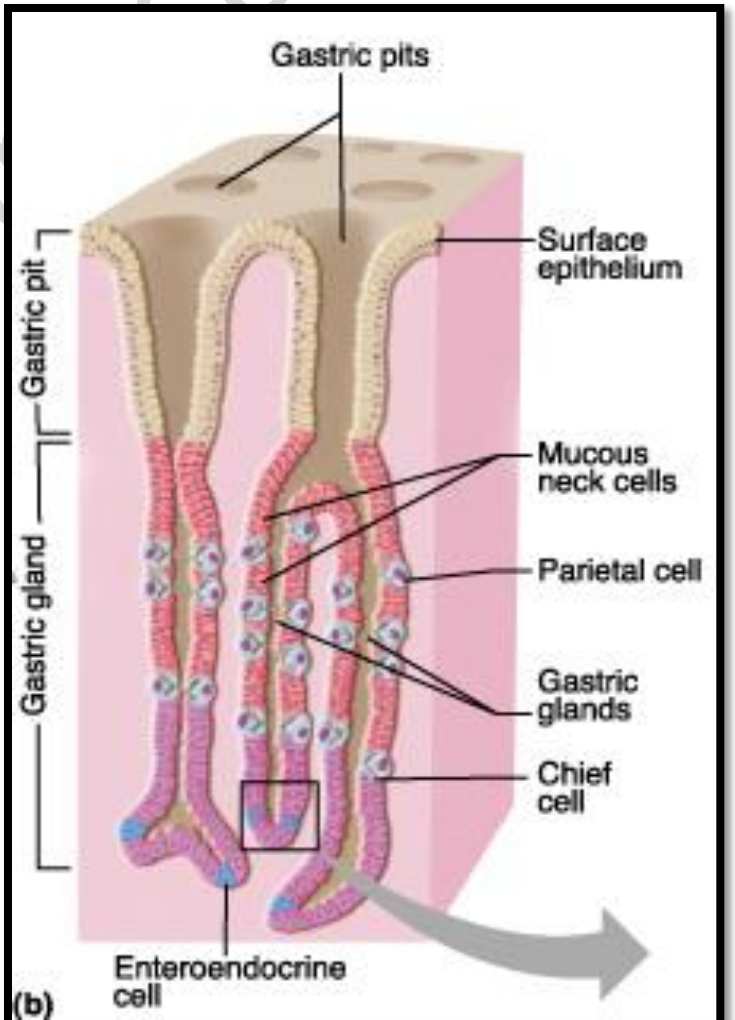
- Invaginations of gastric mucosa

↓

Gastric Glands

- **Types of gastric glands**





Cardiac Glands

Main Gastric glands

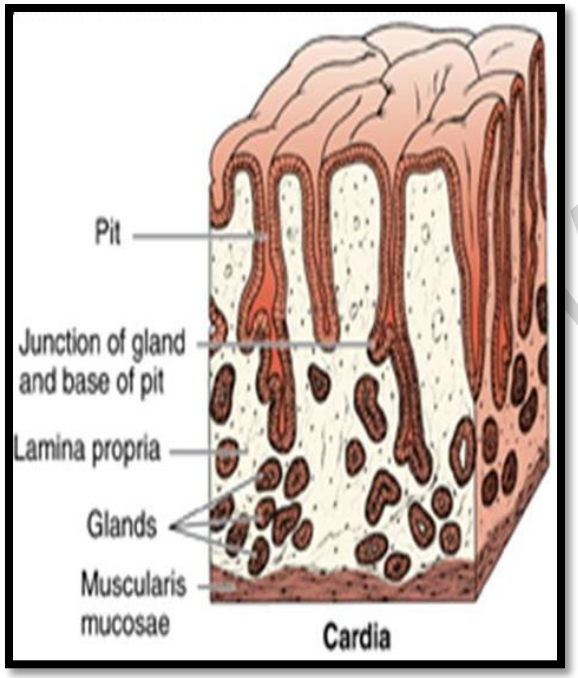
Pyloric glands

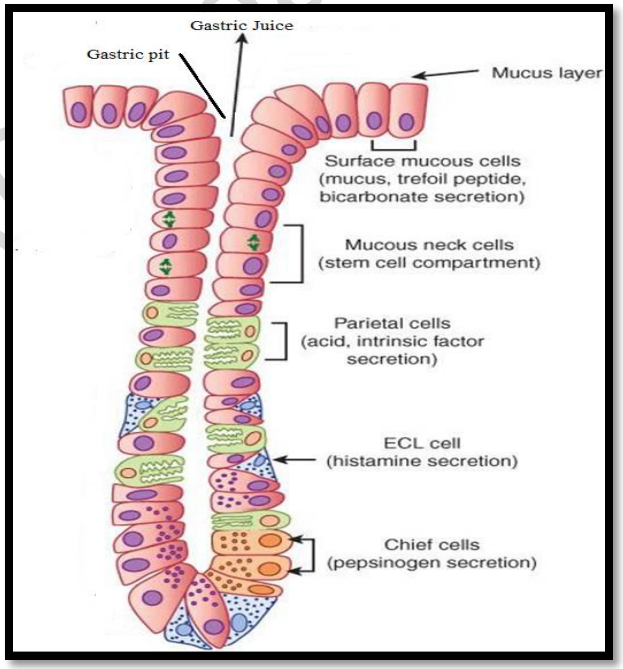
Secretes – mucus

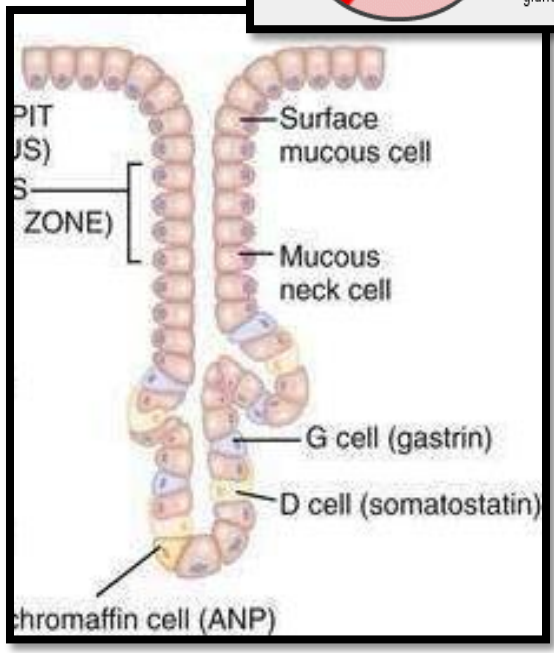
Oxyntic glands

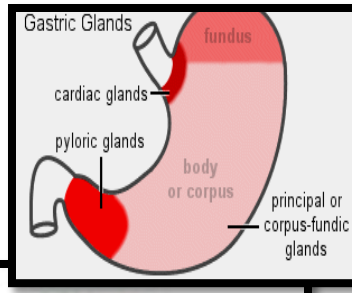
mucus, Gastrin

Mucus, Hcl, Intrinsic factor of castle, Pepsinogen, gastric lipase, histamine

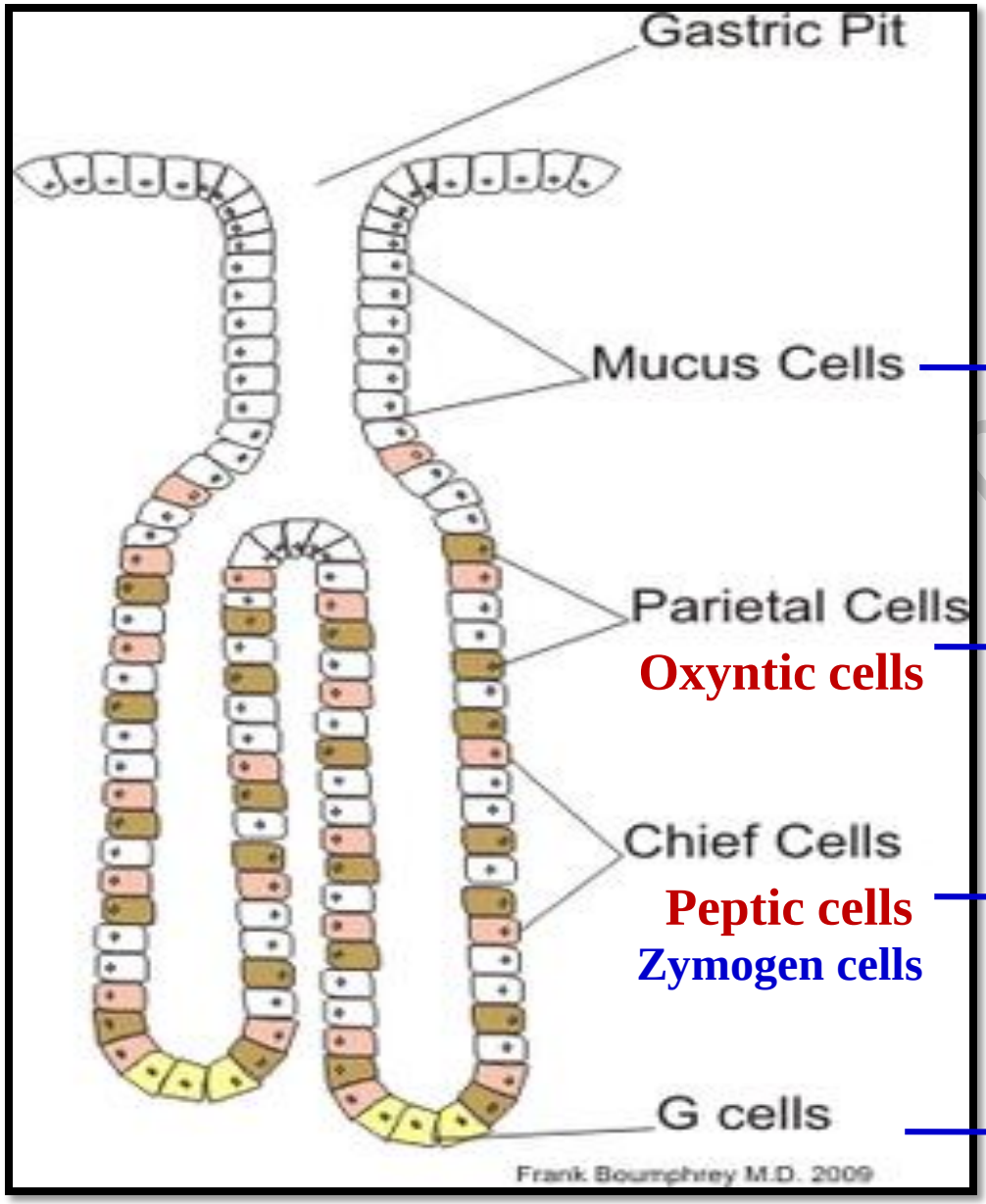


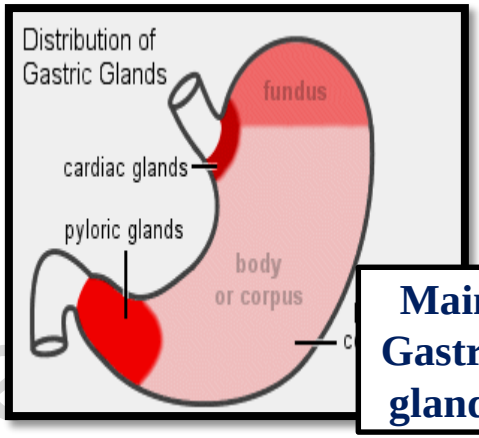






Cells in Main Gastric gland





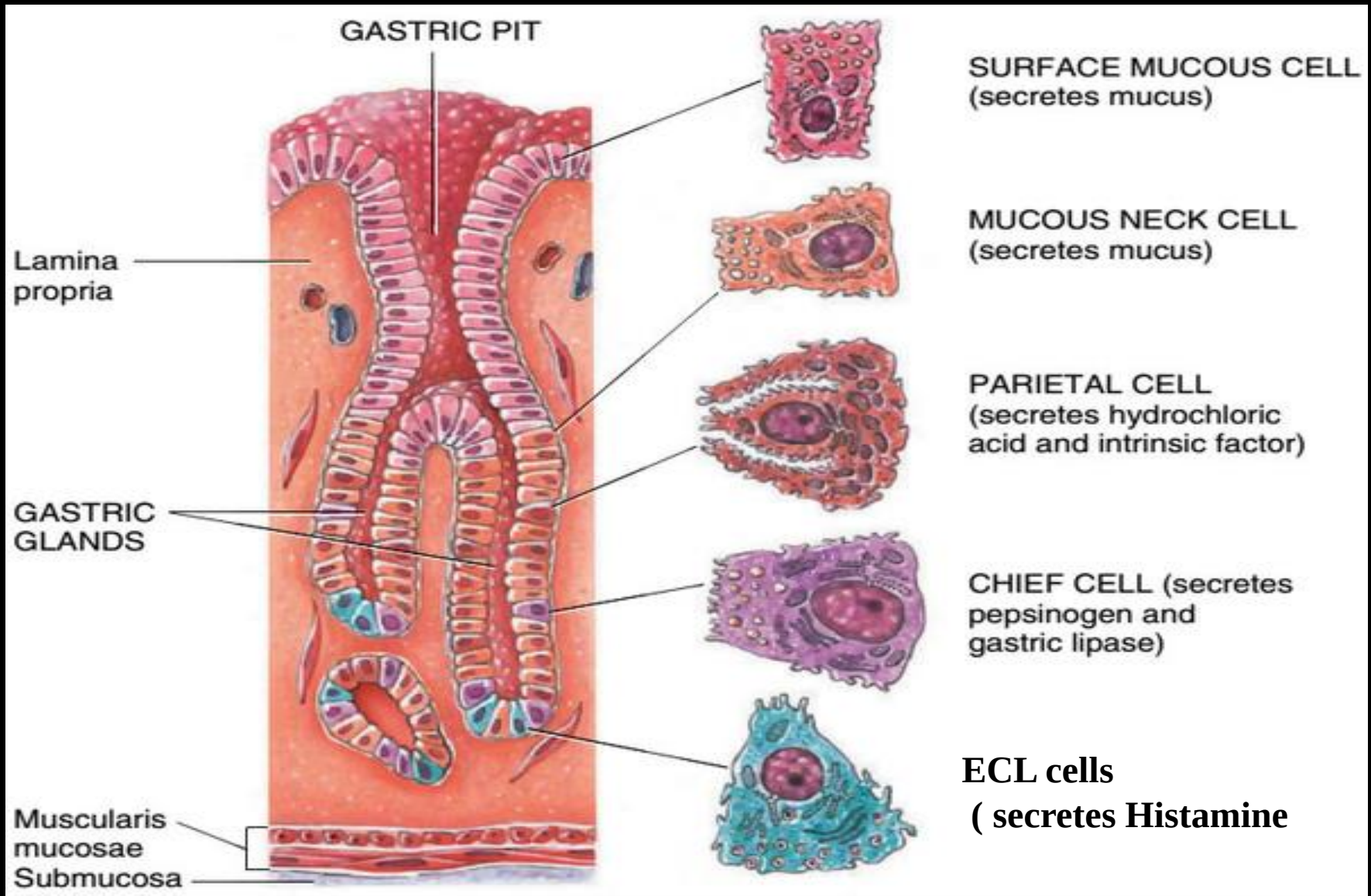
Mucin ,HCO_3^-

HCl , Intrinsic factor

pepsinogen
proteolytic enzymes
gelatinase

Gastrin hormone

Main Gastric glands



Composition of gastric juice

2 – 3lt /day

Water - 99.55%

Solids- 0.5%

pH: 1- 3.5 (acidic)

Inorganic substances: Na^{+}, Cl^{-}, K^{+}, Mg^{+}, H^{+}, Hcl, $HCO3^{-}$, So_4^{2-}

Composition & Functions of gastric juice

Organic substances

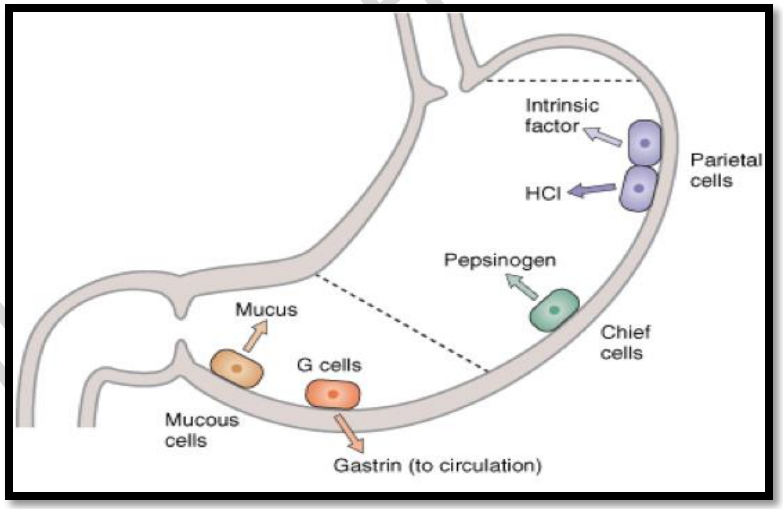
1. **Pepsonigen** → **Pepsin**
   (**Hcl activates**)

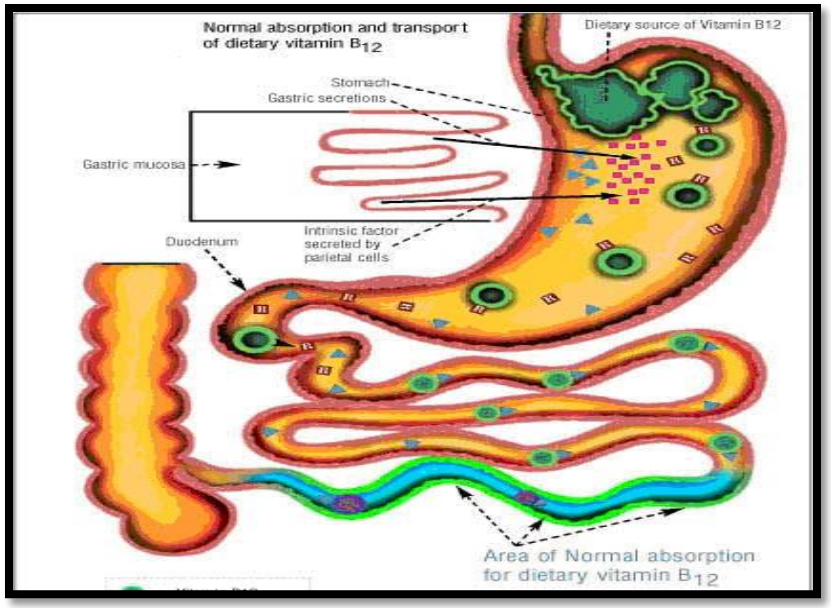
2. **Renin/ chymosion** - **present in infants and animals (curdles milk)**
   casein protein → **calcium paracaseinate**

3. **Gastric lipase** → **milk fat tributyrin** → **fatty acids**
4. **Gastric amylase** → **on starch**
5. **Mucous** – gel like , lubricates food & coats the mucosa.
6. **Intrinsic factor of castle** → **Absorption of vit B_{12}**
7. **Gelatinase** → **acts on meat proteoglycans**

Intrinsic Factor of Castle

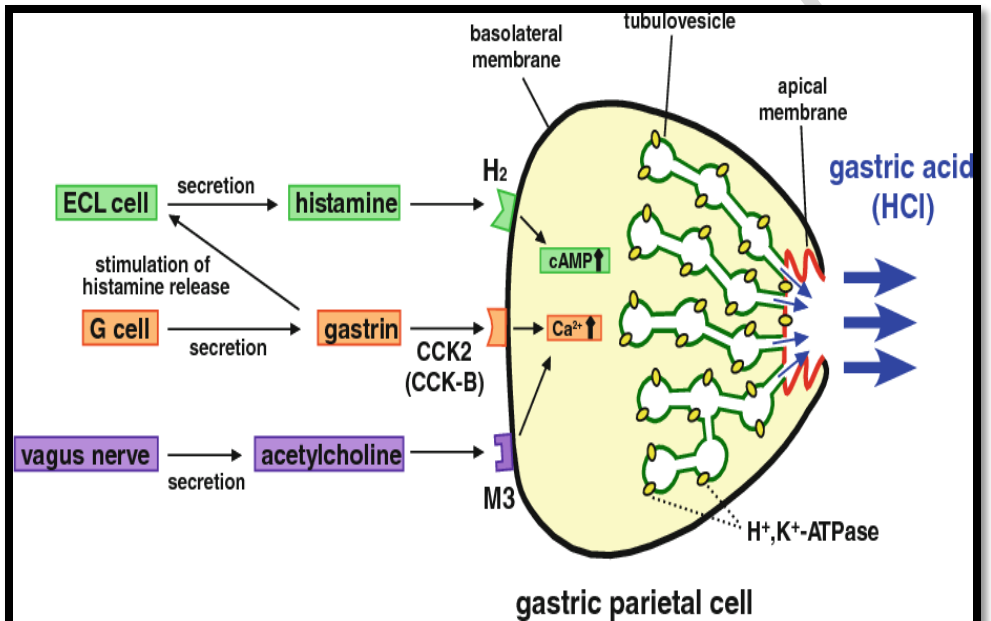
- **Source** : Parietal cells in fundus of stomach.
- **Function**: Absorption of Vit B_{12} from terminal ileum.
- **Deficiency** : Pernicious anemia

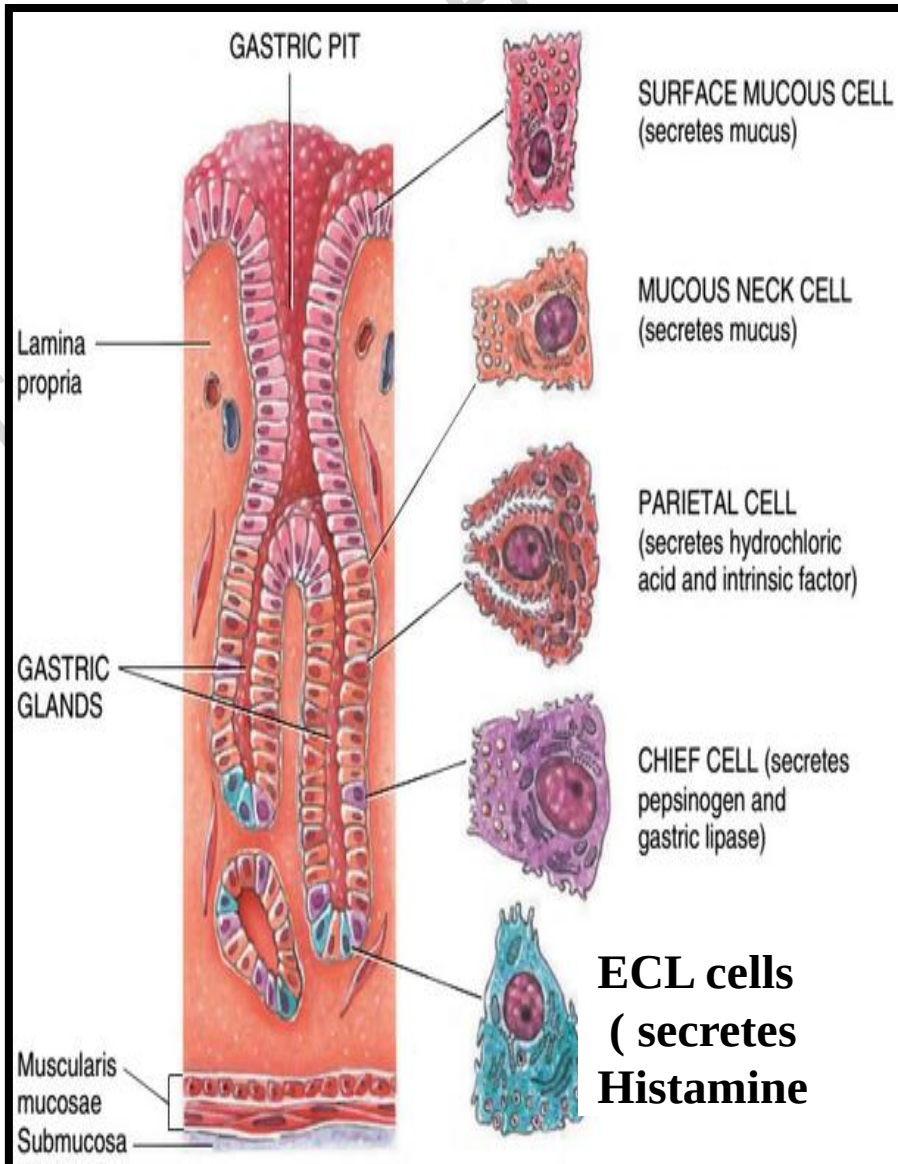




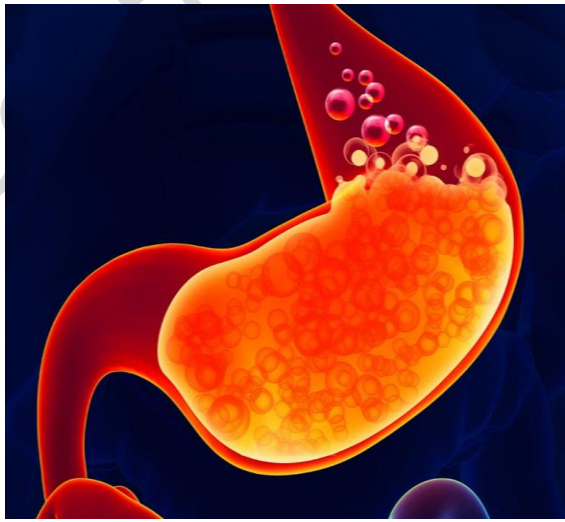
- **Enterochromaffin cells**
- **Secrete Histamine, seretonin**

Stimulates parietal cells for Hcl secretion



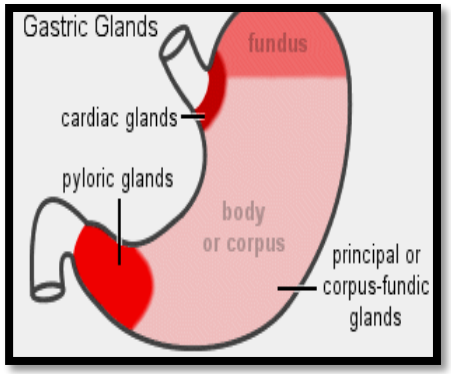


ACTIONS OF HCl



1. Bacteriolytic action
2. Activation of Pepsinogen
3. Denaturization of the proteins
4. It causes the acidity of the chyme
5. It provides the acid medium for the action of the enzymes.
6. Iron released from the organic compounds are converted from Ferric to ferrous form.

Hormones secreted by Gastric glands



Main Gastric glands

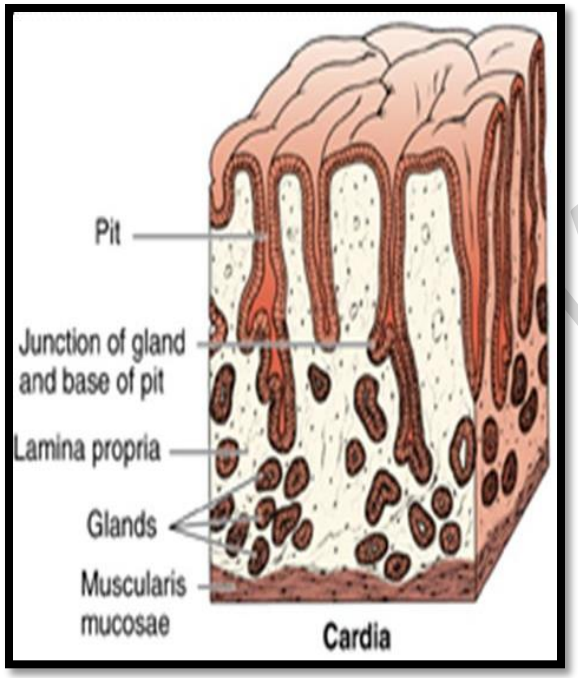
Oxyntic glands

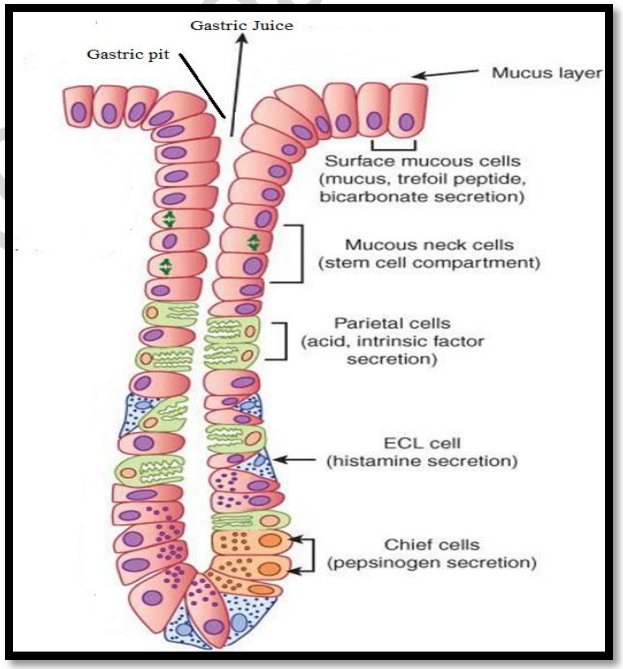
Pyloric glands

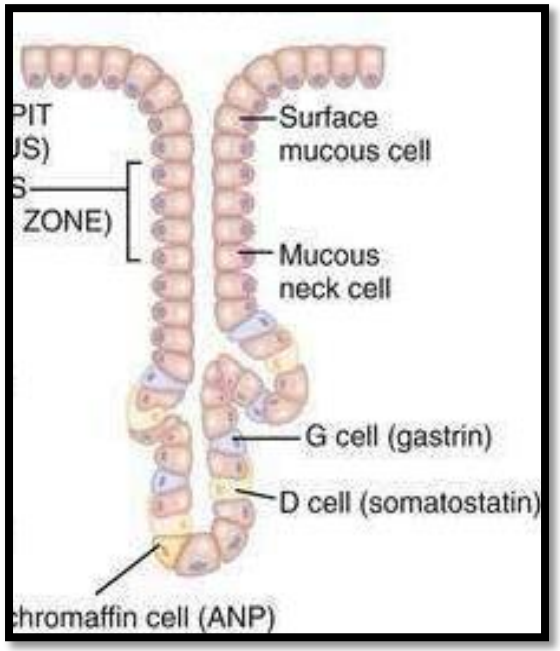
Cardiac Glands

histamine
&
seretonin

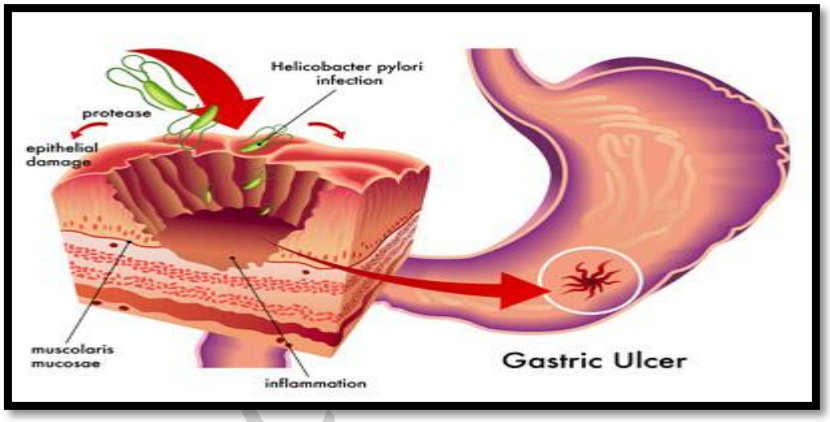
G cells –Gastrin
D cells - Somatostatin







Peptic Ulcer

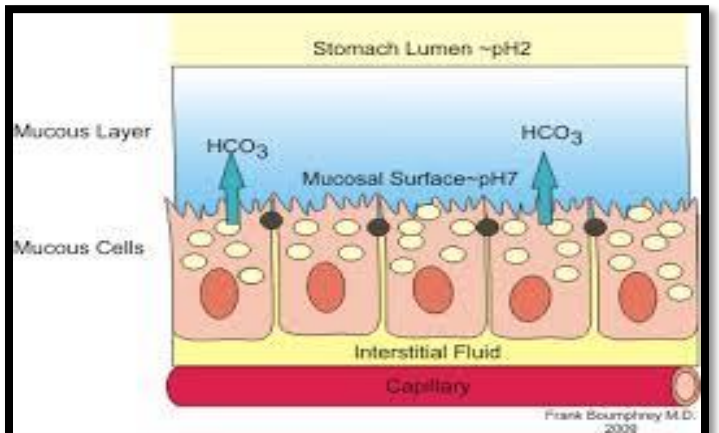


- **Definition :**

- Breakdown of mucosal- epithelium of stomach/ duodenum due to digestive action of gastric juice.

- **Cause :**

1) Reduced ability of mucosal barrier to produce enough mucus & bicarbonate ions to prevent irritation by gastric secretion.



2) Hyper secretion of gastric acid

- **Absence of Hcl secretion – Achlorhydria**
- Gastic juice does not have carbohydrate digesting enzymes

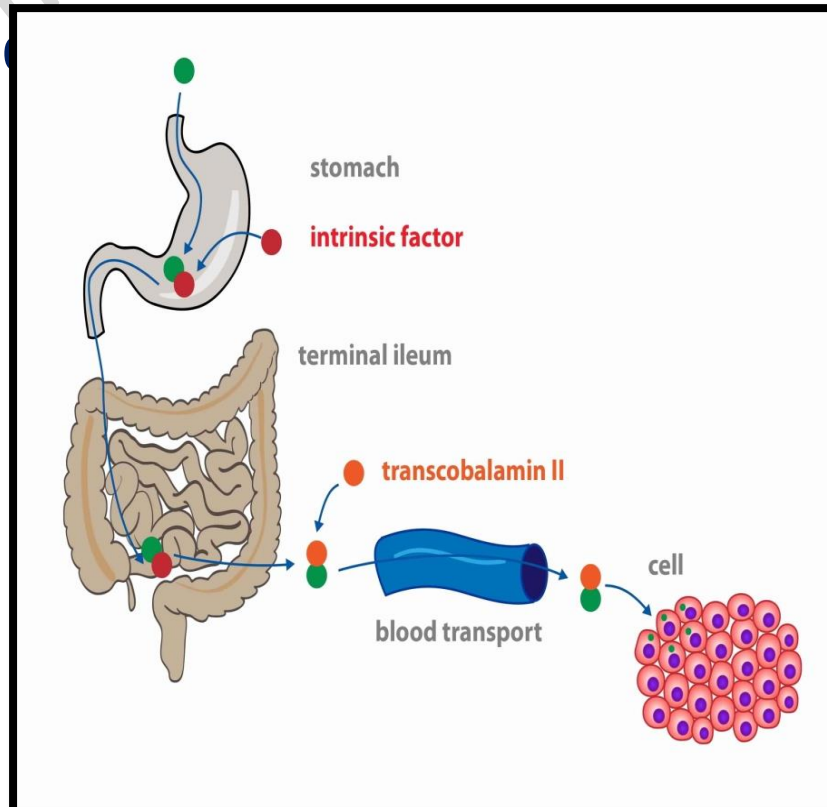
- Oxyntic cells of gastric glands

↓

Intrinsic Factor of castle

↓

For vit B_{12} absorption in ileum



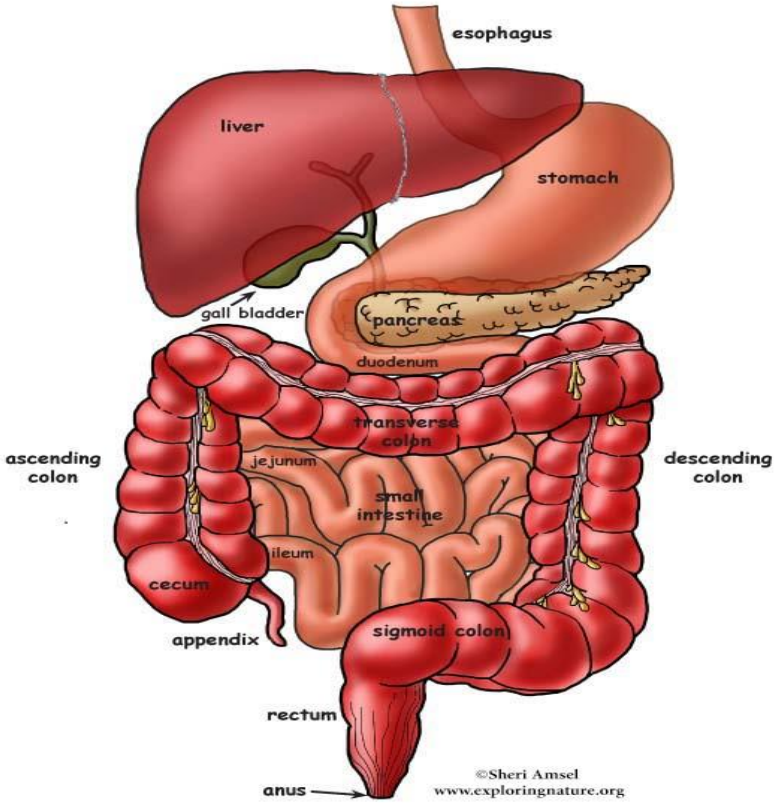
Digestion in Intestine

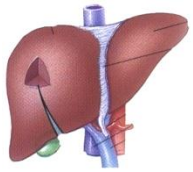
- Chyme is mixed with 3 digestive juices

1) **Bile juice**

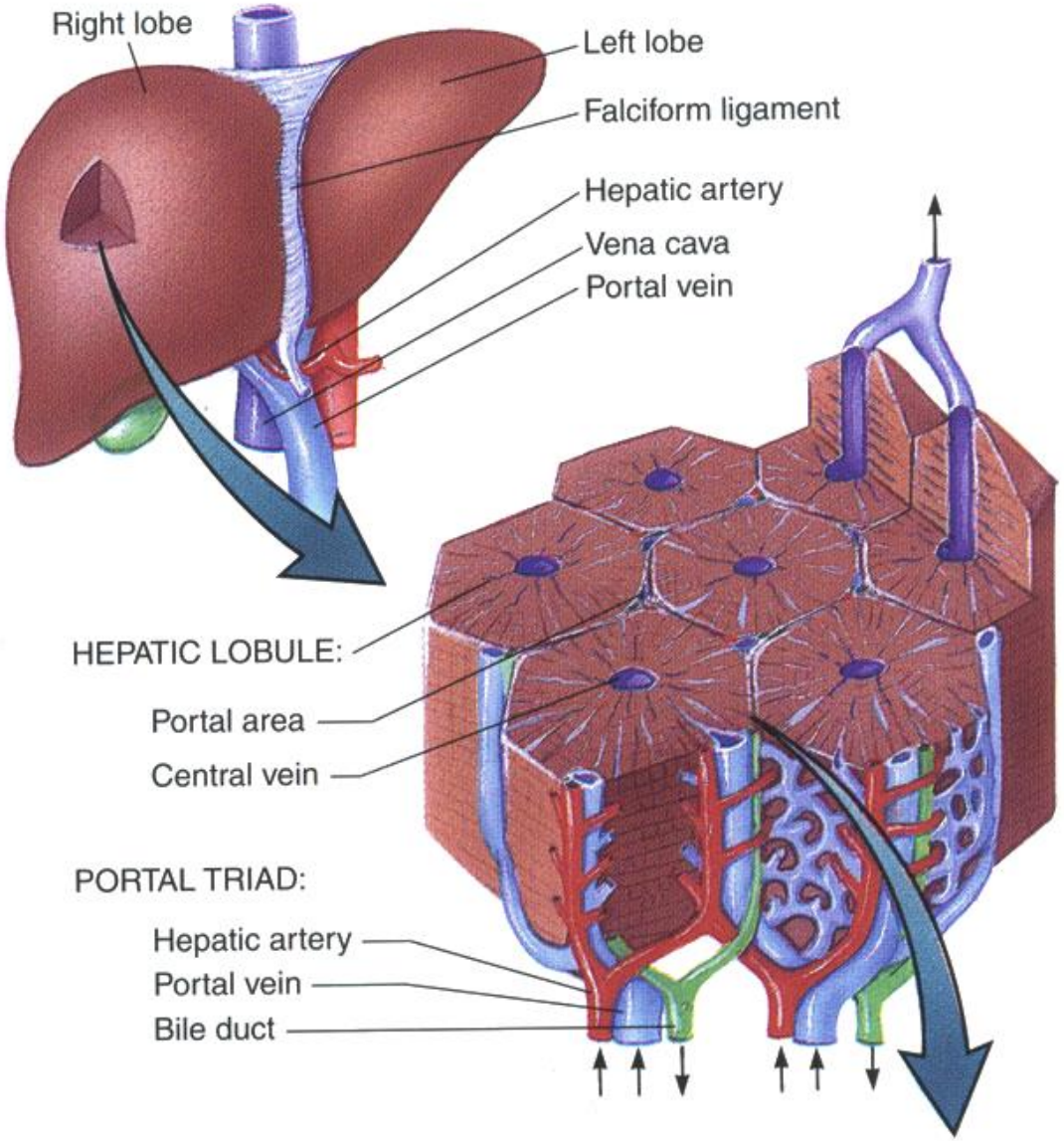
2) **Pancreatic juice**

3) Succus Entericus





LIVER



- Largest gland in the body

- Liver tissue is divided into hexagon shaped lobules seperated by connective tissue septa

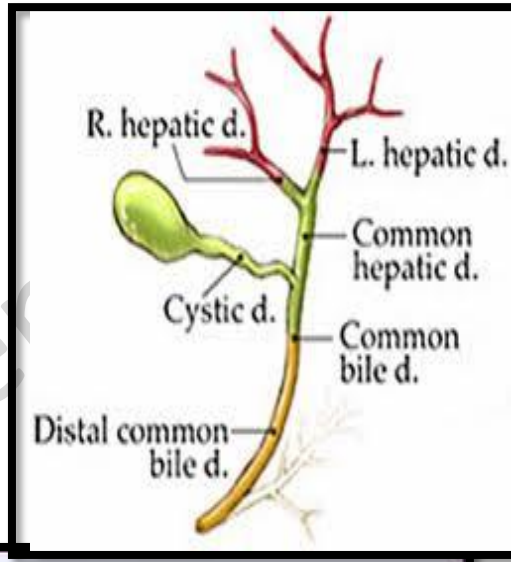
- Function: Bile synthesis

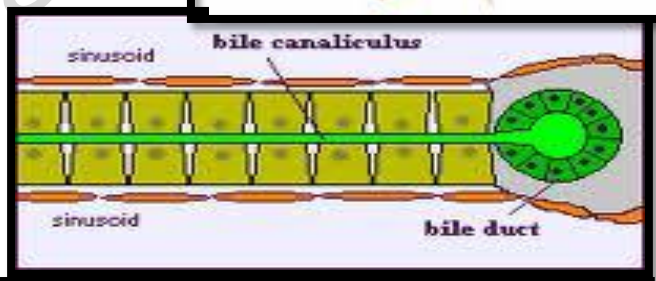
↓

Choleresis

Bile

- A digestive juice secreted by hepatocytes.
- Drained in to bile canaliculi.





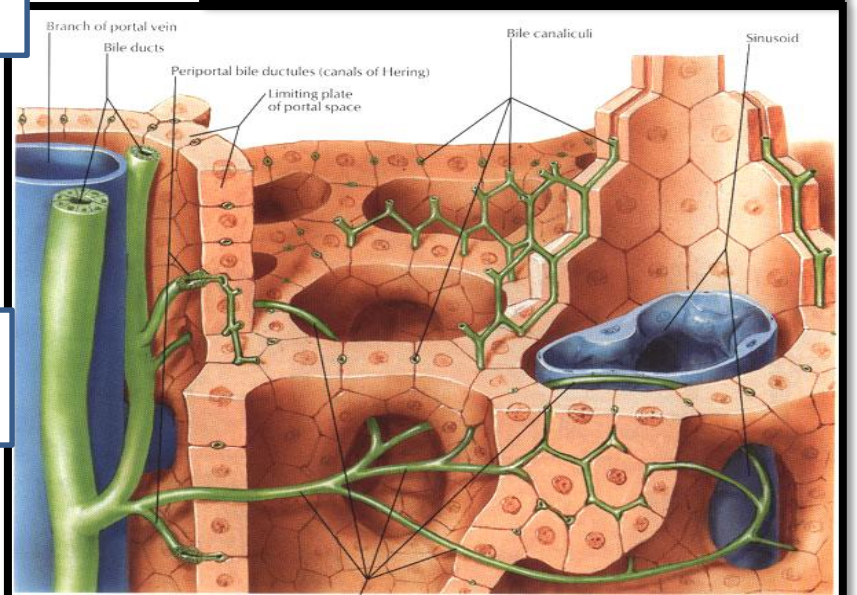
Inter Lobular ducts

Rt & Lt hepatic ducts

Common Hepatic duct

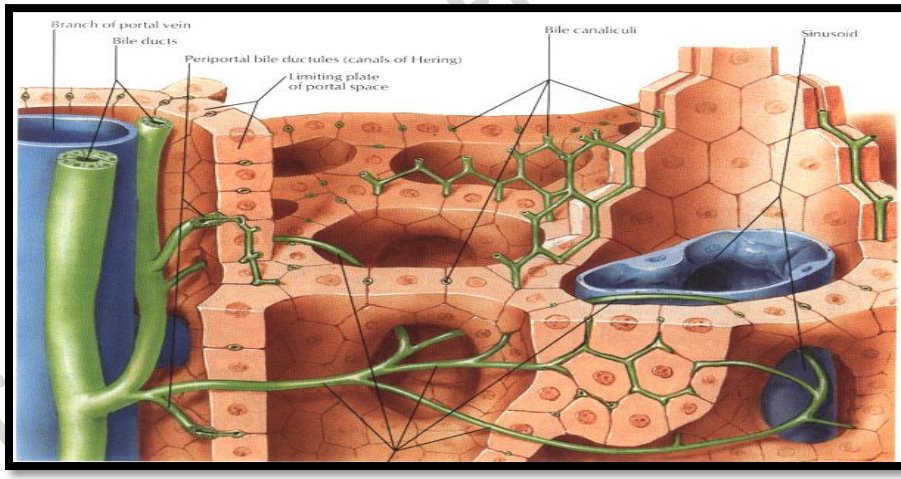
cystic duct

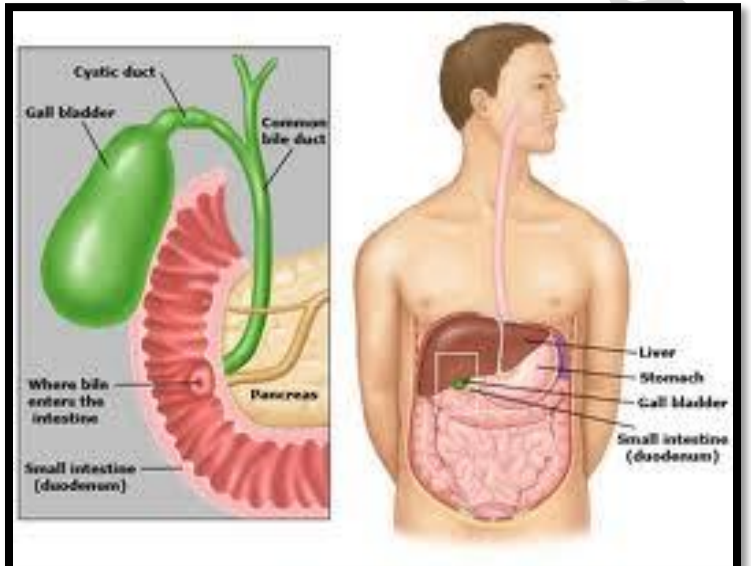
Common bile duct

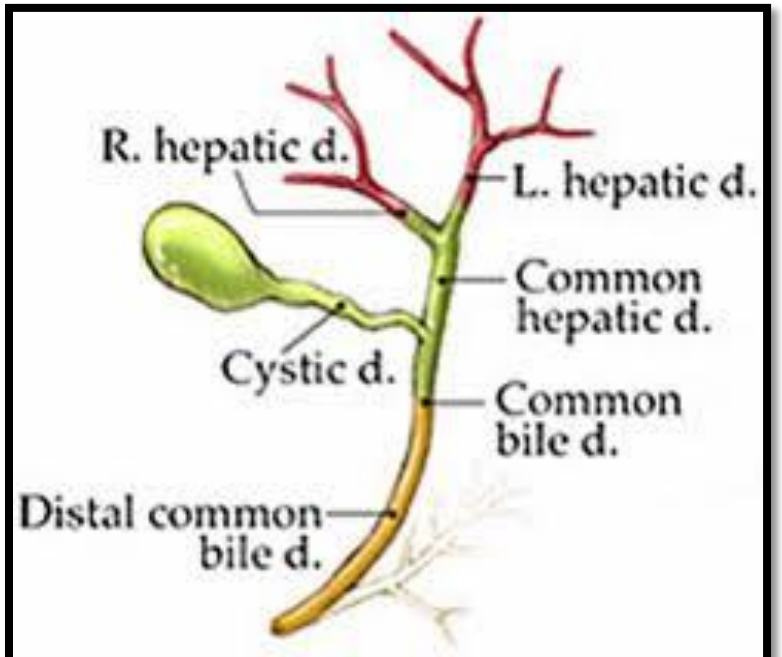


Bile Juice

- Secreted by **Hepatocytes.**
- Drained via hepatic duct to **Gall bladder.**
- When chyme enters duodenum **bile is released** from gall bladder

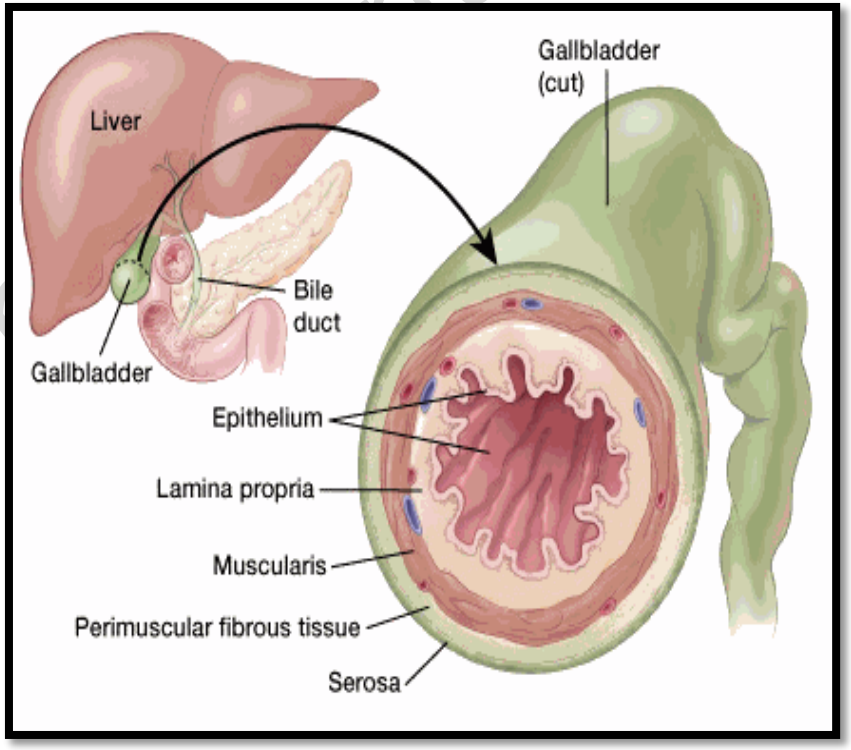






GALL BLADDER

- Pear shaped dilated sac.
- Capacity – 50 – 60 ml



- ***FUNCTIONS***

– storage & concentration of bile in interdigestive phase.

- Mucosa absorbs water, Nacl, HCO_3^-
- Reduces Bile ph. [8.6 → 7.6]
- Mucosa secretes mucin to lubricate chyme.
- Organic constituents 5-6 times concentrated
- Makes bile thick, viscous & dark colored.

BILE

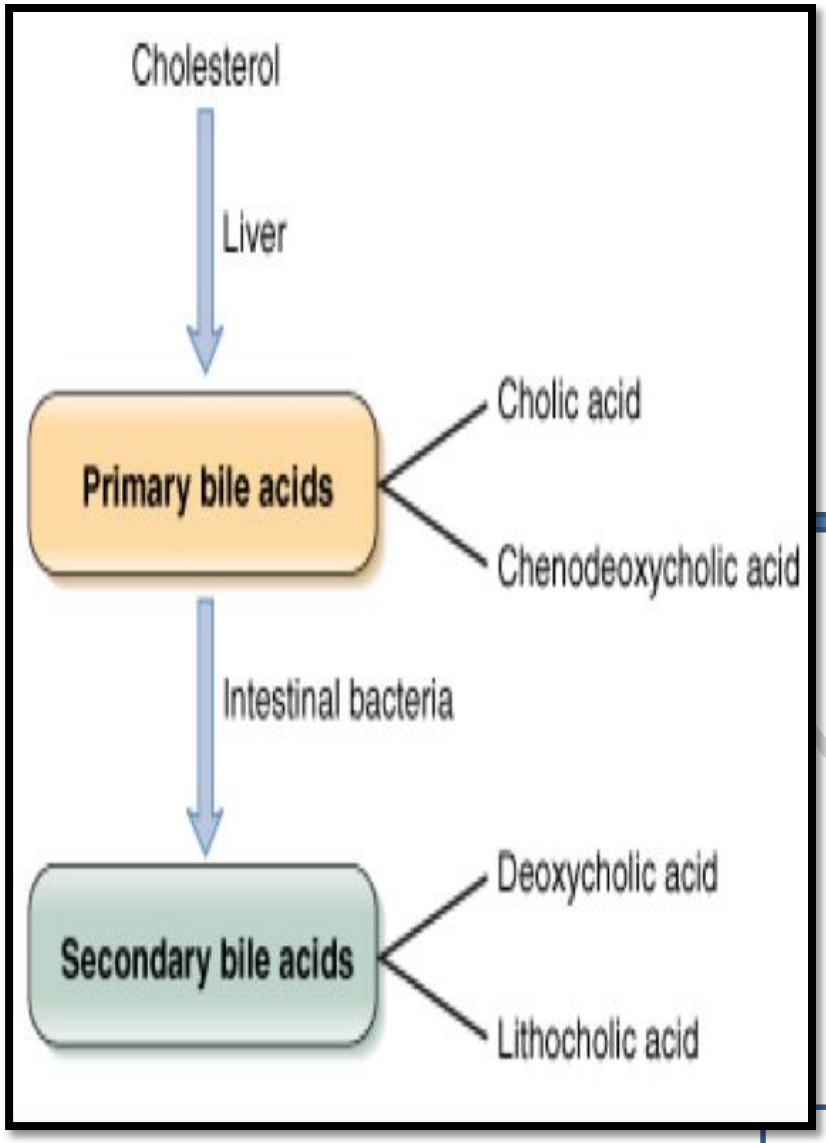
- Colour : golden yellow
- Volume : 600 – 1000ml/day
- Ph : 7.8 – 8.6 (alkaline)
- **92% water ,**
- **Composition :**

Organic

- Bile salts – 6%
- Bile pigments- 0.3 %
- Cholesterol- 0.9 %
- fatty acids – 0.3%
- Lecithin – 0.3 %

In organic

- Electrolyte (Na^{+}, cl^{-}, HCO_3^{-} ,Ca^{2+})
- Water



Glyco cholicacid
&
Tauro cholicacid

Combines

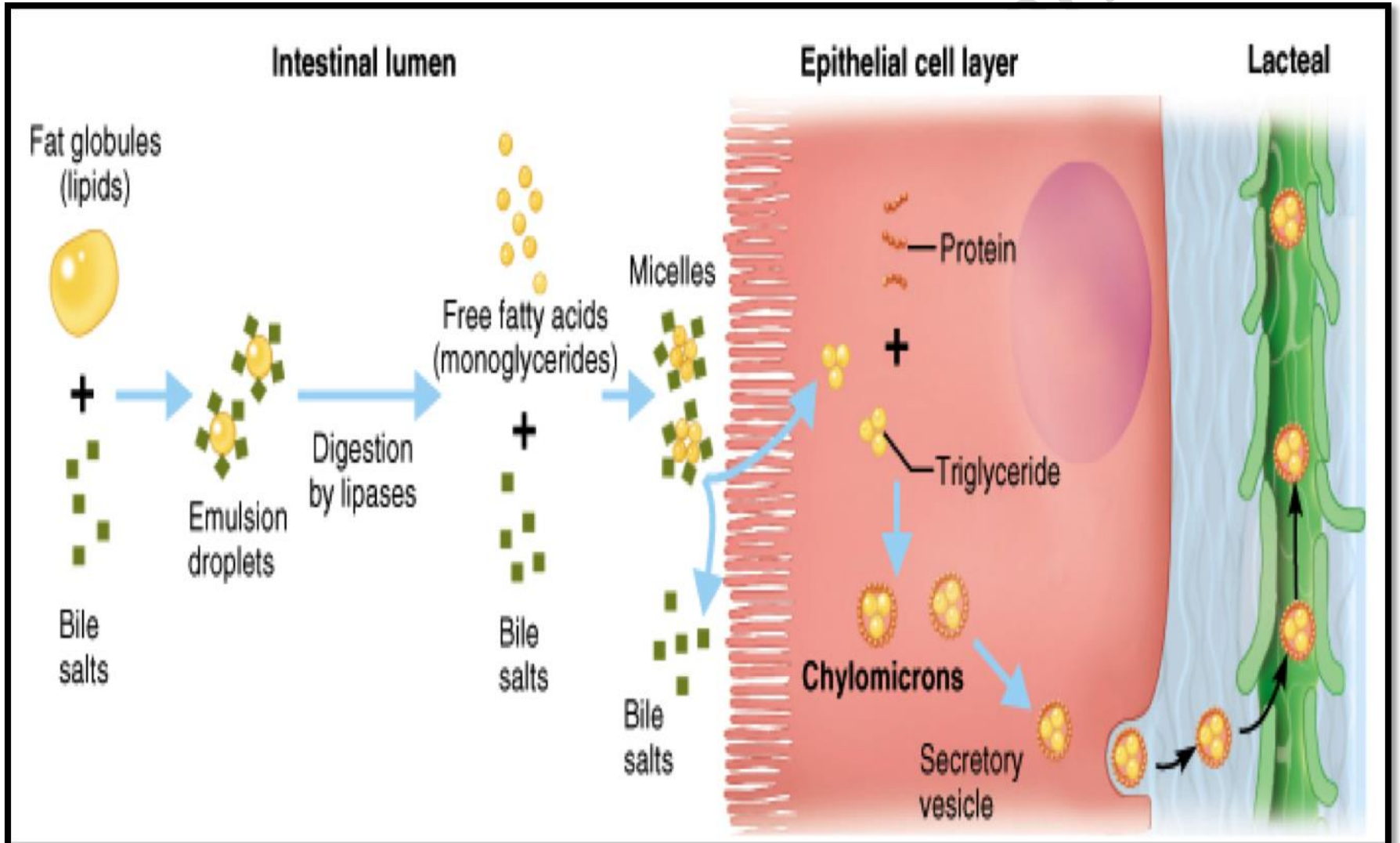
Sodium & potassium salts

Sodium glycocholate
sodium taurocholate

Sodium & Potassium glycocholate

Functions of bile acids

Bile Acids , Lecithin helps in digestion & absorption of fats

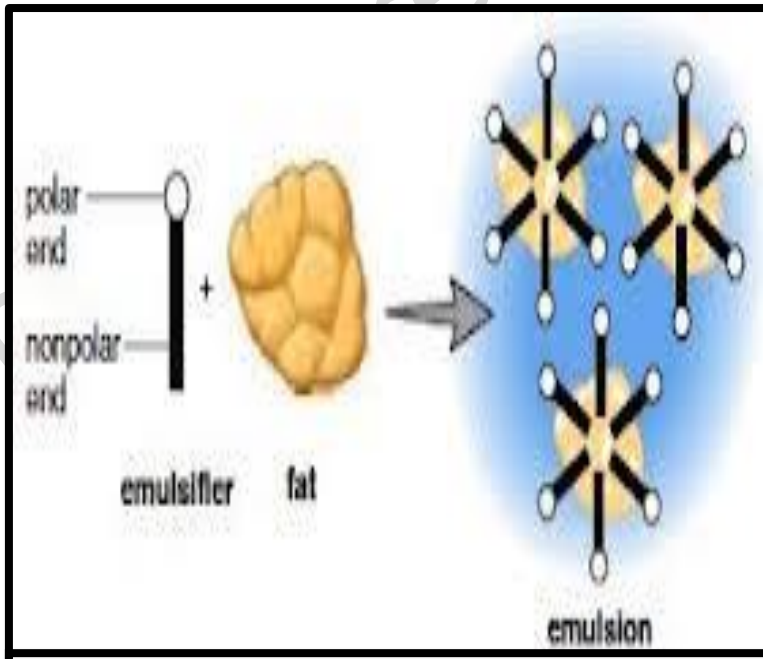


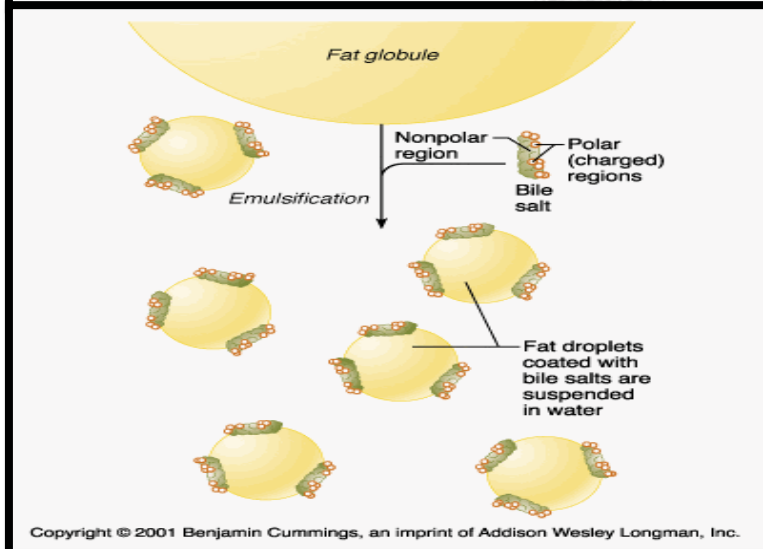
Digestion of Fats

- Bile salts surrounds fat
- Reduce the surface tension of fats.
- detergent action of bile salts breaks large fat molecule to smaller droplets.

Emulsification

- Thus increases the surface area for the action of intestinal lipolytic enzymes





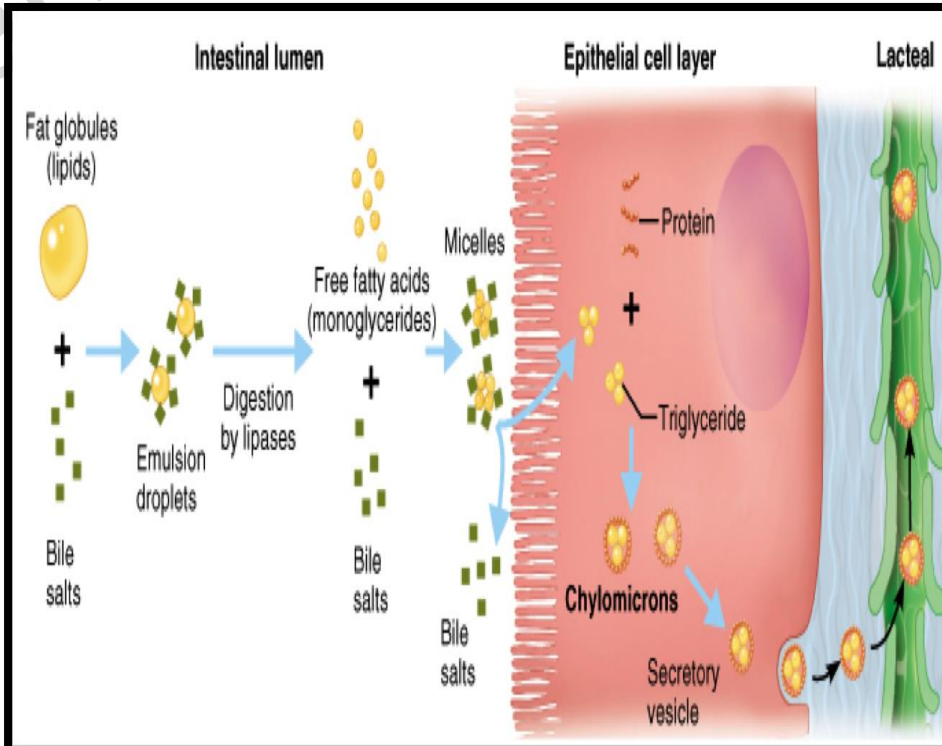
Emulsified fat

↓ **Intestinal Lipases**

Fatty acids + monoglycerides

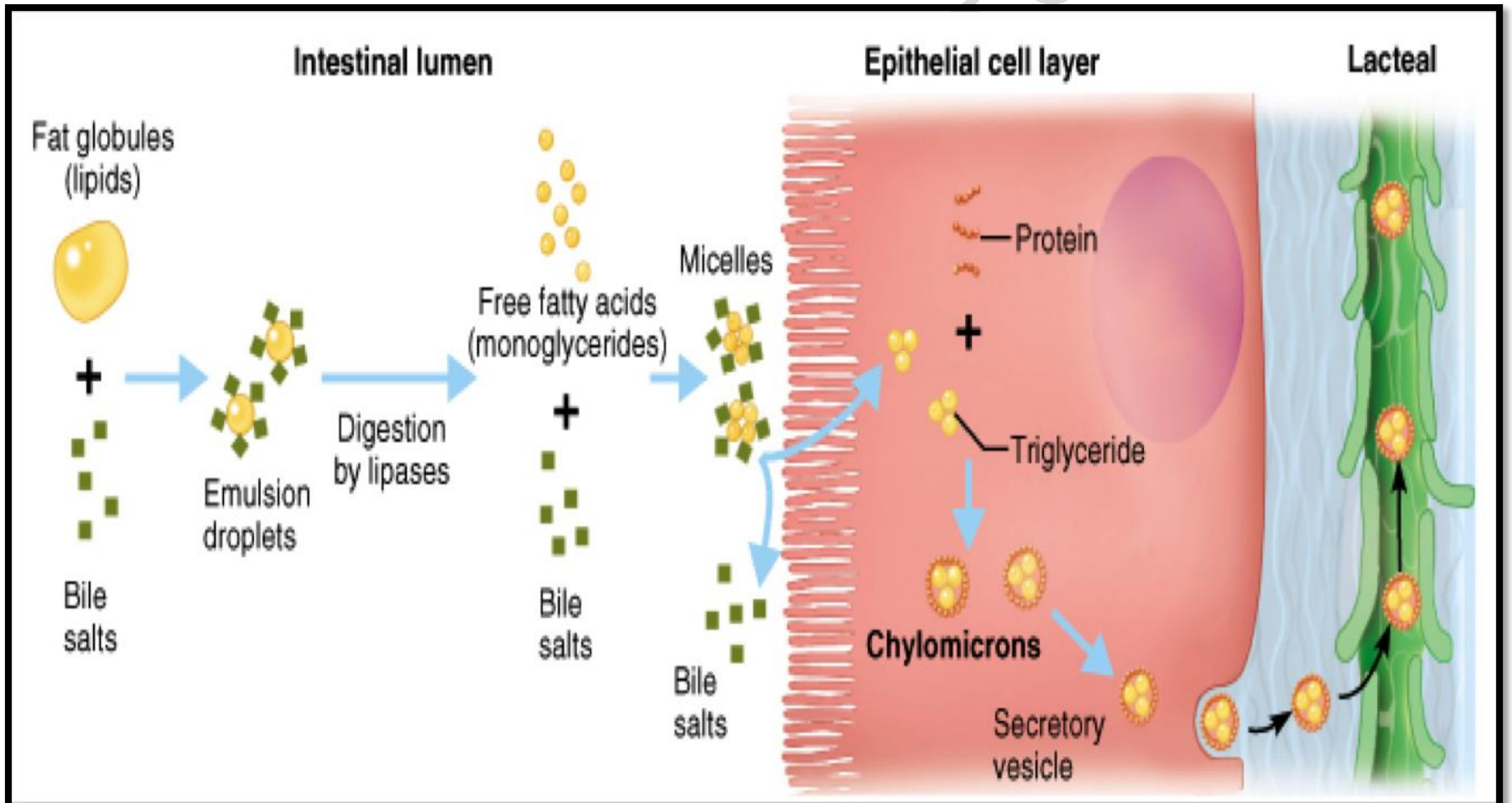
Includes lipases

- **from pancreatic juice**
- **from intestinal juice**

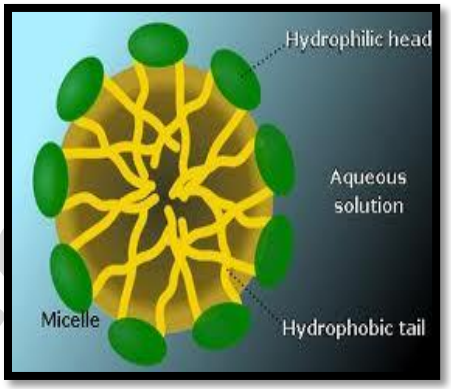


Intestinal fat absorption

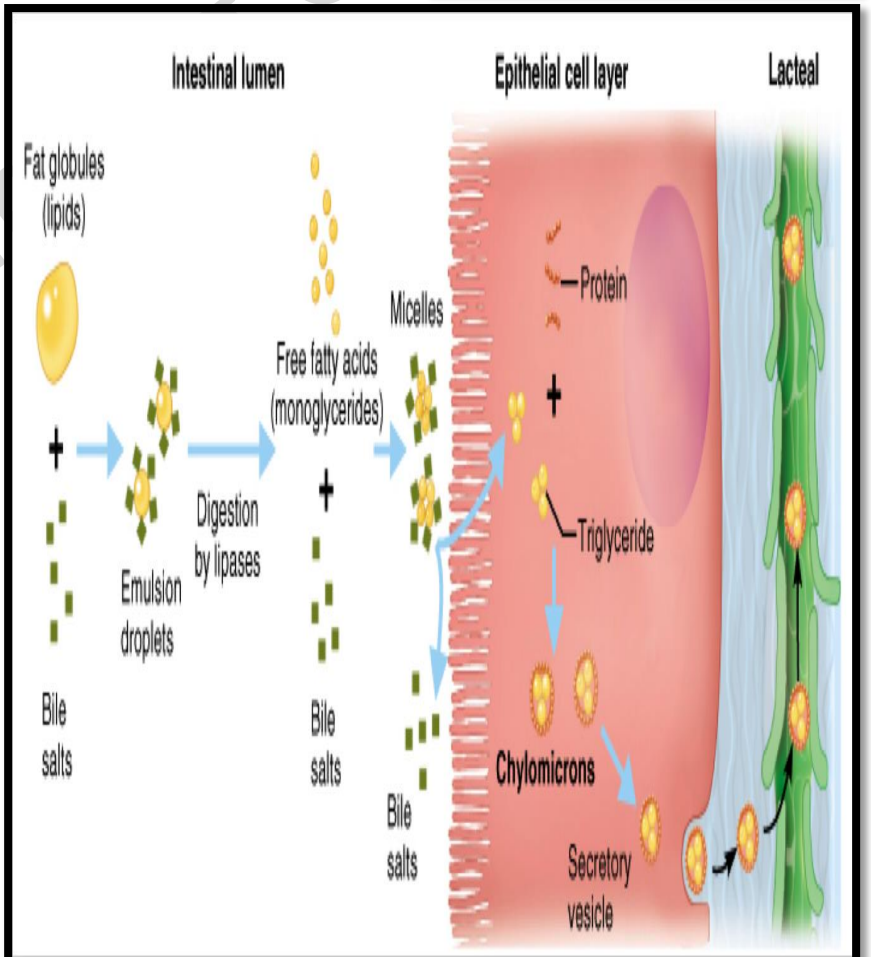
- **By forming Micelles**



Intestinal fat absorption



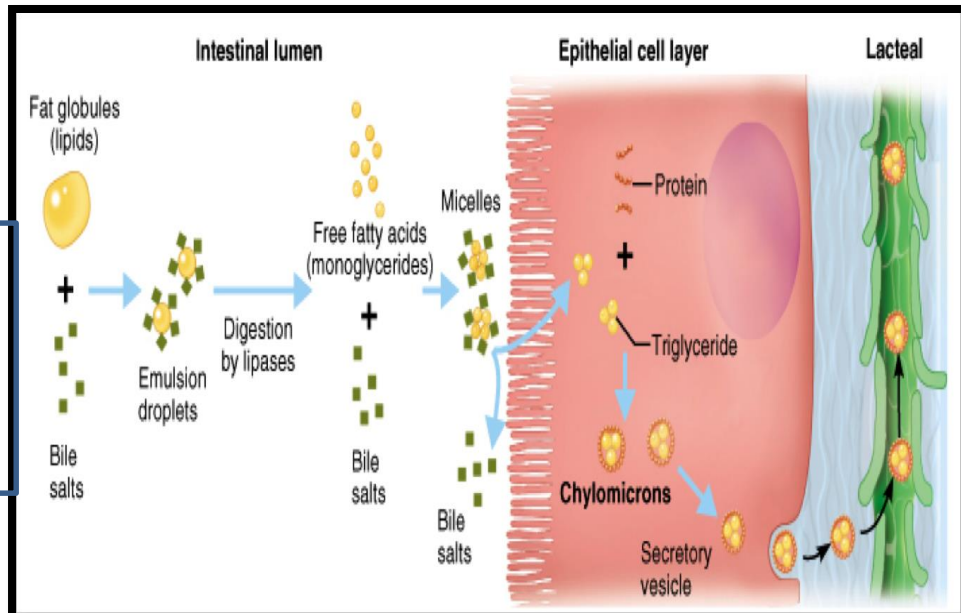
- By forming Micelles
- They are spherical globules
- 3-6 nm in diameter
- Formed by 20 – 40 bile salts .
- Hydrophobic – combines with fat
- Hydrophilic projecting outward
- Monoglycerides & fatty acids in its core .



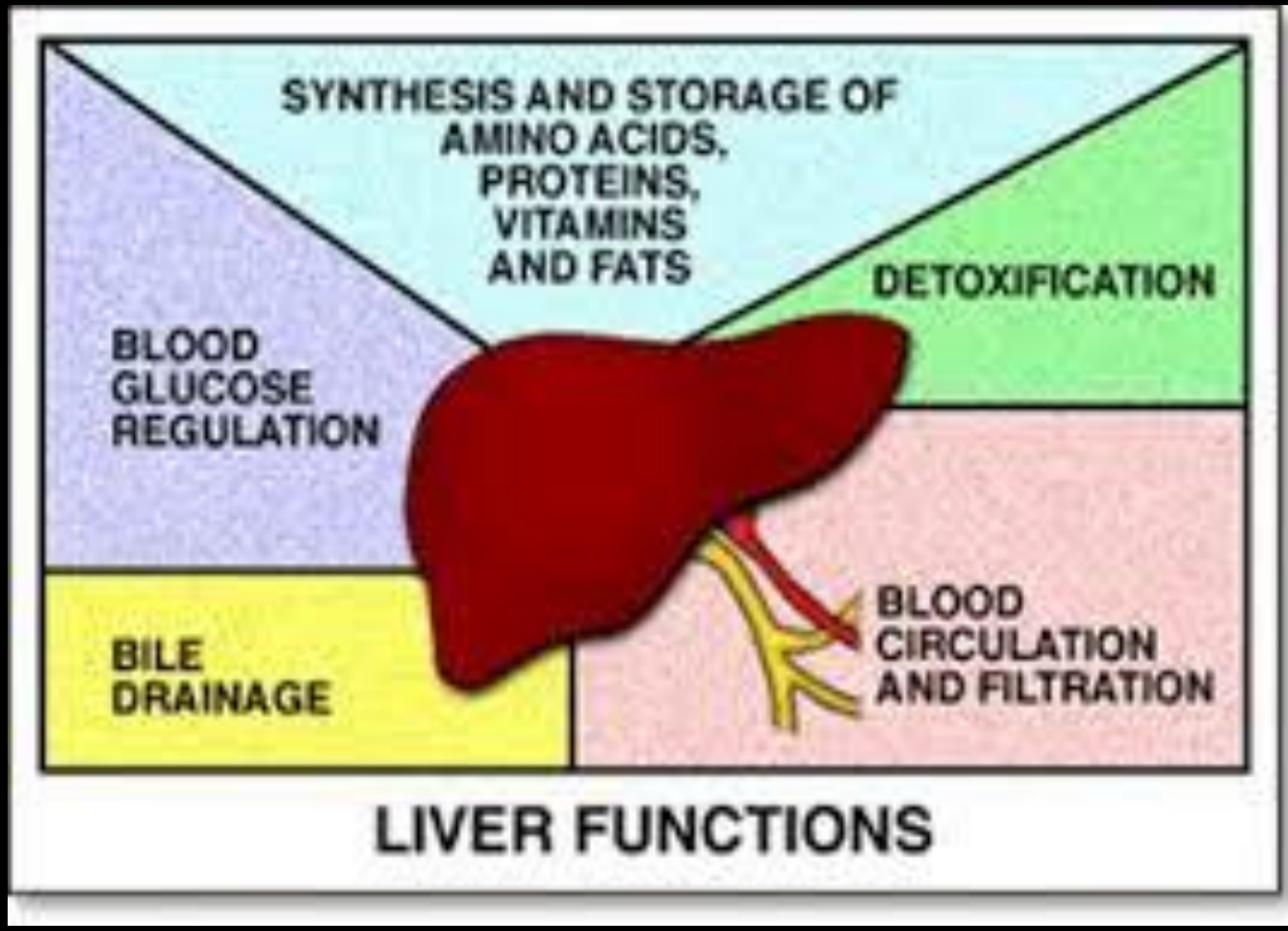
Fat Absorption

- When Micelle contacts intestinal epithelial cell membrane.
- Fat digestion products & fat soluble vitamins diffuse into the cell.
- Bile salts of micelle remains in intestine
- **Later gets absorbed into portal blood from ileum**

Bile salts helps in absorption of fat soluble vitamins like A,D,E,K

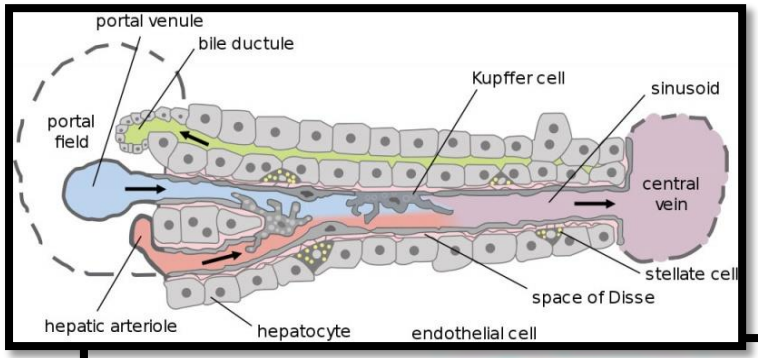


LIVER FUNCTIONS



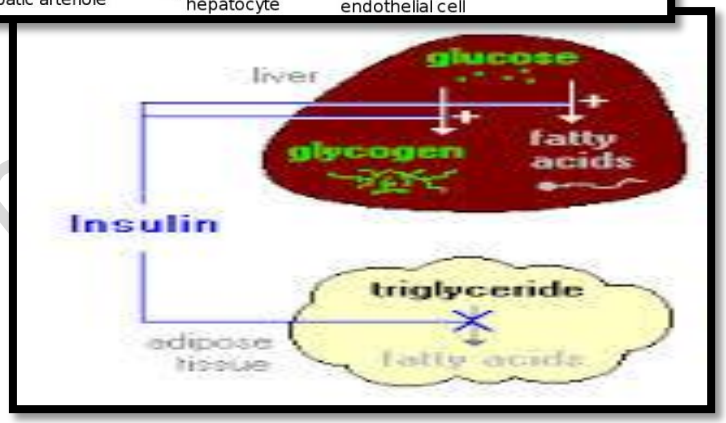
1. Secretary Function :

Bile ⟶ fat digestion & absorption



2. Metabolism

- glycogenisis, gluconeogenesis, glycogenolysis , lipoprotein synthesis.



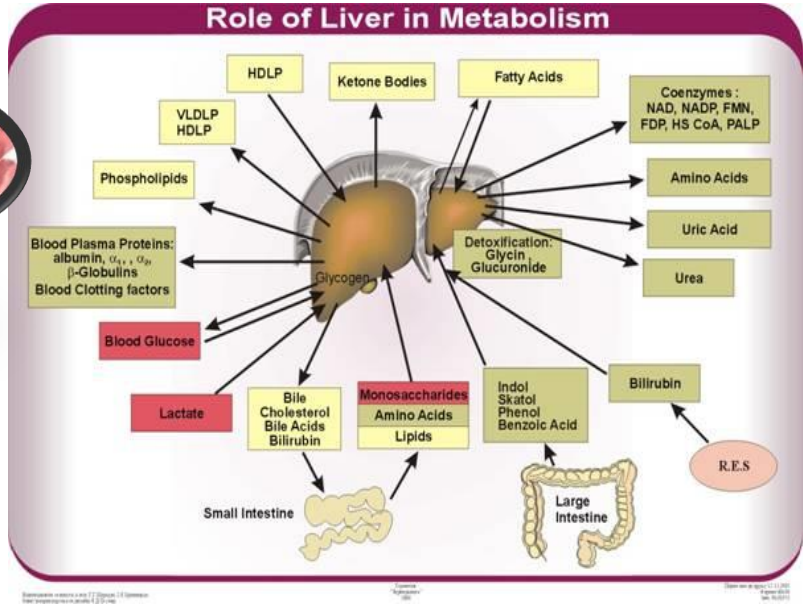
3. Detoxification

- Kupffer cells removes bacteria
- Detoxifies drugs & excretes through bile

4. Storage & synthesis

Storage - Glucose, vit A,D,E,K, vit B12, iron, copper, molybdenum

Synthesis – Heparin, vit A

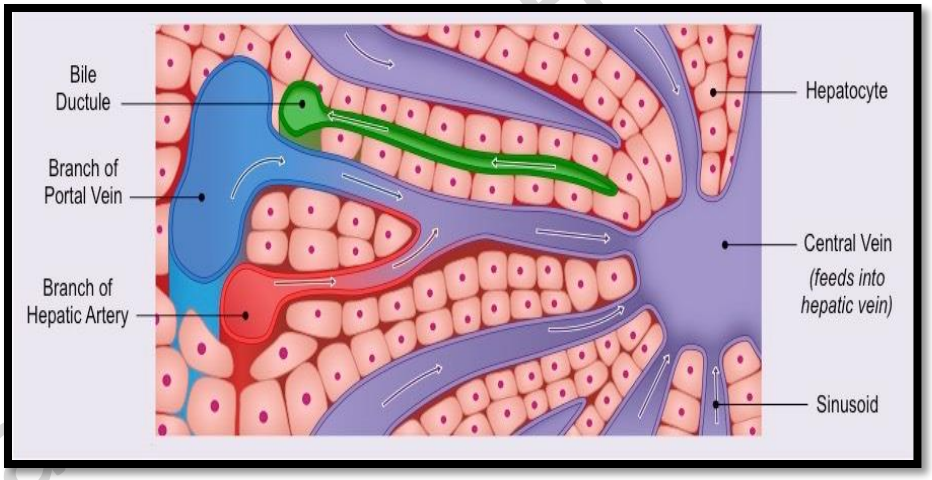


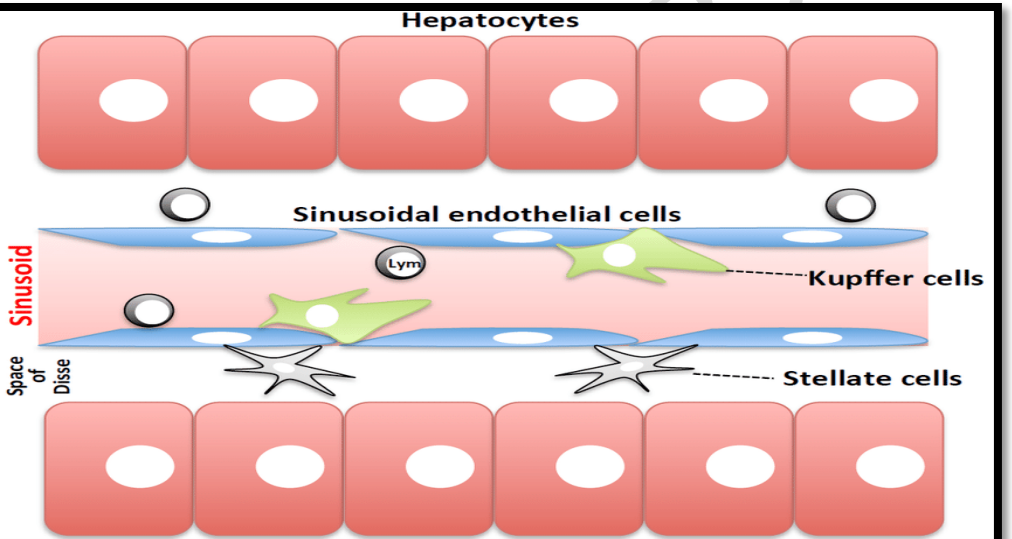
- **Liver sinusoids – Kupffer cells**

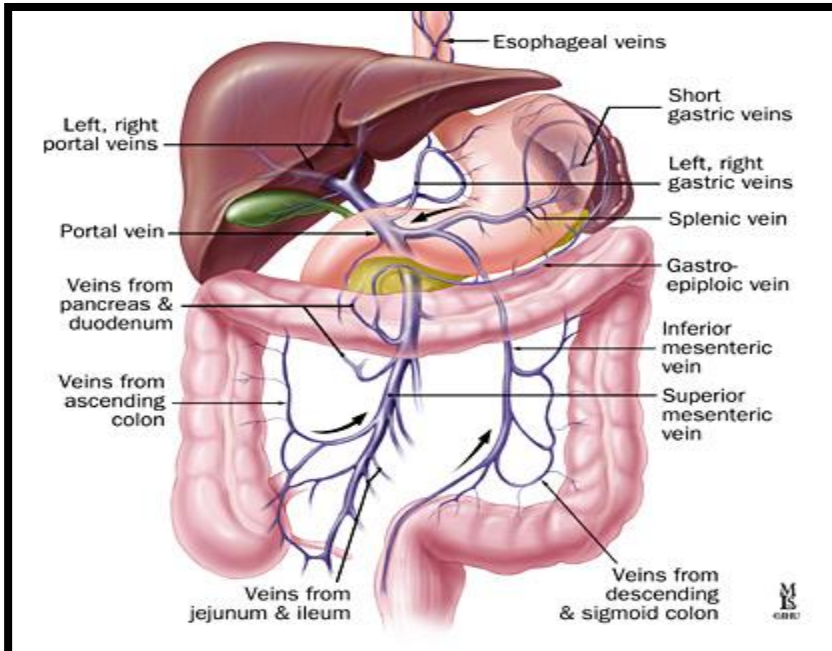
Ingested pathogens in intestine

Reaches liver via portal vein

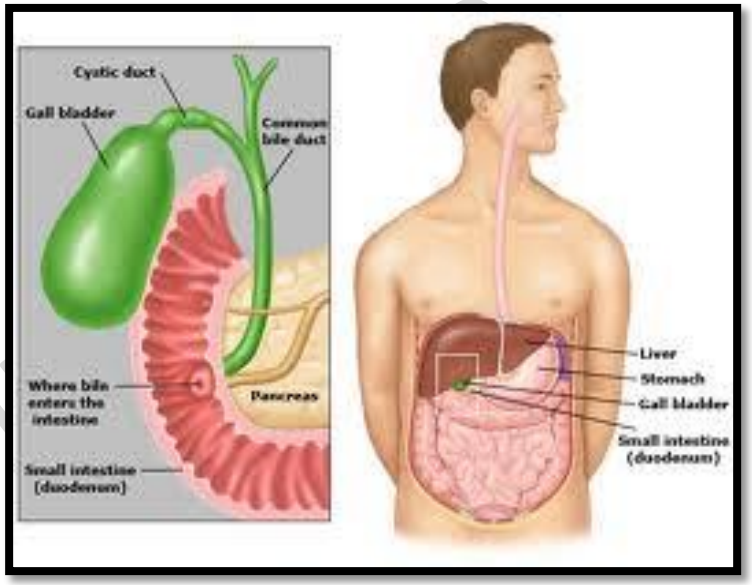
Destroyed by Kupffer cells







Gall Bladder



- Pear shaped structure

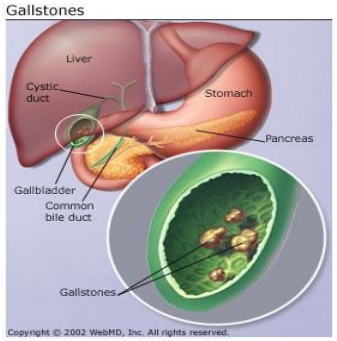
- Inferior surface of liver
- Storage and concentration of bile.
- **Gall stone** :

 - cholesterol, calcium carbonate

 - bilirubin

- **Treatment** – Lithotripsy

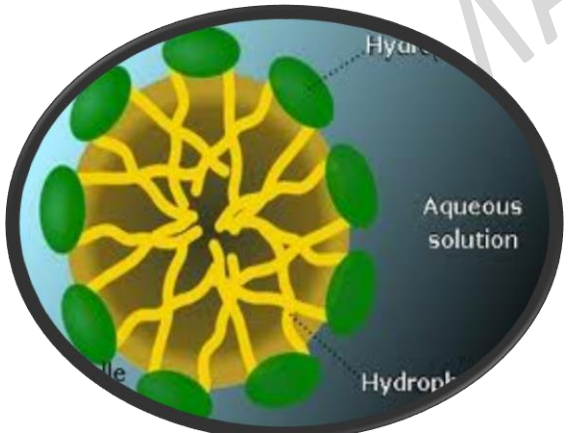
 -cholecystectomy



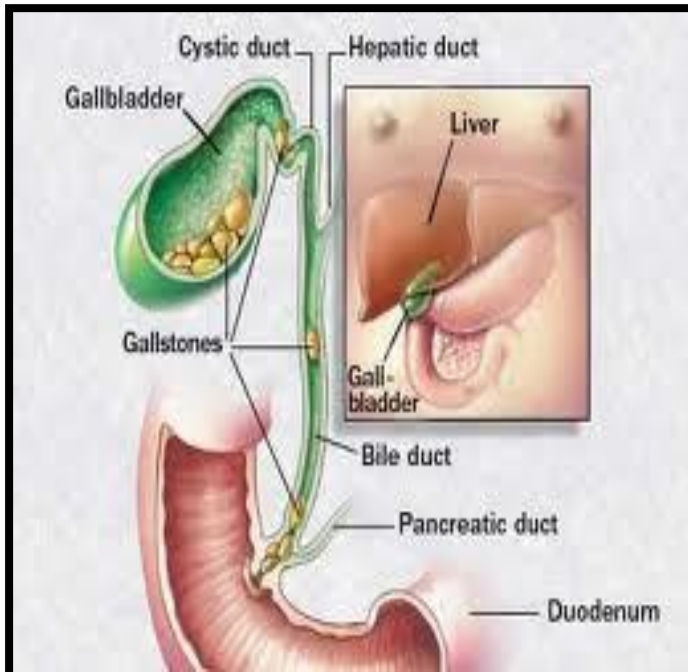
GALL STONES

- Cholelithiasis/ cholecystolithiasis
- **Cause** : Precipitation of Cholesterol in bile
- cholesterol : bile salts - 1: 20

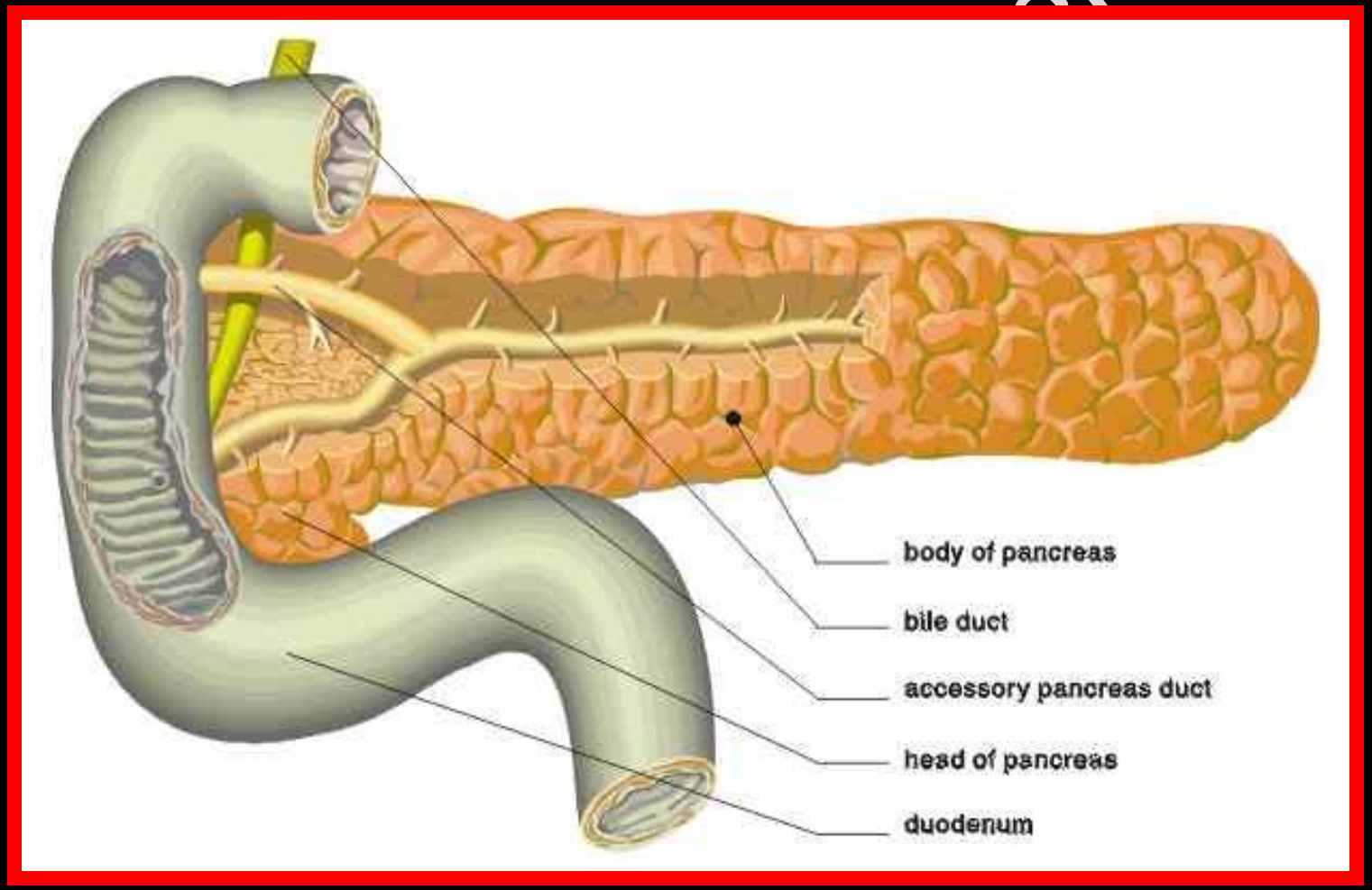
- When ratio < 1:13



Cholesterol precipitates forming stones

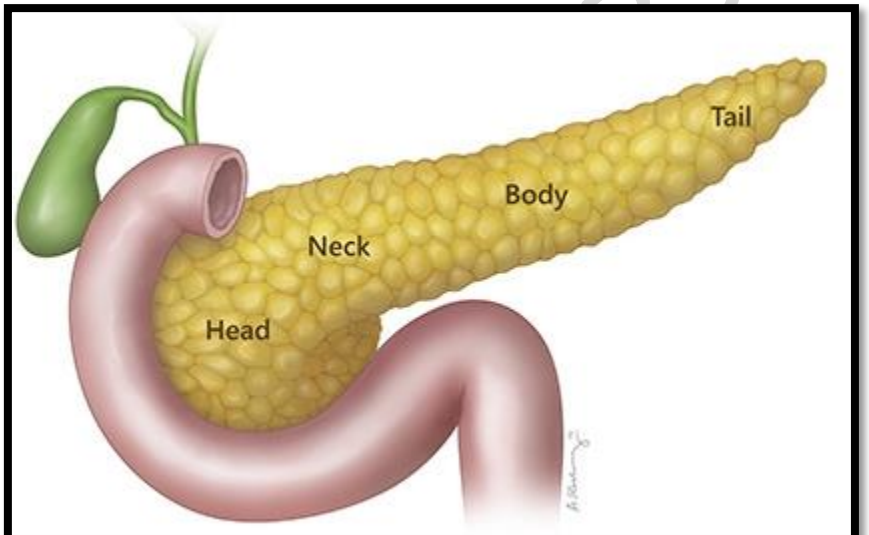


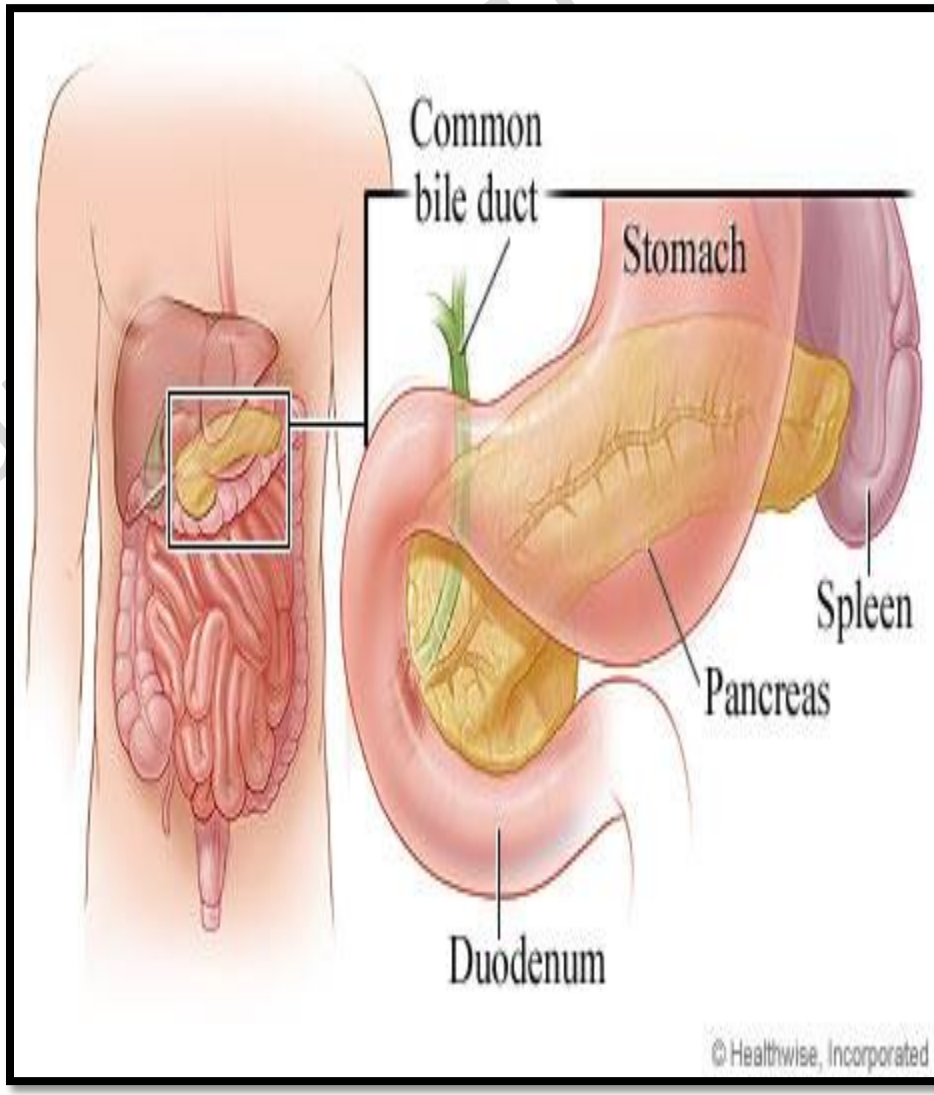
Pancreatic Juice



PANCREAS

- Accessory digestive gland
- Location : Retroperitoneal
- **Parts :**





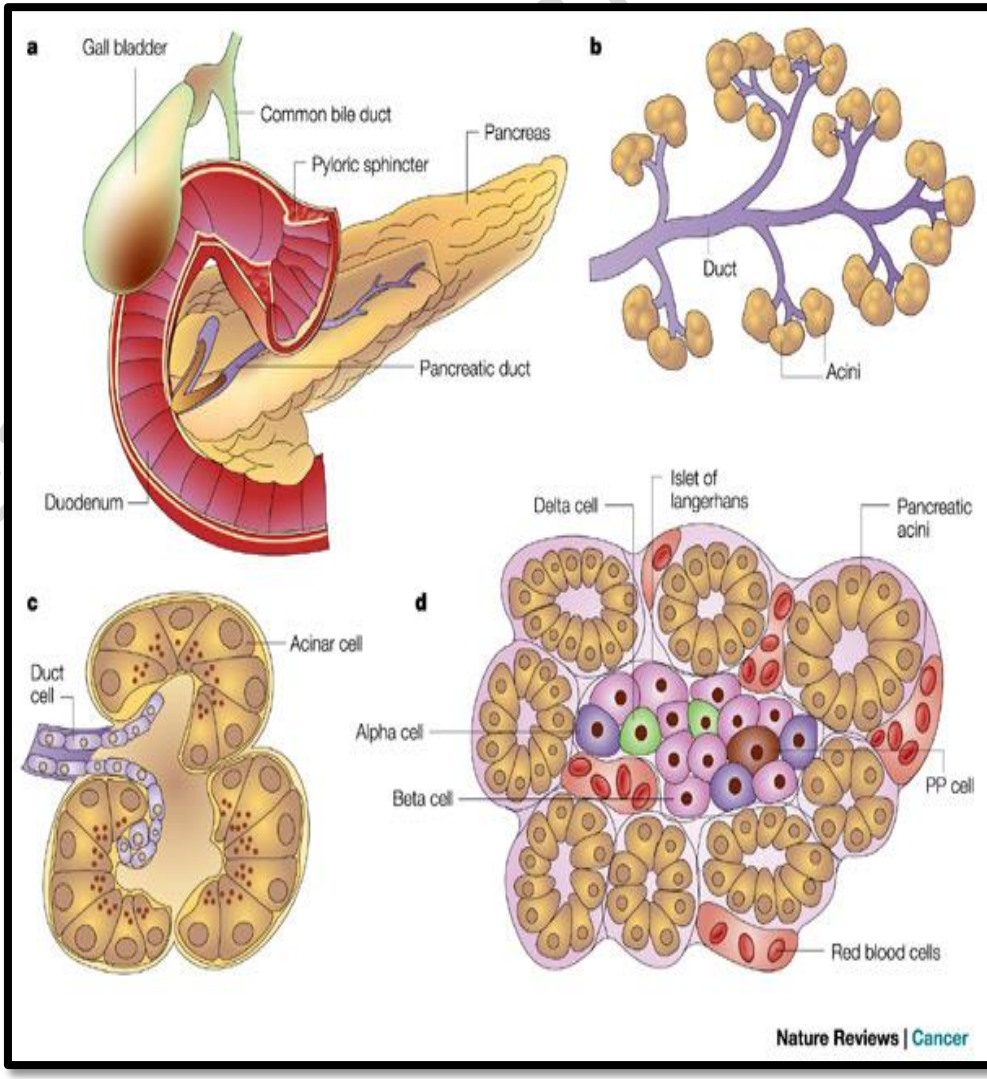
Functions of Pancreas

- **Exocrine** :

secrete pancreatic juice

- **Endocrine** :

secrete insulin,
glucagon, somatostatin



- **Pancreatic Ducts**

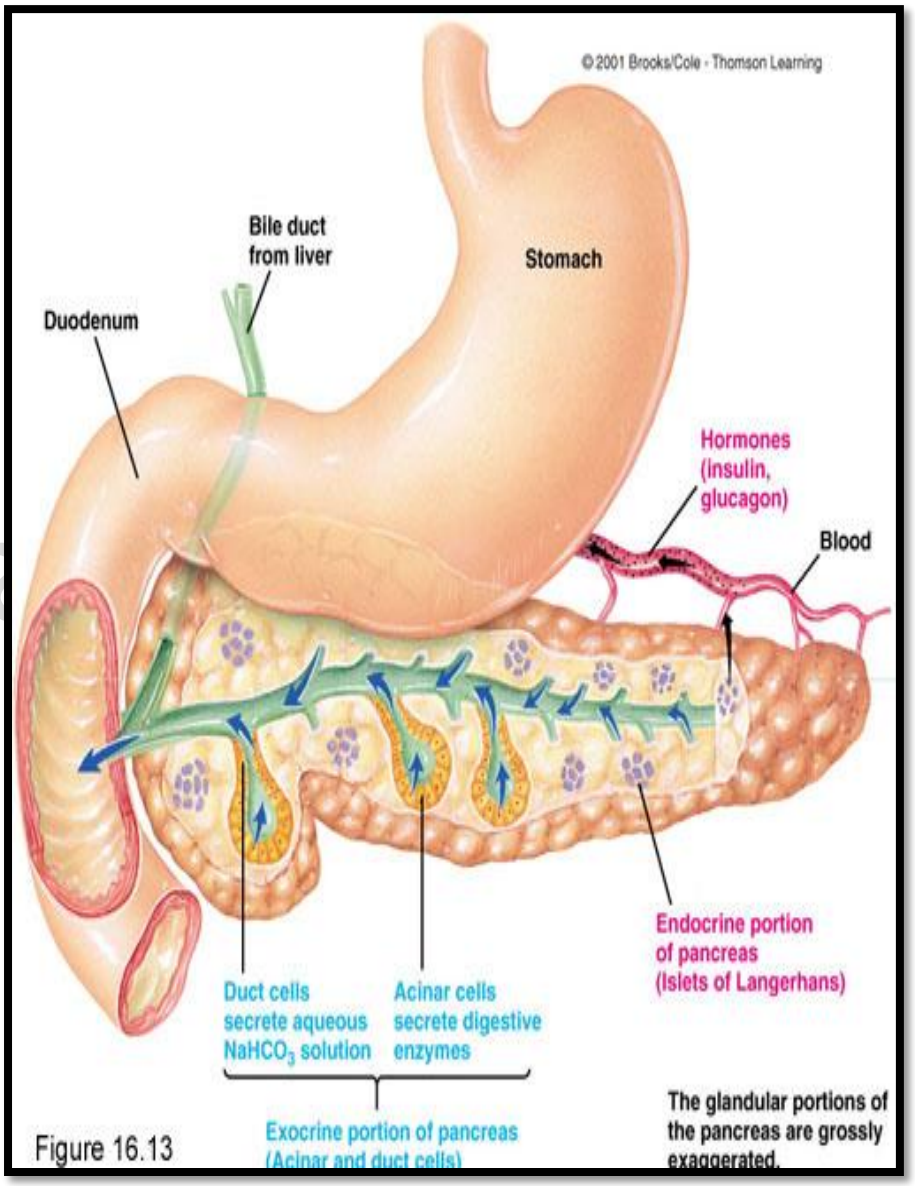
➢ Duct of wirsung

- Wirsung + CBD

Ampulla of Water

Gaurded by

Sphincter of Oddi



Pancreatic Juice

- **Volume : 1200 – 1500 ml/day**
- **Colourless fluid**
- **Highly alkaline –Ph 7.8 – 8.4**

Due to

- **High conc of HCO_3^- ions**

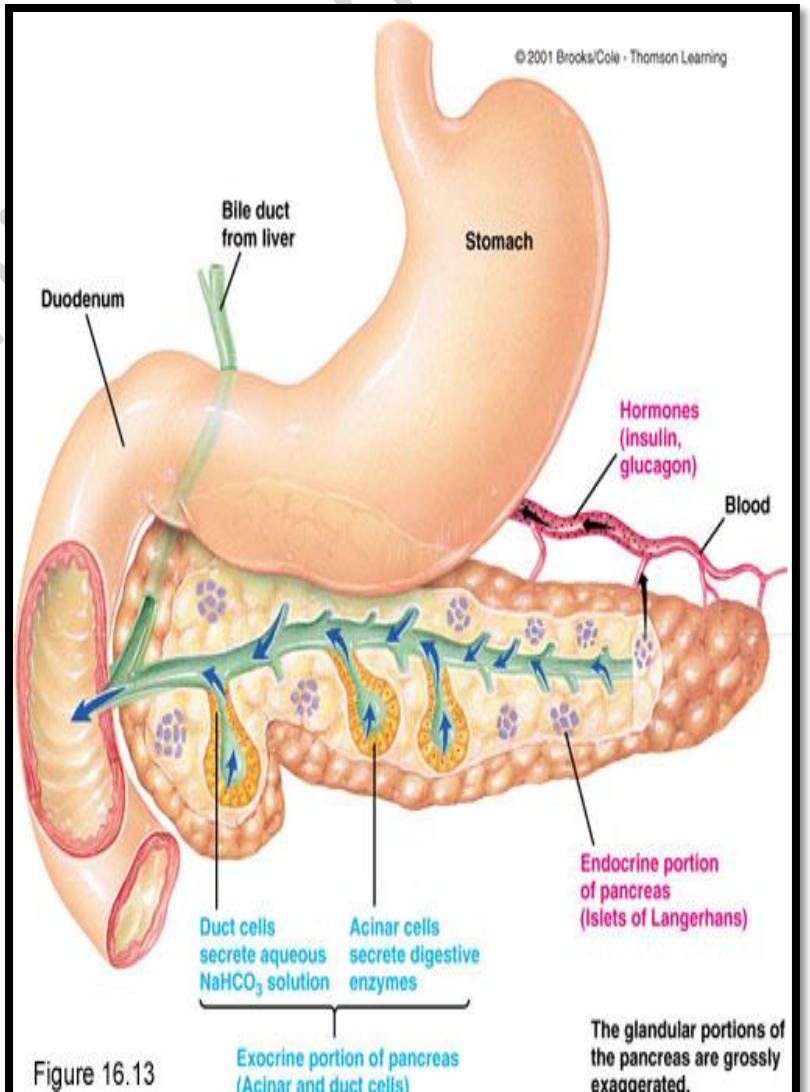


Figure 16.13

Composition of Pancreatic Juice

- 96 % H_2O + 4% Solids

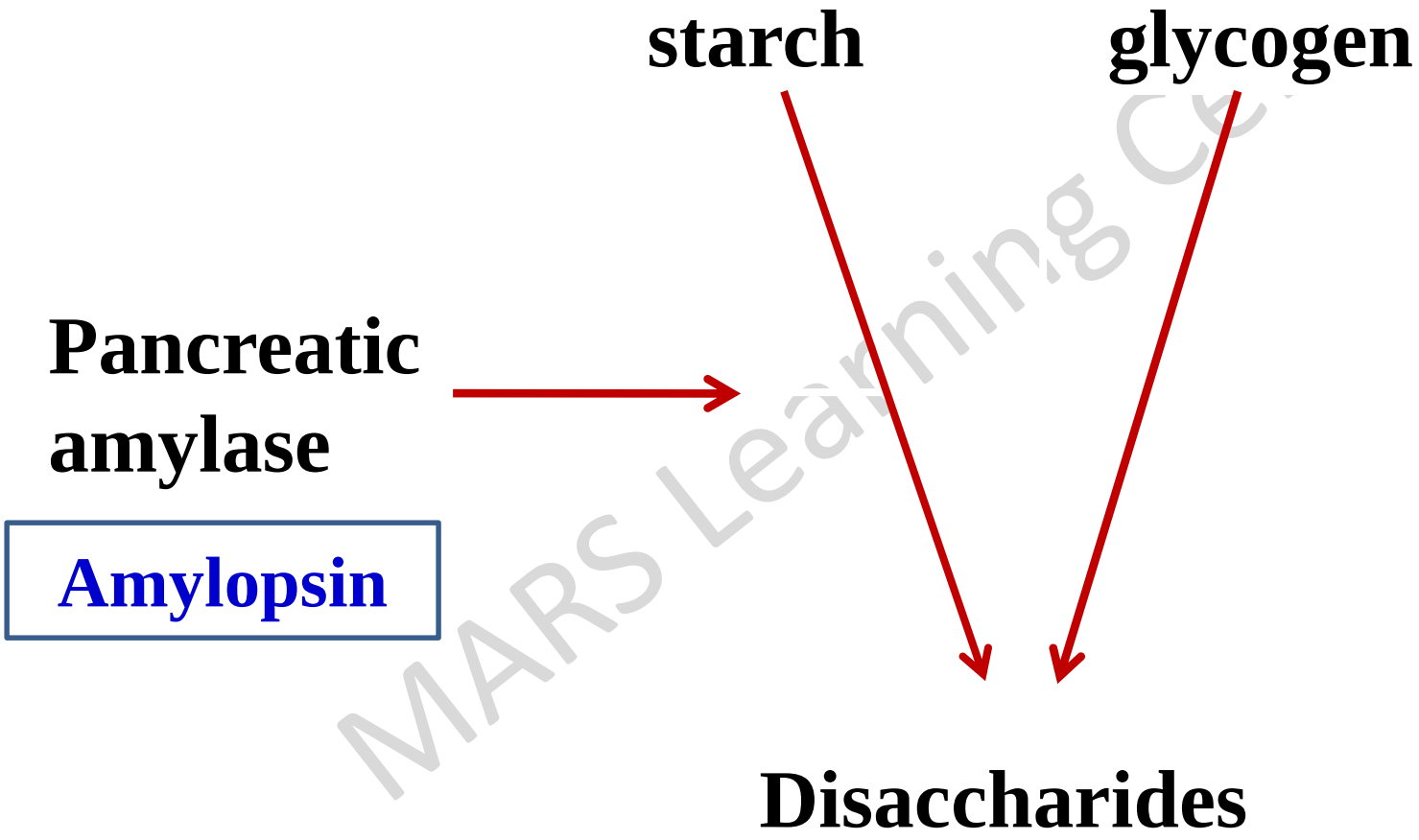
Organic

- Pancreatic Amylase
- Pancreatic Lipase
- Pancreatic Protease
- Trypsin Inhibitor

In Organic

- Na^+ , K^+
- Ca^{2+} , Mg^{2+}
- HCO^{3-} , Cl^-

Functions of Pancreatic Enzymes

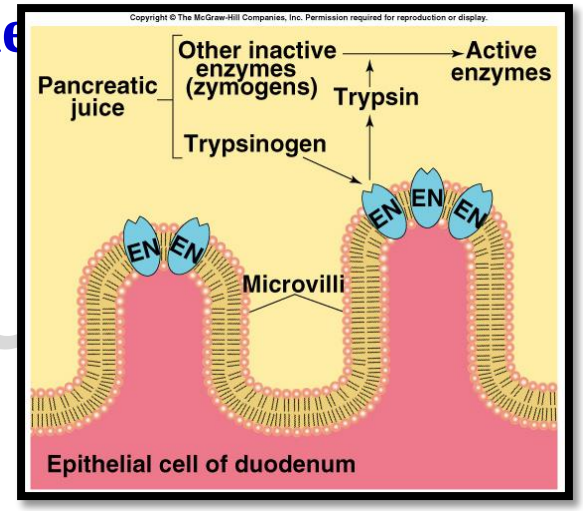


Proteolytic enzymes

Inactive when secreted

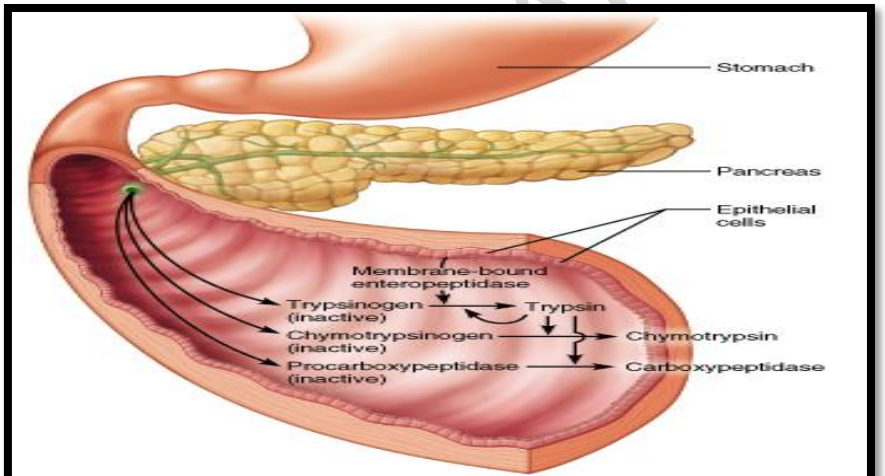
Enterokinase of small intestine activates tripsinogen

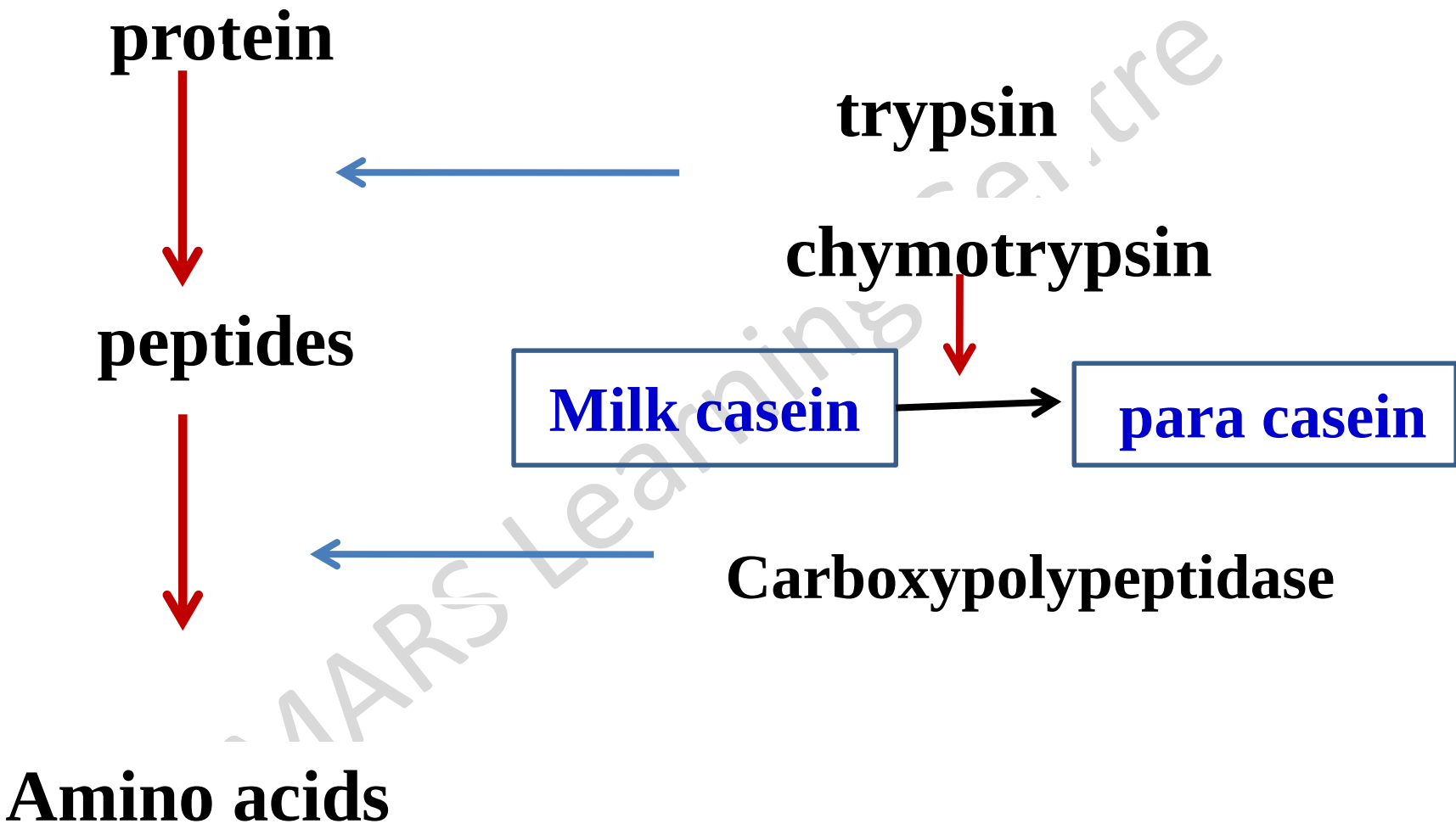
trypsinogen → trypsin



chymotrypsinogen → chymotrypsin

procarboxypolypeptidase → Carboxypolypeptidase




protein
trypsin
chymotrypsin
peptides
Milk casein
para casein
Carboxypolypeptidase
Amino acids

Pancreatic lipase

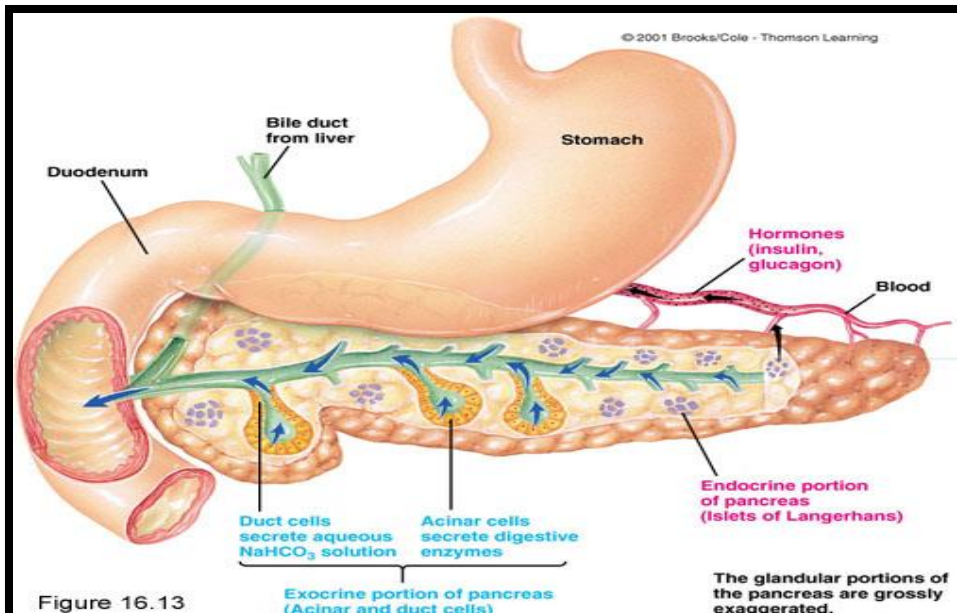
fats

Fatty acids and monoglycerides glycerol

Steapsins

Trypsin inhibitor

- **Secreted by Acinar cells .**
- **Prevents activation of trypsin in the pancreas .**
- **prevents the digestion and other enzymes**



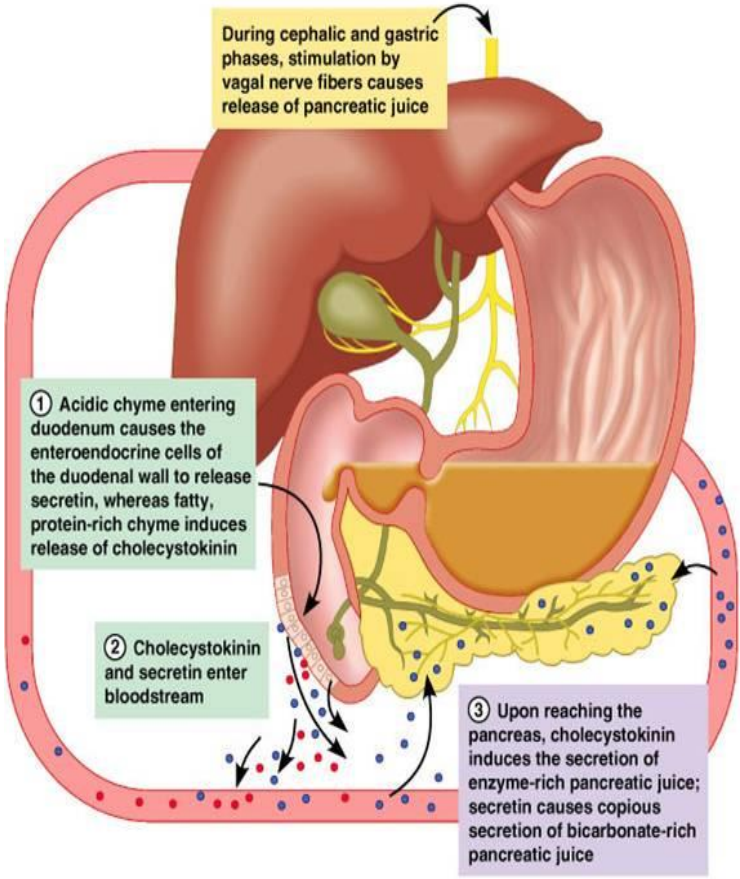
Regulation of Pancreatic secretion

- Entry of acidic chyme to duodenum

↓

↑ Pancreatic secretion

By releasing two hormones from duodenal cells



Secretin → ↑ HCO3- secretion

cholecystokinin → ↑ enzyme secretion

Acetylcholine (Ach) released by vagus nerve

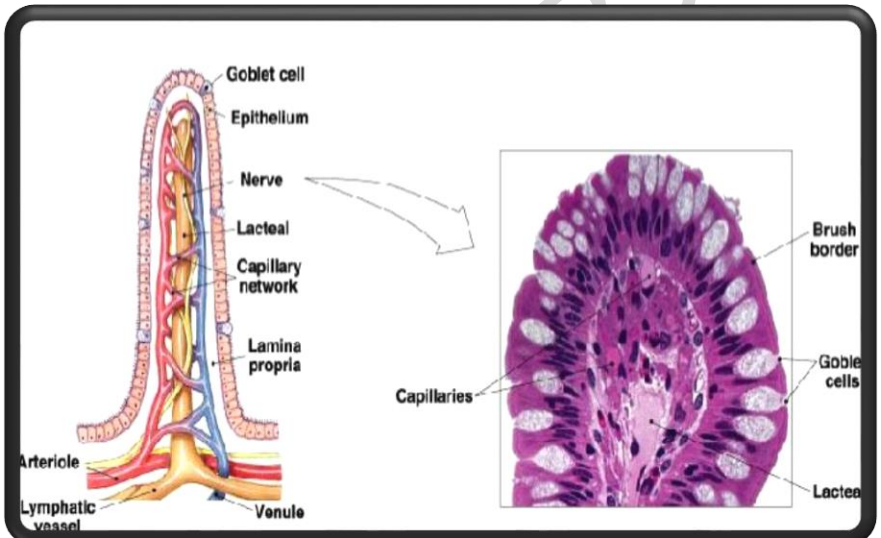
Small intestinal secretions

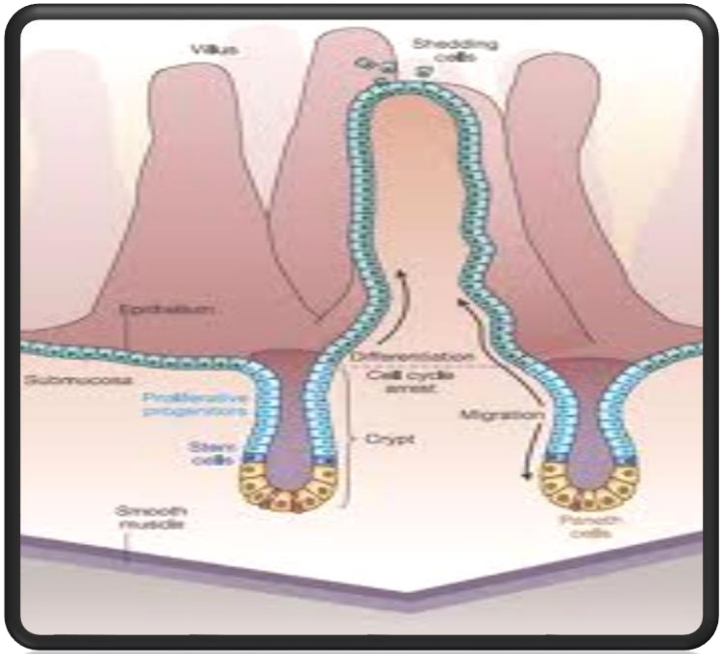
- Between adjacent villi

crypts of lieberkhun

Intestinal glands

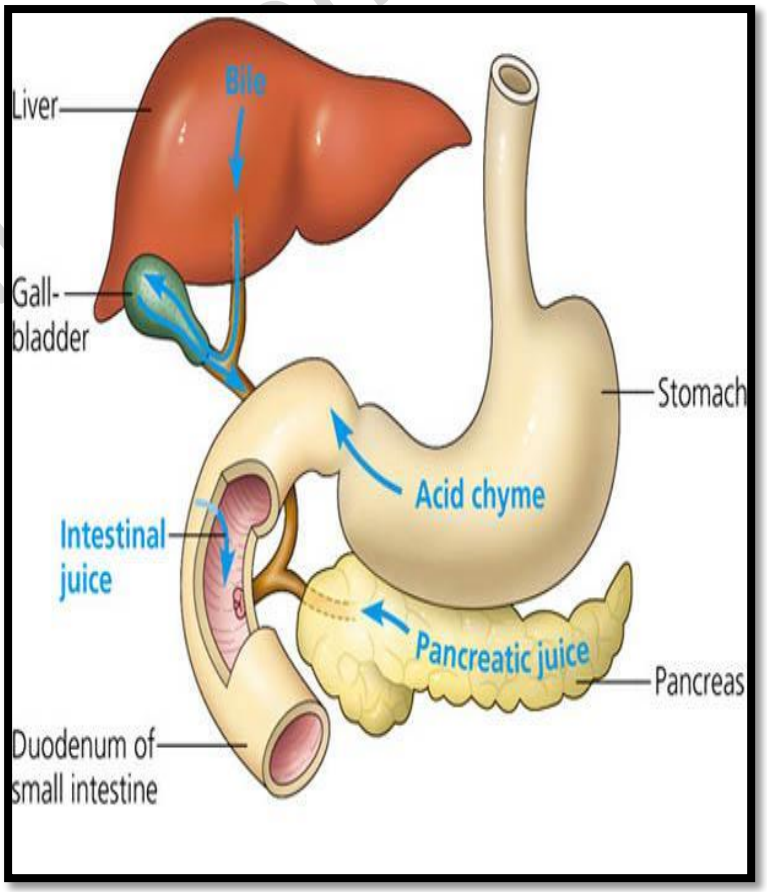
-





Intestinal juice/ Succus Entericus

- 1800- 2000 ml/day
- Transparent yellowish fluid
- **Alkaline pH (7.5-8)**
- Water – 98%
- Solids-organic , inorganic



Succus Entericus

Organic

- Activating enzymes
- Digestive enzymes
- Hormones
- Mucus by Goblet cells

Inorganic

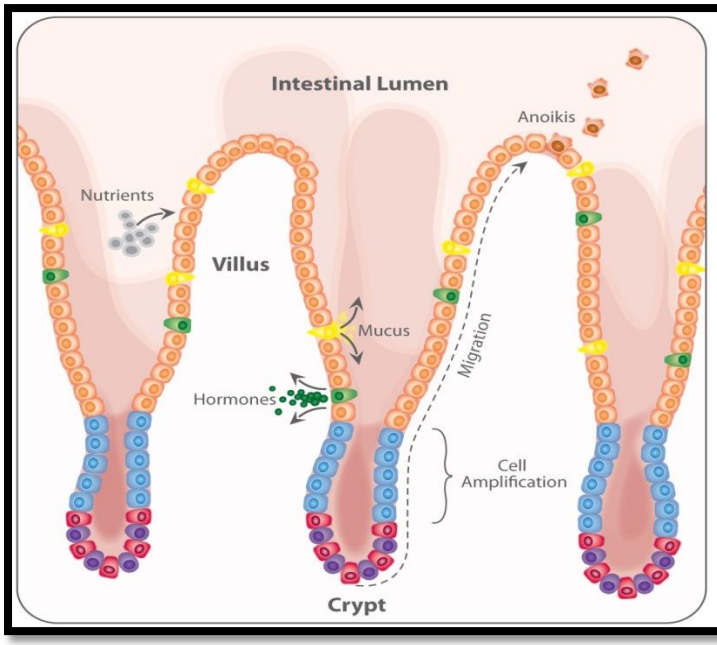
- Sodium
- Chloride
- Bicarbonates

Enzymes

- **Enterokinase**
- **Sucrase, maltase, lacatase**
- **Amino peptidase, dipeptidase**
- **Lipase**

Hormones

- **Secretin, CCK-PZ, Enterogastrone, VIP ,GIP**

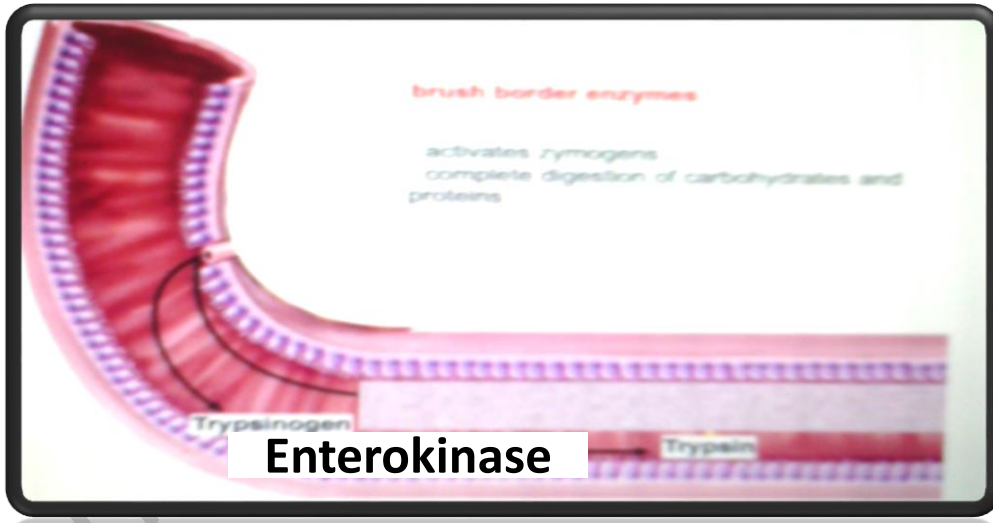


Enzymes :

1. Activating Enzymes

   - Enterokinase

activates pancreatic trypsinogen



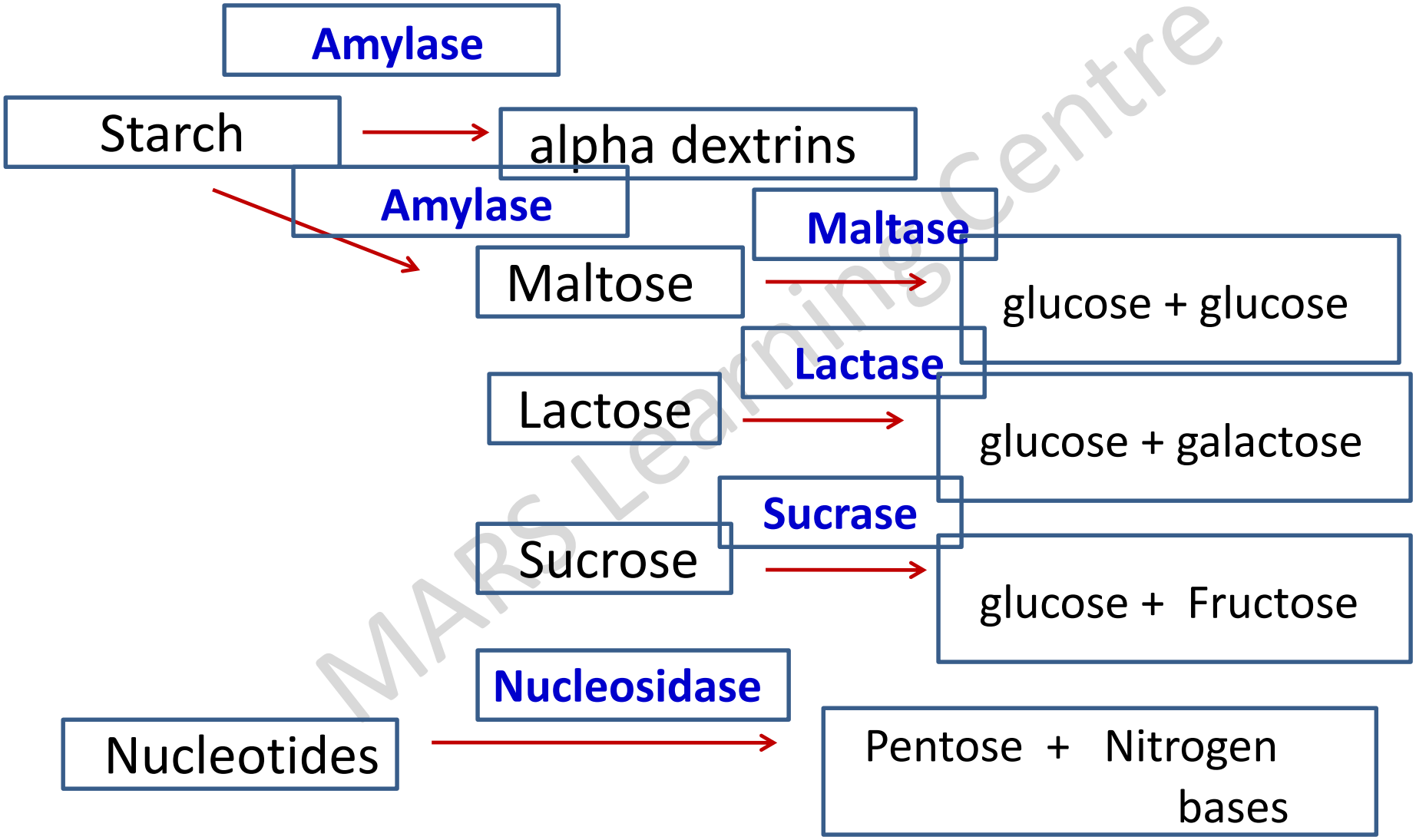
2. Digestive enzymes

- sucrase, maltase, lactase → disacch → monosacharides

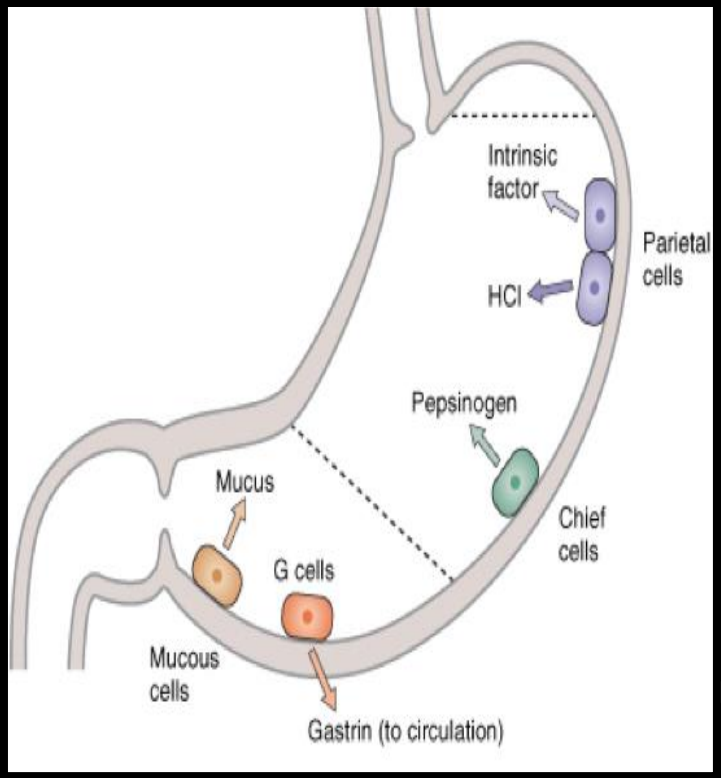
- amino, dipeptidase → peptides → amino acids

Erepsins

- intestinal lipase → fats → fatty acids,glycerol



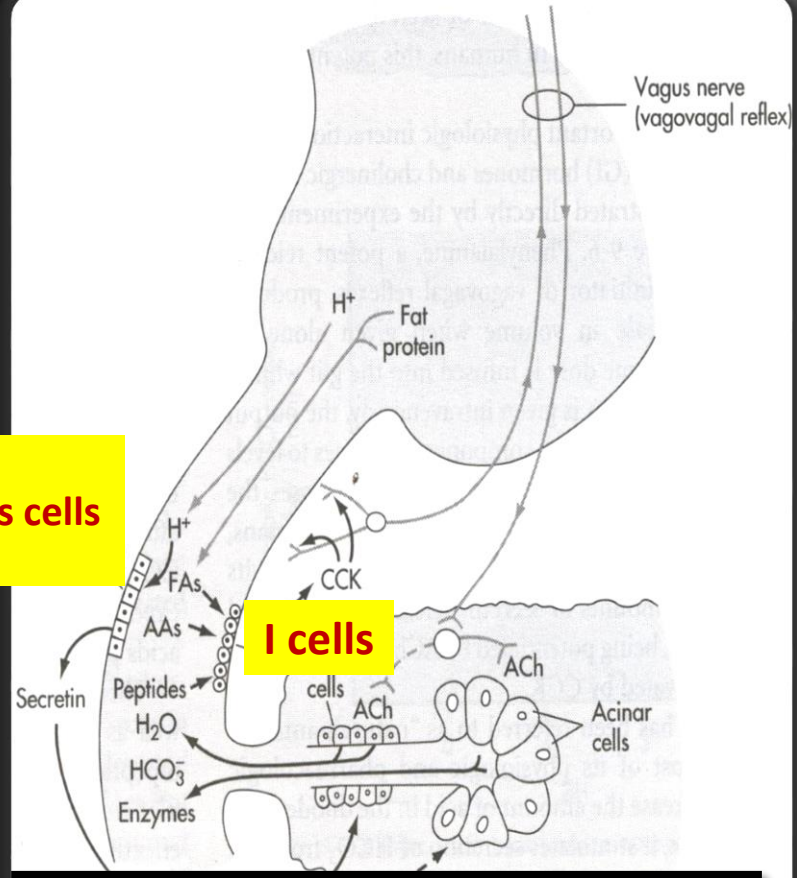
HORMONES	SOURCE	ACTIONS
GASTRIN	**G** – Cells in stomach	- Increases - Gastric juice - Gastric motility
CCK -PZ	**I** – Cells of duodenum , jejunum Stimulus- **acidic chyme in deuodenum, fat and protein breakdown products in chyme**	- **Succus entericus** - **enzyme rich pancreatic juice** - **contraction of gall bladder to release bile** - **intestinal motility**
SECRETIN	**S** – Cells of duodenum , jejunum	- **Alkaline watery pancreatic & bile secretion**

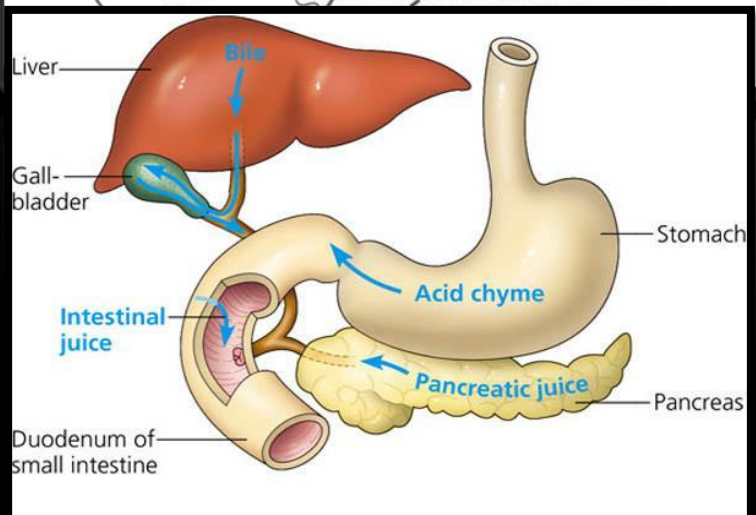


G – cells

s cells

I cells

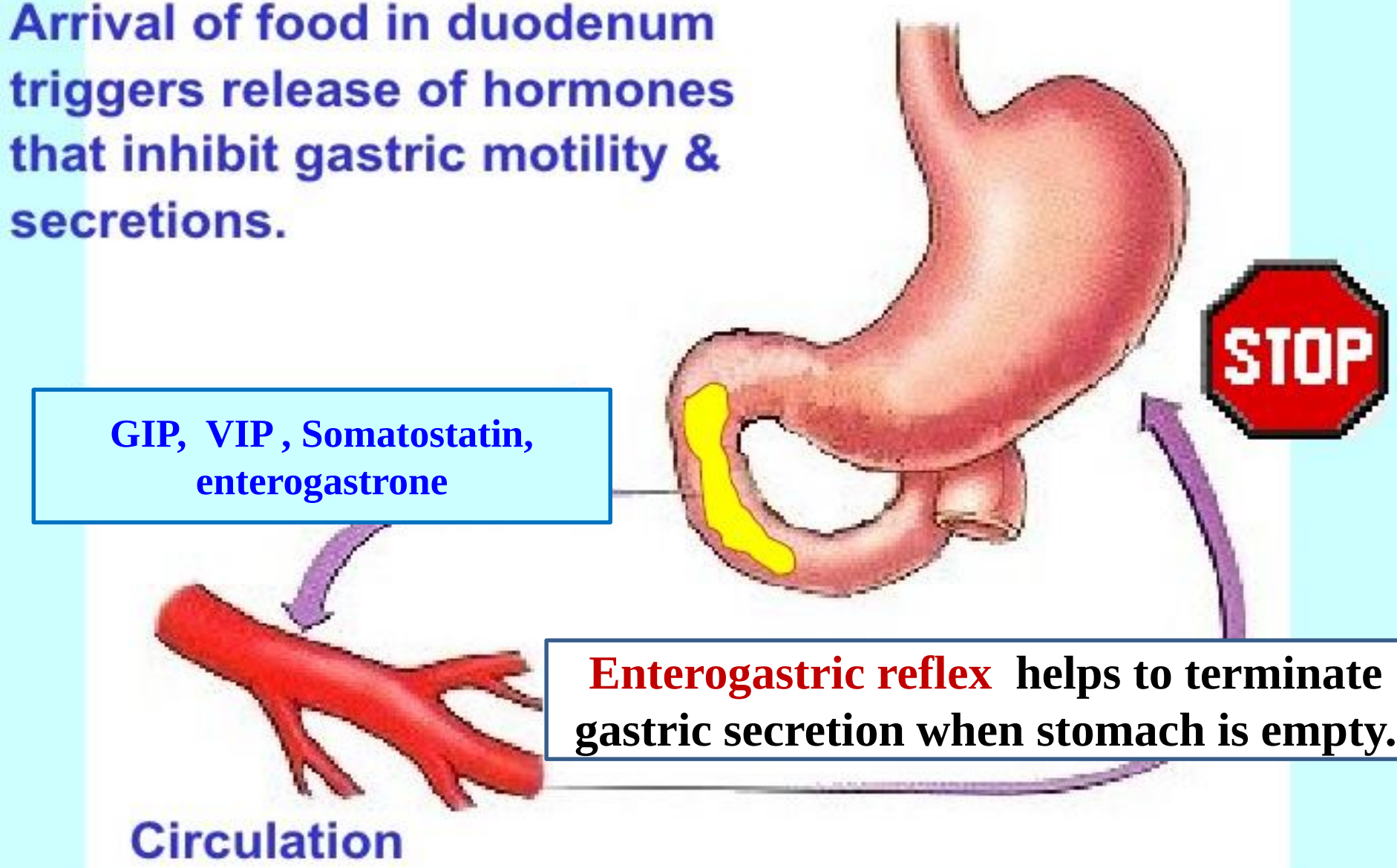




GIP **(gastric inhibitory polypeptide)**	**mucosa of duodenum , jejunum**	**- ↓ gastric secretion** **- ↓ gastric motility**
VIP **(vasoactive intestinal polypeptide)**	Jejunum in response to fatty meals	**- ↑ Intestinal secretions** **- inhibits gastric juice** **- dialates blood vessels**
Duocrinin	cells of duodenum	**- ↑ Intestinal secretions (Brunners gland)**
Enterocrinin	small intestinal epithelium	**- ↑ Succus entericus**
Somatostatin	delta cells of Islets of Langerhans	**- ↓** insulin , glucagon from pancreas

Intestinal Phase

Arrival of food in duodenum triggers release of hormones that inhibit gastric motility & secretions.

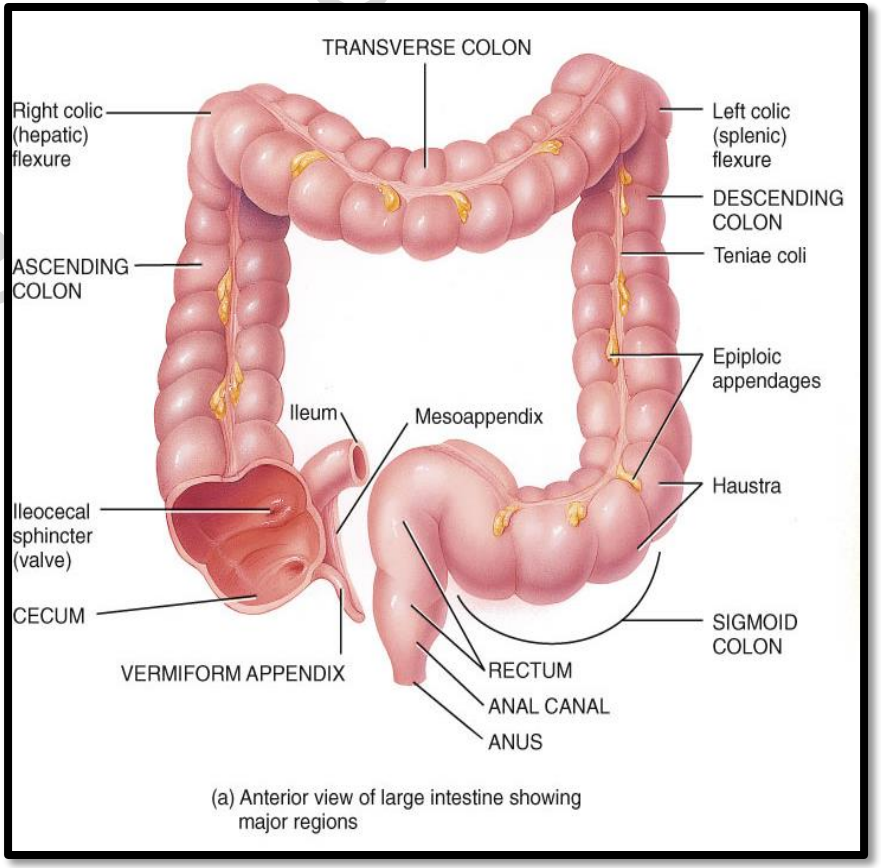


GIP, VIP , Somatostatin, enterogastrone

Enterogastric reflex helps to terminate gastric secretion when stomach is empty.

Parts of large intestine

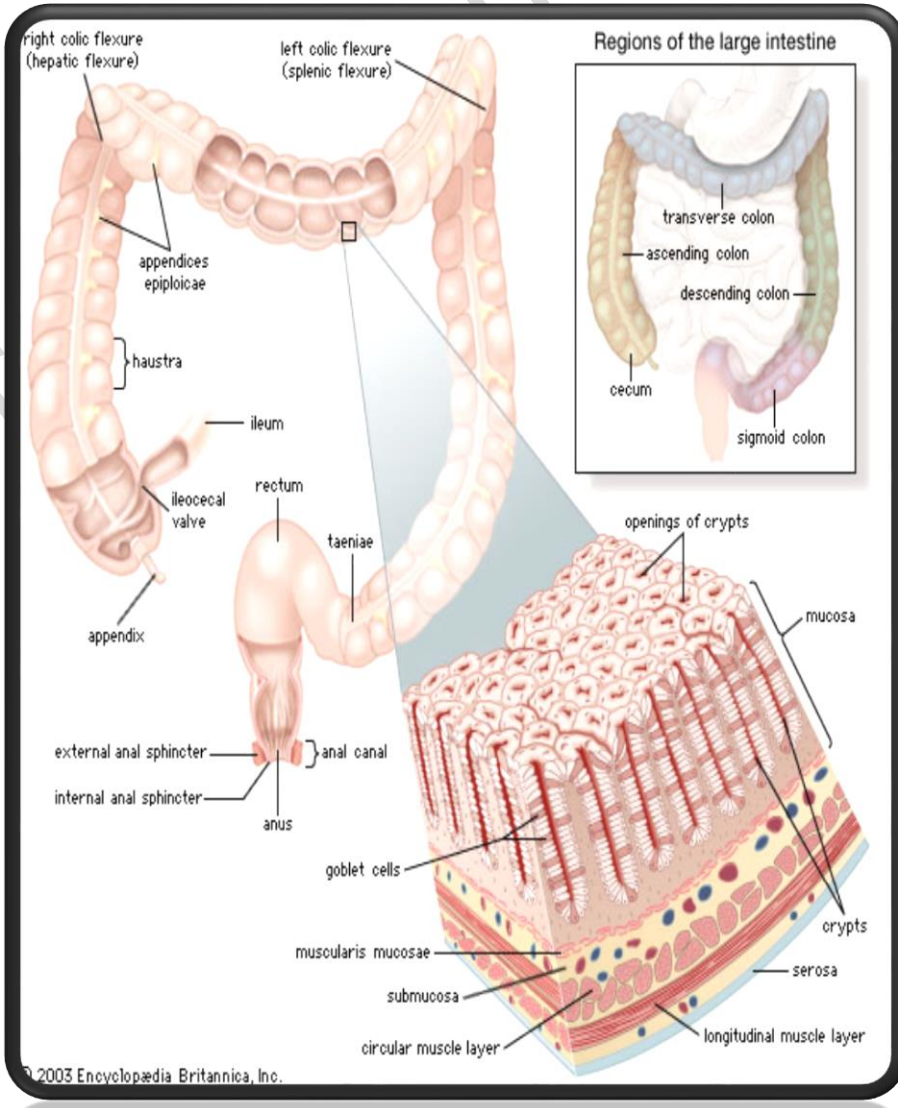
- Ceacum
- Appendix
- Ascending colon
- Transverse colon
- Descending Colon
- Sigmoid colon
- Rectum



(a) Anterior view of large intestine showing major regions

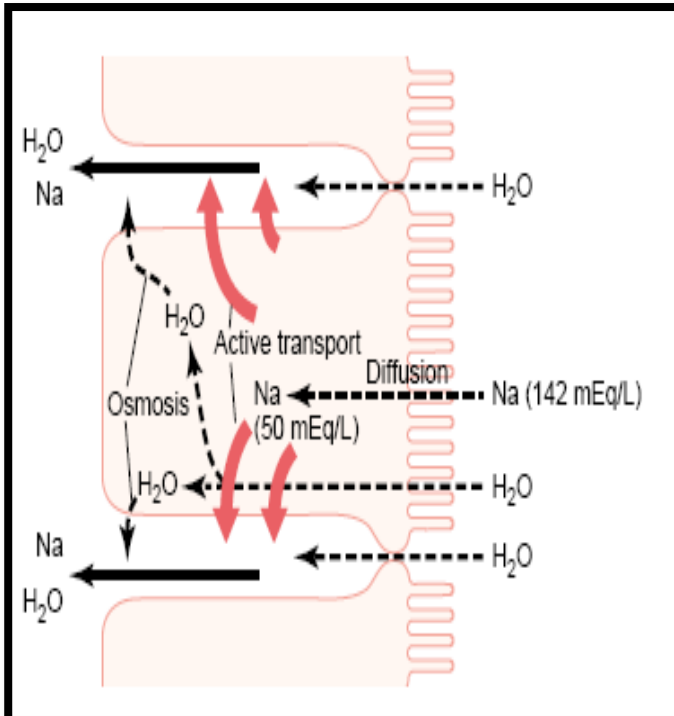
Secretions of LI

- Highly alkaline
- **Composition**
  - Mucus
  - $NaHCO_3$
  - Potassium
  - Chloride ions
  - Water



Functions of LI

- **Absorption** : water , electorlytes.
- **Synthesis**: production of some vitamins (vit K, B –comp, vit K, folic acid)
- **Excretion** : waste products (mercury, lead)
- **Formation of Feaces**
- **Defecation**



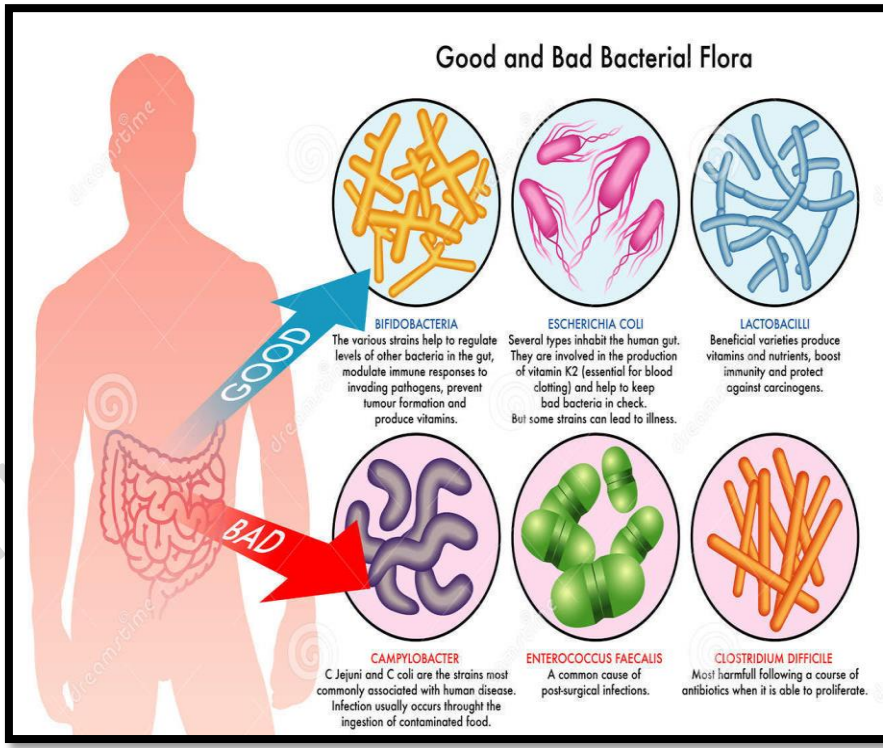
Bacterial Flora of LI

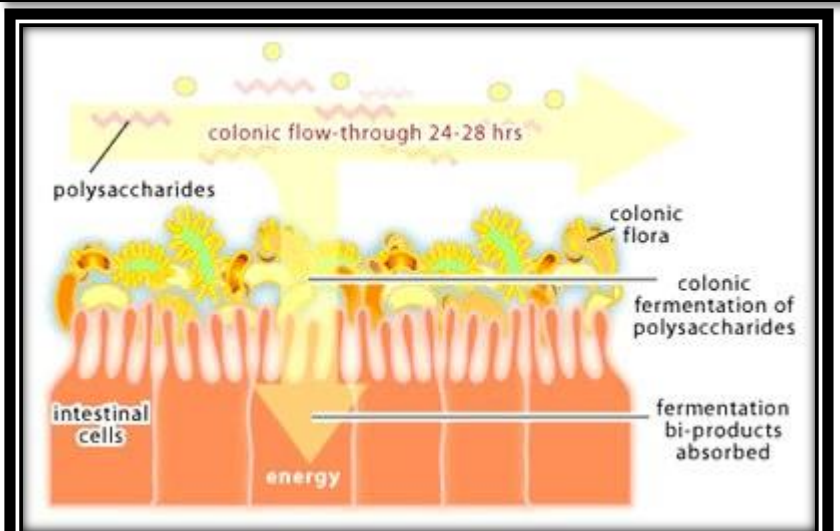
- Stagnation , low oxygen tension favours bacterial growth .

- **Harmless** : - E.coli

  -enterobacter aerogenes

- **Harmful** :gas gangrene bacilli





Significance of Colonic Bacterial Flora

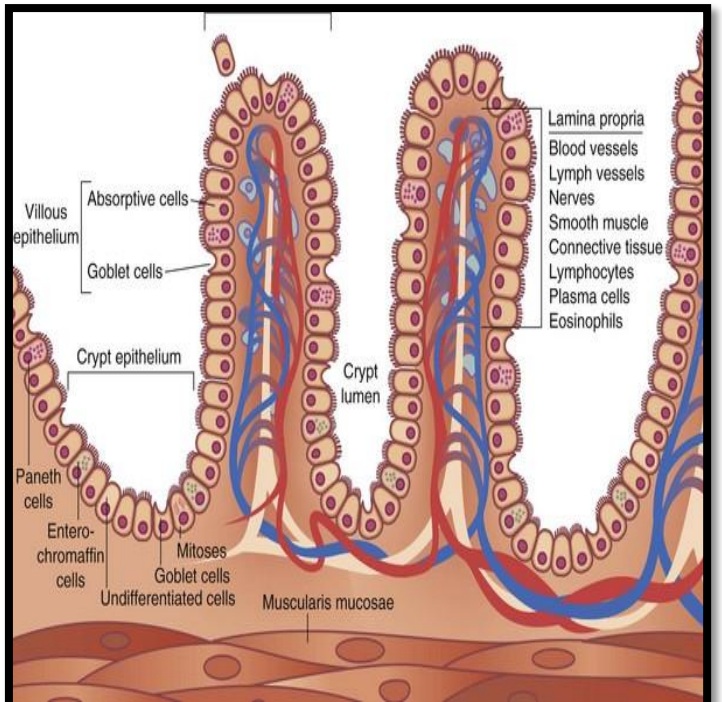
1. **Synthesis** : Vit C , Vit B group ,folic acid , Vit K_2
   - indole , skatole – faecal odour

2. **Convert bile pigments** → **Stercobilinogen , urobilinogen**
   - Imparts colour to feaces
   - Imparts colour to urine

3. **Production of intestinal gases (7-10L/day)**
   - breakdown of undigested nutrients
   - **600ml/day is released out**

Summary of Digestion & Absorption

- Absorption mainly occurs in ileum of small intestine by intestinal villi.



CHO digestion

Mouth

Starch

Salivary α-amylase

Maltose

Stomach

Small intestine

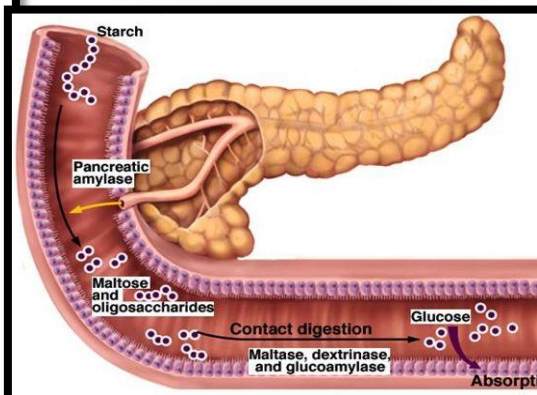
Pancreatic α-amylase

Starch ---- maltose , sucrose , lactose

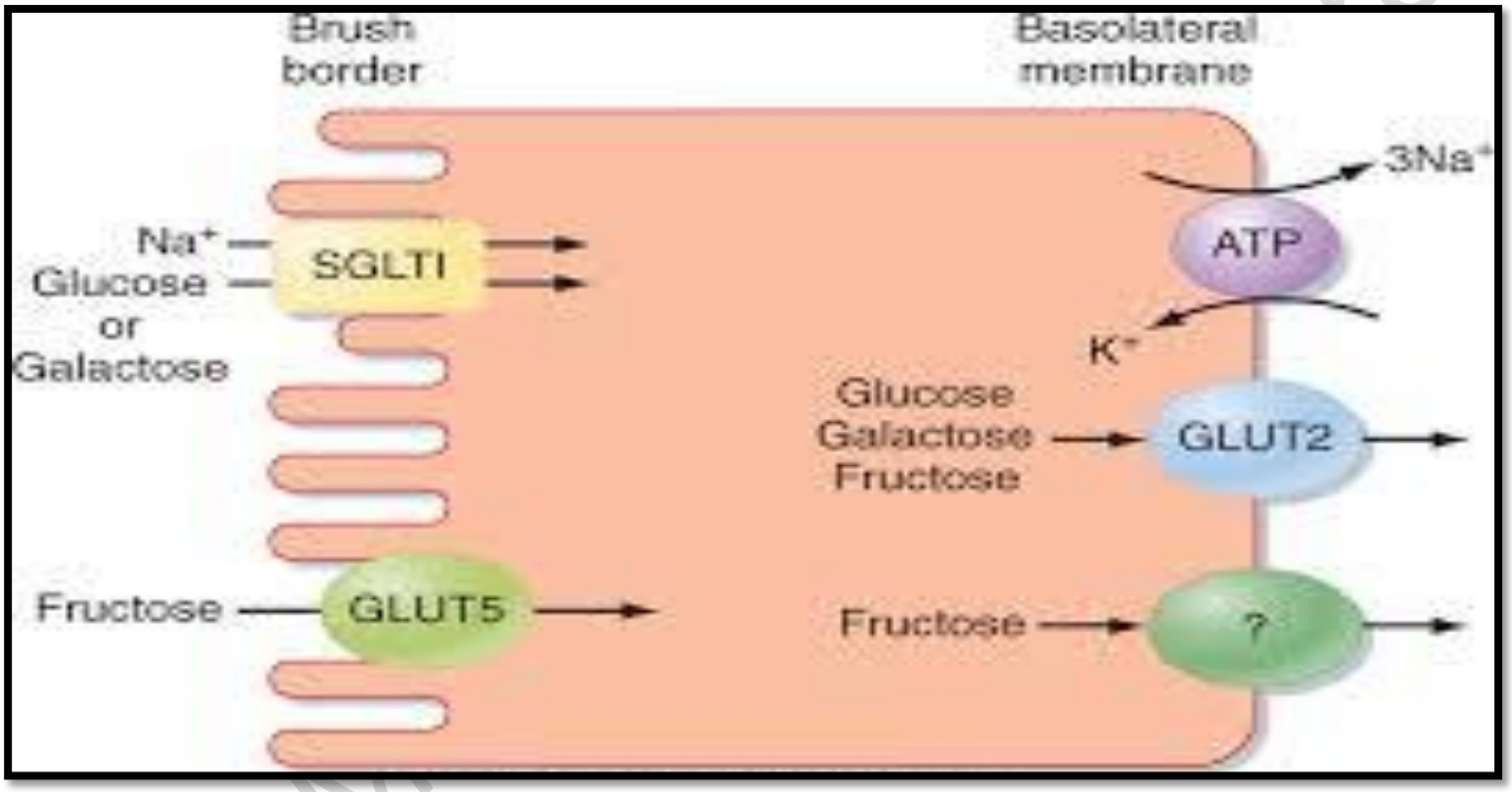
Intestinal lining

Brush border enzymes

Monosaccharides in blood stream



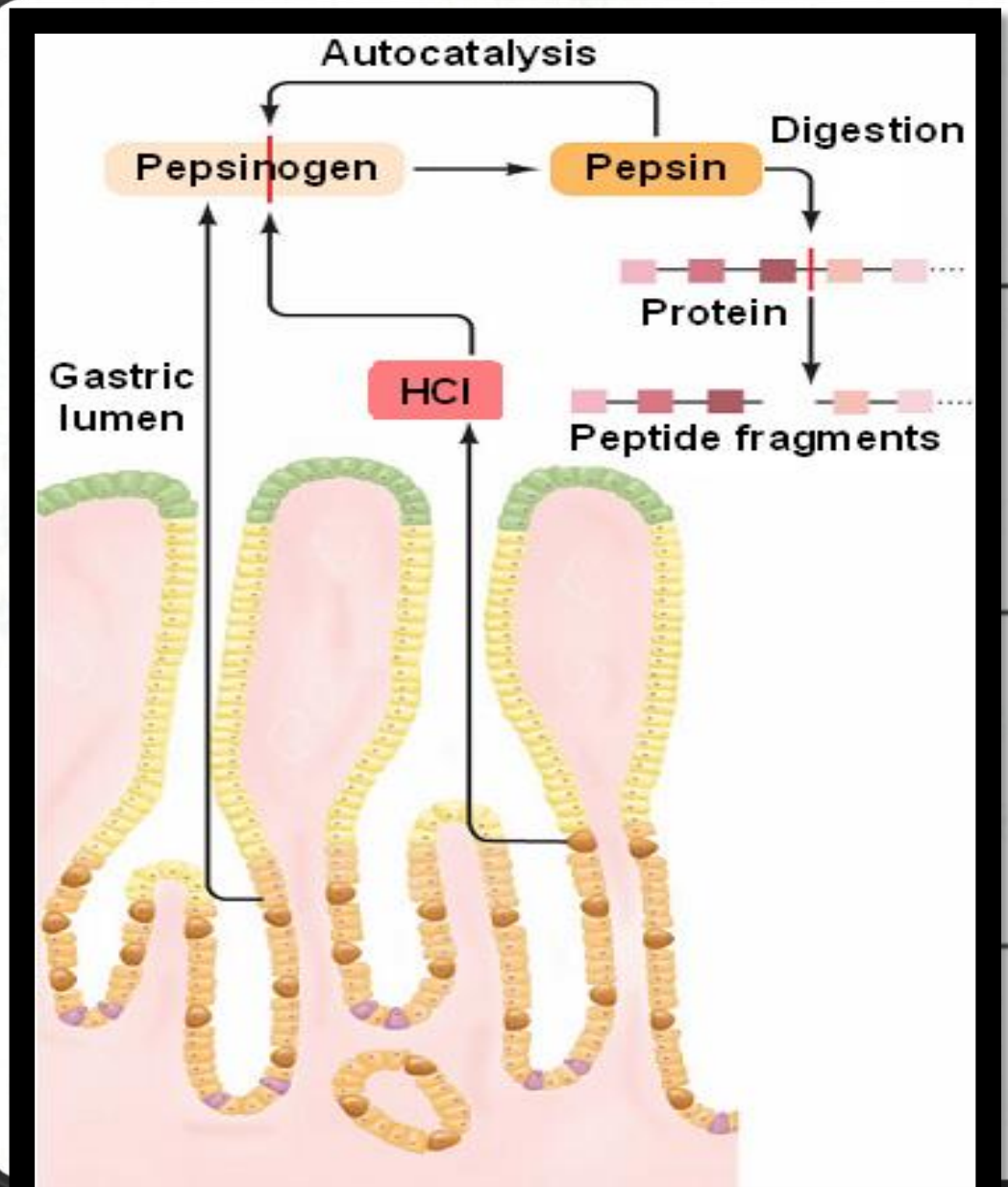
CHO absorption



Glucose, galactose --- sodium dependent active transport

Fructose --------- Facilitated Diffusion

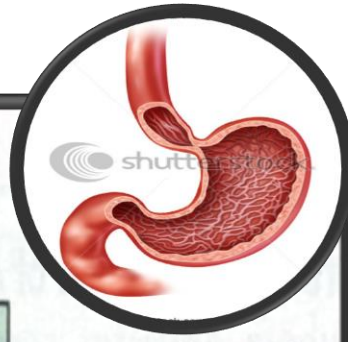
DIGESTION OF PROTEINS

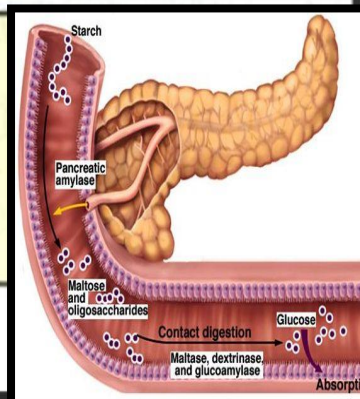


Pepsin in presence of hydrochloric acid

Pancreatic enzymes (trypsin, chymotrypsin, carboxypeptidase)

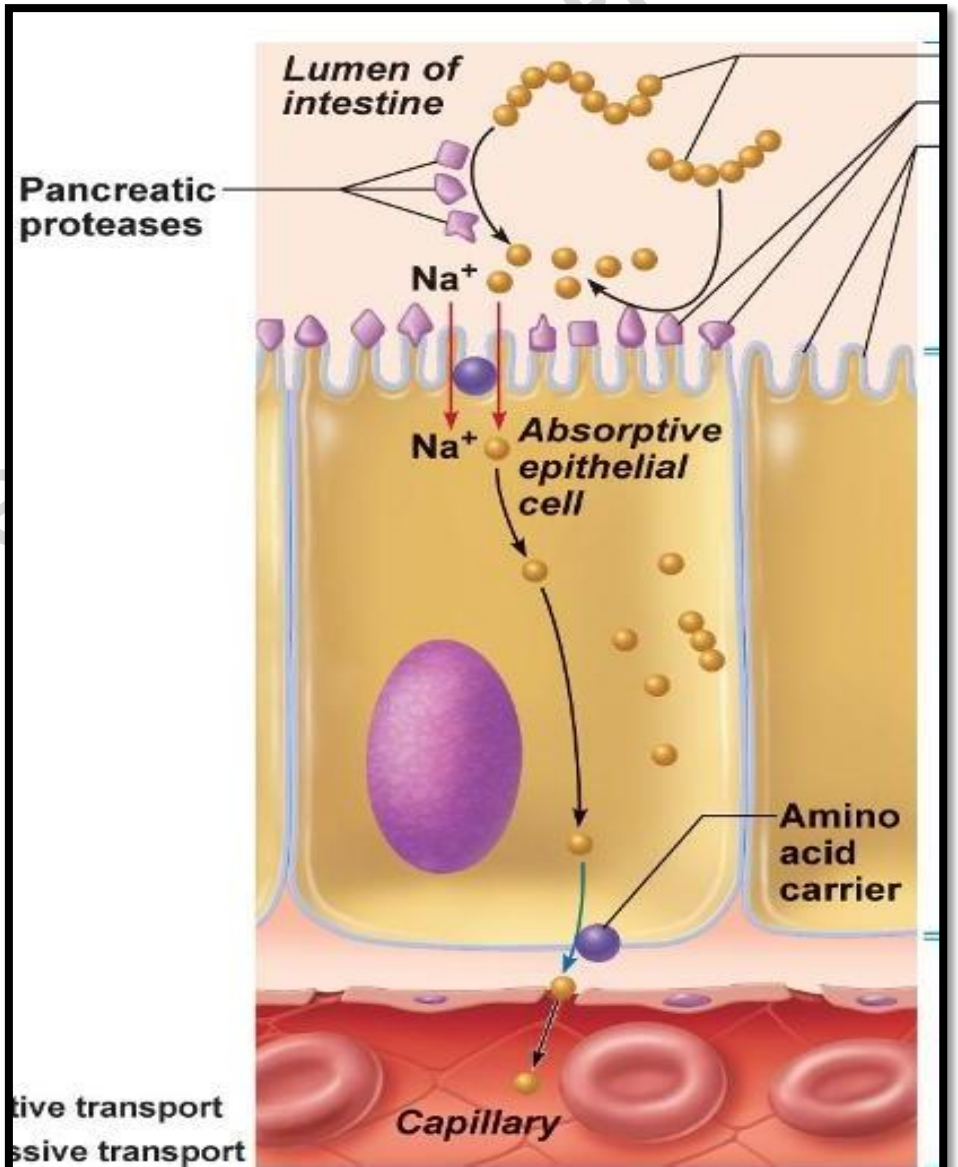
Brush-border enzymes (aminopeptidases and dipeptidases)





Protein absorption

- Na+ dependent Active transport.
- ATP dependent

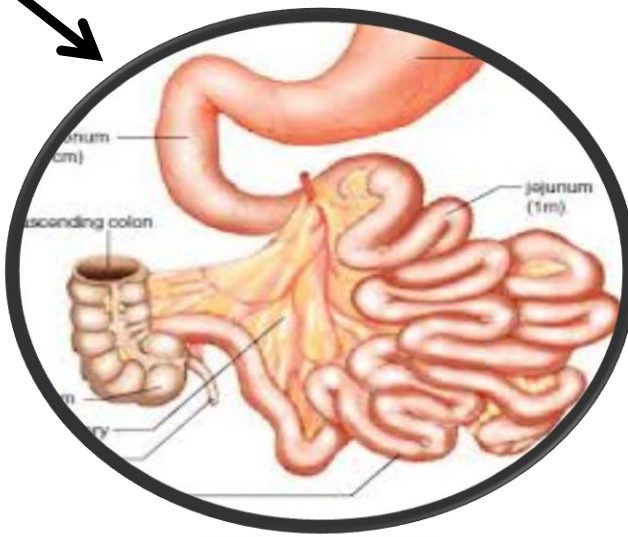


DIGESTION OF FATS

Mouth

Stomach

Small Intestine

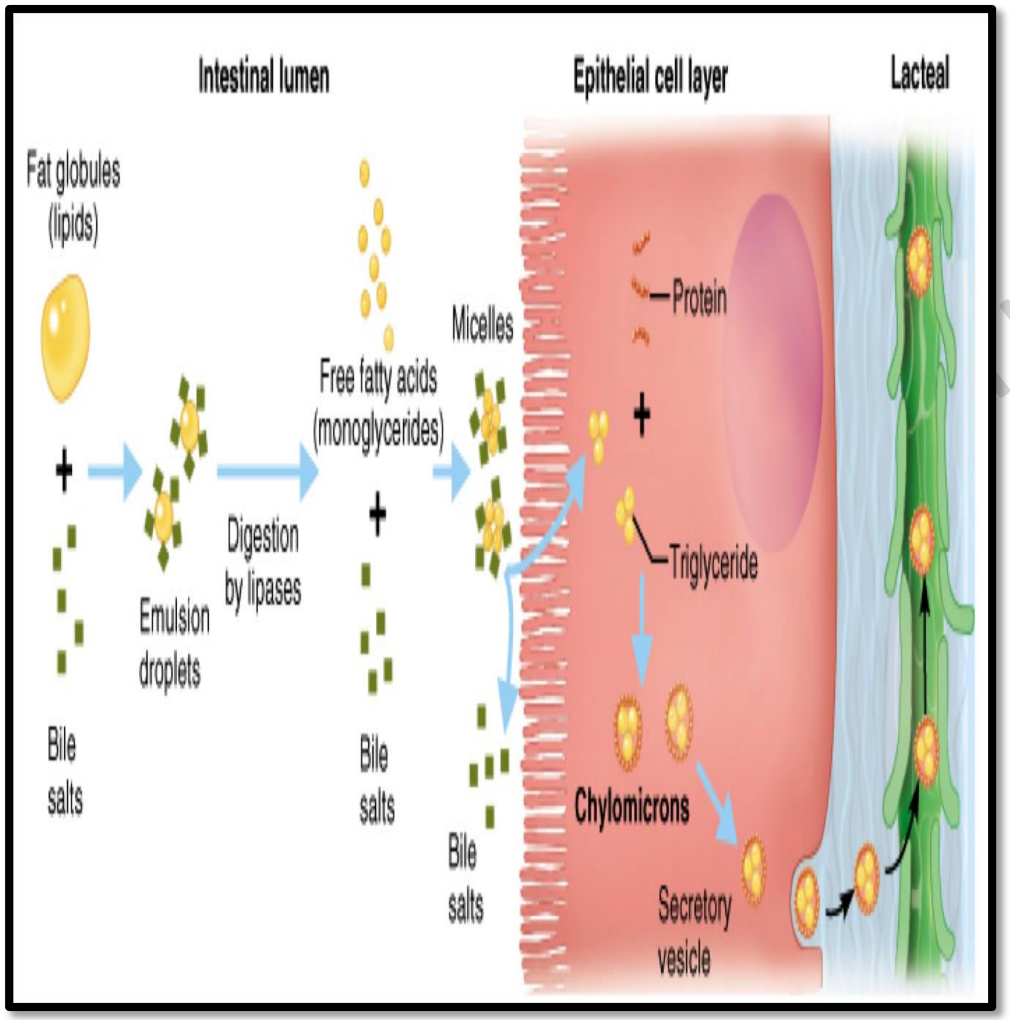


~~Salivary lipase~~

Gastric lipase

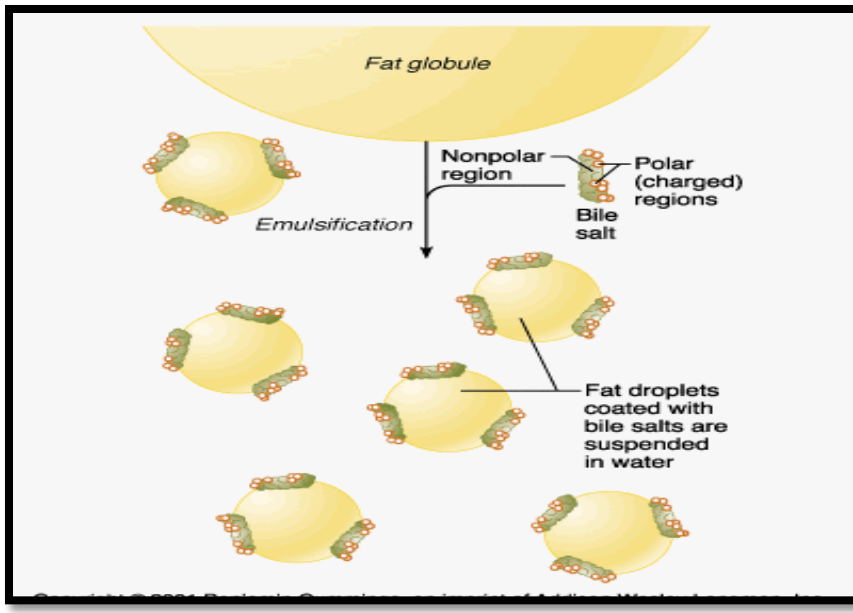
Insignificant

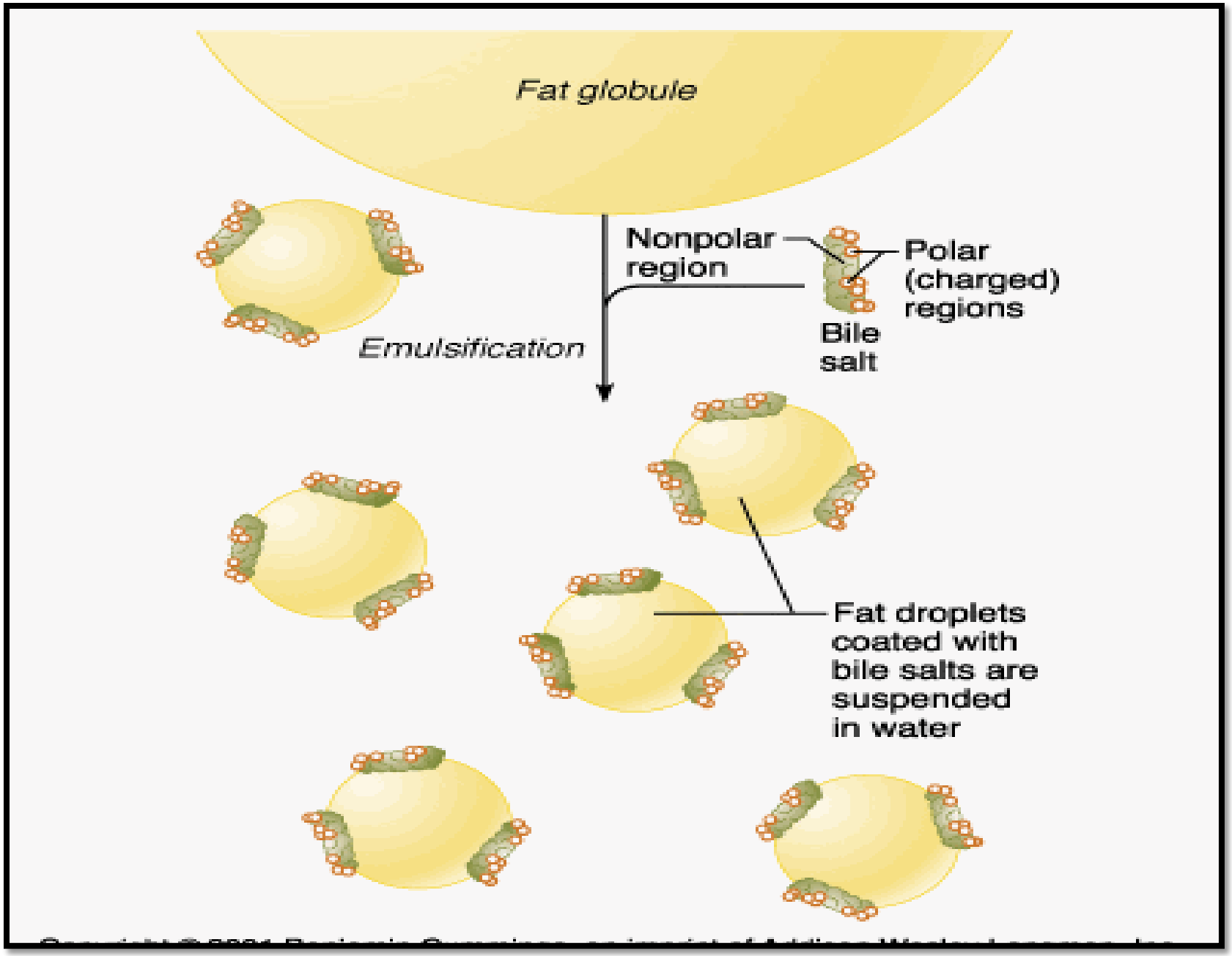
Digestion of Lipids

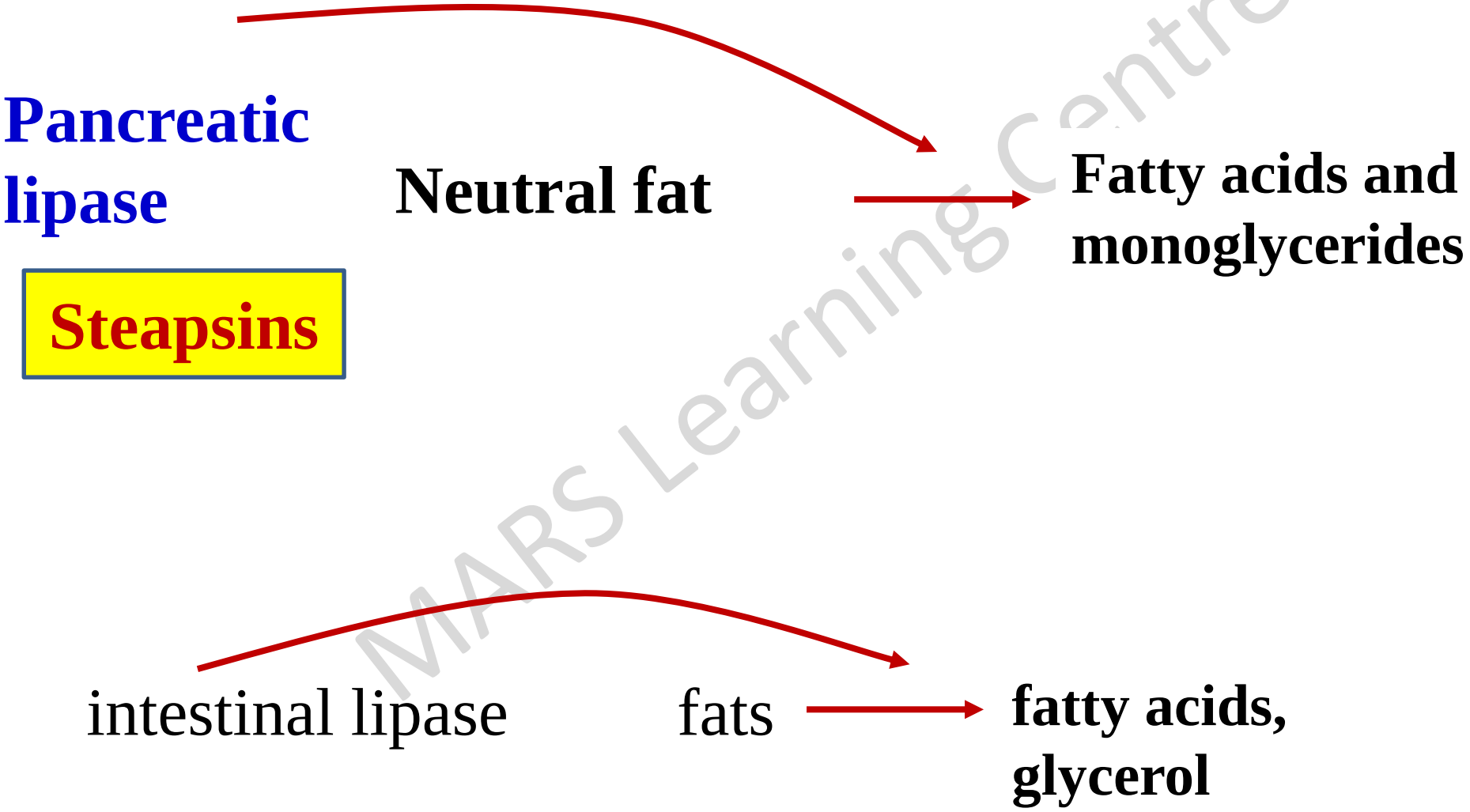


- **In small Intestine**

1) **Bile salts of liver**
2) **Pancreatic Lipases**
3) **Intestinal Lipases**

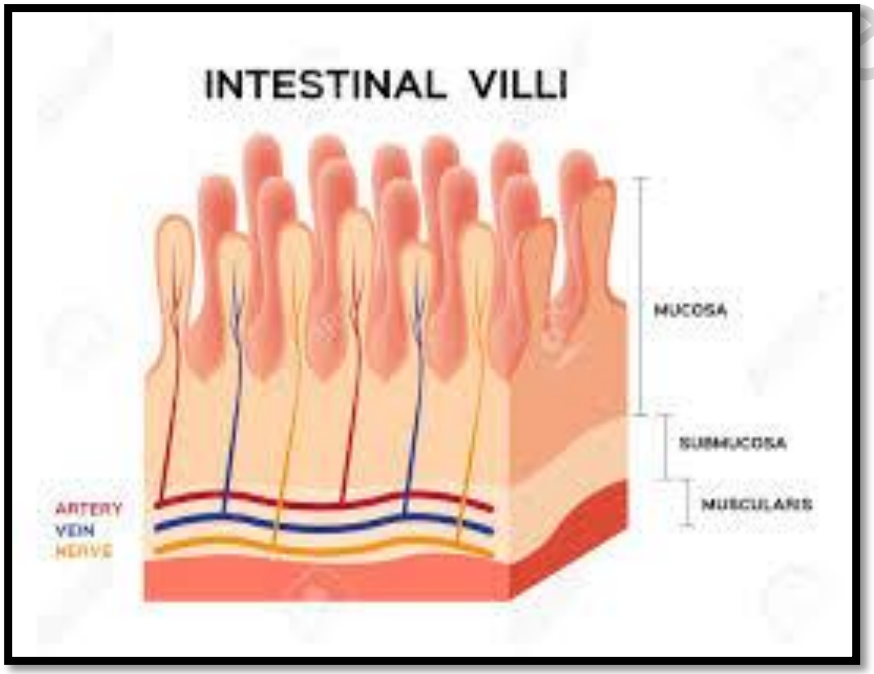


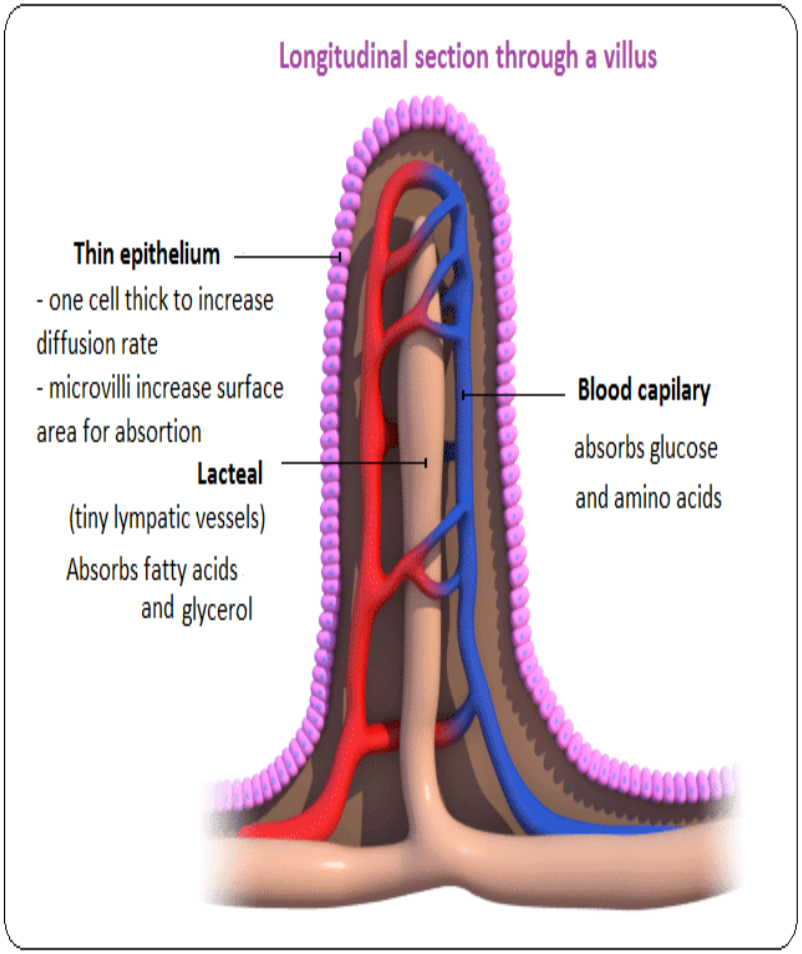

Fat globule
Nonpolar region
Polar (charged) regions
Bile salt
Emulsification
Fat droplets coated with bile salts are suspended in water



Intestinal fat absorption

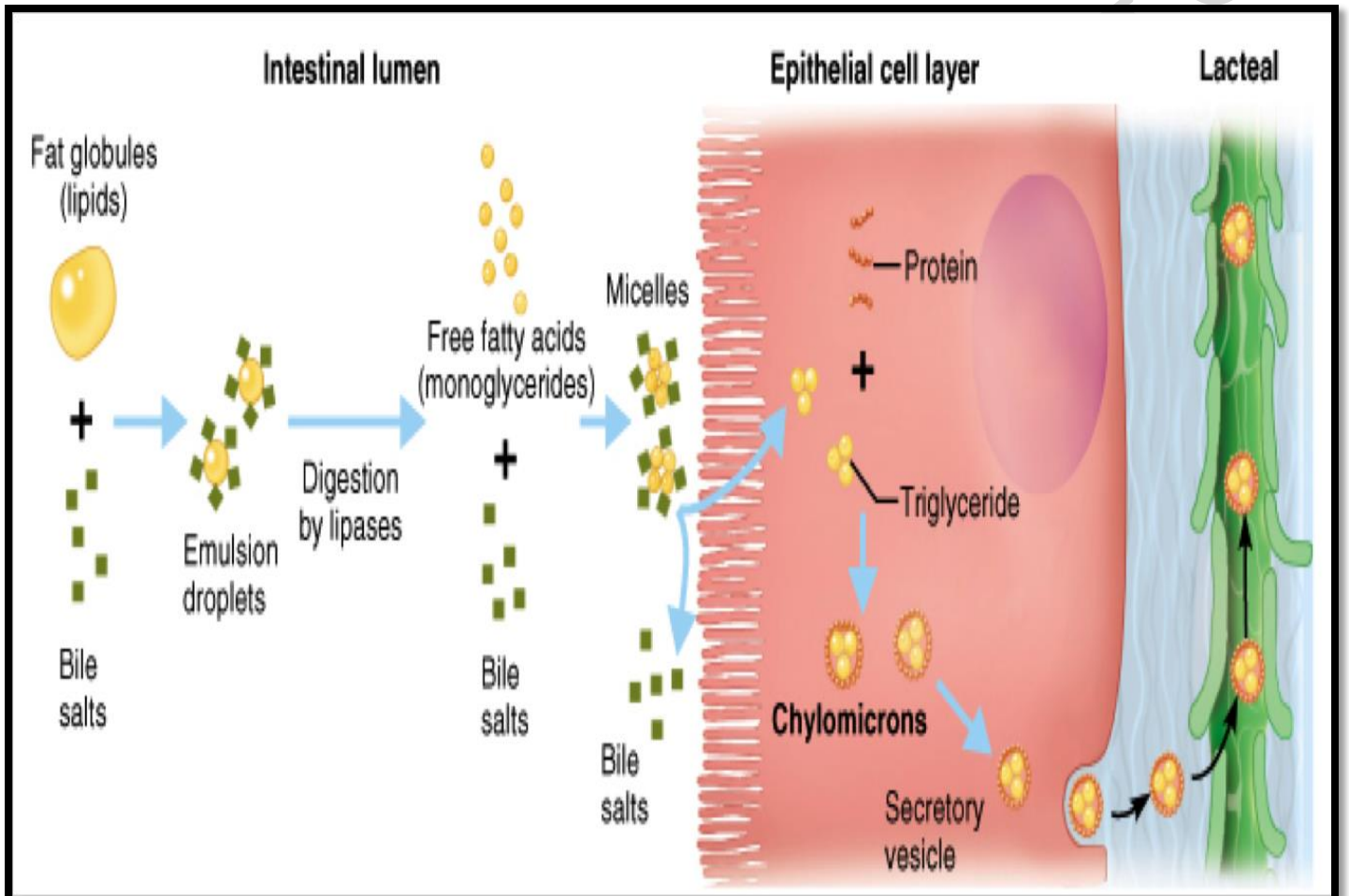
- **Small intestine has villi**
- **Lacteal in its center**
- **Lipids are absorbed as micelle**

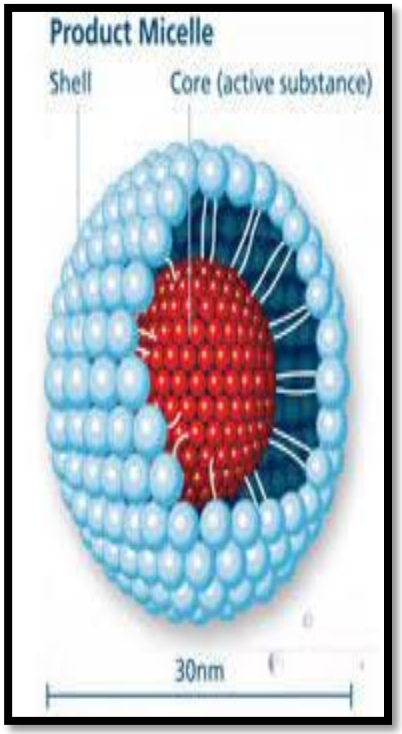


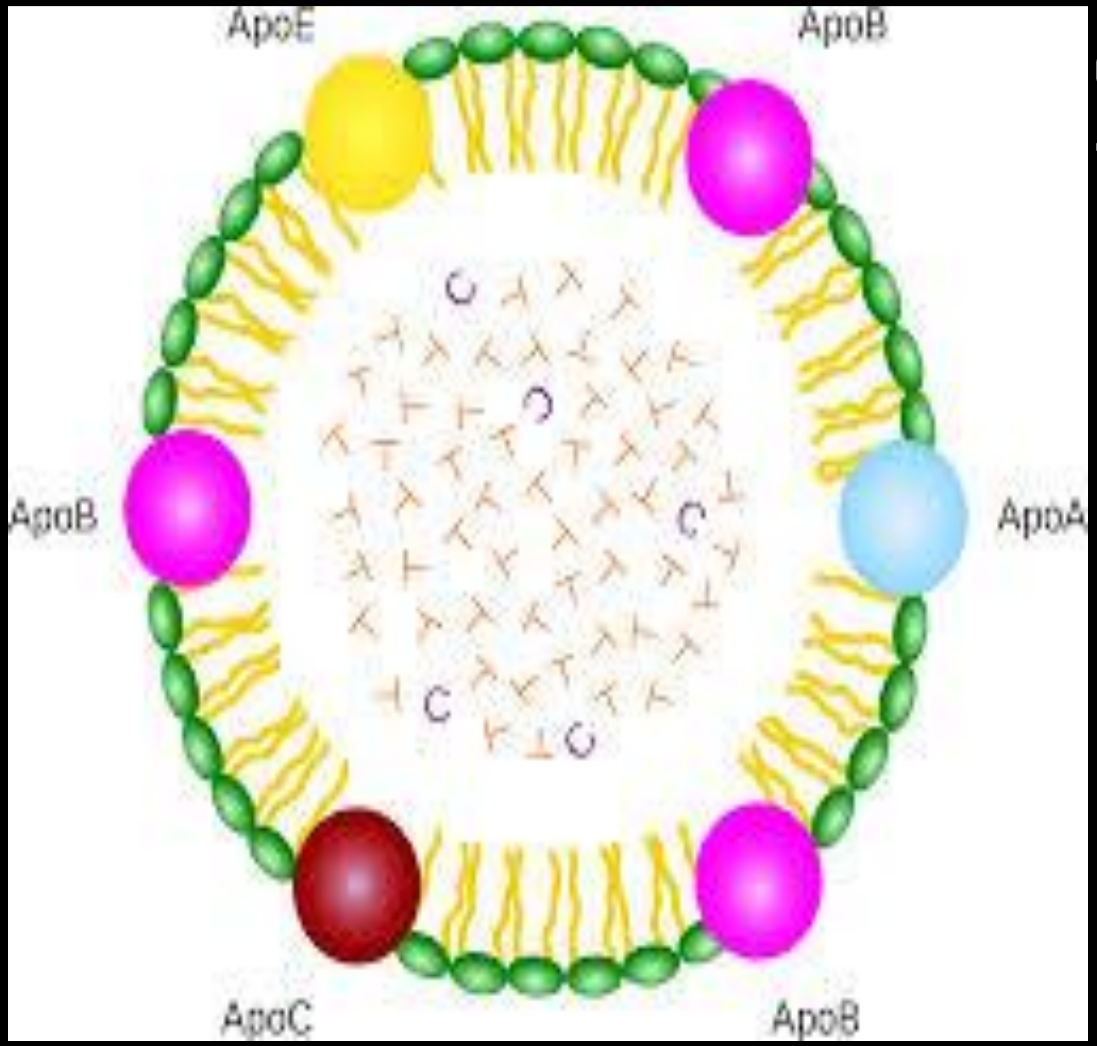


Intestinal fat absorption

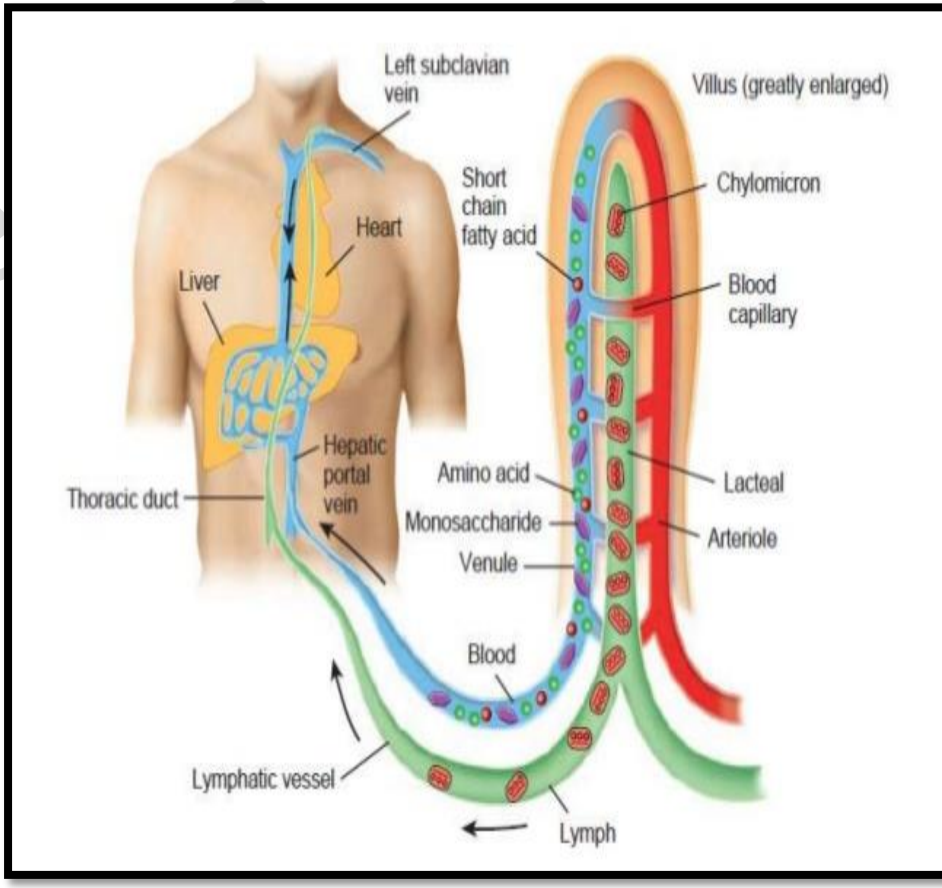
- **Micelles – spherical water soluble droplets formed by bile salts , phospholipids with fat in the center**






ApoE
ApoB
ApoB
ApoA
ApoC
ApoB

- Lacteal after absorption of lipids
- Has white colored fluid
- **Chyle**



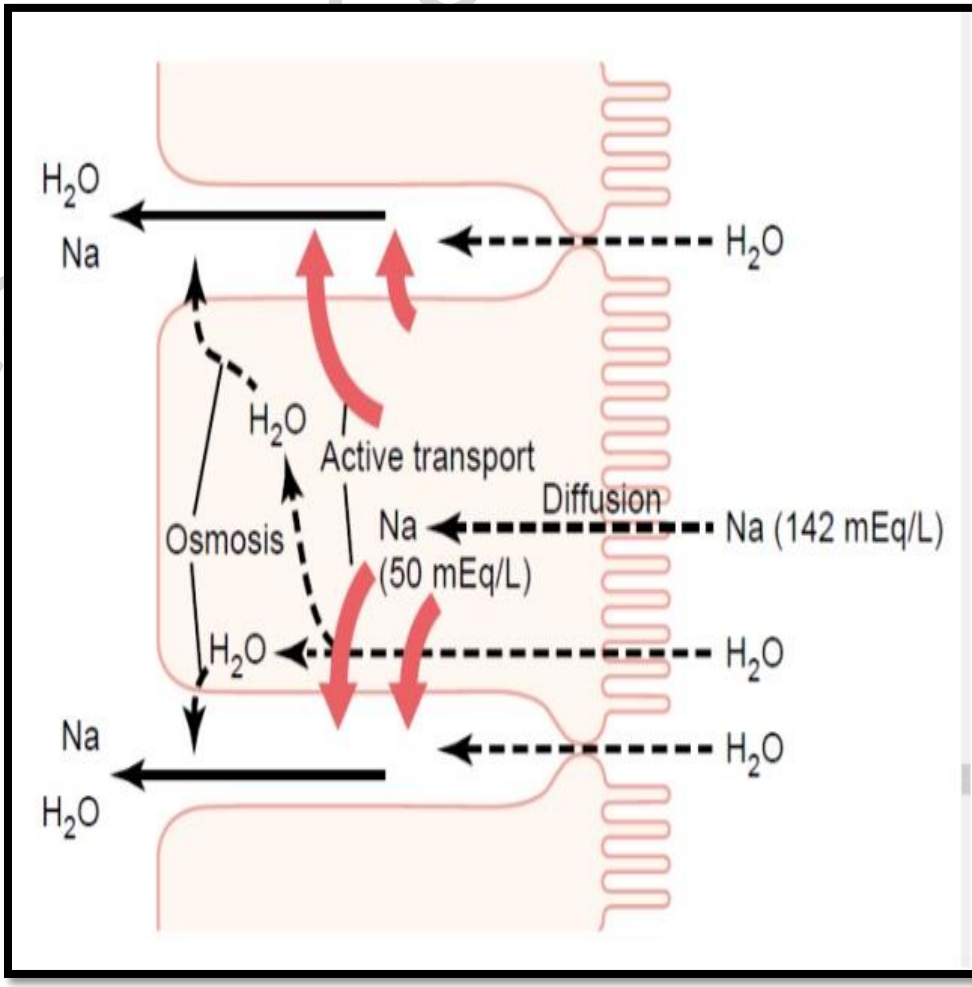
Water reabsorption

- Water reabsorbed with

electrolytes

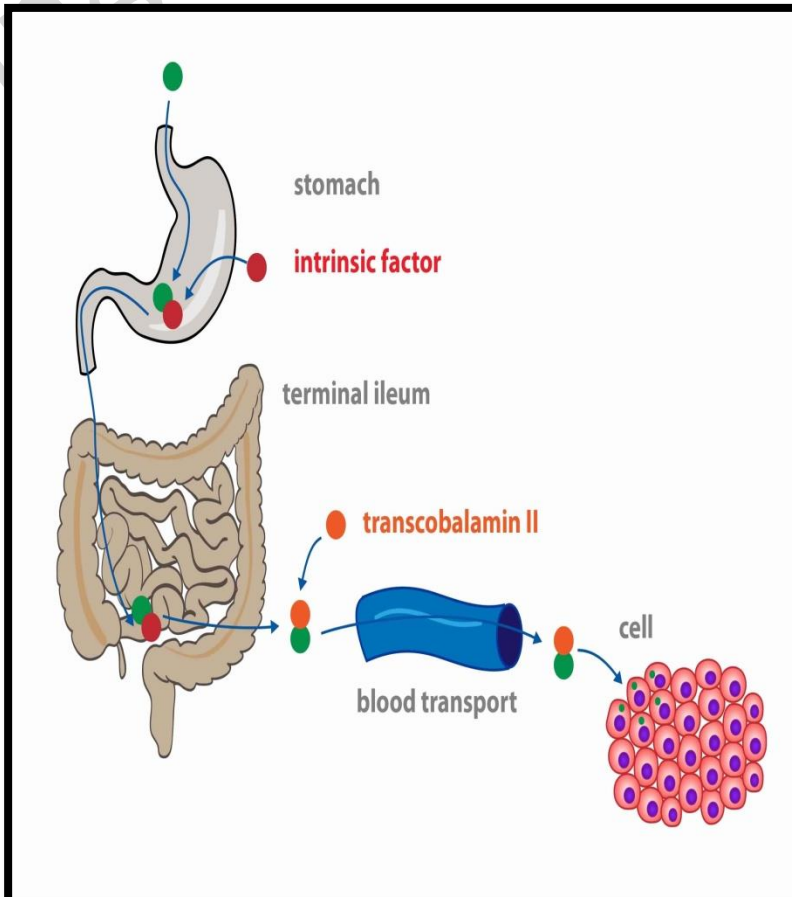
&

water soluble vitamins



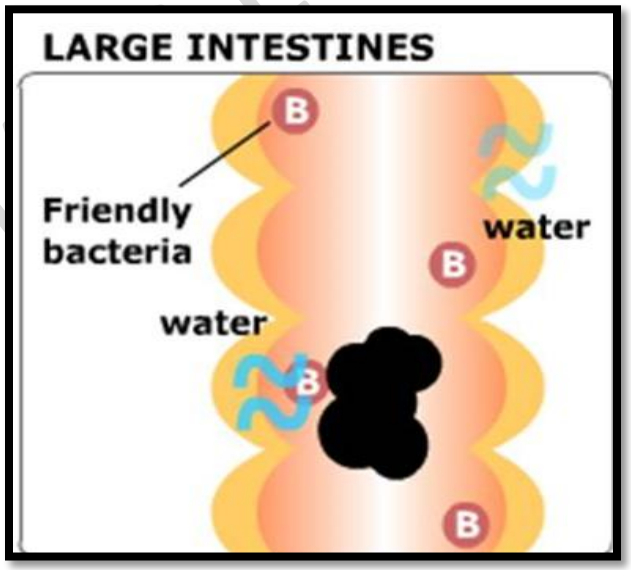
Vitamin B_{12} reabsorption

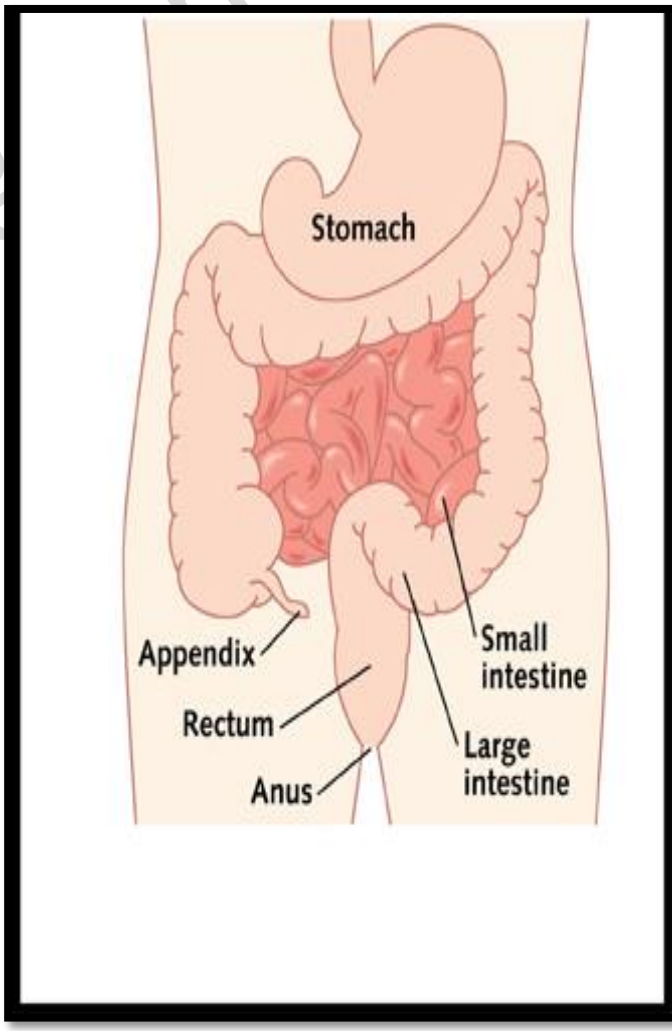
- From Terminal Ileum
- With **Intrinsic Factor of castle**
- Released from **parietal cells of stomach**



Absorption in large intestine

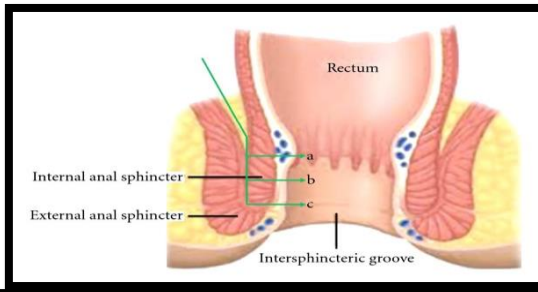
- Water
- **Vit – B complex**
- **Vit K**





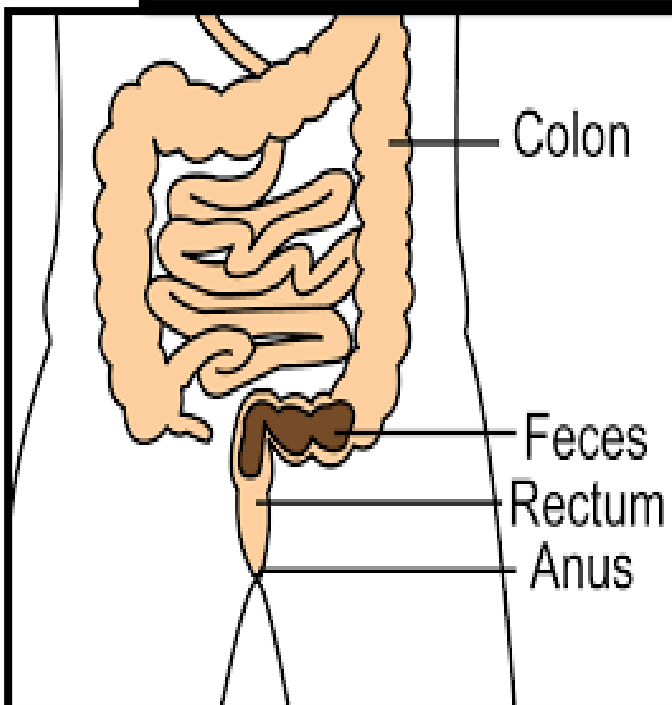
Egestion

- **Excretion of undigested remains of food.**



- **Feaces is brown**

- **Urobilin & stercobilin**

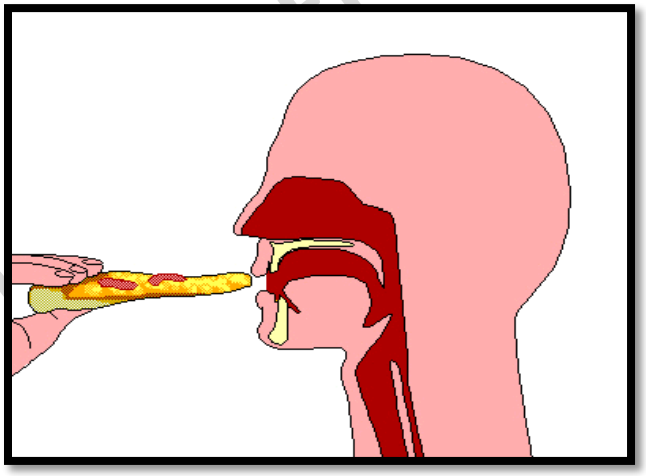


- Defecation is by movements

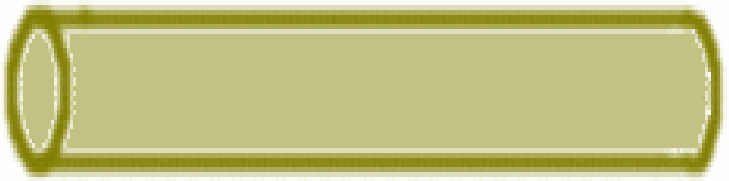
of stomach, large intestine , rectum & anal sphincters.

Movements of GIT

- Deglutition

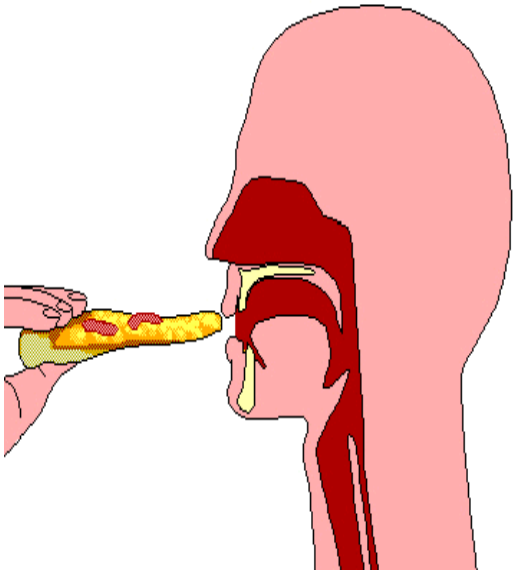


- Segmentation Contractions



- Peristalsis

Deglutition is a process by which bolus is moved from mouth into stomach via esophagus.



Stages of deglutition

1.ORAL STAGE

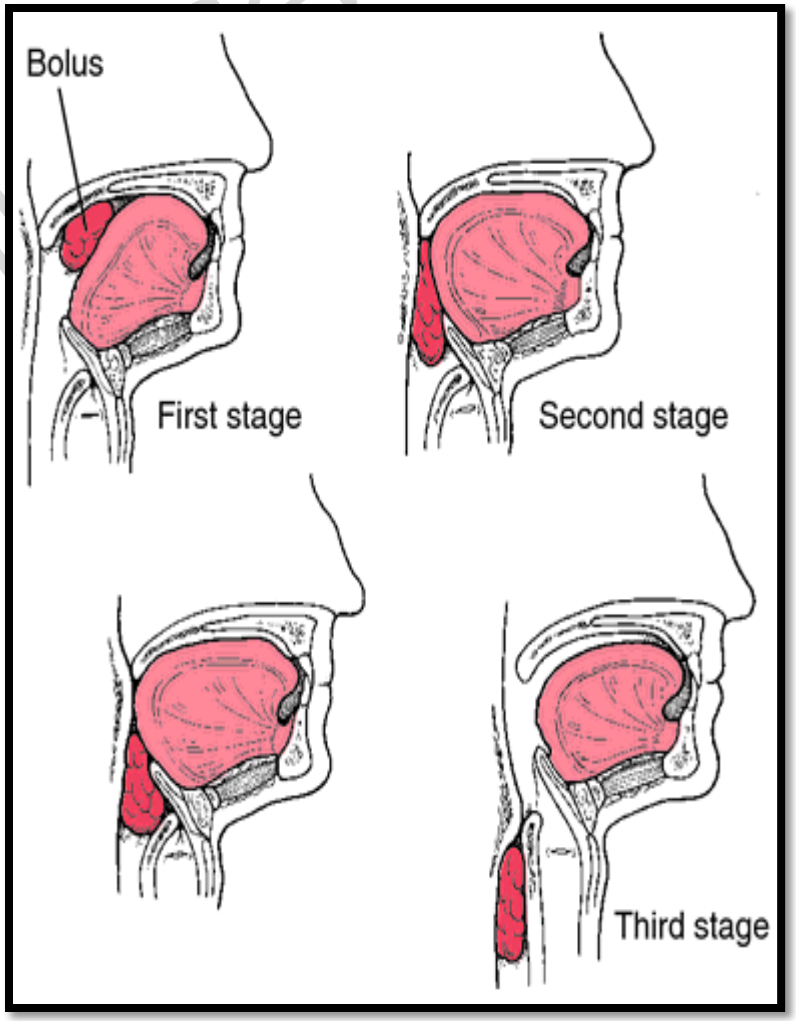
[voluntary]

2.PHARYNGEAL STAGE

[Involuntary]

3. ESOPHAGEAL STAGE

[Involuntary]



ORAL STAGE

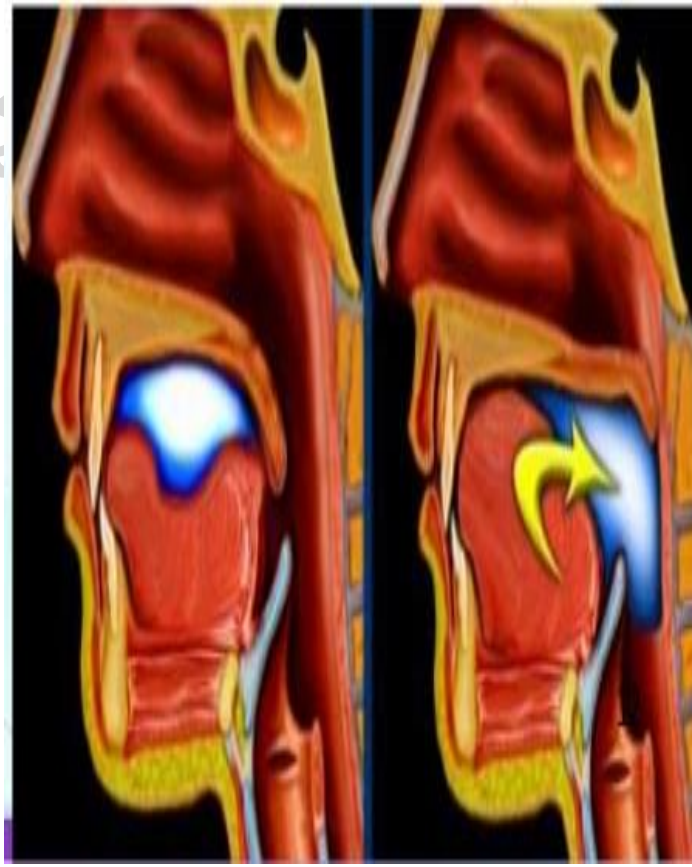
- Voluntary stage

- Bolus is pushed from oral cavity into the pharynx

-Tongue is elevated and pressed against hard palate .

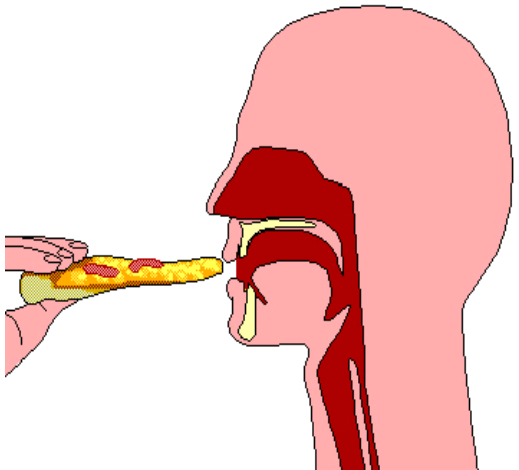
- Develops positive pressure in the posterior part of the oral cavity

- **Which pushes bolus into pharynx**



PHARYNGEAL STAGE

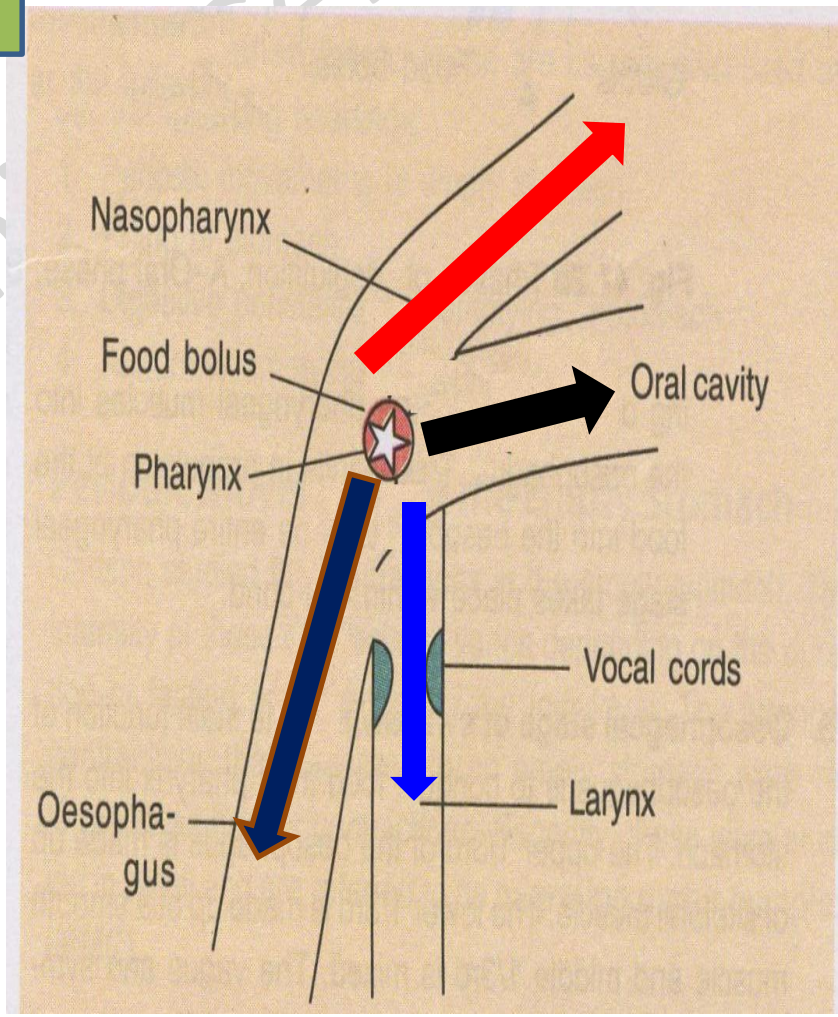
- involuntary stage
- **Bolus is pushed from pharynx into esophagus**



PHARYNGEAL STAGE

4 possible exits for bolus

- **back into mouth**
- **upwards into nasopharynx**
- **forward into larynx**
- **entrance into esophagus**



BACK INTO THE MOUTH

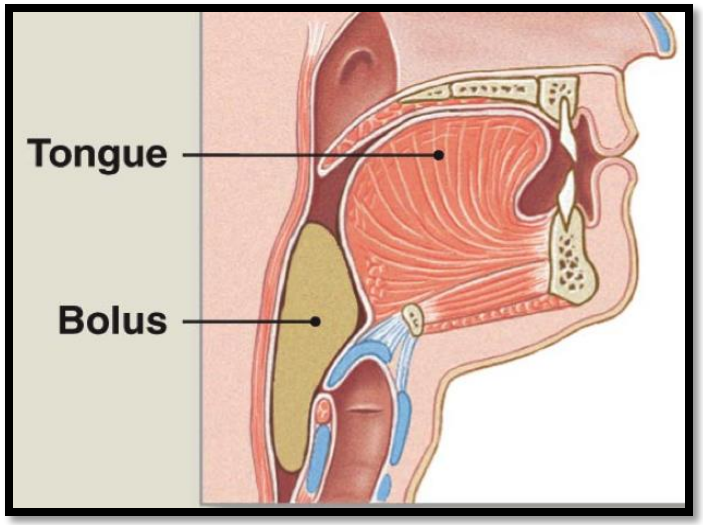
- Tongue is positioned against palate

↓

- Raised intraoral pressure

↓

- Prevents backward movement of bolus into mouth

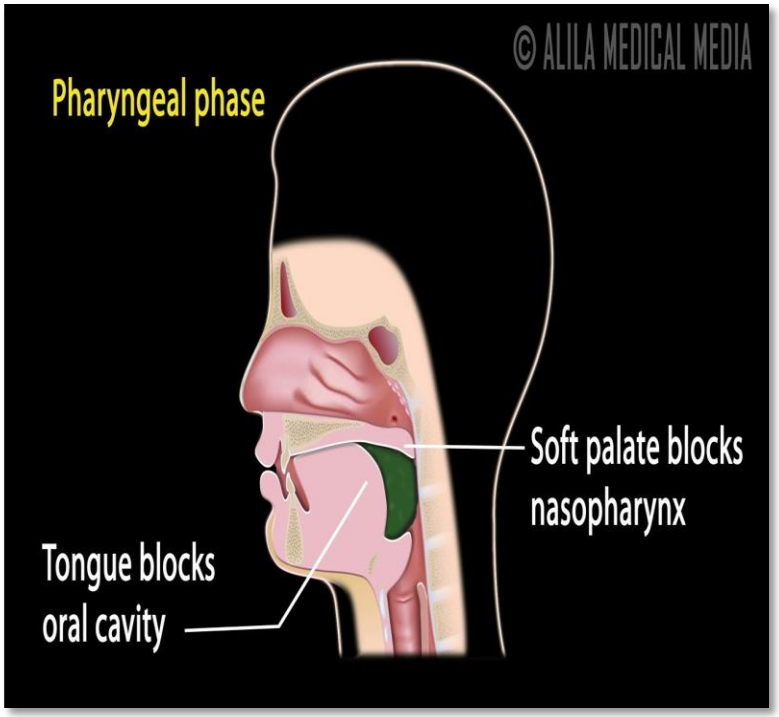


2. Upwards into nasopharynx

- **Upward movement of soft palate**

↓

- **blocks posterior nares**

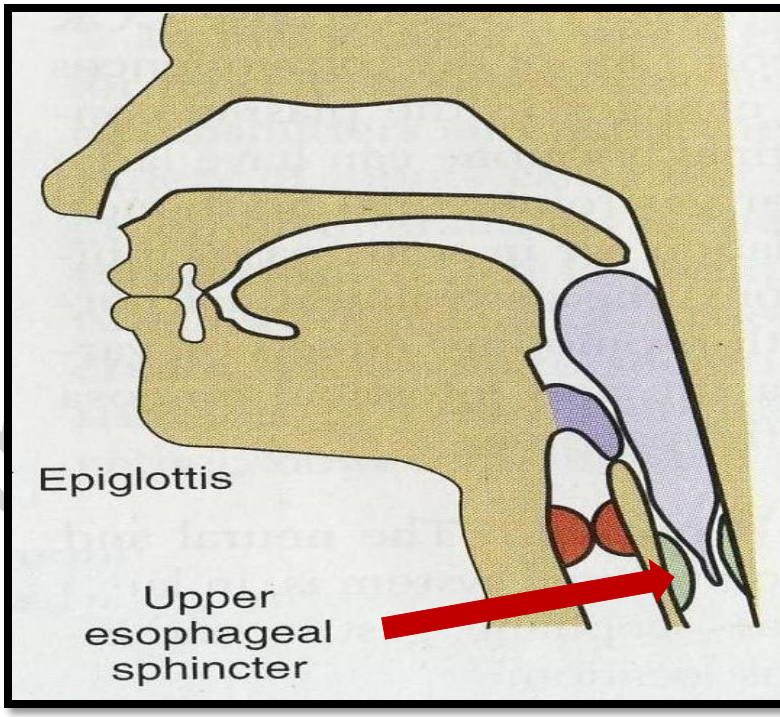


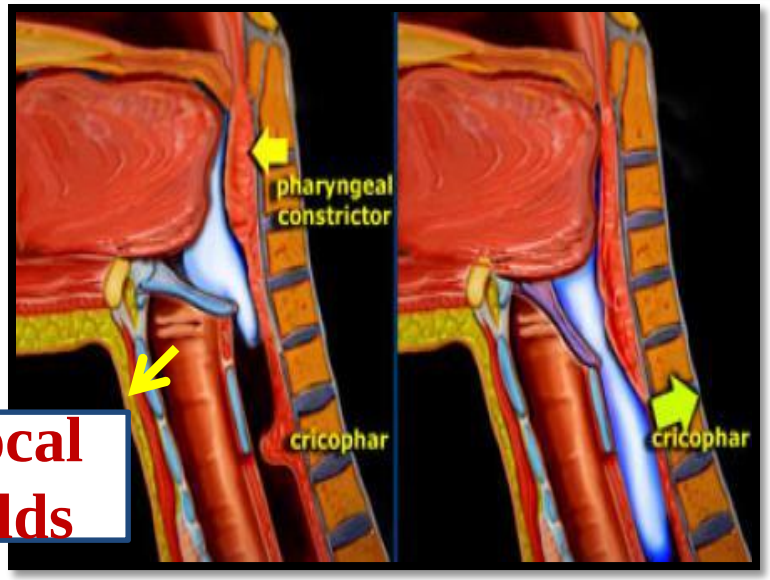
3. Forward into larynx

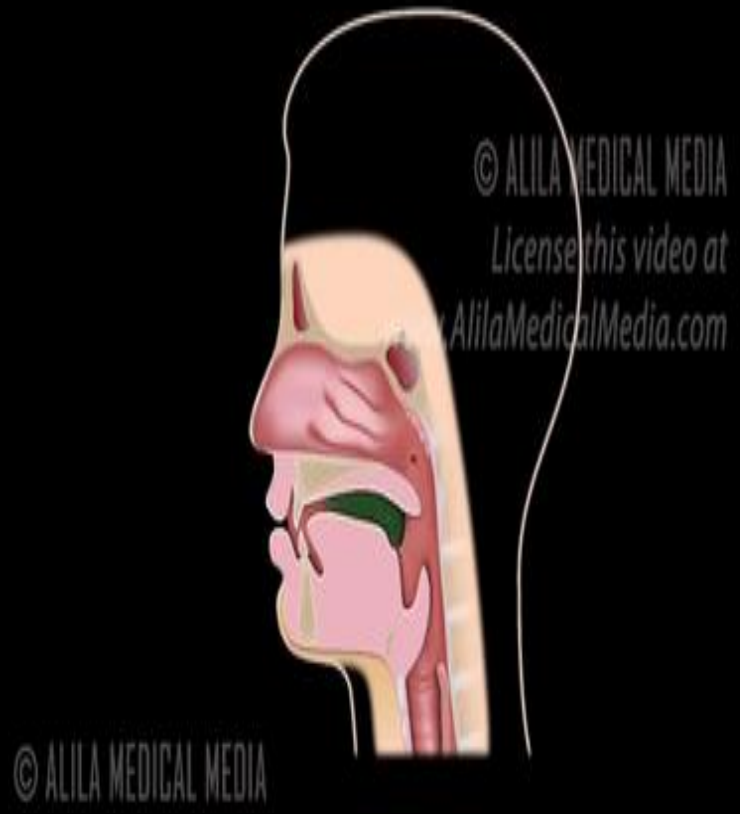
- Approximation of vocal folds
- Forward and upward movement of larynx
- Epiglottis swing back over the laryngeal opening

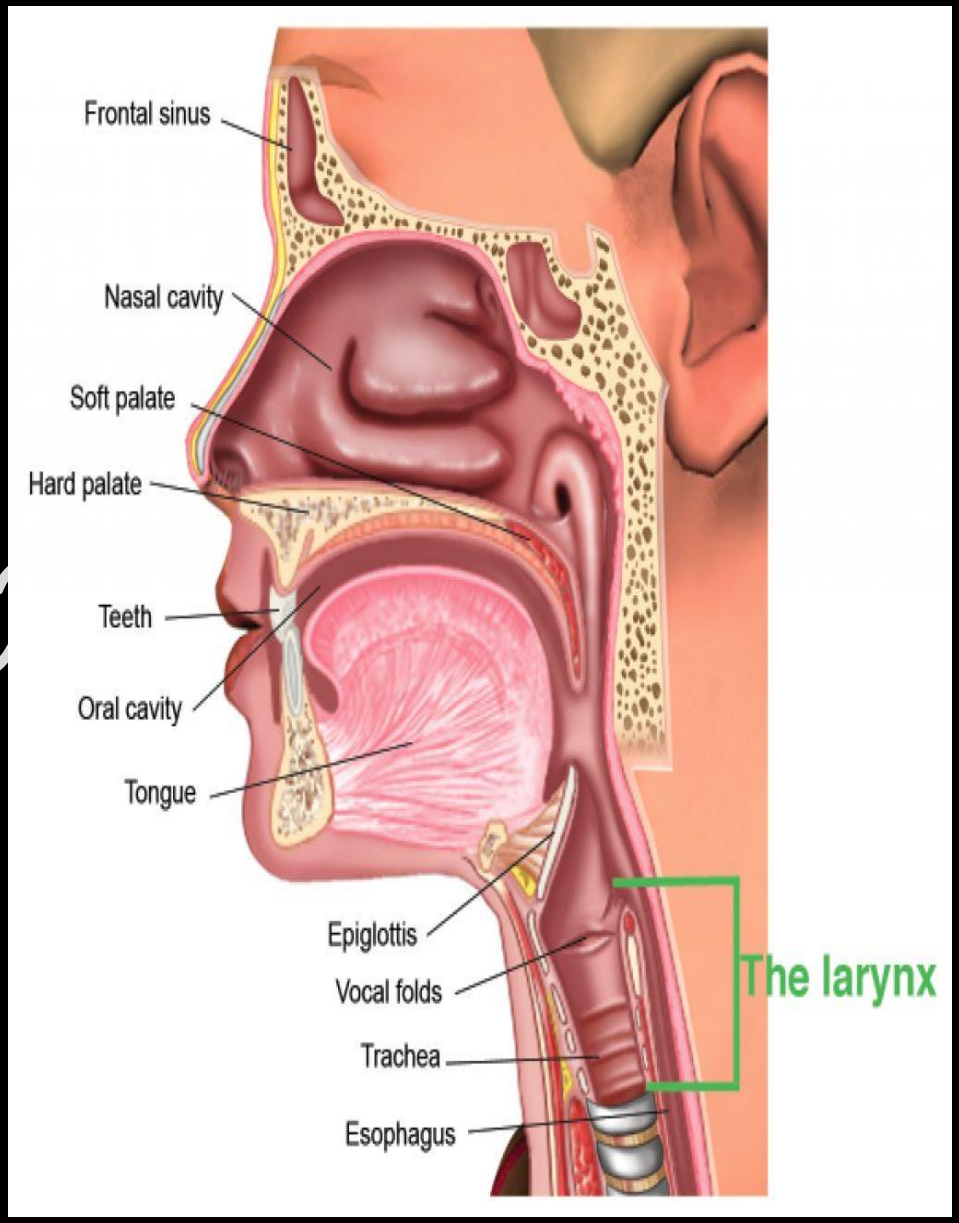
Prevents bolus from entering trachea

- **Causes temporary arrest of breathing.**






© ALILA MEDICAL MEDIA
License this video at
AlilaMedicalMedia.com
© ALILA MEDICAL MEDIA


Frontal sinus
Nasal cavity
Soft palate
Hard palate
Teeth
Oral cavity
Tongue
Epiglottis
Vocal folds
Trachea
Esophagus
The larynx

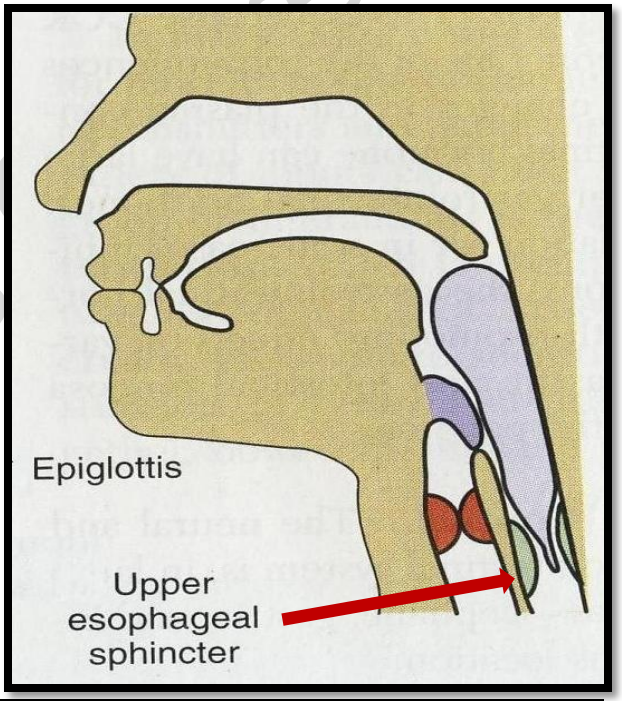
4. BOLUS INTO ESOPHAGUS

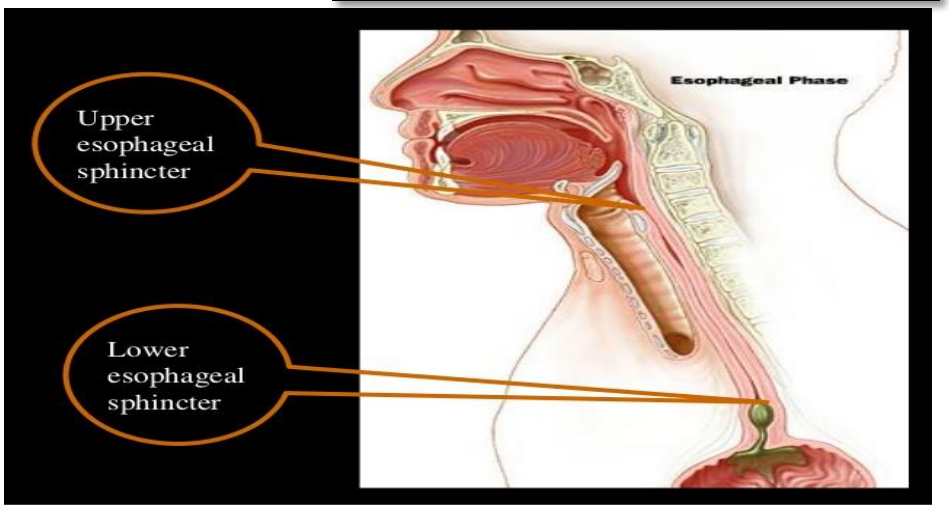
- **Upward movement of larynx by neck muscles**

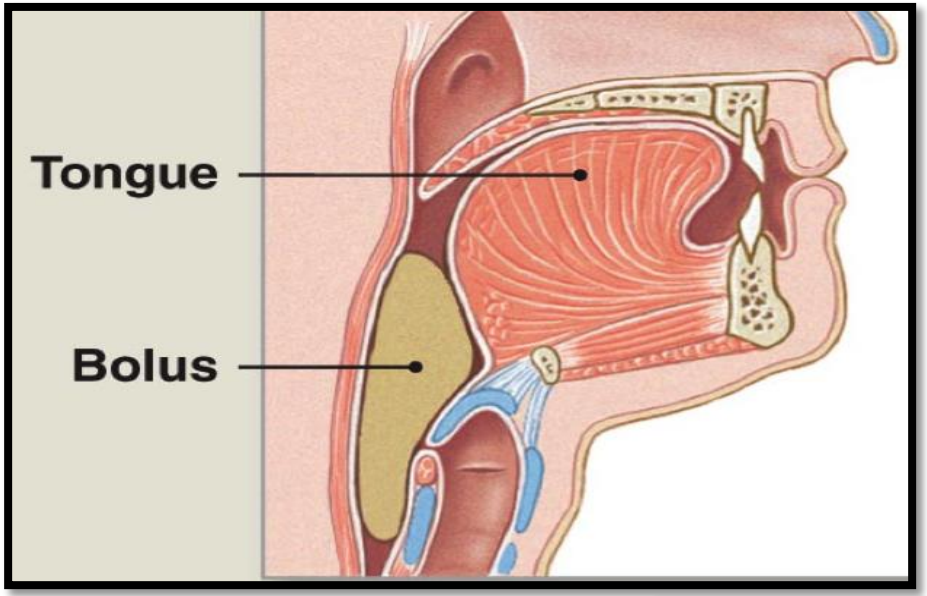
↓

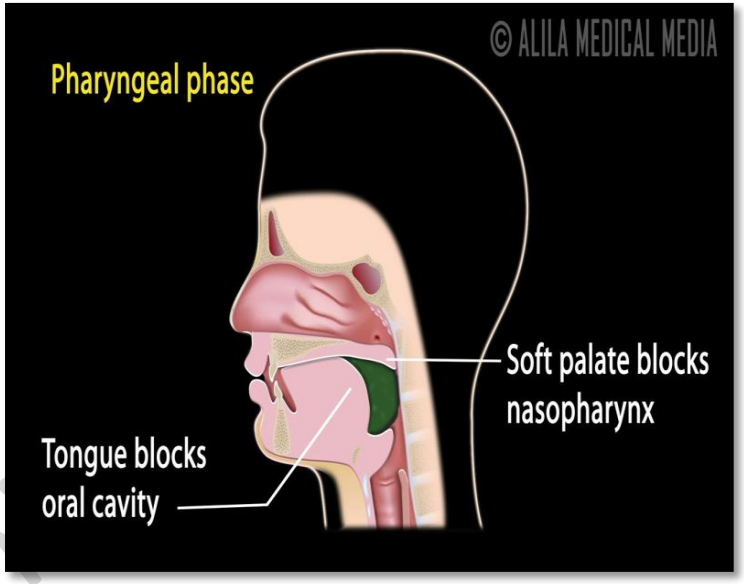
Relaxes upper esophageal sphincter

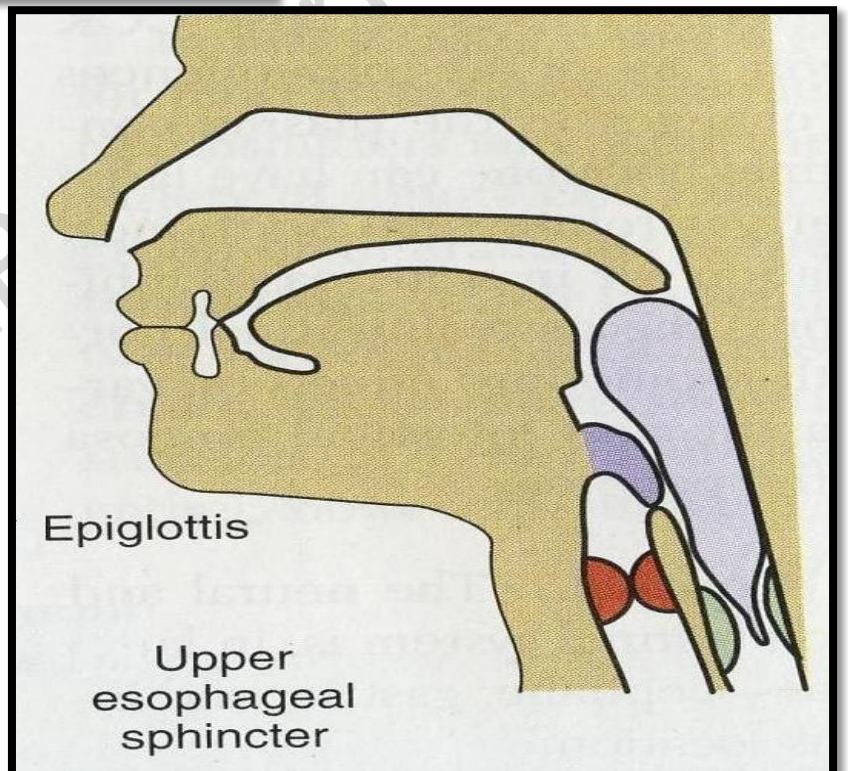
- **Bolus enters esophagus**





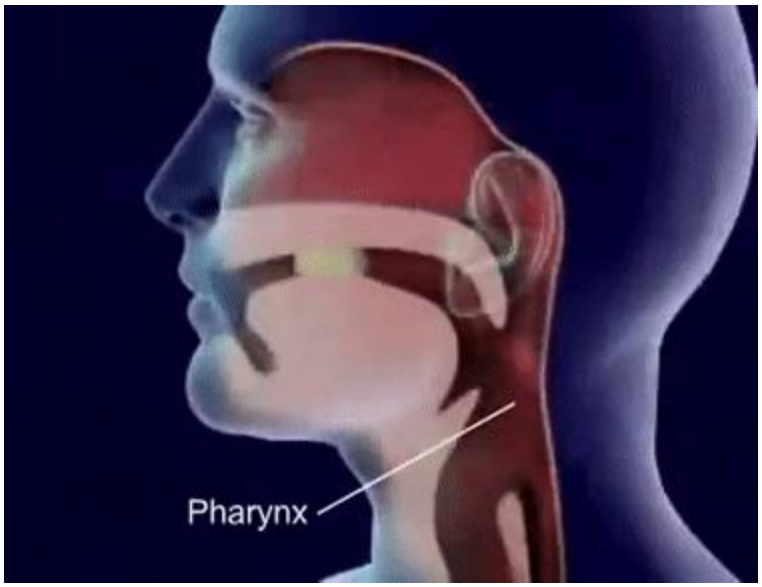

Tongue
Bolus


© ALILA MEDICAL MEDIA
Pharyngeal phase
Soft palate blocks nasopharynx
Tongue blocks oral cavity


Epiglottis
Upper esophageal sphincter

Pharyngeal stage of deglutition

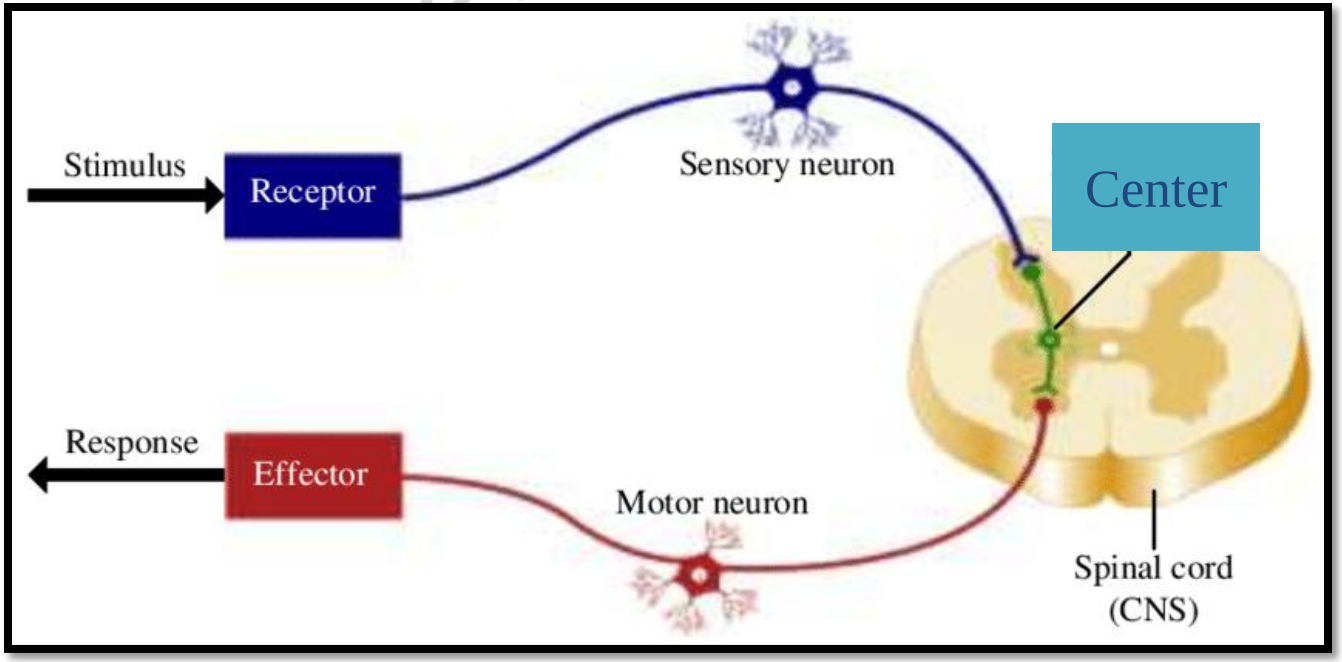
- Involves co-ordinated movements of soft palate, larynx, vocal folds and upper esophageal sphincter.
- Entire process is involuntary (reflexive)
- Called **Deglutition Reflex**
- **Time – 2 seconds**



What is a Reflex ?

- Is an instantaneous movement in response to stimulus due to neural pathways.

- **Components of reflex arc**



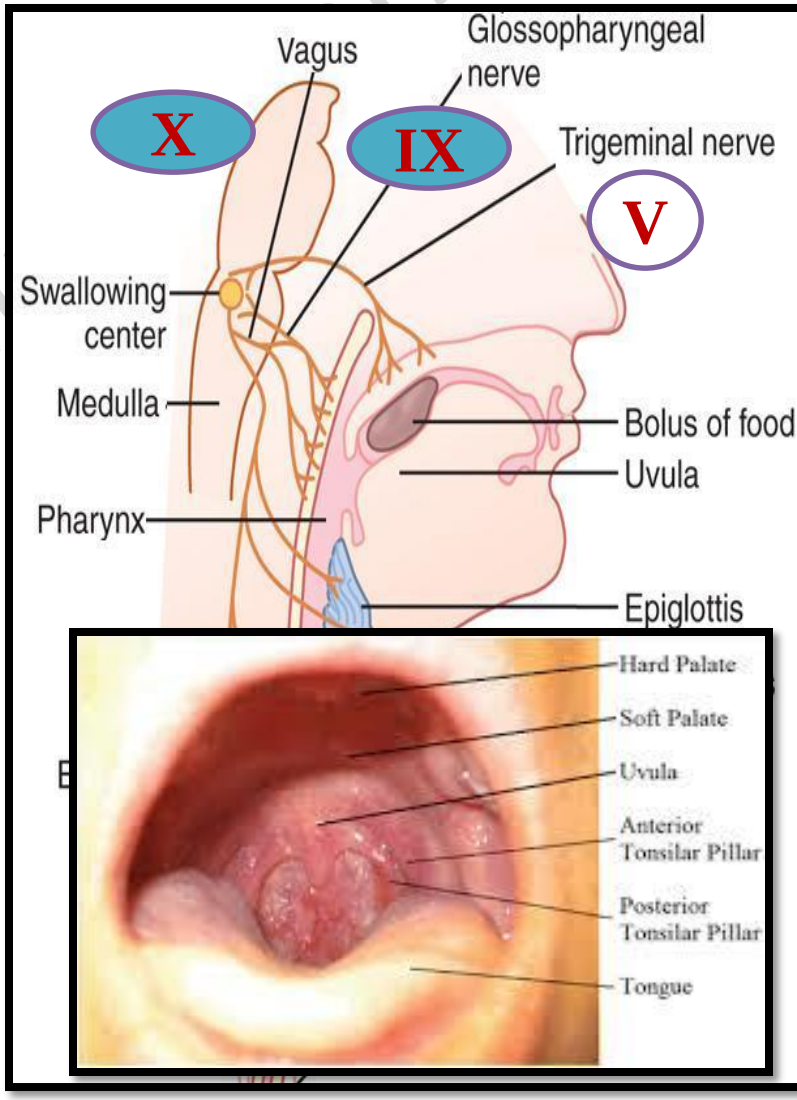
DEGLUTITION REFLEX

Stimulus : Bolus in pharynx

Receptors-

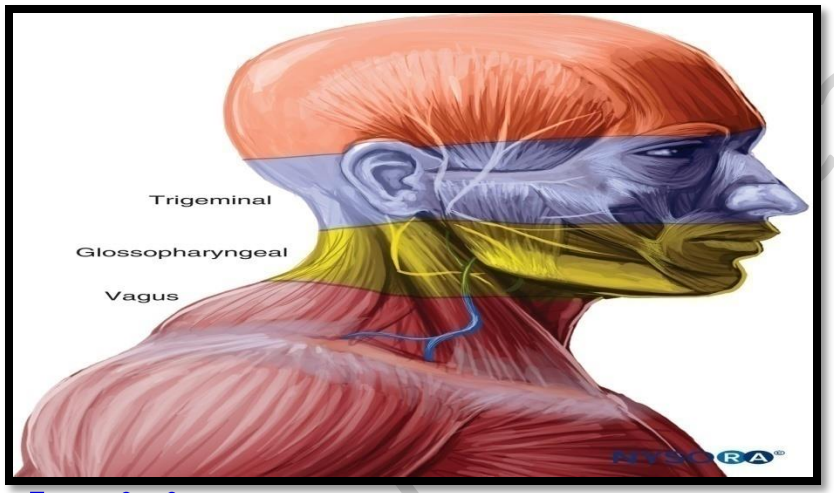
Mechano & tactile receptors in tonsilar pillars,posterior pharyngeal wall, soft palate, epiglottis

Afferent – V, IX, X cranial nerves



DEGLUTITION REFLEX

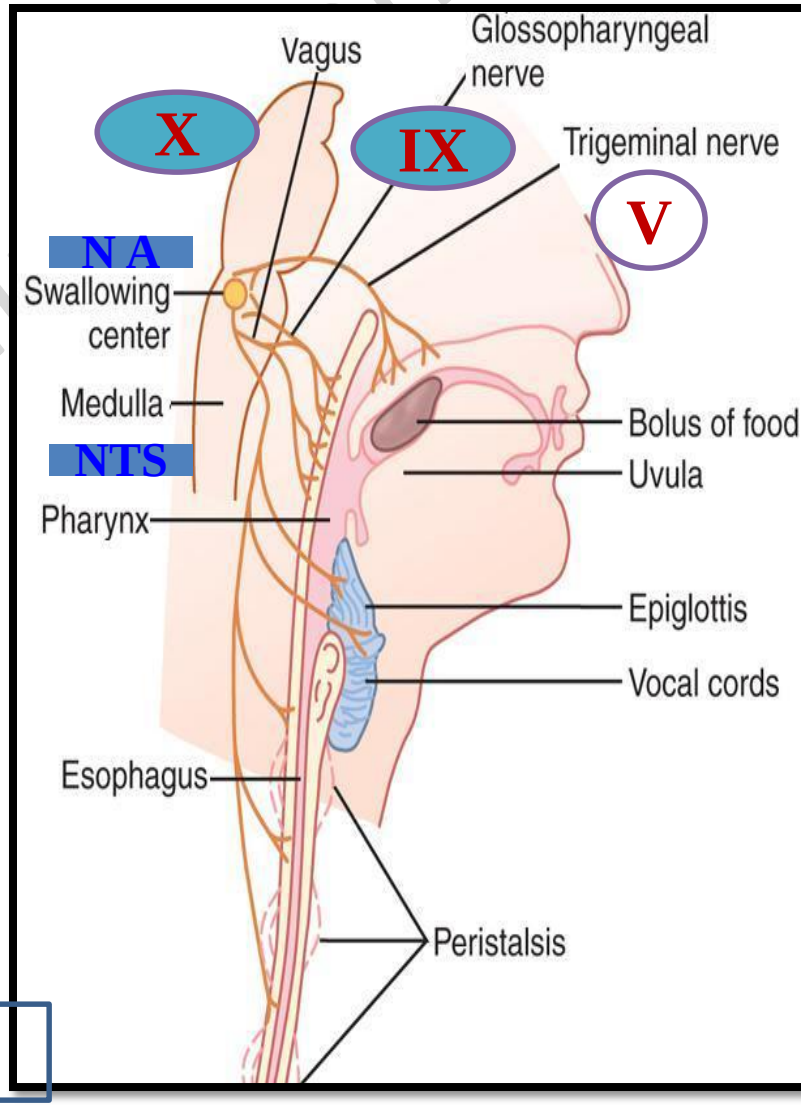
Afferent – **V, IX, X cranial nerves**



Deglutition center-

lower pons & medulla

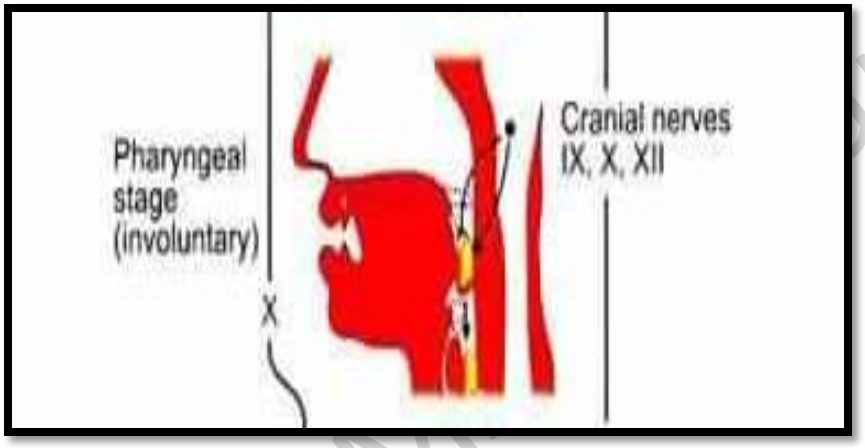
Nucleus Tractus solitarius, N Ambiguis



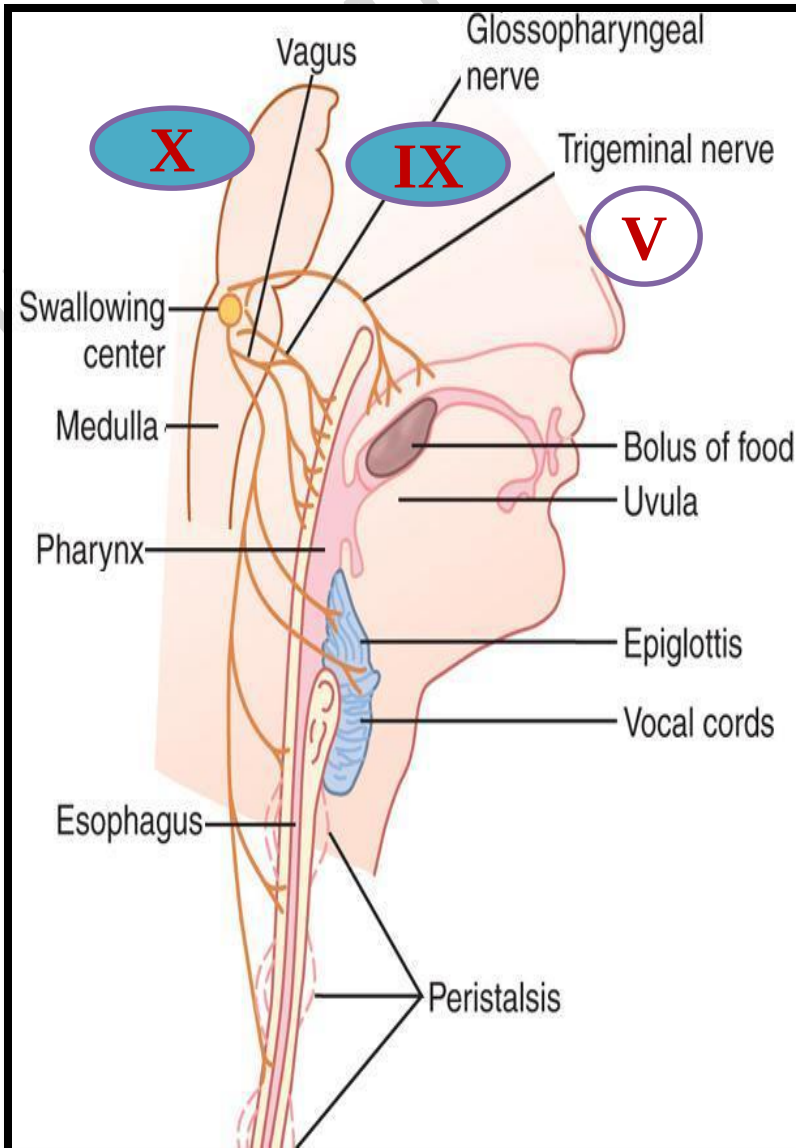
DEGLUTITION REFLEX

Efferent – Motor impulses via

V,IX, X, XII cranial nerves



Effect – **muscular contraction in pharynx & larynx**



DEGLUTITION REFLEX

Stimulus : Bolus in pharynx

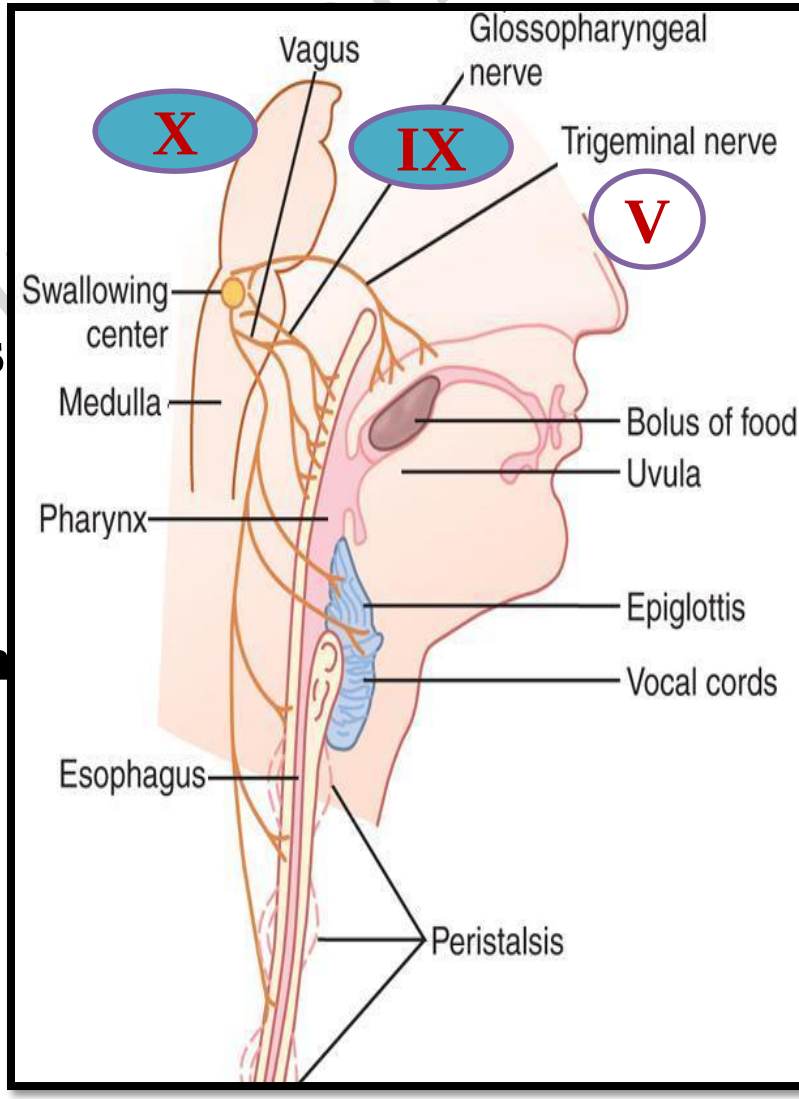
Receptors- Mechano & tactile receptors in tonsilar pillars,posterior pharyngeal wall, soft palate, epiglottis

Afferent – V, IX, X cranial nerves

Deglutition center-lower pons & medulla

Efferent – V,IX, X, XII, cranial nerves

Effect – muscular contraction in pharynx & larynx



DEGLUTITION REFLEX

Food in Pharynx → **stimulates tactile receptors of pharynx**

↓

afferents via sensory division of V, IX nerve

↓

to Deglutition centre in Pons & Medulla

↓

inhibits respiratory centre → **Deglutition Apnea**

Motor impulses V, IX,X, XII →

- movement of soft palate
- approximation of vocal cords , closure of epiglottis
- esophageal sphincter relax

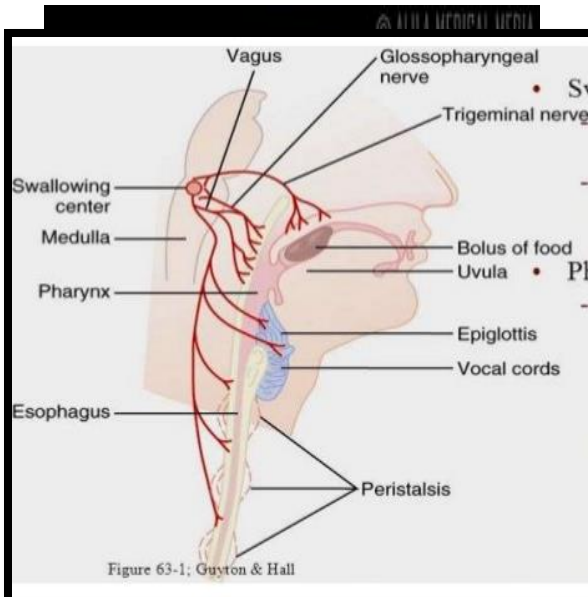
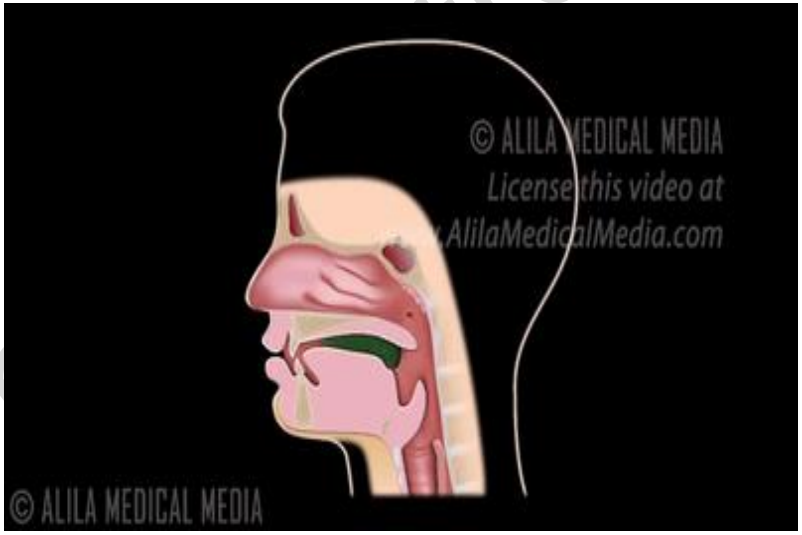


Figure 63-1; Guyton & Hall

Changes in Pharyngeal stage of deglutition

- **Upward movement of soft palate**

  - closes posterior nares



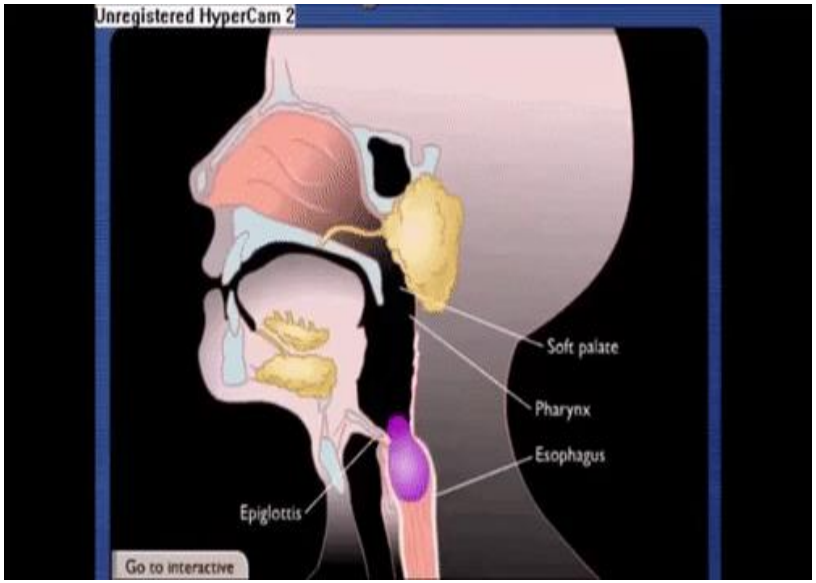
- **Approximation of vocal folds**
- **Upward movement of larynx**

- Relaxes upper esophageal sphincter

- **Epiglottis swings over glottis**

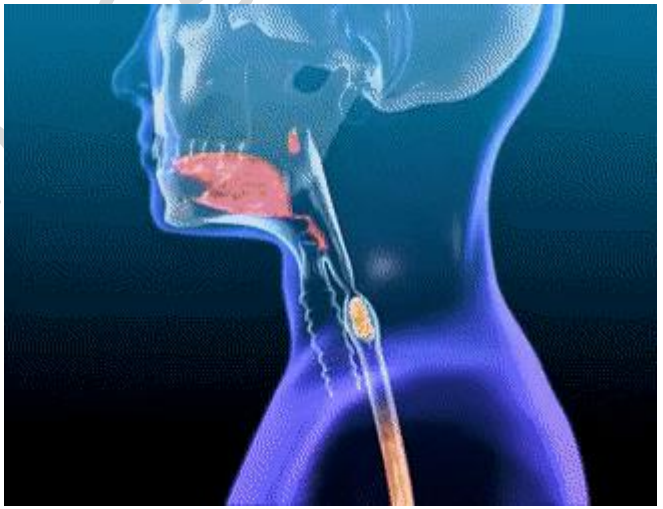
- Temporary arrest of breathing

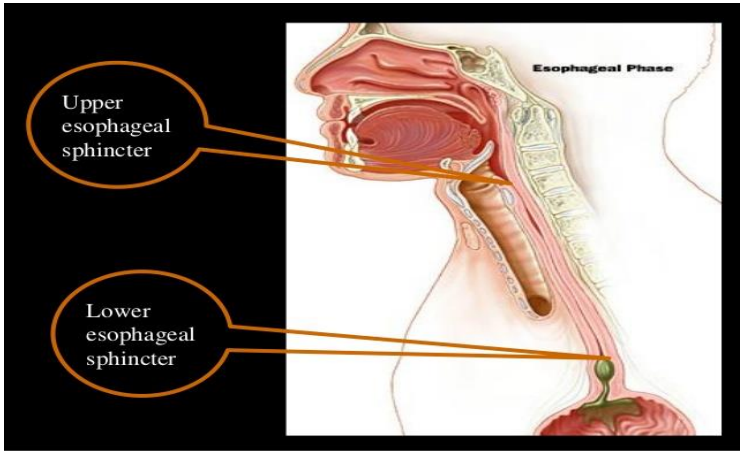
- **Strong wave of contraction begins in pharyngeal muscle**



ESOPHAGEAL STAGE

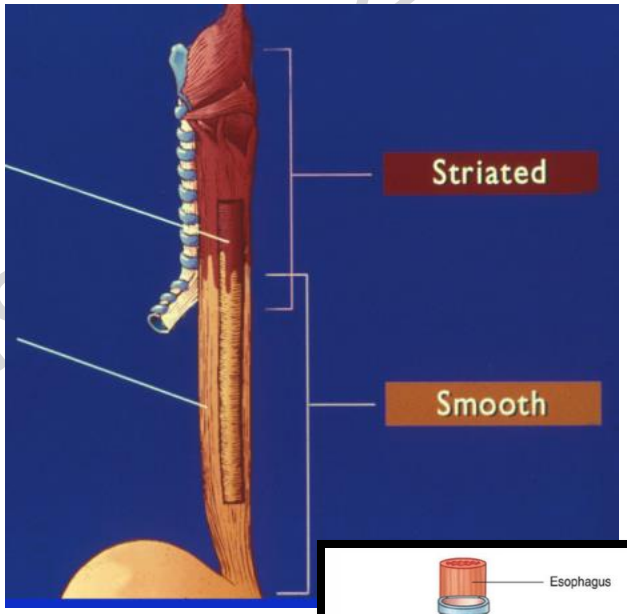
- **Movement of bolus from upper esophagus to stomach**
- **involuntary stage**
- **By Peristaltic contractions of muscular wall of esophagus**
- **Time – 8 – 10 seconds**



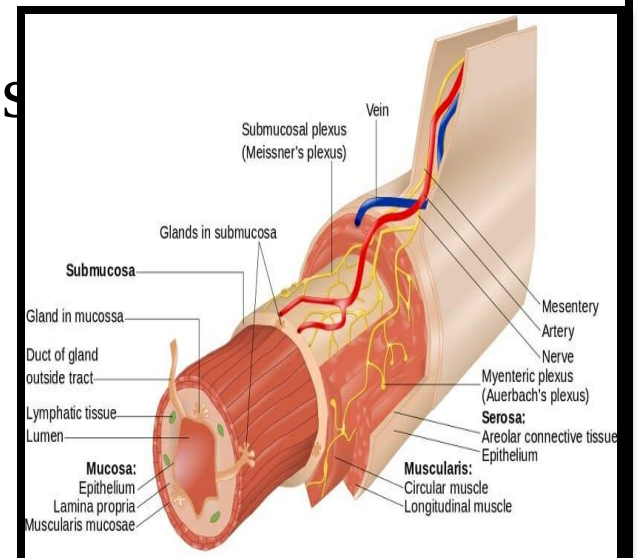


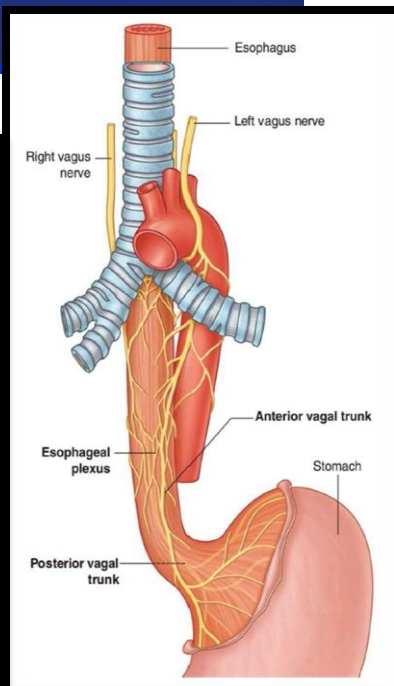
Anatomy of oesophagus

- Hollow muscular organ
- Length: 25cm
- Upper 1/3rd : skeletal muscle
- Lower 2/3rd: smooth muscle



- **Innervation of muscles**
- Intrinsic – Myentric plexus
- Extrinsic – Vagus nerve

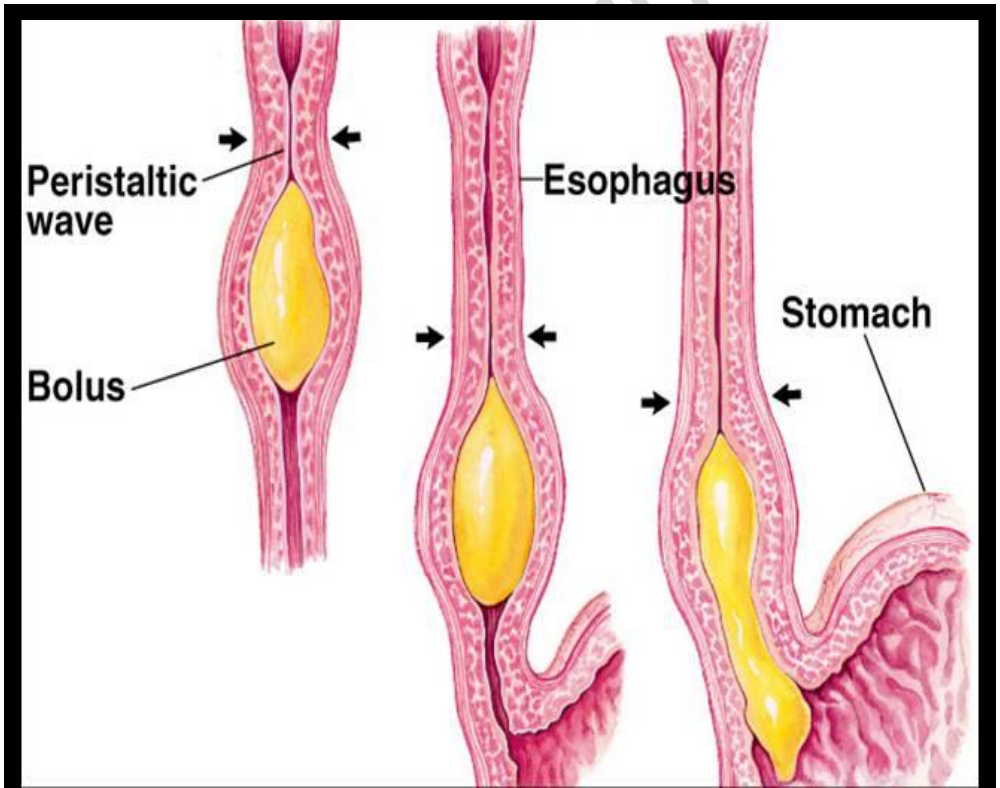




Esophageal stage is aided by two types of peristalsis

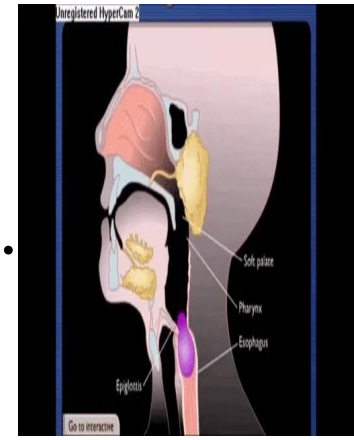
Primary Peristalsis

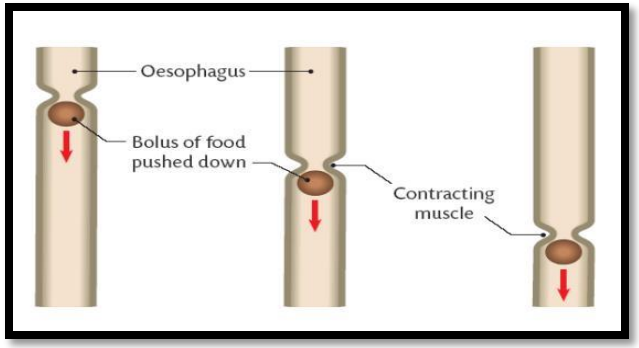
Secondary Peristalsis



Primary Oesophageal peristalsis-

- A wave of contraction preceded by wave of relaxation
- propels the food through the esophagus to the stomach
- Is the continuation of pharyngeal peristaltic wave.
- **Mediated by --- Vagus (extrinsic) Nerve from deglutition centre.**





If the primary peristaltic wave fails to push bolus

↓

Accumulated food in esophagus

↓

Stimulates stretch & tactile receptors of esophageal wall

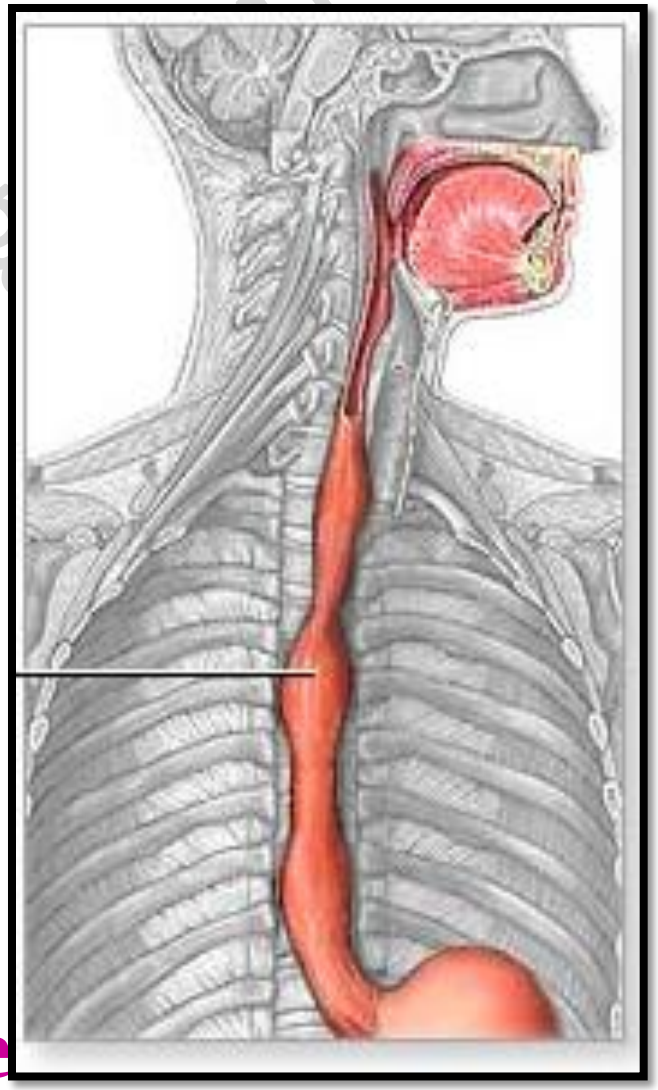
↓

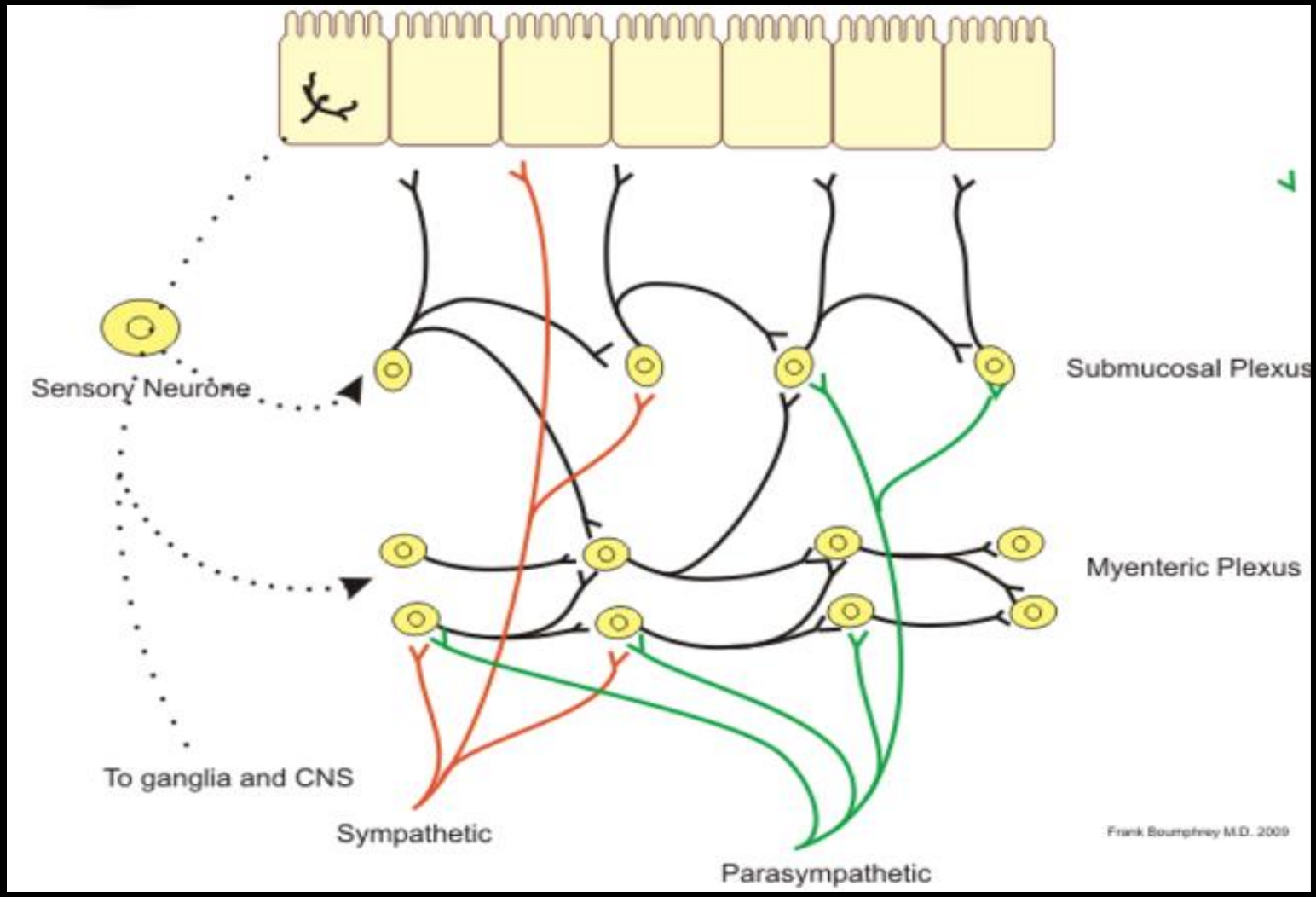
Stimulation of myentric plexus

↓

initiates secondary peristalsis

Later supported by vagus nerve





Sensory nerves from receptors sends signals to myentric plexus and to medulla

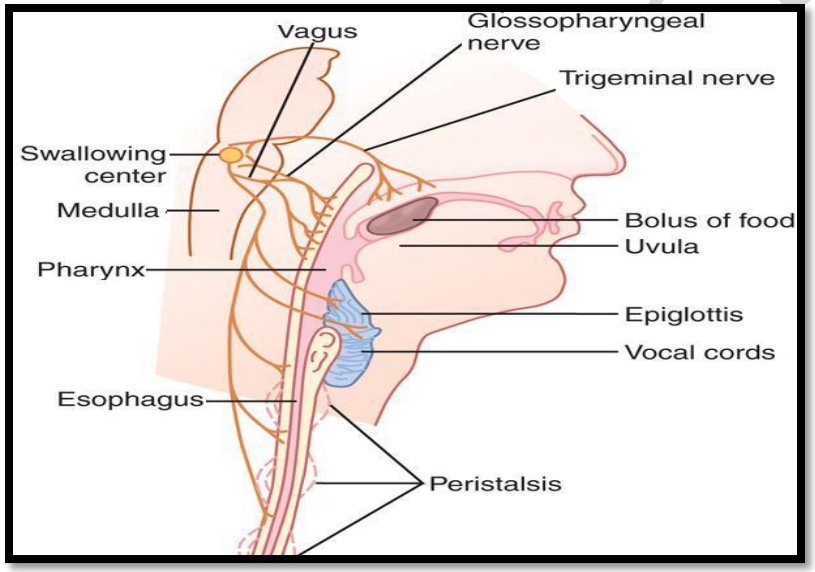
Disorders of deglutition

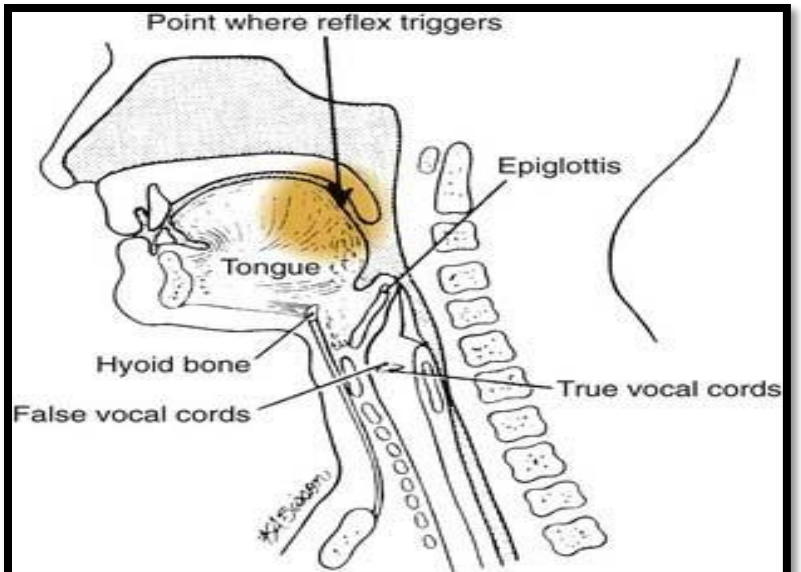
1) Absence of deglutition reflex

Cause: Paralysis of V, IX, X cranial nerve.

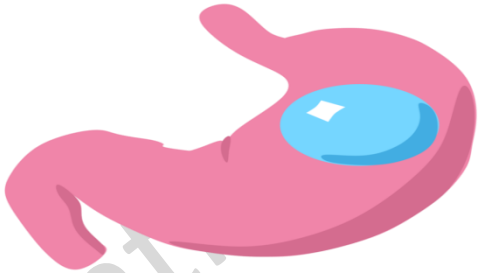
Effect : Regurgitation of food into nasal cavity

Aspiration into trachea.





2) Aerophagia

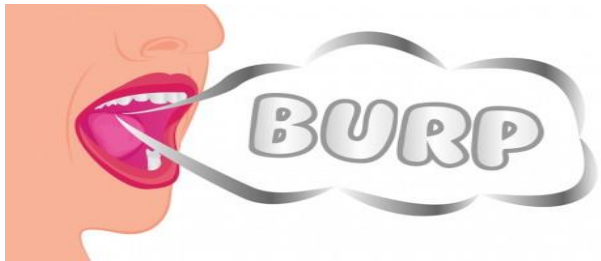


unavoidable swallowing of air along with food and liquids

Cause : Reduced tone of upper esophageal sphincter

Swallowed air

Regurgitates to oral cavity (burp)



passes into colon

colonic bacteria converts it to flatus

3) Dysphagia

- **Difficulty in swallowing**

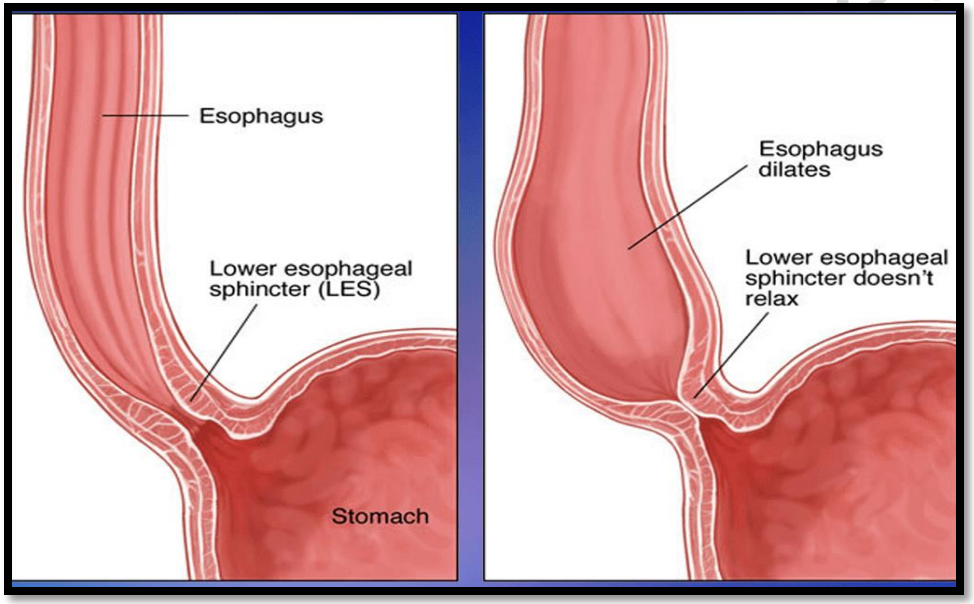
Ex: - presence of foreign body in pharynx

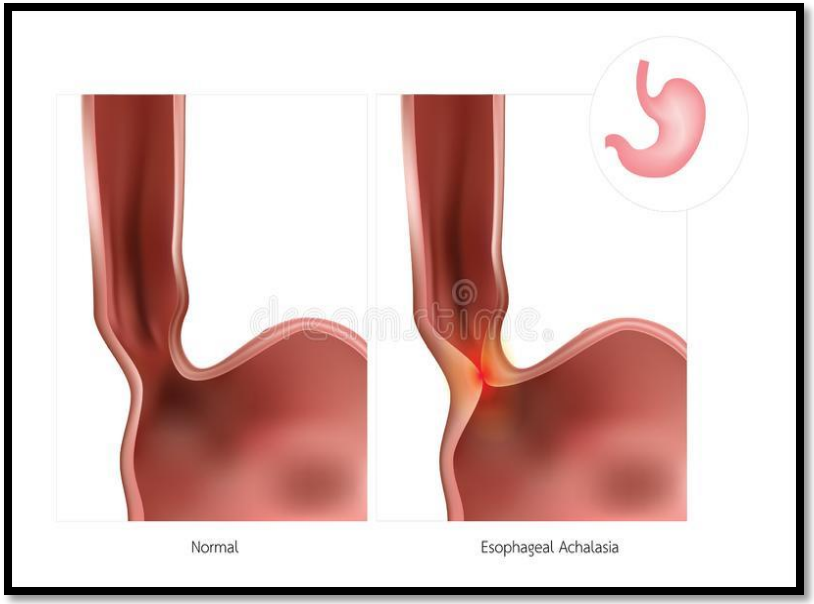
- Pharyngitis

- Inflammation of oral cavity

4) Achalasia cardia

- Accumulation of food in lower part of esophagus resulting in massive dilatation and infection of esophagus.





Achalasia cardia

- **Cause:**

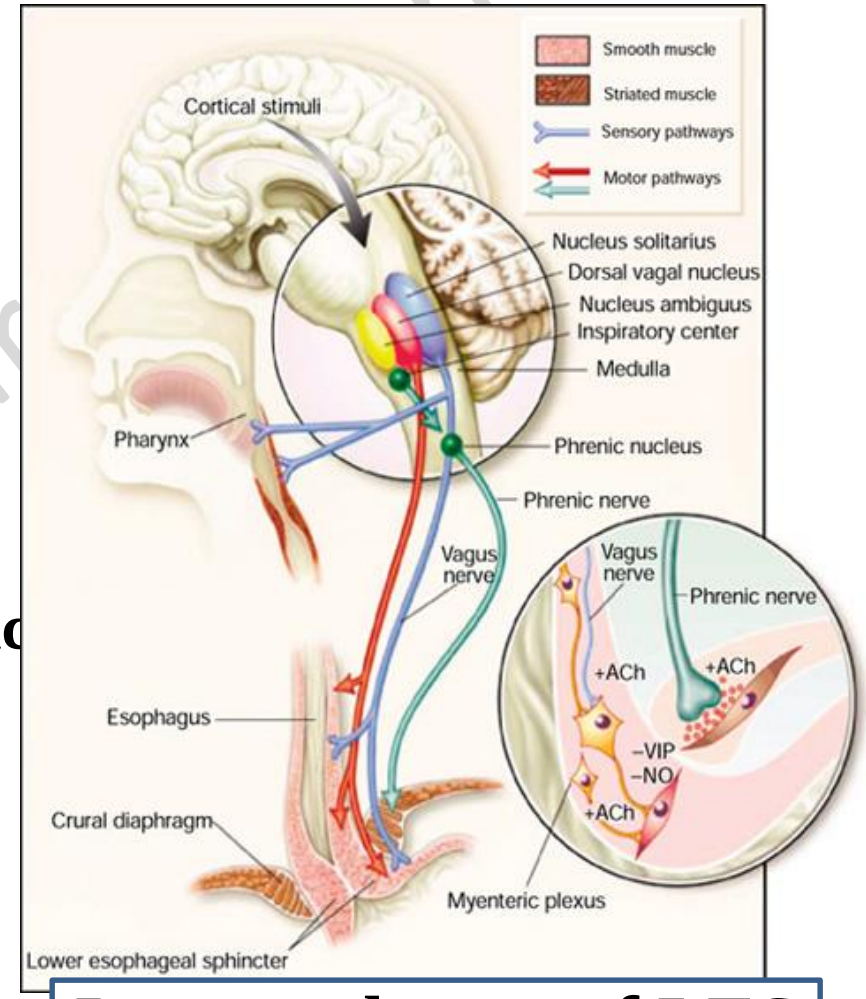
Degeneration of inhibitory fibers of Myentric plexus at lower2/3rd of esophagus

↓

Defective release of inhibitory neurotransmitter - **NO** (**nitric oxide**) , **VIP** (**vasoactive intestinal polypeptide**)

↓

LES doesnot relax



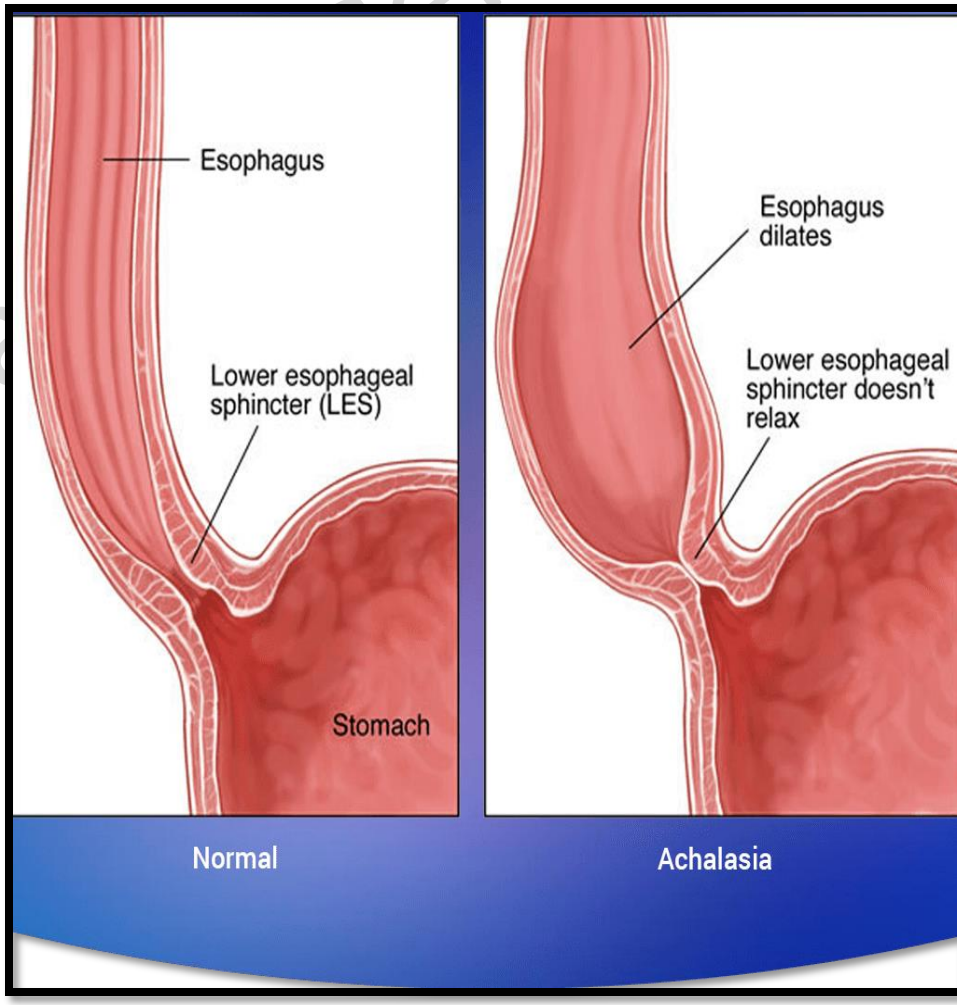
Increased tone of LES

Achalasia cardia

Disturbed emptying

Esophageal accumulation for months & years

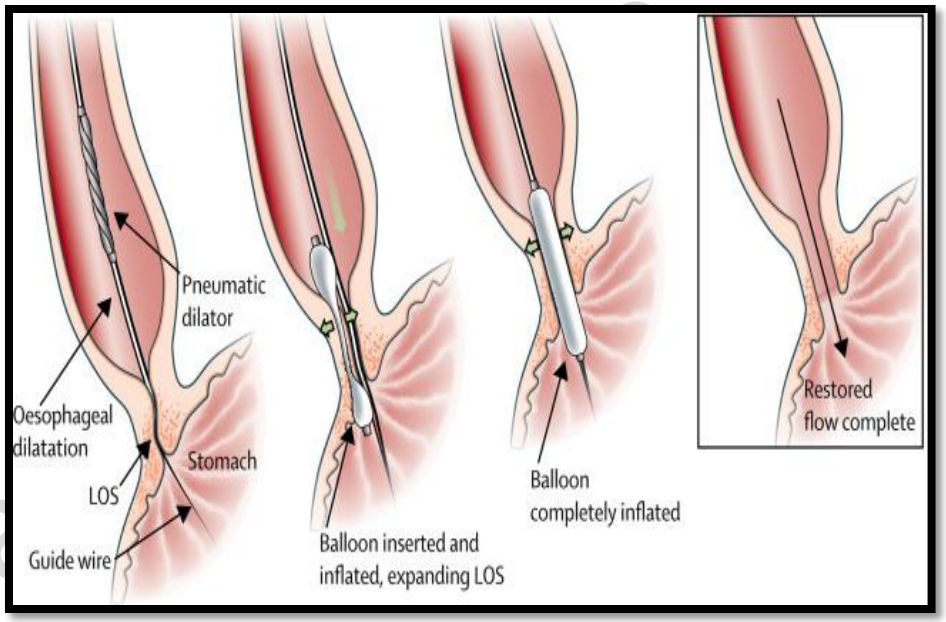
Massive distension & infection



Achalasia cardia

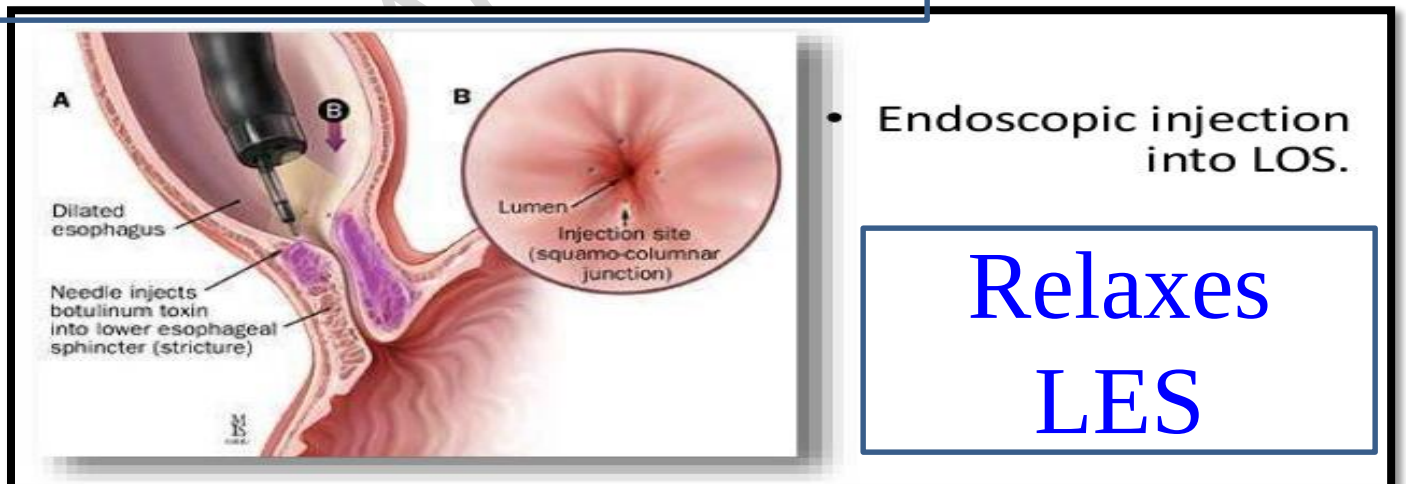
- **Treatment:**

1)Pneumatic dilatation



- Balloon insertion and inflation.

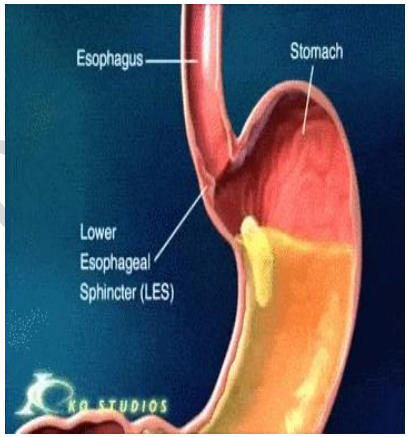
2) Injection of Botulinum toxin



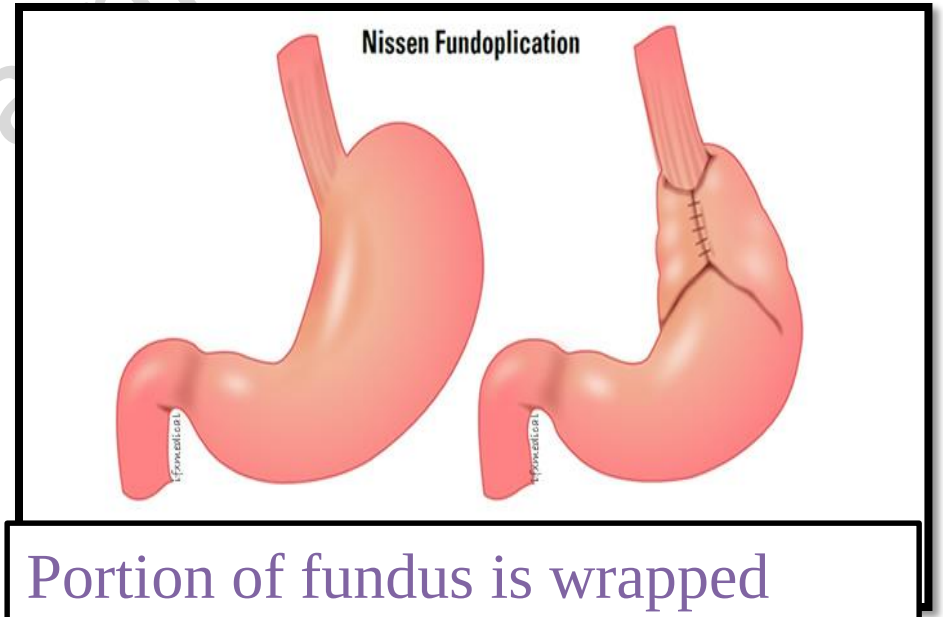
- Endoscopic injection into LOS.

Relaxes LES

5) Gastric Reflux Disease



- **LES incompetence**
- Reflux of acidic gastric contents into esophagus.
- **Features**: Heat burn
  - Esophageal ulcer
- **Trt: Fundoplication**

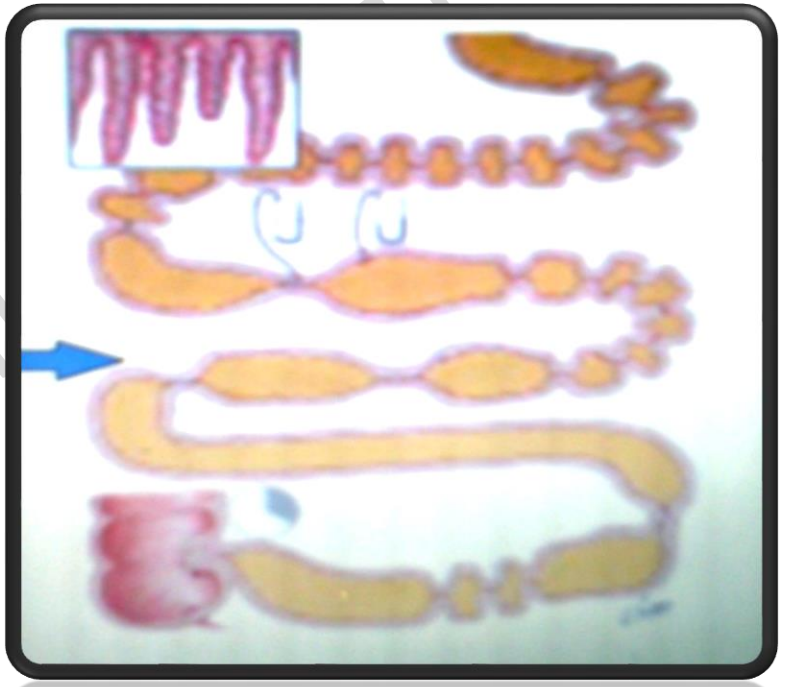


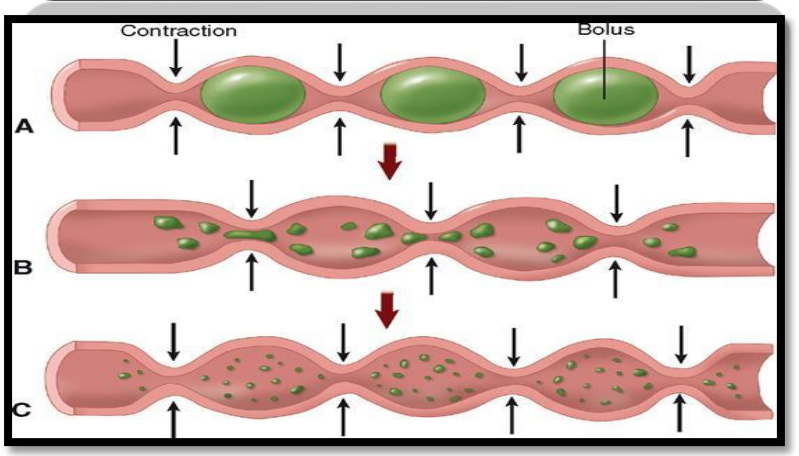
Portion of fundus is wrapped around lower end of esophagus. Thus LES is inside stomach

Segmentation contraction

- Mixing / Churning movements
- Small intestine is divided into segments 2 – 5cm in length
- Alternate contracted & relaxed segments.
- **Function:**

- Helps in digestion and absorption of nutrients.





Segmentation Contraction

on contraction

↓

chyme moves back & forth

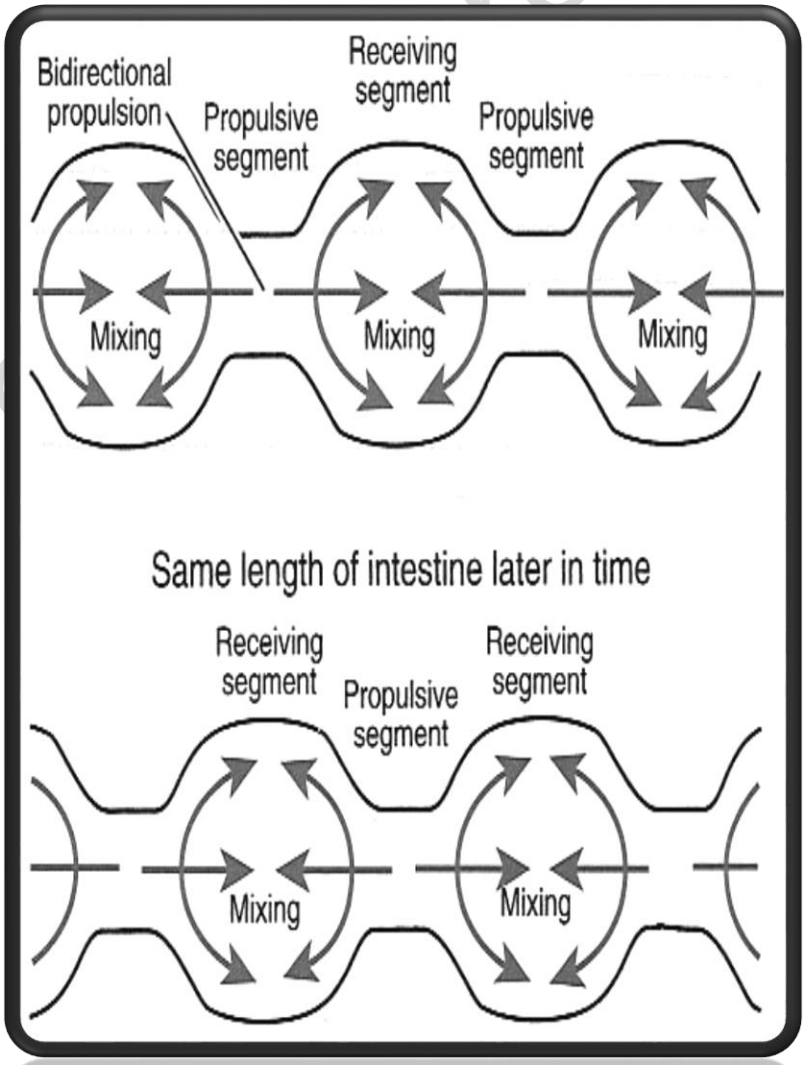
up & down

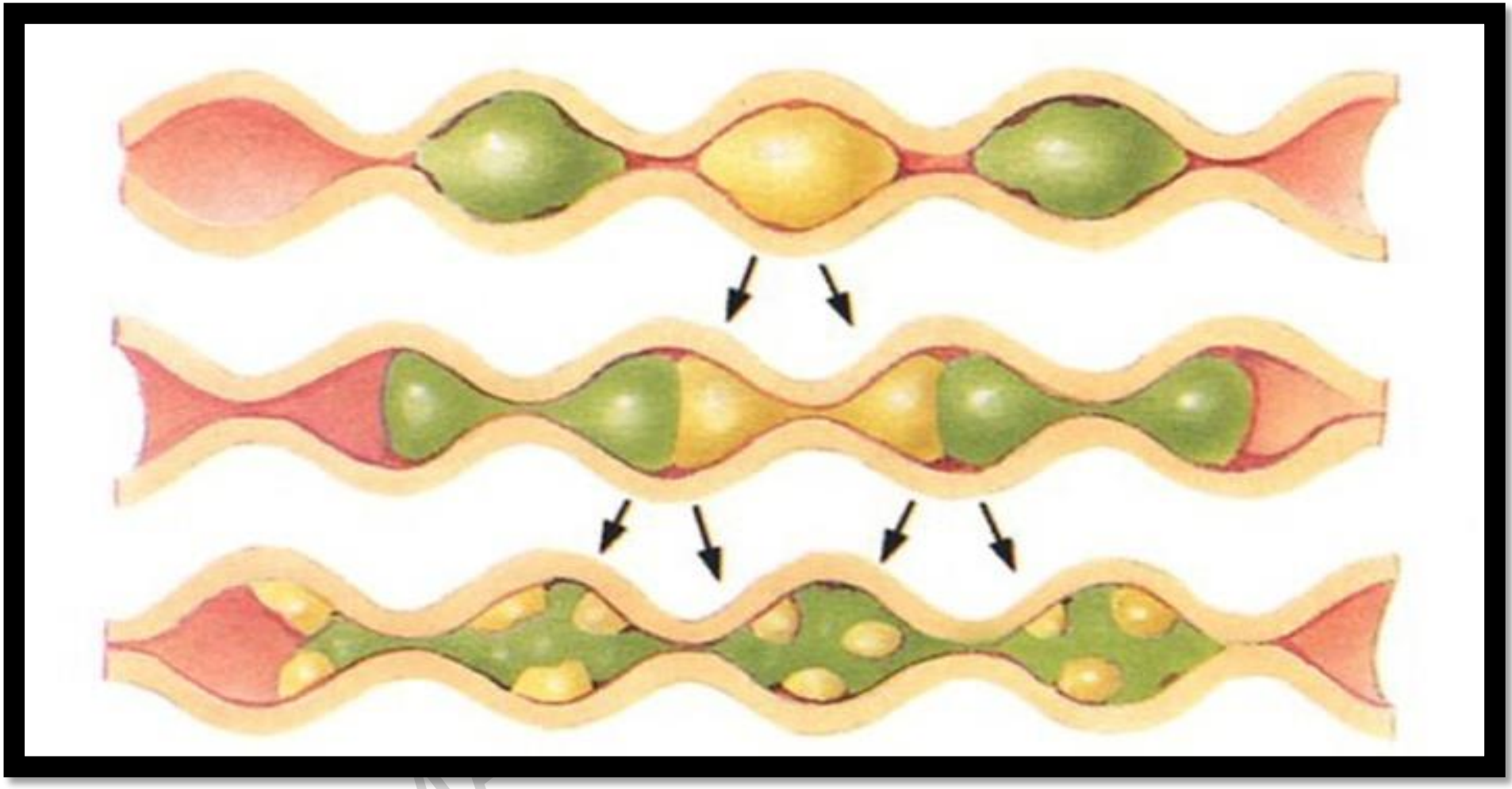
↓

on relaxation of the segment

↓

chyme moves back into the segment

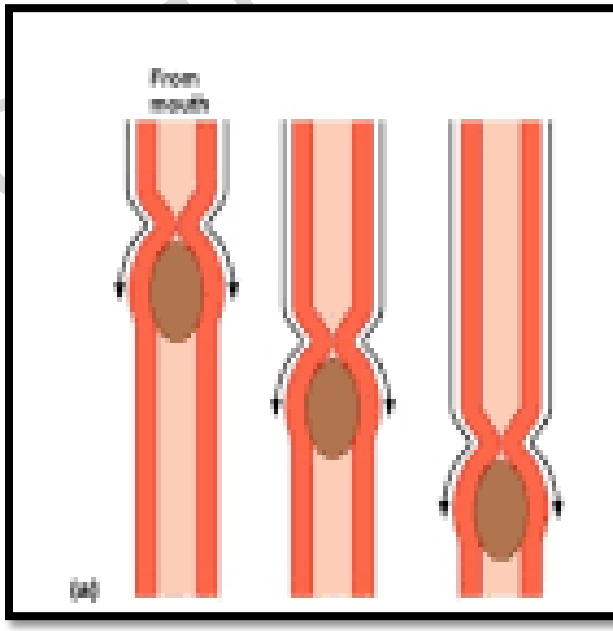




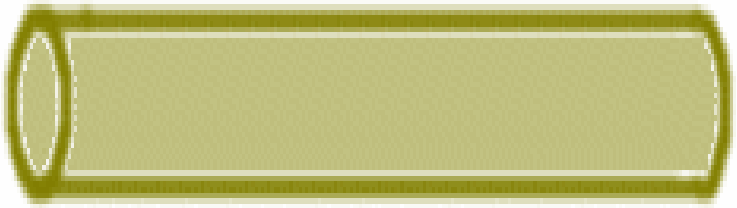
Long transit time helps in thorough Mixing, digestion , absorption of the Intestinal Contents

Peristalsis

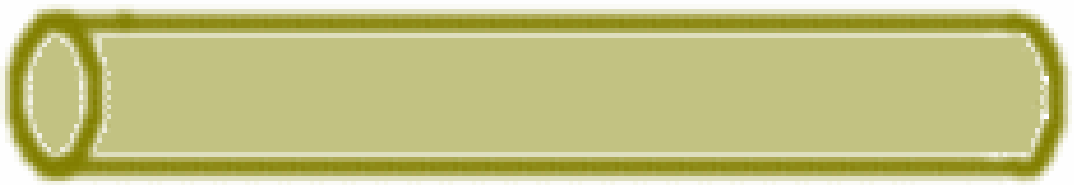
- A wave of contraction & relaxation of circular muscles.

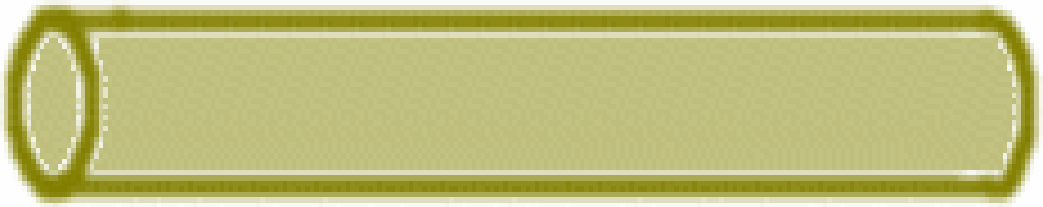


- **In oesophagus, small intestine & large intestine.**



- **Function: Propels food forward**





Balanced diet

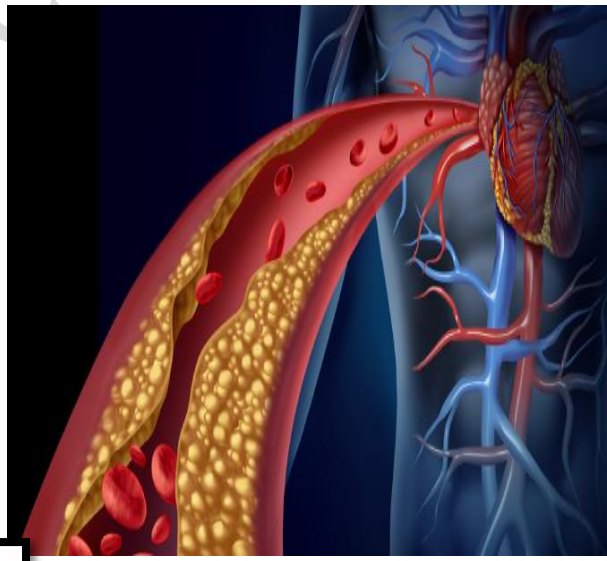
- Diet which contains nutrients in appropriate proportions for the normal growth and development.

- Proteins: 1/5 (Body builders)
- Fat: 1/5
- CHO: 3/5

Energy producers

Hypercholesterolemia

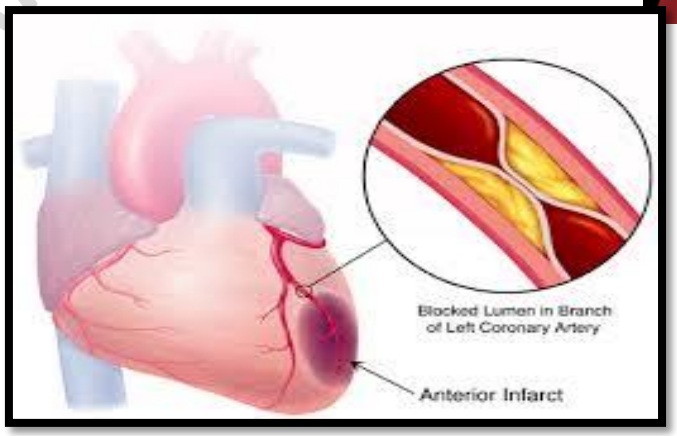
- Excess cholesterol level in blood



- Excess saturated fat intake

- Leads to :

- **Thrombosis**
- Heart attack



Fluorosis

- Excess Flouride intake

- **Features:**
- Tooth Decay
- Bone decay

Kwashiorkor

- **Protein Deficiency disorder**

- **in children 1-5 years**

-Retarded growth of body and mind.

- Muscle wasting

- Swelling of ankles, feet, belly

- Enlarged liver

- Immune deficiency.

Marasmus

- **Severe deficiency of all nutrients.**

- **Features :**
- **Stunted growth**
- **Wasting of all tissues**
- **Anemia**
- **Infections**

- **Seen in infants below 1 year.**

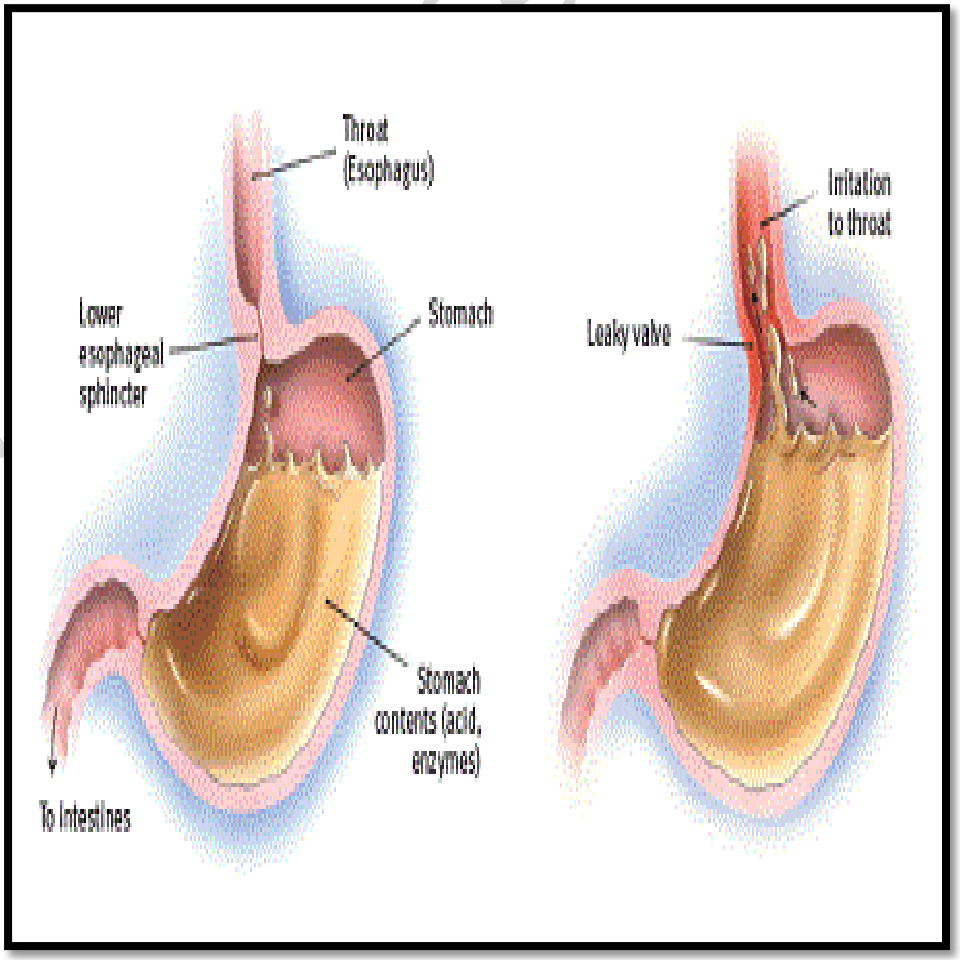
- **Kwashiorkor**
- Above 1 year of age
- Deficiency of proteins only
- Extensive oedema
- Subcutaneous fat present
- Under weight

- **Marasmus**
- Below one year of age
- Deficiency of both proteins & calories
- No oedema
- Subcutaneous fat absent
- Severely emaciated

Dyspepsisa

- Indigestion

- **Features**
- **Heart burn**
- **Abdominal pain**
- **Nausea**
- **Bloating**



JAUNDICE

Definition :

Jaundice is a condition characterized by yellowish discolouration of skin , sclera & mucus membrane due to increased plasma bilirubin concentration.

- *Normal Plasma Bilirubin* – **< 1.2 mg/dl (< 25 µmol/L)**

Plasma Bilirubin > 2.5 mg/dl

↓

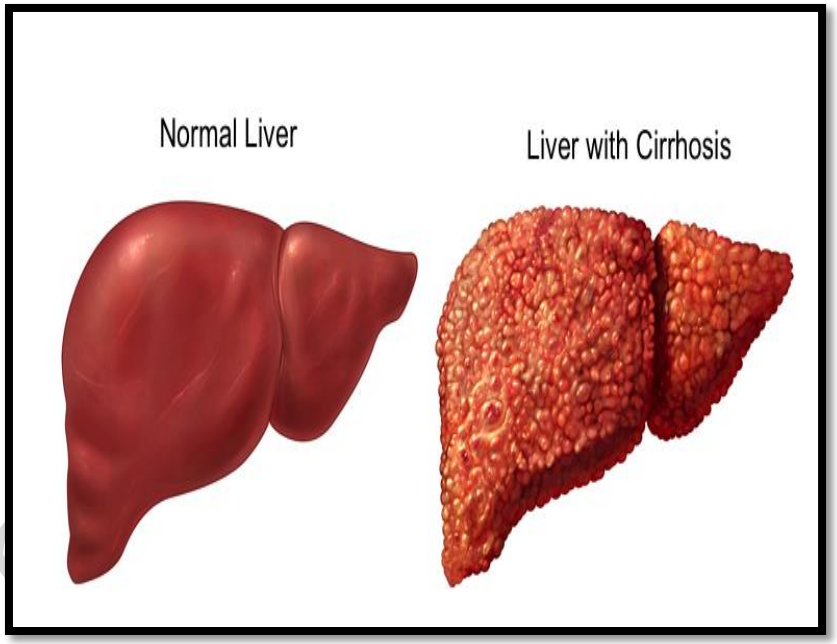
disorder

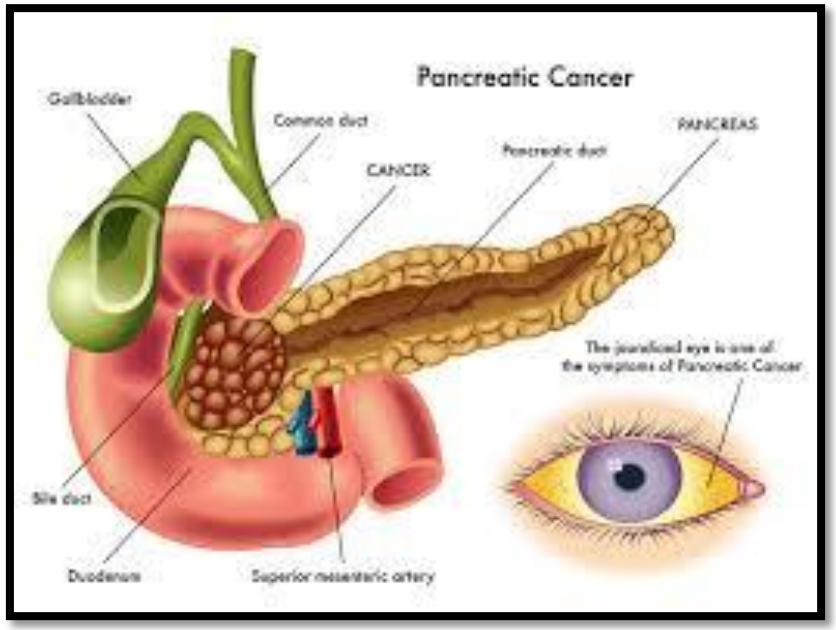
↓

Jaundice

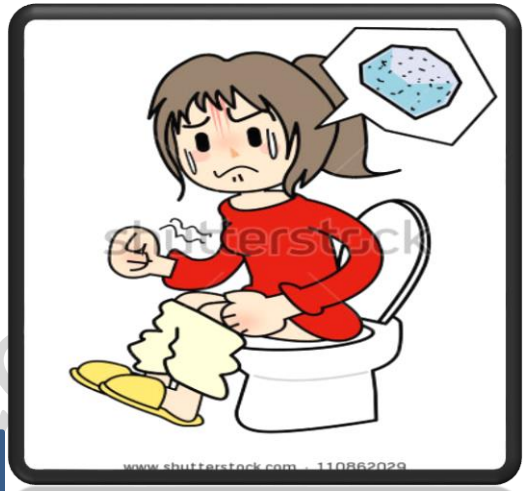
JAUNDICE

- **Causes :**
- Hepatitis
- Liver cancer
- Gall stones
- Pancreatic cancer





Constipation



- Defn : **Difficulty / failure of voiding of feces.**
- **Reduced colon motility**

Slows faecal movement

Excess absorption of water
Hard , dry faeces

Causes :

1. **Irregular bowel habit**
2. **Lack of dietary fibers**
3. **Endocrine disorders- hypothyroidism , Diabetes Mellitus**

Diarrhoea

- Frequent discharge of soft / fluid stools.
- Irritation of colon ----- ↑ Mass peristalsis

- **Causes :**

1. **Infections – amoebic dysenteries**
2. **Presence of irritants**
3. **Anxiety**
4. **Thyrotoxicosis**

Vomiting **(EMESIS)**

- **Abnormal emptying of the stomach and upper intestine through esophagus and mouth.**

Stimuli that induce vomiting:

- Gastritis
- Gastroenteritis
- Pyloric stenosis
- Over eating
- Cholecystitis
- Food allergy
- Pancreatitis
- Hepatitis
- **Lactose intolerance**