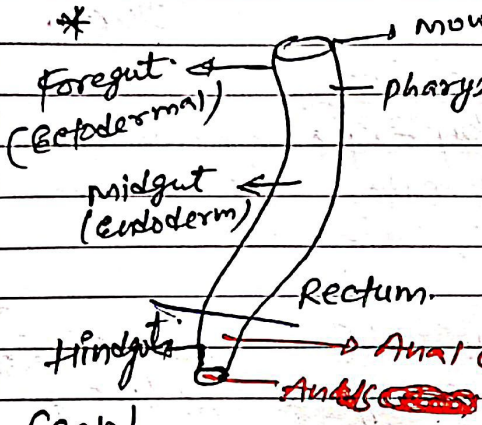
Digestive system.

Ingestion → Digestion → Absorption → Assimilation → Egestion.

* Assimilation → Transport of absorbed substance to tissue by blood and utilised by them is called Assimilation.

*



* Alimentary canal is ecto-endodermal.

* Salivary glands :-

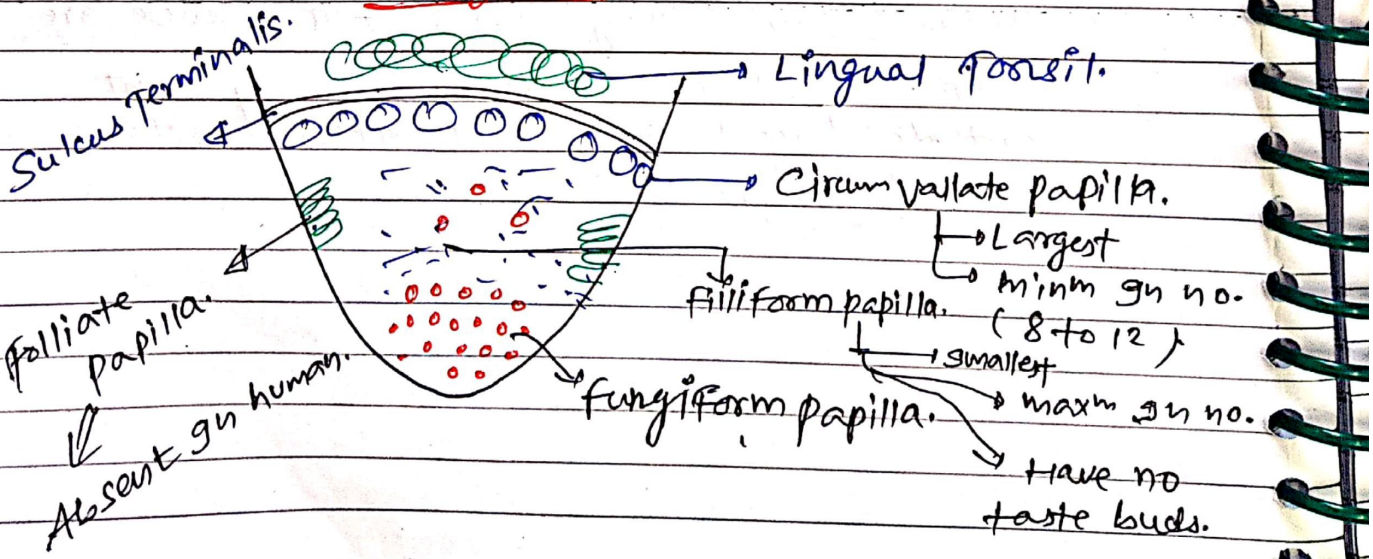
In human 3 pair salivary gland hot. These are exocrine in nature (have ducts). They hot outside buccal cavity but open into buccal cavity.

S.No.	Salivery glands	Location	Duct name.
1.	Parotid gland. (Largest)	In cheek.	Stenson's duct.
2.	Sublingual gland. (Smallest)	Below the Tongue.	Duct of Rivinus.
3.	Submaxillary. (Submandibular)	In Lower Jaw	Warton's Duct.

* Salivation is stimulated by → parasympathetic and inhibited by sympathetic nervous system.

* Saliva contains electrolytes (Na^+, K^+, Cl^-, HCO_3^-), IgA antibody, digestive enzyme: Salivery amylase (ptyalin), Antibacterial enzyme Lysozyme.

Tongue.



Sonu pratap singh

Teeth

* Ventral surface of tongue is connected to floor buccal cavity by thin membrane called Frenulum Linguae.

* On the dorsal surface of tongue papilla are which contains taste buds.

Teeth.

* Origin = ectomesodermal.
* Teeth forming cell = Odontoblast cell.
* Mammalian teeth are :-
  1. Thecodont = Teeth embeded in bony sockets
  2. Diphyodont teeth → Teeth appear twice time.
  3. Hetrodont = Teeth are differ in str. & function.
     - incisor (I)
     - canine (C)
     - premolar (PM)
     - molar (M).

* Diphyodont → milky / Deciduous / Temporary teeth. (20)
  → permanent teeth. (32)

* 12 teeth are monophyodont.

** All premolars + last molar teeth are Monophyodont.

Alveoli → (दाँत का Bone).
→ Lungs का unit.
→ mammary glands.

* Upper Jaw made up of maxila bone.
* Lower " " " " Mandible bone.

(*) Incisor and canines have 1, 1 root.

* Dental formula of adult = $\frac{2123}{2123}$

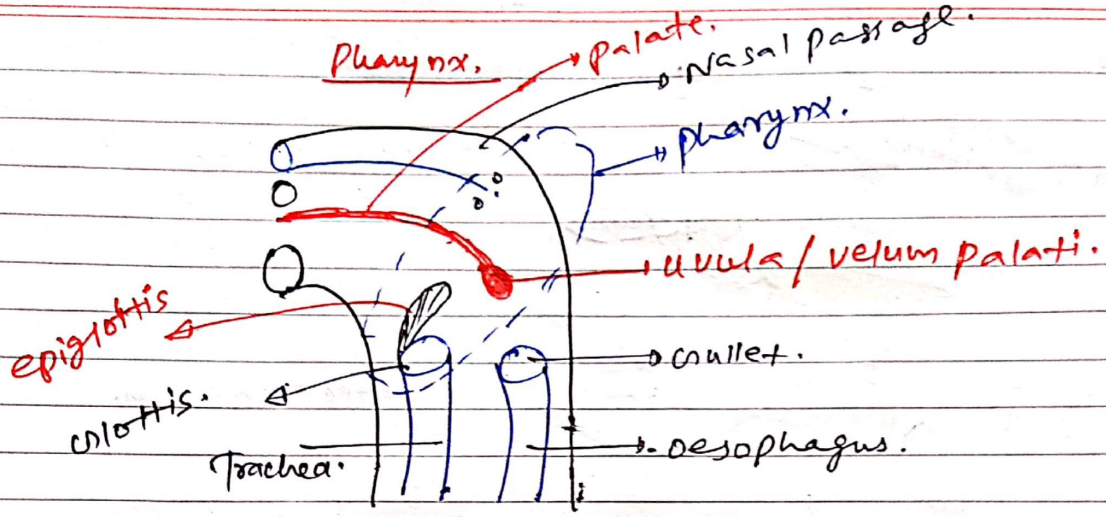
* Dental " " child = $\frac{2102}{2102}$

* Tusk of elephant is a upper incisor.
* These are ~~root~~ less teeth.

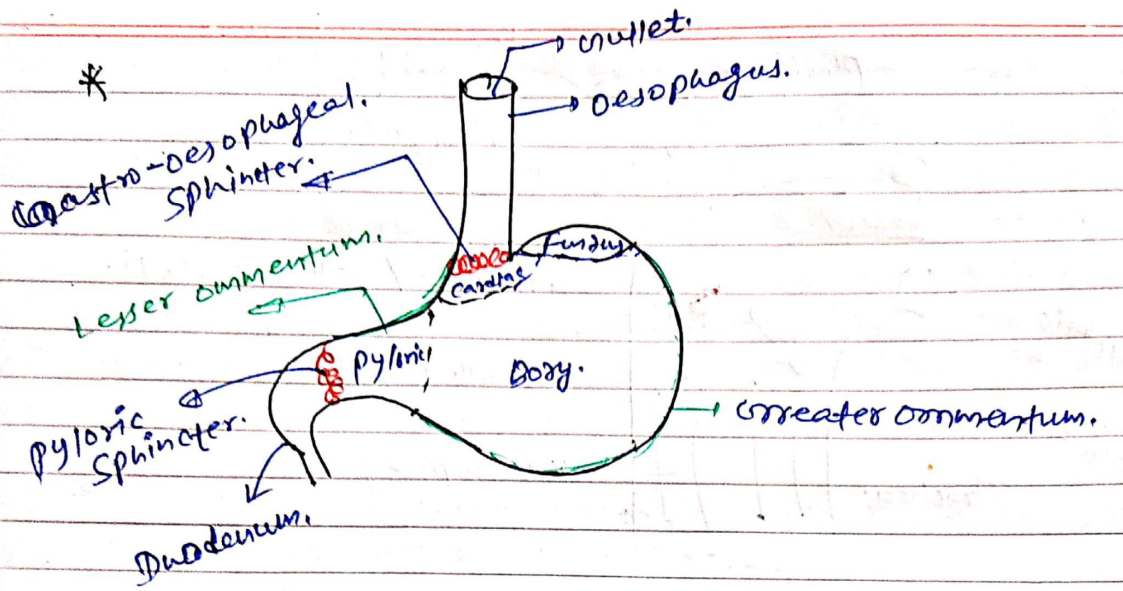
Enamel.
- hardest substance. (96% inorganic salt) of animal kingdom.
- Ectodermal.

* **Dentine**
- contain 69 % inorganic salt.
- mesodermal.
- Secreted by odontoblast cells.

* cavity of ~~tote~~ is called pulp cavity which is lined by odontoblast cell.



* Common passage of food and air is pharynx.
* A cartilagenous flap (epiglottis) prevent the entry of food into glottis.
* During swallowing Breathing rate Zero.
* Min^m Breathing during sleeping.



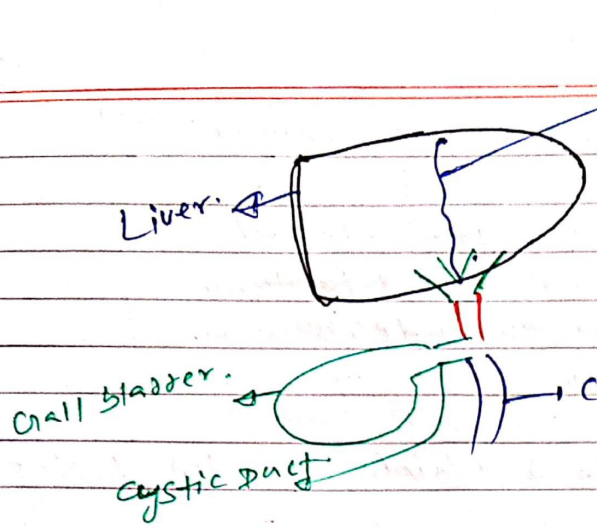
* In oesophagus only mucus gland hai; no digestive gland.
* Oesophagus has voluntary and involuntary both muscles.
* Oesophagus open into muscular bag stomach through gastro-oesophageal sphincter / cardiac sphincter.
* Stomach open into Duodenum through pyloric sphincter.
* Stomach is J-shaped, widest part.
* Stomach has 4 parts: cardiac + fundus + Body + pylorix
* Muscular contraction in stomach wall called Churning movement.
* Empty stomach has longitudinal folds called gastric rugae.

(*) Vit B_{12} → RBC बनाने में सहायक

(*)
1. Widest part = stomach.
2. Longest part = ileum.
3. Maxm peristalis occur in → stomach.
4. Minm " " " → Rectum.
5. Maxm digestn occur in → duodenum.
6. Maxm absorption " " → Jejunum.

Stomach has gastric gland which secreted gastric juice.

S.No.	Cells of gastric gland.	Secretion.
1.	Mucous cell. (Goblet cell).	Mucous.
2.	Oxyntic cell. (Parietal cell)	HCl + CIF.
3.	Chief cell/Peptic cell/ Zymogen cell.	→ pepsinogen. → pro-rennin. → Gastric Lipase.
4.	Argentaffin cell.	
	(a) G-cell	→ Gastrin hormone.
	(b) D-cell	→ Somatostatin.
	(c) EC-cell	→ Histamine & Seretonin.



* C.I.F (Castell's Intrinsic Factor) is essential for absorption of Vit-B_{12}.

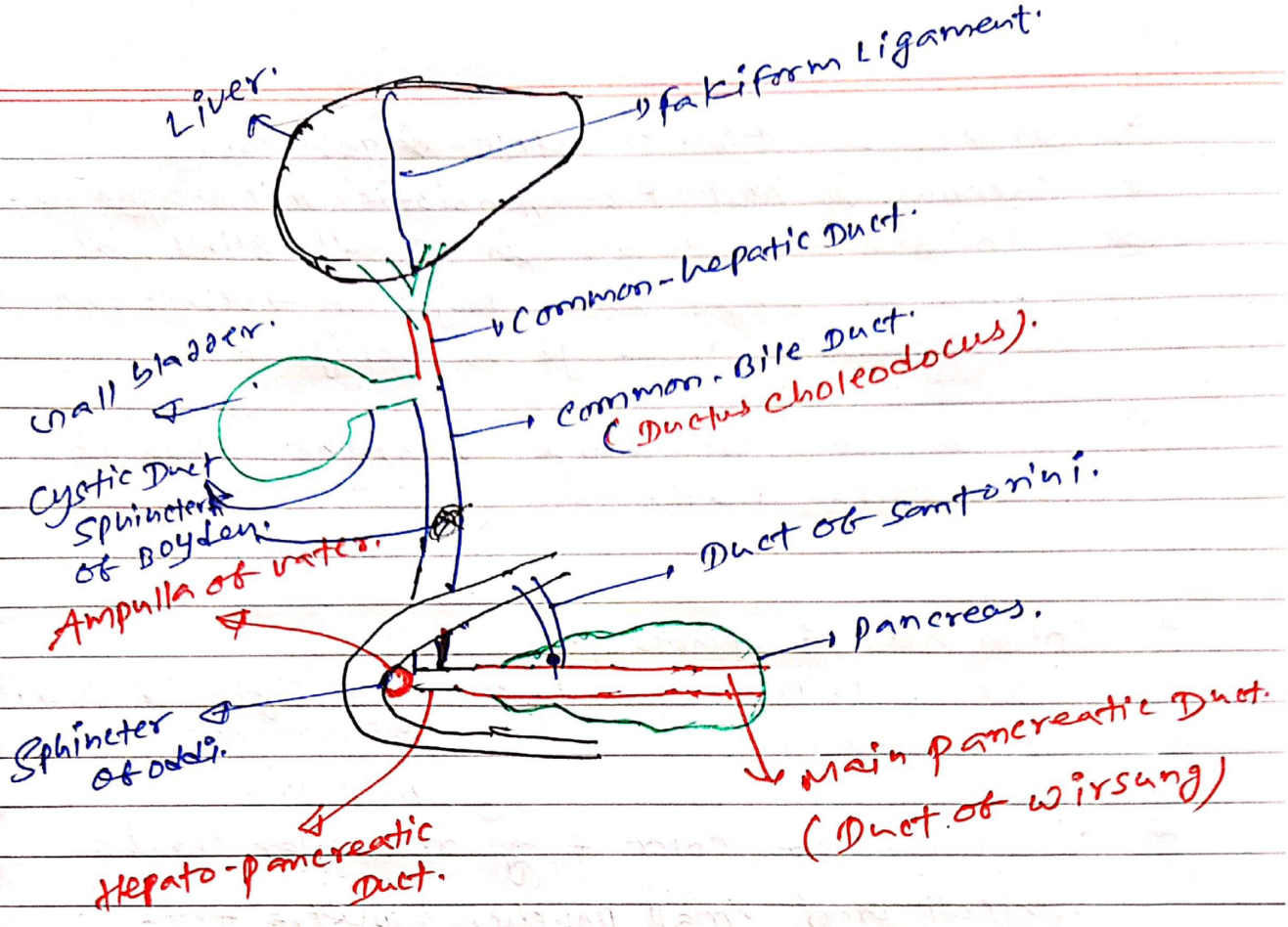
* Vit-B_{12} is required for RBC maturation.

* Gastric juice contain 3 enzymes :-
  - Pepsinogen + prorennin + gastric Lipase.

Intestine.

Small intestine.
- Length more.
- diameter less.
- Duodenum
- Jejenum
- ileum.

Large-intestine.
- Length less.
- Diameter more.
- Caecum
- Colon.
- Rectum.



* Duodenum is C-shape, in this Bile juice and pancreatic juice are carried by hepatopancreatic duct.

* Opening of hepatopancreatic duct is guarded by Sphincter of Oddi.

* Gall bladder is for storage and concn of Bile-juice. It's duct is called cystic duct.

* Contractn in gall-bladder is stimulated by CCK hormone.

* Gall-Stone is due to accumulation of cholesterol.

* Caecum is for cellulose digestion.
* Caecum is host for symbiotic micro-organisms.
* In human caecum is small-Blind sac from gt finger like projection → vermiform appendix arise. gt is vestigeal.
* ileum open gnto large gntestine through ileo-caecal wall.

* Colon has 4 parts :→
Ascending, Transverse, Descending & Sigmoid colon.

* gn the wall of colon 3 longitudinal muscular bands tinicoli and small pouches haustra ~~nt~~.

* ganeal, haustra gncrease water absorption surface area.

* Rectum is for storage of excreta. muscular movement gn Rectum is called bowl movement

* Due to enlargement of rectal vein causes piles / Haemorrhoides. (Bleeding with excreta).

* gf Bowl movement irregular then constipation.

* gf " " abnormal frequently then Diarrhoea.

Histology of Alimentary canal :-

The wall of A.C made up of 4 layers:-

(A) Serosa → Visceral peritoneum.
→ Areolar connective.

(B) Muscularis Layer → outer → LML (Longitudinal muscle Layer)
Contain. (Smooth muscle) → inner → CML (Circular muscle Layer)

(C) Submucosa → It consist of loose connective tissue. This layer contain Blood vessels, nerve, Lymph vessels.

(D) Mucosa = inner Layer . Consist of 3 sublayer.
- Muscularis mucosa = thin layer of smooth muscle.
- Lamina propria = made up of RFCT (Reticular fibrous Connect. tissue)
- Epithelium → It lines the lumen.

* In a pharynx, buccal cavity, oesophagus stratified squamous epith. tnt. but in a stomach + intestine simple columnar epithelium tnt.

* 2 nerve plexus tnt in the wall of Aliment. canal.

(1) Auerbach's plexus. (~~Meissners~~ plexus)
↓ Myentric.
tnt b/w (LML and CML).

It control peristalsis.

(ii.) Submucosal plexus. (Meissener's plex.) → +nt b/w CML and Sub-mucosa layer. gt control secretion of GIT.

* Activity of GIT regulated by ANS.

* parasympathetic System stimulate peristalsis and secretion of G.I.P.

* Sympathetic system inhibited peristalsis and secretion.

* Modifications:→

(i.) gn oesophagous outer layer. is not visceral peritonium. gt is tunica adventia.

(ii) gn Stomach extra/oblique muscle layer +nt.

(iii) In the Submucosa of Duodenum. multi-cellular, Brunner's gland +nt.

gt's secretion is alkaline.

gn gt's secretion no enzyme +nt.

(iv.) In small intestine Epithelium form transverse and longitudinal folds.

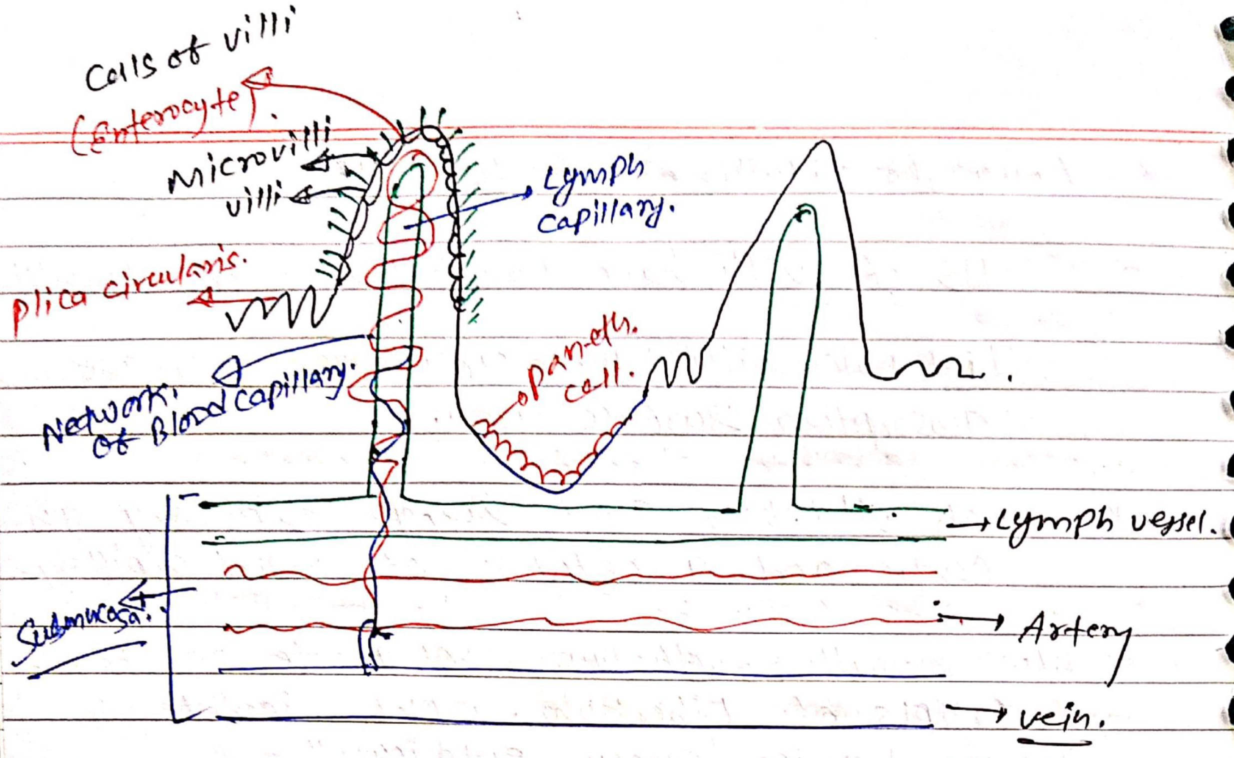
Small transverse fold = plica circularis/valvulae conniventi/ Folds of Kerkaring.

* Long longitudinal Fold = villi.
* Cells of villi have. Brush Border of microvilli.
* villi + microvilli + pleca circularis = increase. absorption surface area.
* each villi has single lymph capillary in centre and a network of Blood capillary.
* B/w 2 villi epithelium inveginate and formes crypts of Liberkuhn. which secrete intestinal juice "succus entericus."

These crypts are lined by paneth cell. which secrete enzymes.

* in ileum region payers patches / gutertinal tonsils are which secrete lymphocyte.

Word	Location.
(1.) tunica adventia.	→ oesophagus.
(2) oblique muscles.	→ stomach.
(3) Brunner's gland.	→ duodenum.
(4.) payer's patches.	→ ileum.
(5.) Taenia & Haustra.	→ Colon.
(6.) Maxm villi	→ Jejunum.



* Physiology of Digestion.

(A) Digestion in Buccal cavity:-

Buccal cavity perform 2 major functn.

1. Mastication of food. (Tes surface area बढ़ enzyme इसका particle पर काम करे)
2. fascilitation of swelling.

** Saliva is mixed into food in buccal cavity. In saliva, starch digestive enzyme = salivary amylase/ ptyalin +nt.

** About 30% starch is hydrolysed in Buccal Cavity into maltose, by Salivary amylase enzyme at optimum PH 6.8.

Anusingh rajput

* Salivary amylase is activated by cl⁻ ge PH of Buccal cavity fall then ptyalin activity reduce.

* gn Buccal cavity only carbohydrate digestion occur.

* Saliva mix masticated food is called Bolus. which enter gnto oesophagous through pharynx. From Buccal cavity is called, Deglutition.

* In oesophagous no digestion.

(B) Digestion gn Stomach.

(*) Due to relaxation of Gaso-oesophageal Sphincter Bolous enter gnto stomach.

(*) Contraction gn muscular wall of stomach is called churning movement due to this gastric Juice mixed gnto food.

(*) Relaxation of Gastroesophageal Sphincter at regular gnterval during churning movement is called Gastroesophageal relaxation disorder/ Heart-Burn Disease.

(*) ge this Sphincter do not open properly then food accumulate gn Oesophagous this is cardiac achlasia disease.

* Gastric Juice contain HCl + CIF + Mucous + Enzyme (Pepsinogen + Prorennin + Gastric Lipase.)

* mucous + Bicarbonate protect epithelium of Stomach from HCl.

* HCl convert Fe+3 of food into Fe+2 form. अगर convert नहीं होगा तो Fe+2 absorb नहीं हो पाएगा duodenum के द्वारा।

⇒ So, no secretn of HCl causes * Iron deficiency anaemia. (Acholaroidea)

** group of protein digestive enzymes are called proteolytic Enzymes. These are of 2 types - Endopeptidase, Exopeptidase

protein —Endopeptidase.→ peptones + proteoses. —Exopeptidase.→ Dipeptide + AA.

* Main function of HCl is activation of enzyme.

* pepsinage activated by HCl. It is endopeptidase enzyme in acidic medm.

* Pepsinogen $\xrightarrow{HCl.}$ pepsin ~~→ protein.~~

protein $\xrightarrow[pH = 2-3]{pepsin.}$ peptones + proteases

* Gastric Lipases is secreted in small amount. It acts on only 1% Emulsified Fat.

** Rennin is activated by HCl. It is for milk protein coagulation. So help in milk protein digestion.

the initial step of milk protein digestion is Rennin. It is found only in infant (mammalian child). It is absent in adult.

prorennin $\xrightarrow{HCl.}$ Rennin.

Casein (milk protein) $\xrightarrow{Ca^{++}}$ Rennin. Ca – paracaseinate.

Ca – paracaseinate $\xrightarrow{pepsin.}$ peptones + proteases.

(4) Enzyme.
Salivary amylase, pepsin, rennin, gastric lipase.

5 Juice → Saliva + Peptic juice + Bile juice + Pancreatic Juice.

* Stomach is main site for protein digestion.

* After activity of gastric Juice acidic food is called chyme.

Digestion in Small intestine.

Bile Juice, pancreatic Juice and intestinal Juice mixes into food in small intestine.

* Bile Juice and pancreatic Juice released into duodenum but intestinal Juice " "
Jejunum.

* Bile - Juice.
  - Synthesise By liver.
  - Store; concentrated by gall bladder.
  - Have no enzymes.
  - alkaline, pH = (7.5 - 8.)
  - Contain Bile salts + Bile pigments + Cholesterol.

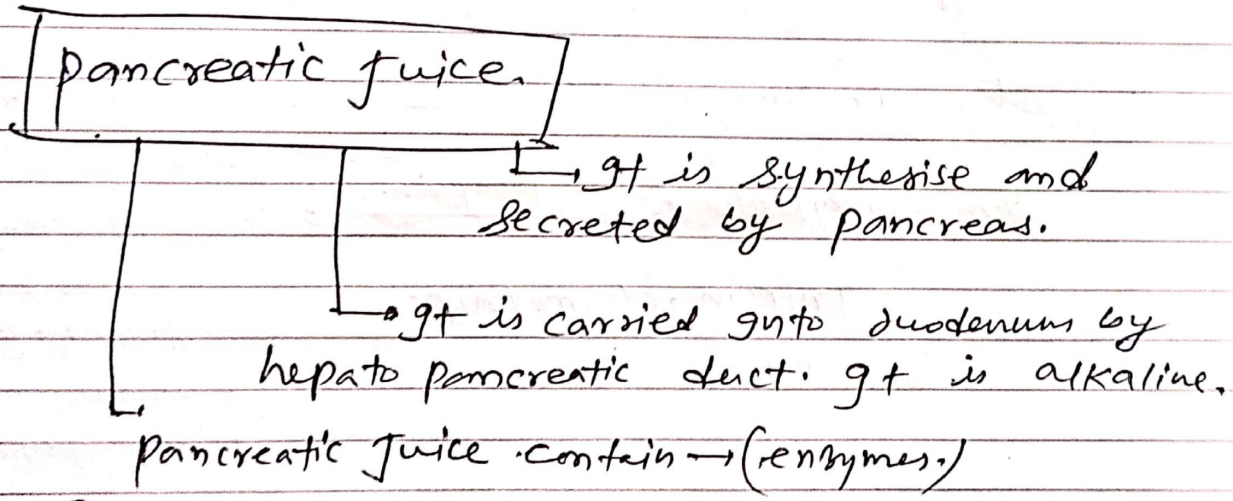
* Bile salts → inorganic → NaCl, $NaHCO_3$.
  - organic → Na-Taurocolate, Na-Glycolate.
  - (1) Emulsification of fat.
  - (2) make food mem alkaline.

(3.) Help in absorption of fat and fat Soluble vitamin.

(4.) Activation of Lipase enzyme.

* Conversion of Large fat globules into Small one is called emulsification.

* If Bile-Duct is Blocked, Fat digestion is effected.



Pancreatic Juice contain → (enzymes.)

(1) Trypsinogen.
(2) Chymotrypsinogen.
+
Procarboxipeptidase.
+
Amylase.
+
Lipase.
+
Nuclease.
+
Nucleotidase.

* Trypsinogen is activated by Entero-kinase enzyme. It is secreted by intestinal Brush-Boarder epithelium.

* Trypsin and chymotrypsine is Endopeptidase in alkaline medm but carboxy peptidase is Exopeptidase.

* Chymotrypsin and carboxy peptidase are activated by trypsin enzyme.

Trypsinogen —Enterokinase→ Trypsin.

Chymotrypsinogen —Trypsin.→ Chymotrypsin.

Pro-carboxypeptidase. —Trypsin→ Carboxypeptidase.

* protein —Trypsin, chymotrypsin. pH = 7 to 8.→ peptones + proteases.

peptones + proteases —Carboxypeptidase→ Dipeptide.

* In adult human chymotrypsin also help in milk protein digestion.

ase - लगा दो enzyme का नाम होगा
(जिसमे काम कर रहा आपे)

* 70% starch $\xrightarrow[pH = 7.8]{\text{amylase.}}$ Maltose.

* Emulsified fat $\xrightarrow[pH = 7.8]{\text{Lipase.}}$ Monoglyceride + Diglyceride

* Nucleic acid (DNA + RNA). $\xrightarrow{\text{Nucleases. (DNase + RNAase).}}$ Nucleotide. $\xrightarrow{\text{nucleotidase.}}$ Nucleoside.

Intestinal Juice.

↳ It is also called succus enterikus.

* It is secreted by krypts of Liberkuhn.
* It is alkaline fluid.
* It contain enzyme. → Dipeptidase.
  Maltase.
  Lactase.
  Sucrase.
  Lipase.
  nucleotidase.
  nucleosidase.

(*) Dipeptide $\xrightarrow[PH=7.528]{\text{Dipeptidase.}}$ Amino Acid.

(*) Maltose $\xrightarrow{\text{Maltase.}}$ Glucose + Glucose.

(*) Lactose. (milk sugar) $\xrightarrow{\text{Lactase.}}$ Glucose + Galactose.

(*) Sucrose/ Invertase. $\xrightarrow{\text{Sucrase.}}$ Glucose + Fructose.

(*) Monoglyceride + Diglyceride. $\xrightarrow{\text{Lipase.}}$ Fatty acid + Glycerol.

(*) Nucleotides $\xrightarrow{\text{Nucleotidase.}}$ Nucleosides. $\xrightarrow{\text{Nucleosidase.}}$ base + pentose sugar.

(**) After activity of pancreatic juice alkaline food is called chyle.

(**) End product of digestion = AA + glucose + Fructose + galactose + Fatty acid + glycerol.

Absorption

process by which end product of digestion. move into blood or lymph through epithelium of gut.

* Absorption occur by simple diffusion, facilitated transport and active transport.

* Some glucose, Some AA., Cl^- By → Passive Transport. (Simple diffusion)

* Some glucose, Some AA, Fructose By facilitated transport with the help of carrier protein.

* major part of glucose and AA, Na^+, K^+ by active transport.

* Part of gut.	Absorbed Substance.
1. Mouth. (Buccal cavity)	Some chemicals/ Drugs absorbed by lower side of tongue.
2. Stomach.	water, Electrolyte, Drugs, simple sugar, alcohol.
3. Duodenum.	Fe^{++}, Ca^{++},
4. Jejunum.	principle organ for absorption of nutrients (glucose, AA, vitamins) + most of water and electrolyte.

5. ileum = Fatty acid + vit B_{12} + glycerole.

6. colon. = water, electrolyte, vitamins.
(Large intestine)

* All substances are absorbed into Blood. except → long chain fatty acid
+
Glycerol.
+
Fat soluble vitamins.

*
Fatty acids and glycerol being insoluble so can't absorb into blood. they incorporate with bile salt and formed fat droplets called micelles. these micelles enter into epithelial cell of vill. they are reformed into very small protein Coated Fat droplets called chylomicrons. these chylomicron diffused into lymph of lymph capillary / Lactiales.

* Fat is absorb by Lactials, in the form of Chylomicrons.

(1) Jaundice.

Disorders :- (i.) Liver is affected.
(ii.) In this skin, eyes turn yellow due to accumulation of Bile-pigments.

* (2) Constipation.
(3) Diarrhoea.
(4.) Indigestion :-

* In this food is not properly digested so Filling of fullness.

Reason of indigestion = overeating, Spicy Food, Anxiety, Food poisining, Improper secretions of enzymes.

* (5) Vomitting :- Containt of Stomach Expelled out through mouth is called vomitting.

Vomitting centre located on medulla oblongata.

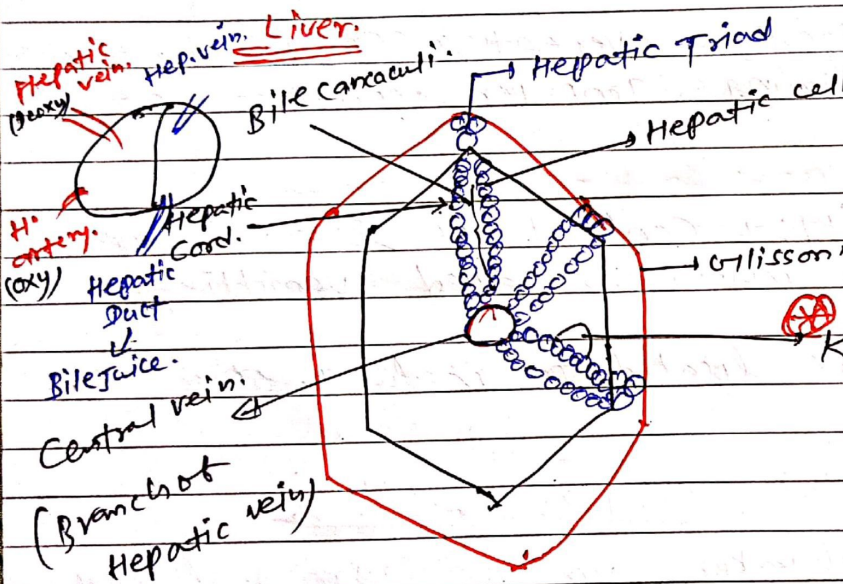
* PEM (protein energy malnutrition)

In this kwashiorker and marasmus. Disease including.

* (i.) Marasamus is produced by deficiency of protein and calorie. It occur in infant's less than 1 year age. It's skin become dry, thin, wrinkled. No swelling on Body, No fat below the skin, Growth rate and body weight decline, ribs are prominent.

Kwashiorker pronce by deficiency of protein in diet. It occur in child more than 1 year age. In this swelling on Body (Oedema Condition), occur. In this same fat is still left on the skin, their skin is normal, failure of Body growth and Brain development.

Digestive gland :-



* Largest gland.
* Endodermal.
* Weight 1·2 - 1·5 kg.
* Triangular shaped, Bilobed, Right lobe is larger than left.
* each lobe made up of many hepatic lobules.

* Structural & Functional unit of Liver = Hepatic lobules.

* Each lobule is covered by connective tissue sheath called gillson's capsule.

* Each lobule contain many hepatic cells which Synthesise and secrete Bile Juice.

* Hepatic cells arrange in radial rows, called hepatic cord.

* B/w 2 hepatic cord Blood sinus present called hepatic sinusoid which is *Lined by Kupffer cells.
these are phagocytic cells.

* Hepatic portal vein Carry deoxygenated Blood From Intenstine to Liver.

* Heart - Lungs, Liver receive Both oxygenated and de-oxygenating Blood.

* Liver Synthesise
- Urea.
- Yolk.
- Bile-Juice.
- plasma-protein.
- clotting factor.
- Heparin.
- vit-A from β-Carotein.

* Detoxification of alcohol done by → liver

* in alcohol addict person liver damage due to accumulation of fatty acid.

Vitamins.

① → organic substance which are not synthesize by body.

→ vit-D (in skin) and vit-K, B_{12} in colon, are formed by body.

* Vitamins are of 2 types.

- Water soluble.
  - → vit C, B-complex.
- Fat-soluble.
  - A, D, E, K.

Vit.	Chemical name.	Deficiency Diseases.
A	Retinole.	→ Night Blindness. → xeropthalmia.
D.	Calciferol.	(Sunshine vitamin.) → osteomalacia in adult → Rickets in child.
E	Tocopherole. (anti aging vitamins). remove scars.	Sterility.
K.	phytoquinone. (Nephthoquinone).	(Haemorrhagia) continuous Bleeding

I c PM

C.	Ascorbic acid. (work as Co-factor)	Scurvey (Bleeding in gums)
B1	Thiamine.	Beri-Beri.
B12 co-containing	cyanocobalmive. (RBC maturation)	pernicious anaemia.

* Vit-K is essential for formation of prothrombin in Liver, so it help in Blood co-agulation.

** In milk, Bread, egg Vit-C absent.

* Watermelon. → (B12)