Biliary and intestinal secretions

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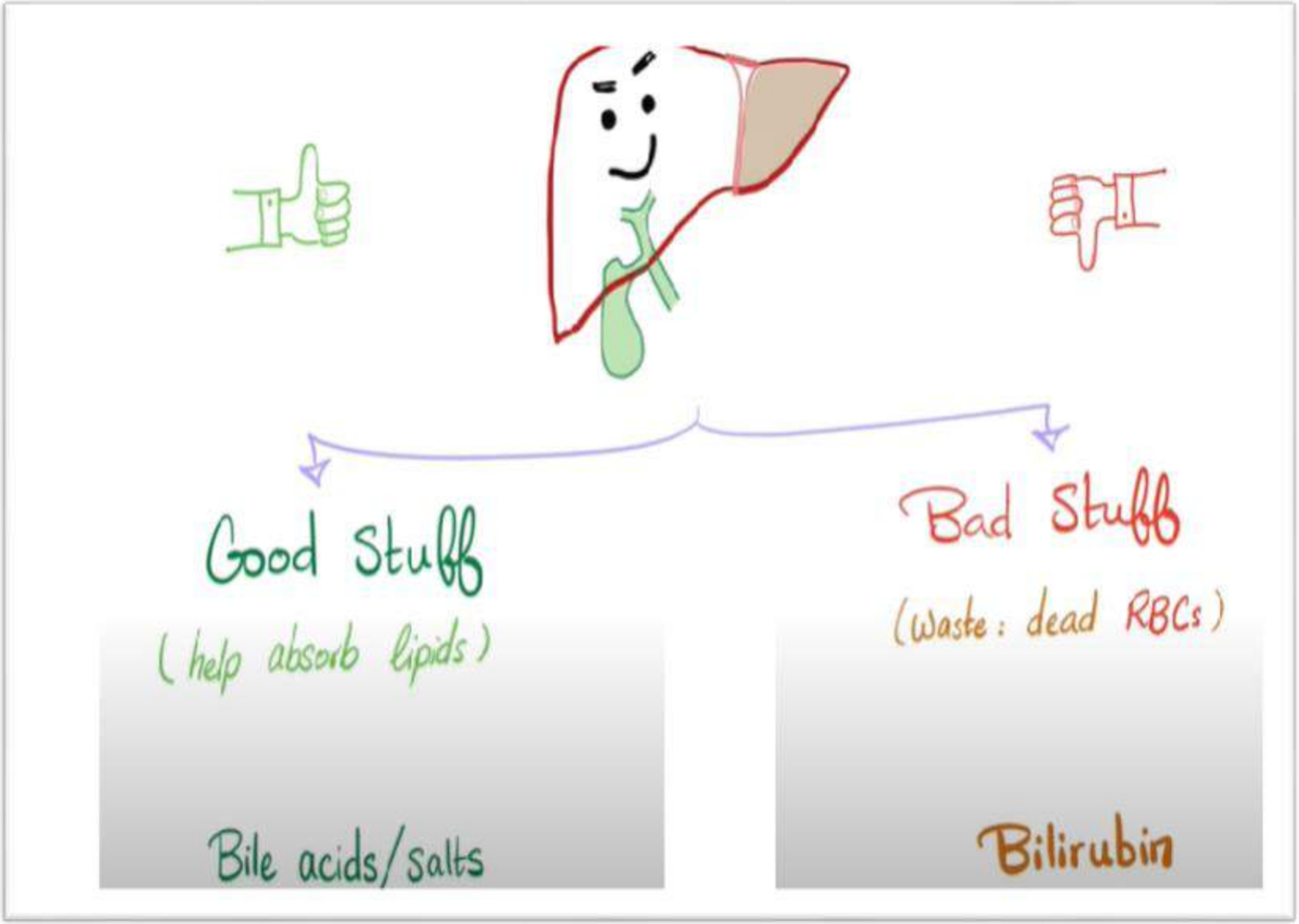
Objectives

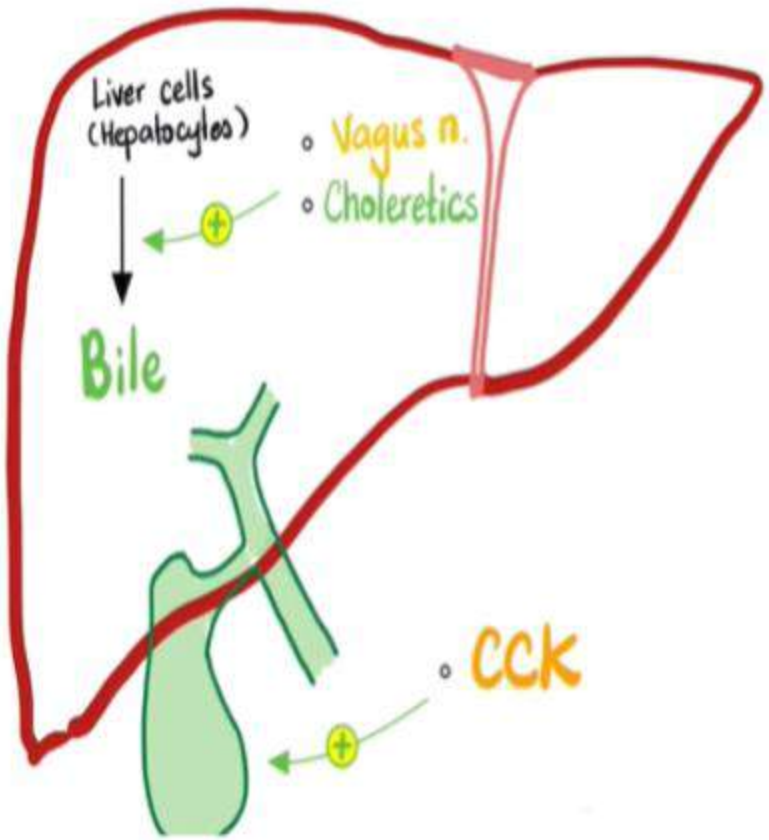
- Describe the components of bile and intestinal secretions
- Indicate the function of each component secreted in bile and intestinal juice in digestion
- Illustrate the regulation mechanisms involved in the secretion of bile and intestinal fluid


Good Stuff
(help absorb lipids)
Bile acids/salts
Bad Stuff
(waste: dead RBCs)
Bilirubin

Composition of Bile

	Liver Bile	Gallbladder Bile
Water	97.5 g/dl	92 g/dl
Bile salts	1.1 g/dl	6 g/dl
Bilirubin	0.04 g/dl	0.3 g/dl
Cholesterol	0.1 g/dl	0.3 to 0.9 g/dl
Fatty acids	0.12 g/dl	0.3 to 1.2 g/dl
Lecithin	0.04 g/dl	0.3 g/dl
Na^+	145.04 mEq/L	130 mEq/L
K^+	5 mEq/L	12 mEq/L
Ca^{++}	5 mEq/L	23 mEq/L
Cl^-	100 mEq/L	25 mEq/L
HCO_3^-	28 mEq/L	10 mEq/L

The liver & gallbladder



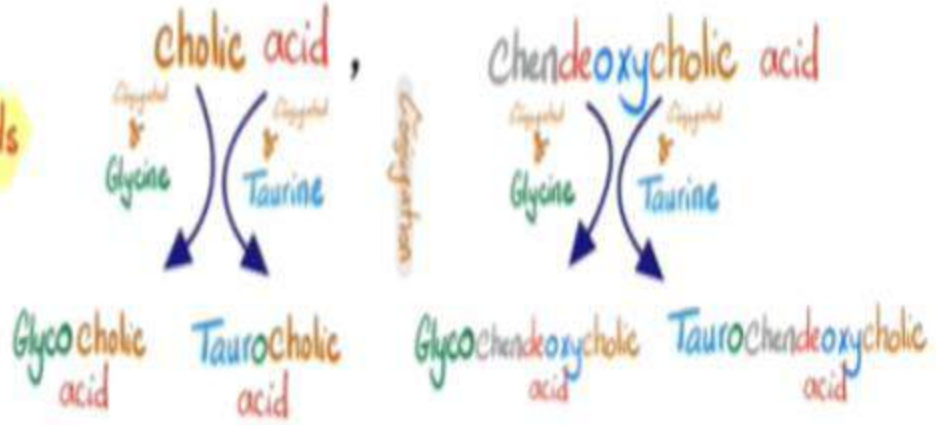
N.B.

Secretin ⊕ → H_2O & HCO_3^- @ bile.

Raw material : Cholesterol

- 1ry Bile acids : made (from cholesterol) in the liver : e.g. cholic acid, Chendeoxycholic acid.
- 2ry Bile acids : made (from 1ry Bile acids) by bacteria in the colon : deoxycholic acid, lithocholic acid

- Bile Salts : Conjugated 1ry Bile acids in the liver



In order : 1ry Bile acids (in liver) —Conjugation→ Bile Salts (in liver) —bacteria→ 2ry Bile acids (in colon)

DIGESTION

Carbs

Salivary Amylase → Pancreatic Amylase → Intestinal

- Maltase
- Isomaltase
- Lactase
- Sucrase

Monosaccharides: Glucose, Galactose, Fructose

Proteins

Gastric Pepsin → Pancreatic (Trypsin, Chymotrypsin, Carboxypeptidase -COOH, Proteases) → Intestinal

- Aminopeptidase -NH_2
- Enteropeptidase
- Dipeptidase

a.a.

Fat (TGLs)

Salivary lipase → Pancreatic (lipase, Phospholipase, Colipase, Cholesterol esterase) → Bile (Acids, Micelles)

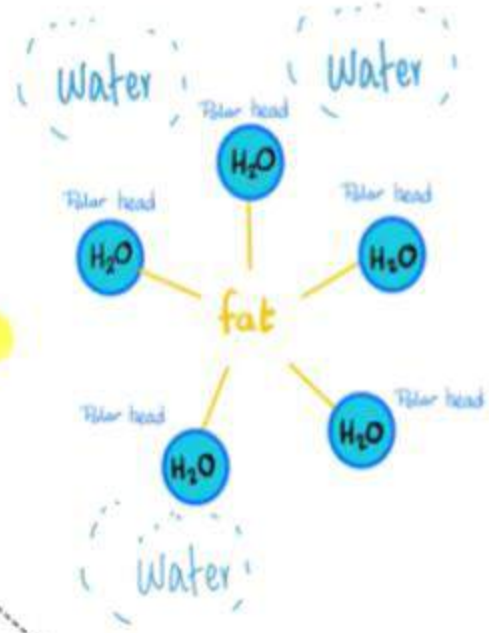
Fatty Acids

2-Monoacylglycerols

Emulsification of fat

Bile Salts → ↓↓ Surface tension
Bile Salts → Emulsify fat into small droplets.

Bile Salts function



emulsification

« Amphipathic »

Hydrophilic

Hydrophobic

lacteals

Micelles transfer fat to brush border

Chylomicrons

ptn

lipid droplets

Bile Acids

pka = 6

your pH = 7.4

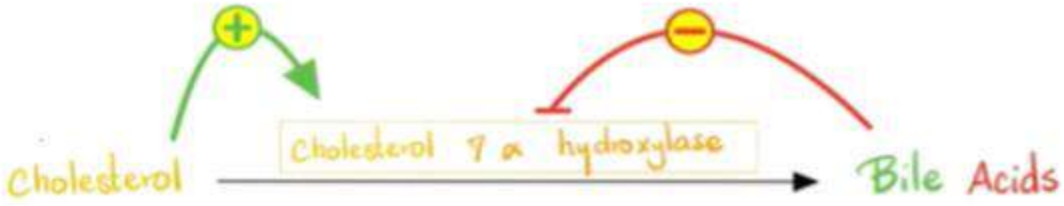
Adding Glycine (or) Taurine → ↓↓ PKa

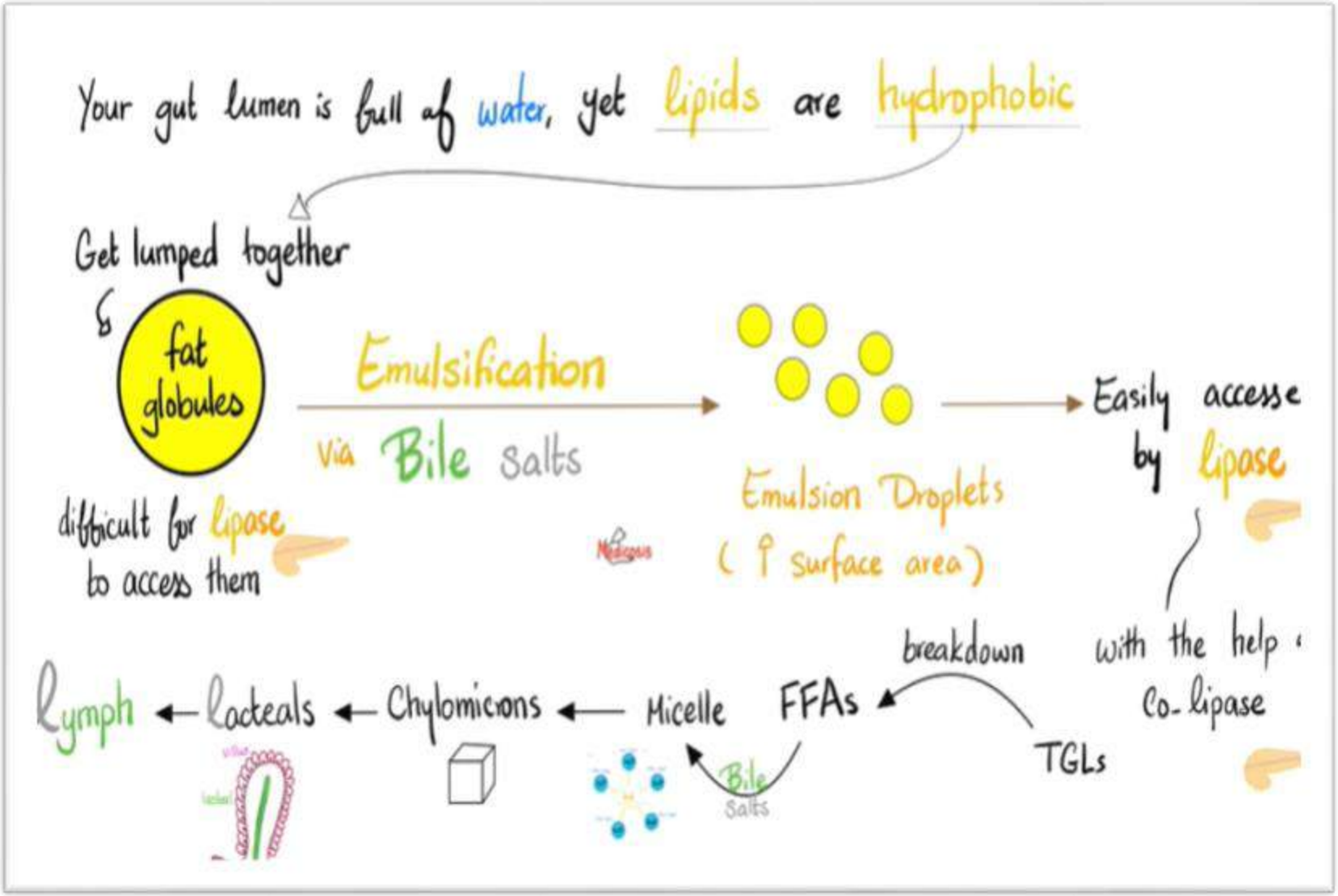
exist predominantly in the fully ionized form

→ better able to dissolve @ aqueous solution @ gut.

∴ Bile Salts are better @ emulsifying fat than Bile Acids

Bile Salts > Bile Acids




Your gut lumen is full of water, yet lipids are hydrophobic
Get lumped together
&
fat globules
difficult for lipase to access them
Emulsification
via Bile salts
Emulsion Droplets
(↑ surface area)
Easily accesse by lipase
with the help o Co-lipase
breakdown
TGLs
FFAs
Micelle
Chylomicrons
Lacteals
Lymph
Bile Salts

HCl

IRON YOUR CLOTHES

Duodenum — IRON , Ca^{++}

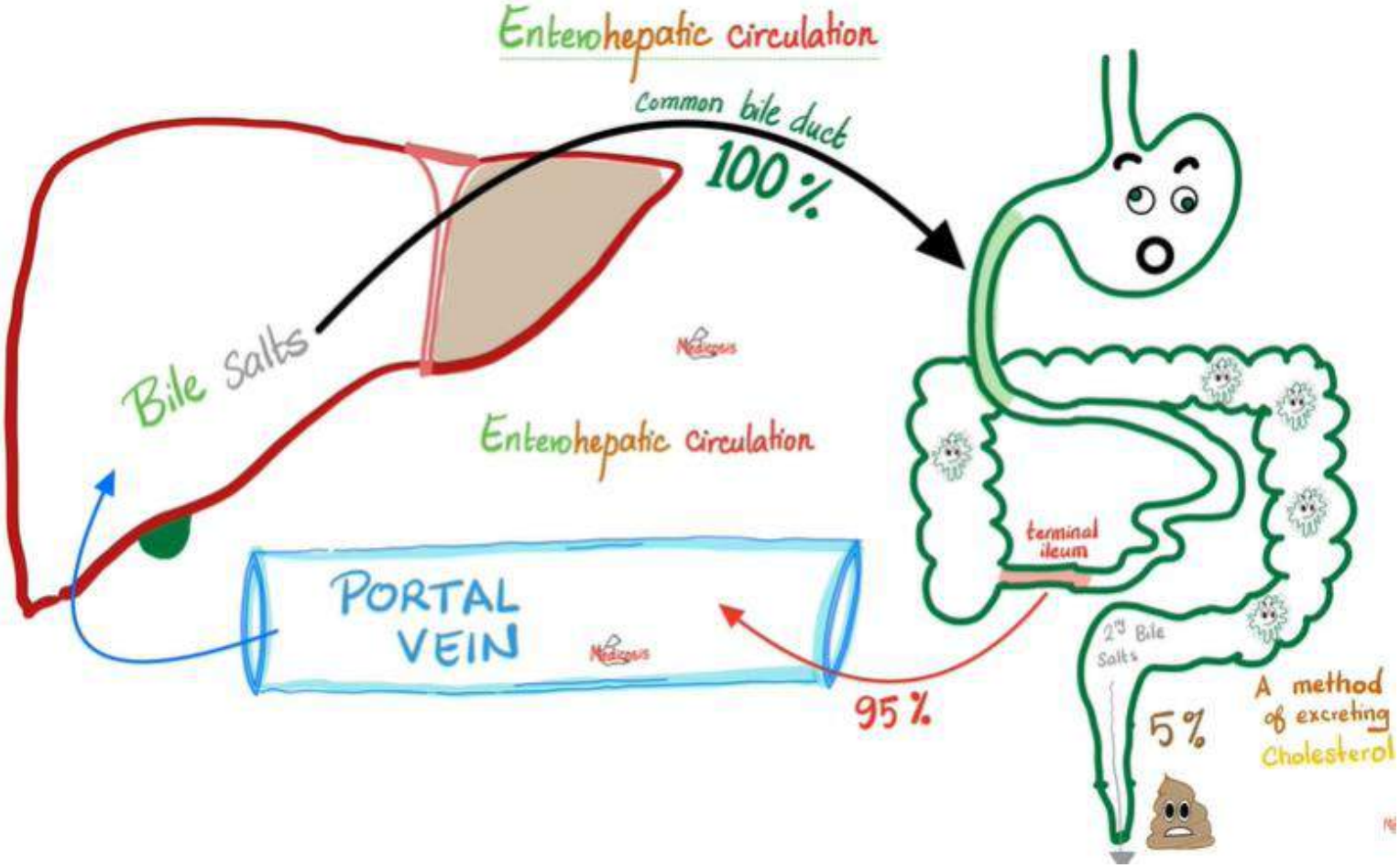
Then Fold them

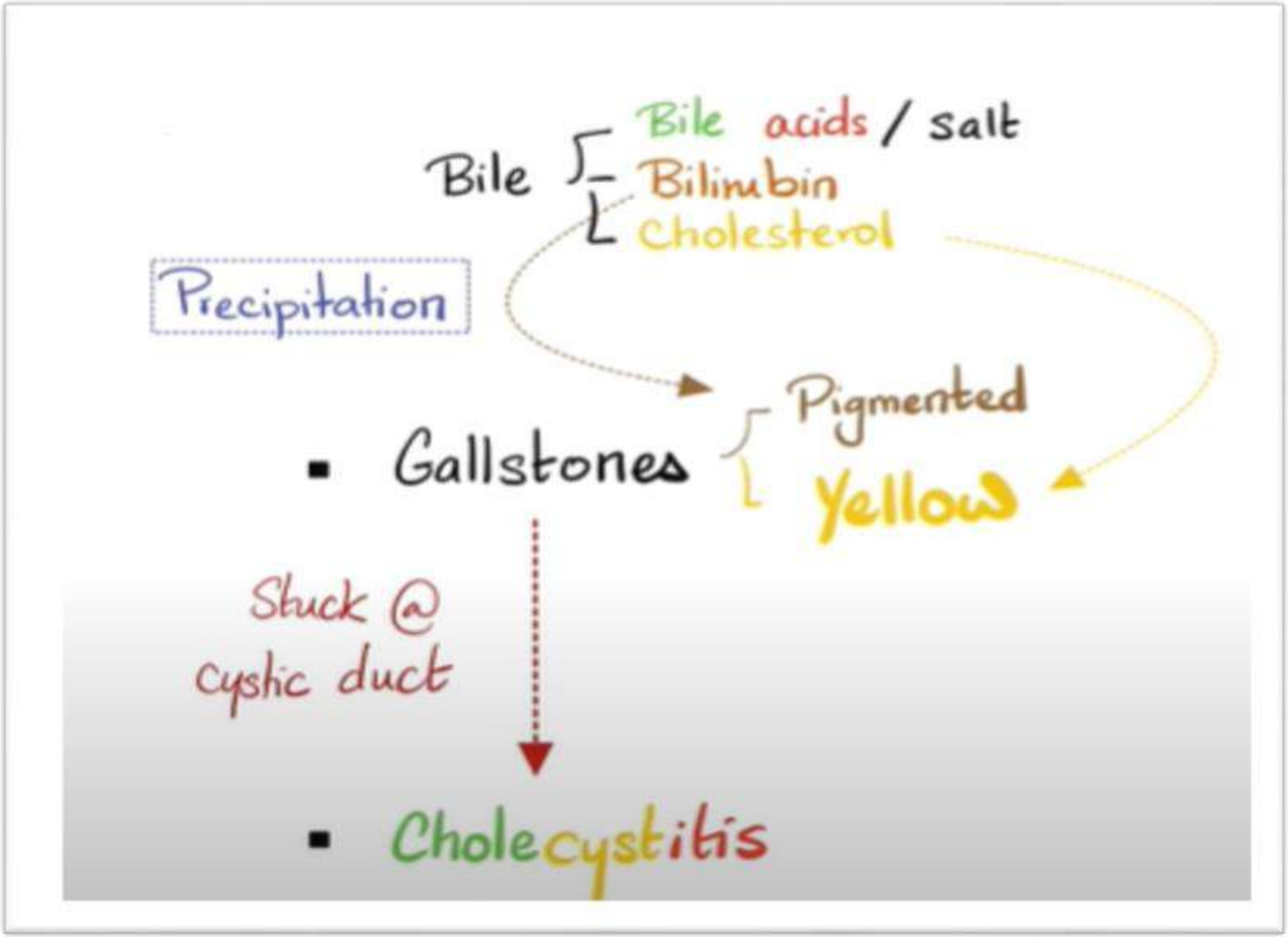
Jejunum — Folate (B_9)

Then Put them in the Closet

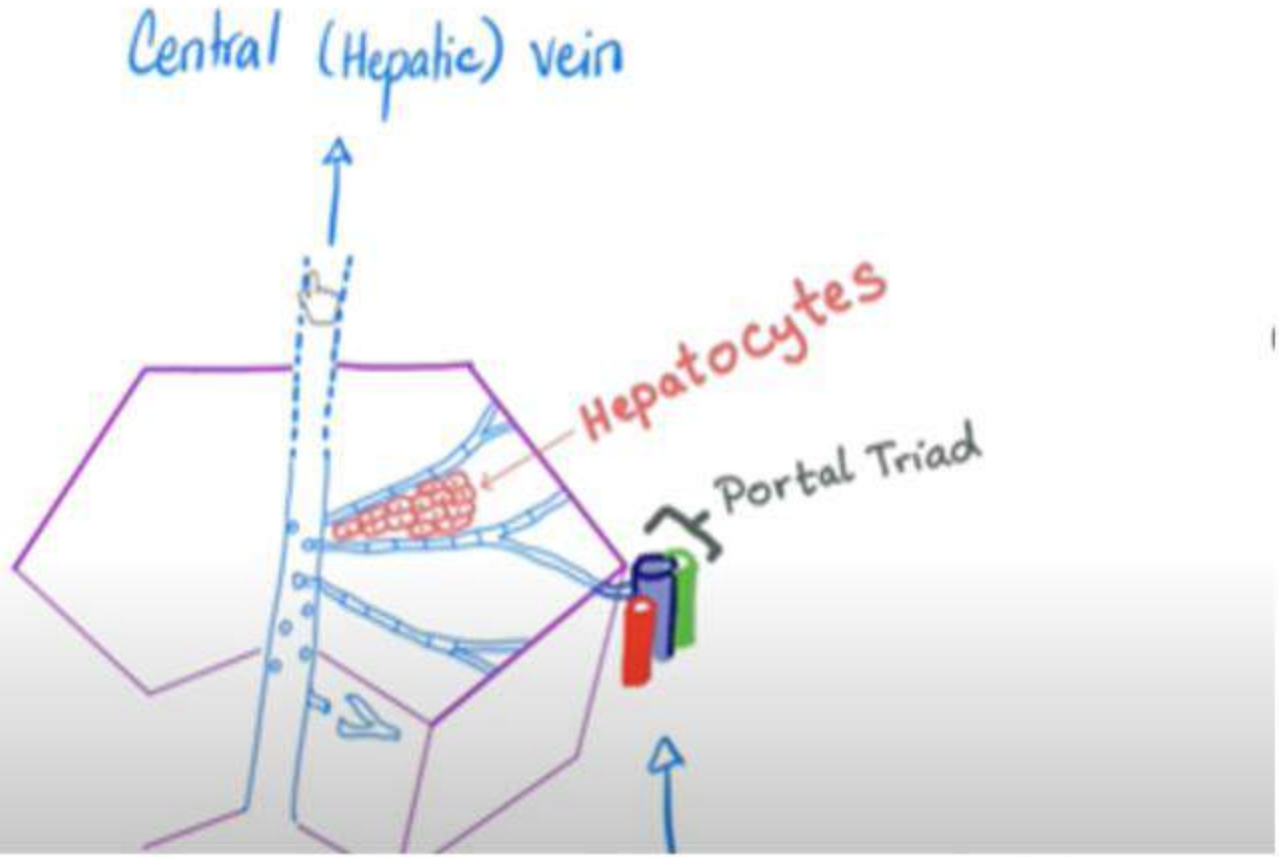
Terminal ileum — Cobalamin (B_{12})

Bile Salts


Enterohepatic circulation
common bile duct
100%
Bile salts
Enterohepatic circulation
terminal ileum
PORTAL VEIN
95%
2° Bile Salts
5%
A method of excreting Cholesterol


Bile
Bile acids / salt
Bilirubin
Cholesterol
Precipitation
Gallstones
Pigmented
Yellow
Stuck @ cystic duct
Cholecystitis

The Structure of the hepatic lobule



* ALT is more specific for liver disease than AST

  - If AST is high, while ALT is normal ⇒ Think extrahepatic "muscle" → Measure CPK

* In liver disease: ALT > AST

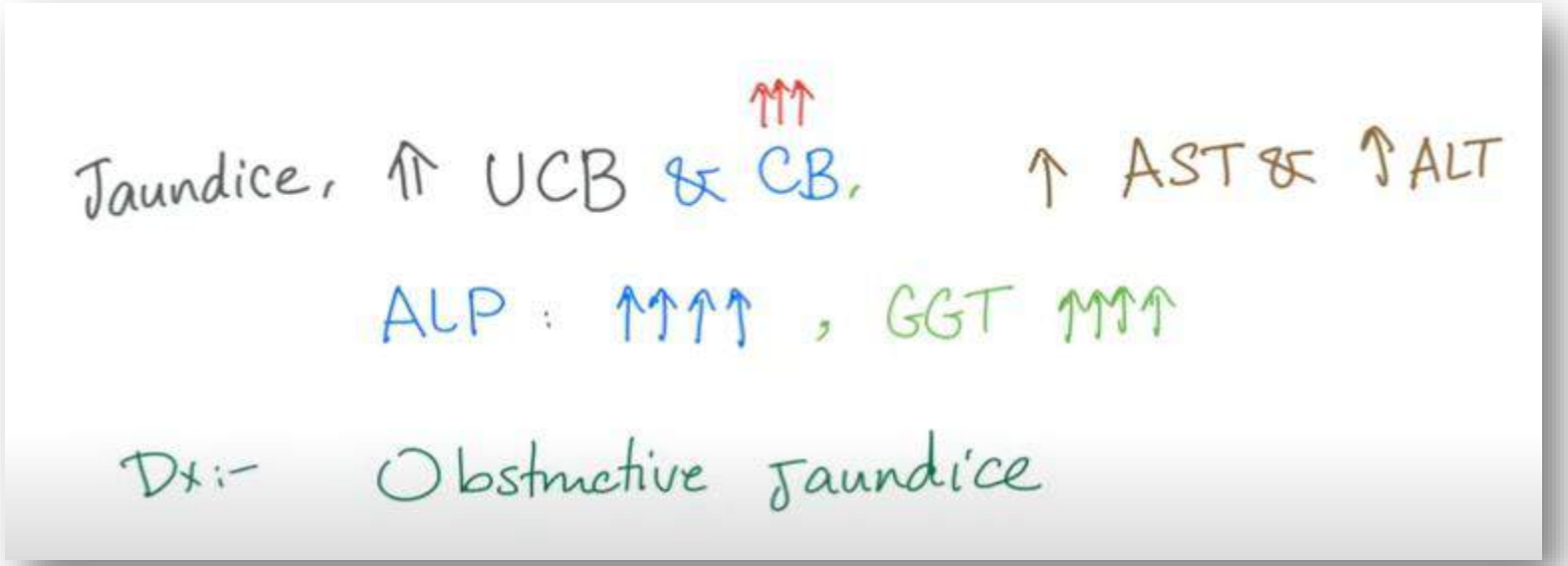
  except in alcoholic liver disease "AST > ALT"

* High ALP & Normal GGT: extrahepatic e.g. bone "↑ osteoblastic activity"

* Sudden ⇑ in ALP & GGT ⇒ Hepatocellular Carcinoma

* Alcohol ⇒ ⇑⇑ GGT

Clinical tie



epigastric pain radiating to the back, fever, ↑↑ amylase, ↑↑ lipase

Dx pancreatitis

400 - 4,000 IU

Fever, RUQ pain, Jaundice, dark urine, ↑↑↑ ALT & ↑↑ AST

ALP ↑ , "ALT > AST"

Vir

Dx: Hepatitis,