INTESTINAL JUICES AND BILE

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بسم الله الرحمن الرحيم

6 of 9

Prayer of Prophet Musa 2

for eloquent & clear speech

Rabbish-shrahli sadri wa yas-sirli amri wahlul uqdatam-mil lisaani yaf qaahu qowli.

O my Lord! Open for me my chest (grant me self-confidence, contentment, and boldness). And ease my task for me; And make loose the knot (the defect) from my tongue, (i.e. remove the incorrectness from my speech), that they understand my speech.


رَّبِّ زِدْنِي عِلْمًا
My Lord, increase me
in knowledge
(SURAH TAHA, 20:114)

LEARNING OBJECTIVES

- DESCRIBE THE COMPOSITION OF THE INTESTINAL JUICES
- DESCRIBE THE CONSTITUENTS OF BILE
- DESCRIBE THE FUNCTIONS OF BILE
- GALLSTONEs

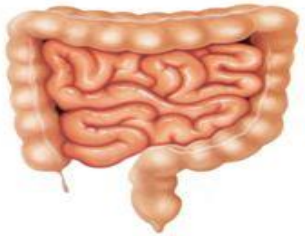
Succus entericus also called intestinal juice is a fluid that is secreted in small quantity in the small intestine. The secretions of the brush border cells of the mucosa alongwith the secretions of the goblet cells constitute this intestinal juice. It is highly variable in constitution, and contains various enzymes (such as erepsin, lipase, lactase, invertase, enterokinase, dipeptidases, nucleosidases and maltase) and mucus.

- Intestinal juice neutralizes hydrochloric acid coming from the stomach; releases gastrointestinal hormones into the bloodstream; and contains digestive enzymes that facilitate the digestion and absorption of food. Intestinal juice is secreted under the influence of hormones, the vagus nerve, and mechanical stimulation produced by the presence of food.

INTESTINAL JUICE

SUCCUS ENTERICUS

- Daily secretions 3 L
- Colourless fluid
- Sp. Gravity – 1.010
- pH 7.6
- Water 98.5%
- Solids 1.5%

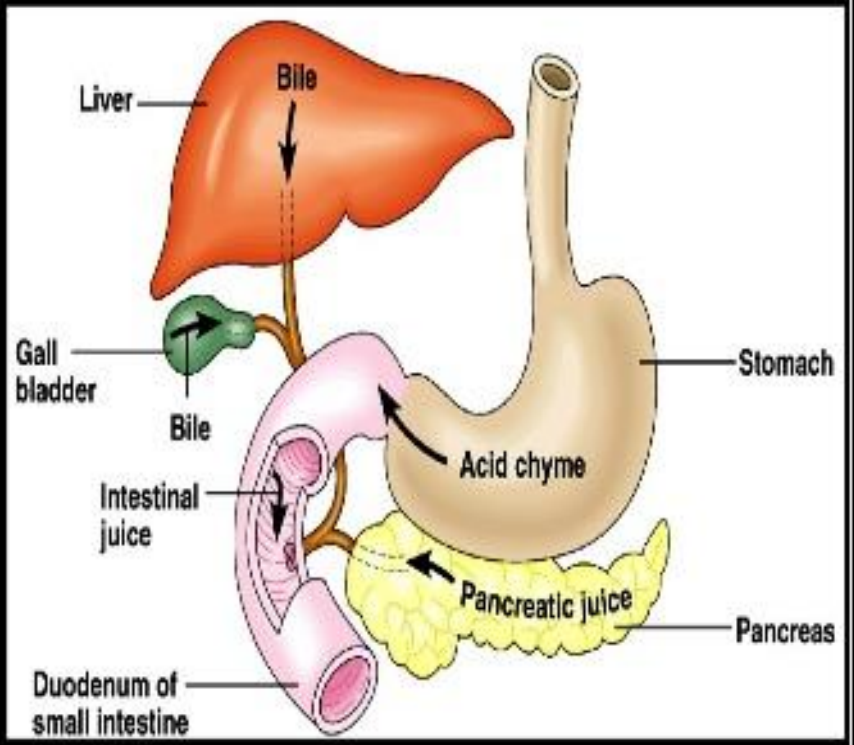


SUCCUS ENTERICUS

- Volume 1800ml/day Alkaline, 8.3 pH
- isotonic with plasma S.G : 1010
- composed of water (about 98%)
- Solids
  - inorganic salts
    - Cations - K^+, Na^+, Ca^{++}
    - Anions - Cl^-, HCO^-
    - jejunal secretions : Cl^-, K^+ is ↑
    - ileal secretions : Na^+, Ca^{++} ↑

INTESTINAL GLANDS & SECRETIONS

- **Intestinal juice – Succus Entericus.**
  - Includes aqueous components
  - Intestinal enzymes
  - Mucus.

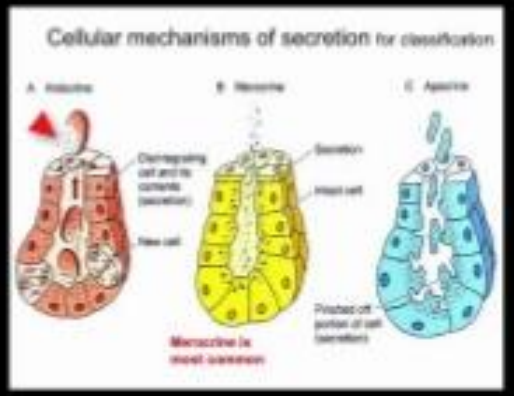


AQUEOUS COMPONENTS

- Mainly water & electrolyte secreted by epithelial cells of intestines(**Crypts of Liberkuhn**)
- **2L/Day**
- Same as ECF but slightly alkaline,
- Colorless, cloudy (Mucus, Epitelial cells & cholesterol)

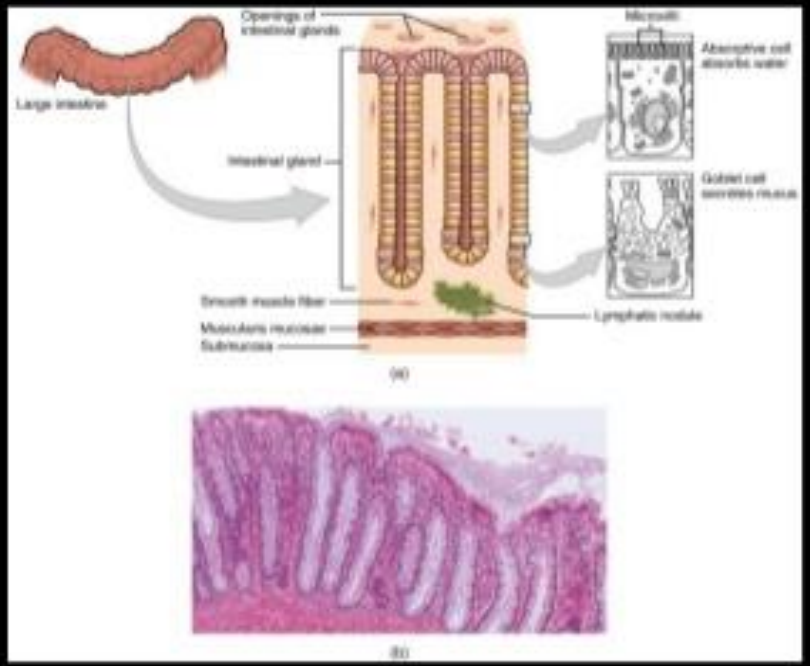
INTESTINAL ENZYMES

- This causes final hydrolysis of food before absorption.
- Mode of secretion of this enzyme- **Holocrine**
- **Enzymes are –**
  - **Peptidases** (Peptide – AA),
  - **Diasaccharidases** (Di – Mono)
  - **Intestinal Lipase** (split TG),
  - **Enterokinase** (Trypsinogen – Trypsin)



MUCUS.

- **Brunner's Gland –**
  - In duodenum, thick, alkaline & Mucoid secretion
  - Protective, prevent HCl & chyme from damaging intestinal mucosa
- **Goblet cells**
  - Secrete Mucus
  - Protect Mucosa & lubricate chyme.



FUNCTIONS OF JUICE

- **Mechanical functions**

  – Mixing & propulsive movements.

- **Digestive functions**

FUNCTIONS

- Provide **solvent medium** in which products of digestion are dissolved.
- Fluid rapidly reabsorbed in villi thus provide **watery vehicle** for absorption.

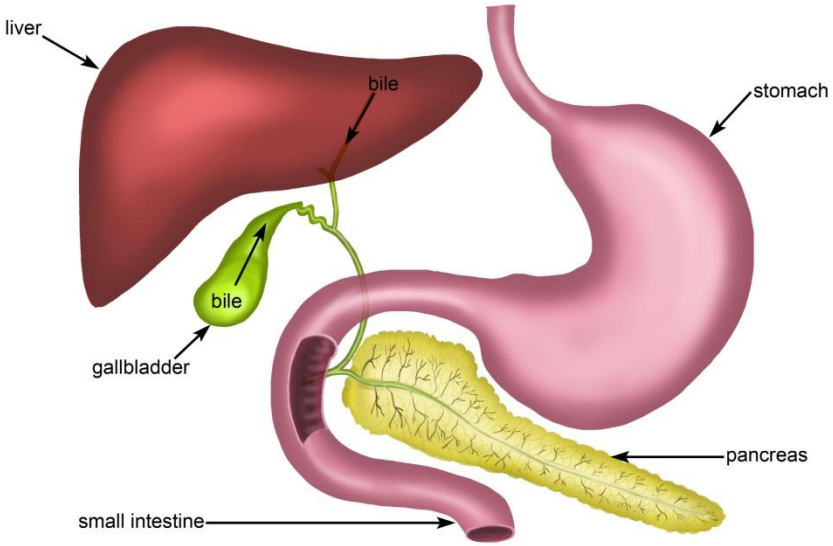
- The alkilinity of the succus entericus helps in neutralizing the acidity present in the chyme leaving the stomach..... A protective function against peptic ulceration

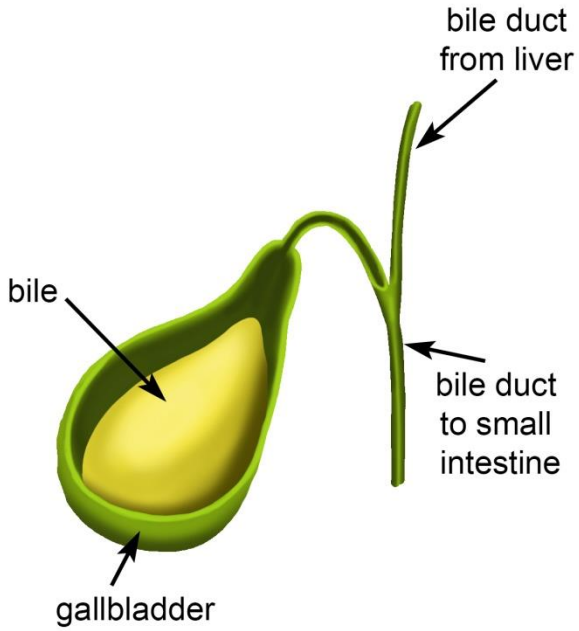
- The juice formed in the duodenum contains a small amount of the Intrinsic Factor which helps in the absorption of Vit.B_{12}

- By greatly diluting the food material it makes it isosmotic with the blood plasma.

- The IgA present in the succus entericus protects against potentially harmful bacteria in the intestinal lumen.

BILE





cross section of the gallbladder showing bile


bile
fat
bile
bile
What is
Bile?

- BILE is both secretion and excretion of the liver
- It is continously secreted by the liver parenchymal cells into the canaliculi
- Ultimately bile reaches the gallbladder where it is stored and concentrated

COMPOSITION OF HEPATIC BILE

Volume: 600-1000 ml bile/day

Greenish-yellow in color

Alkaline fluid (pH 7.8-8.4)

Specific gravity about 1.010-1.011

WATER (97%)

SOLIDS (3%)

Organic Constituents	Inorganic Constituents
Bile salts (1.1 g/100 ml)	Na^+ (145 mEq/L)
Bilirubin (0.04 g/100 ml)	K^+ (5 mEq/L)
Cholesterol (0.10 g/100 ml)	Ca^{++} (5 mEq/L)
Fatty acids (0.12 g/100 ml)	HCO_3^- (28 mEq/L)
Lecithine (0.04 g/100 ml)	Cl^- (100 mEq/L)
Mucin (Absent)	

Composition of bile

Components of bile include :

Bile acids are present as bile salts

Primary Bile acids : cholic acids and chenodeoxycholic acids

Secondary Bile acids : deoxycholic acids, lithocholic acid

Bile acids are conjugated by the liver to form water bile salts →sodium and potassium **glycocholate/taurocholate.**

Bile salts : are reabsorbed from the intestines into the portal blood and then transported to the liver and reexcreted into bile . (enterohepatic circulation)

Bile pigments : bilirubin ,biliverdin and small amount of coproporphyrin

Other Components: Cholesterol ,Lecithin , Electrolytes , fatty acids, Alkaline phosphatase

Functions of Bile

- 1.Digestive function
- digestion and absorption of fat
- absorption of fat soluble vitamins
- neutralization of gastric acid
- 2.Excretory function
- bilirubin
- cholesterol
- many endogenous waste products

Function of bile juice

- 2- Bile serves as the route of excretion for bilirubin.
- 3-The alkaline bile has the function of neutralizing any excess stomach acid before it enters the ileum.
- 4-. Bile salts also act as bactericides, destroying many of the microbes that may be present in the food.

Functions of bile

- Bile salts emulsify tricglycerides and phospholipids in our food. This makes it easier for the pancreatic enzymes to break them down.
- Aids fat absorption
- The bile salts and IgA antibodies inhibit bacterial growth in the small intestine.
- Neutralises gastric acid in the small intestine
- Aids excretion of bilirubin (from recycled red blood cells)

BILE FUNCTIONS

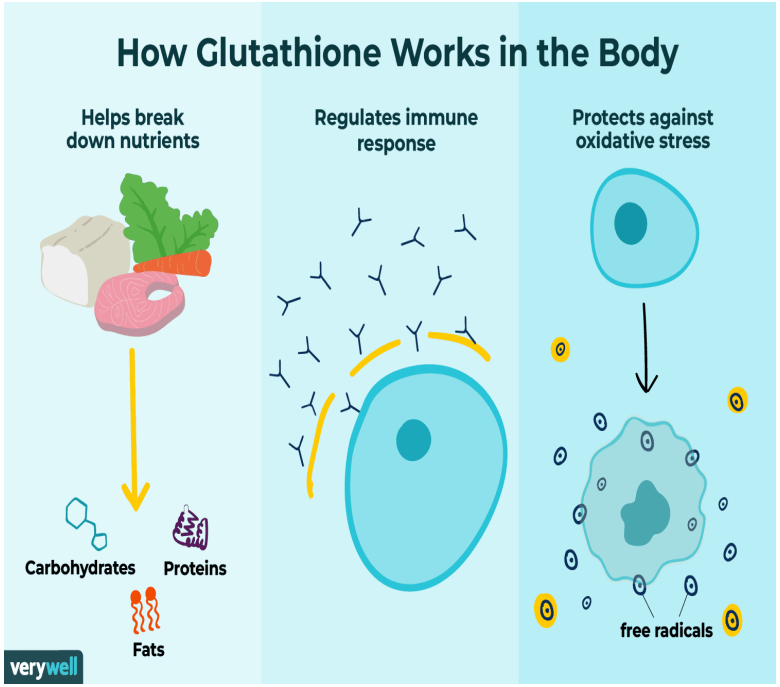
6. **Choleretic Action** – with the help of bile salts, bile secretion is stimulated from the liver.

7. **Maintenance of pH in the GI – tract** – As bile is highly alkaline, it neutrakizes the acid chyme which enters the intestine from stomach. Thus an optimum pH is maintained for the action of digestive enzymes.

8. **Prevention of Gallstone Formation** – Bile salts prevents the formation of gallstone by keeping the cholesterol and lecithin in solution. In the absence of bile salts, cholesterol precipitates along with lecithin and forms gallstone.

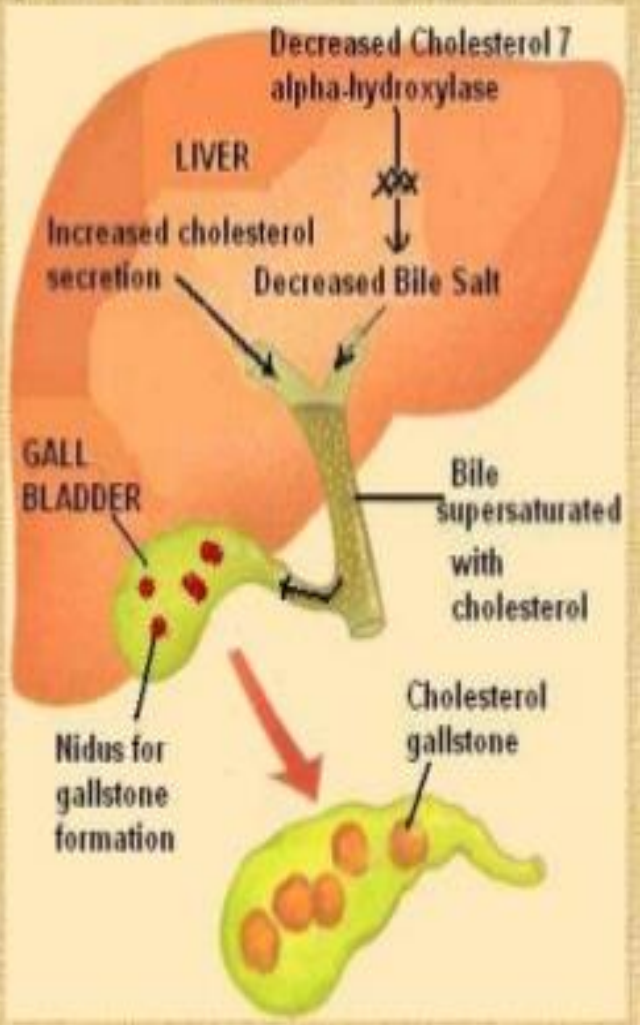
Bile salt functions

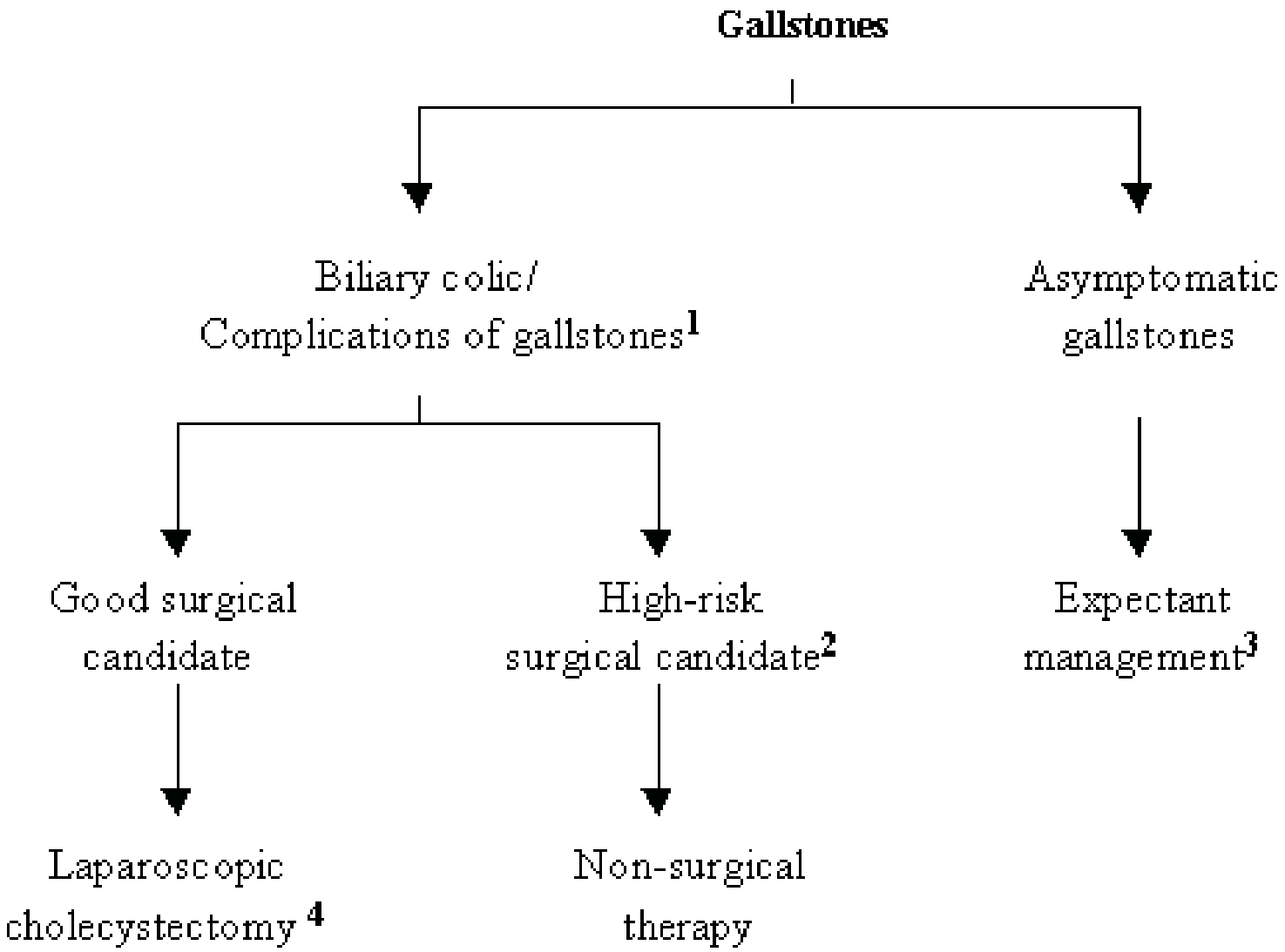
- Aids digestion
- Digest fat soluble vitamins
- Give relief from symptoms of fat malabsorption like bloating & gas
- Helps release of glutathione
- Antiviral
- Antibacterial
- Control blood sugar levels
- Improve energy level
- Improve metabolism



Predisposing factors for gallstone formation

- ✓ Gallbladder hypomotility leading to stasis and formation of sludge
  - Fasting
  - Pregnancy
  - Drugs: octreotide
  - Prolonged parenteral nutrition
- ✓ Clofibrate therapy - increased biliary secretion of cholesterol
- ✓ Decreased bile acid secretion
  - Primary bilary cirrhosis
  - Chronic intrahepatic cholestasis
- ✓ Miscellaneous
- ✓ High-calorie, high-fat diet
- Pigment stones
- ✓ Demographic/genetic factors: Asia, rural settings
- ✓ Chronic hemolysis
- ✓ Alcoholic cirrhosis
- ✓ Chronic biliary tract infections, parasite infestation
- ✓ Increasing age

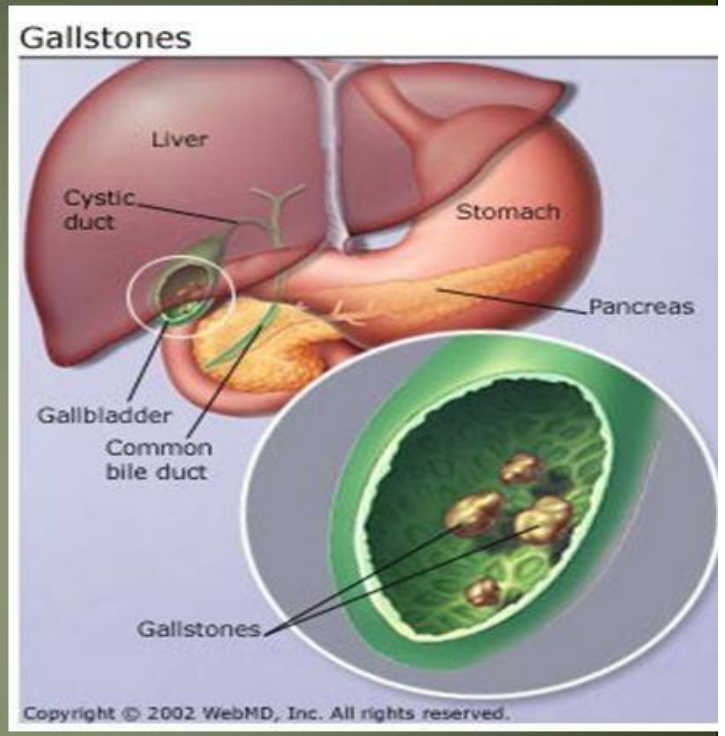



Gallstones
Biliary colic/
Complications of gallstones[1]
Asymptomatic
gallstones
Good surgical
candidate
High-risk
surgical candidate[2]
Expectant
management[3]
Laparoscopic
cholecystectomy [4]
Non-surgical
therapy

SUMMARY

What is bile?

- Bile composed of water, ions, bile acids, organic molecules (including cholesterol, phospholipids, bilirubin)
- Gallstones are mostly cholesterol
- Acids and salts emulsify fats for absorption across wall of small intestines into lacteal lymph capillaries (review)
- Contains waste products from RBC breakdown and other metabolic processing (color of feces from bilirubin in bile)(review)
- Ions buffer chyme from stomach (review)



Function of human bile

Dietary

- Essential for intestinal absorption of dietary cholesterol, fats and lipid soluble vitamins.
- Phospholipid and cholesterol secretion.
  We do not degrade the steroid ring (cholesterol).
- Excretion of lipid soluble bilirubin, xenobiotics, drugs and heavy metals.

Metabolic Signaling

- Decreases triglyceride metabolism and gluconeogenesis.
- Increases energy expenditure, glycogenesis and incretin release.


thank
you