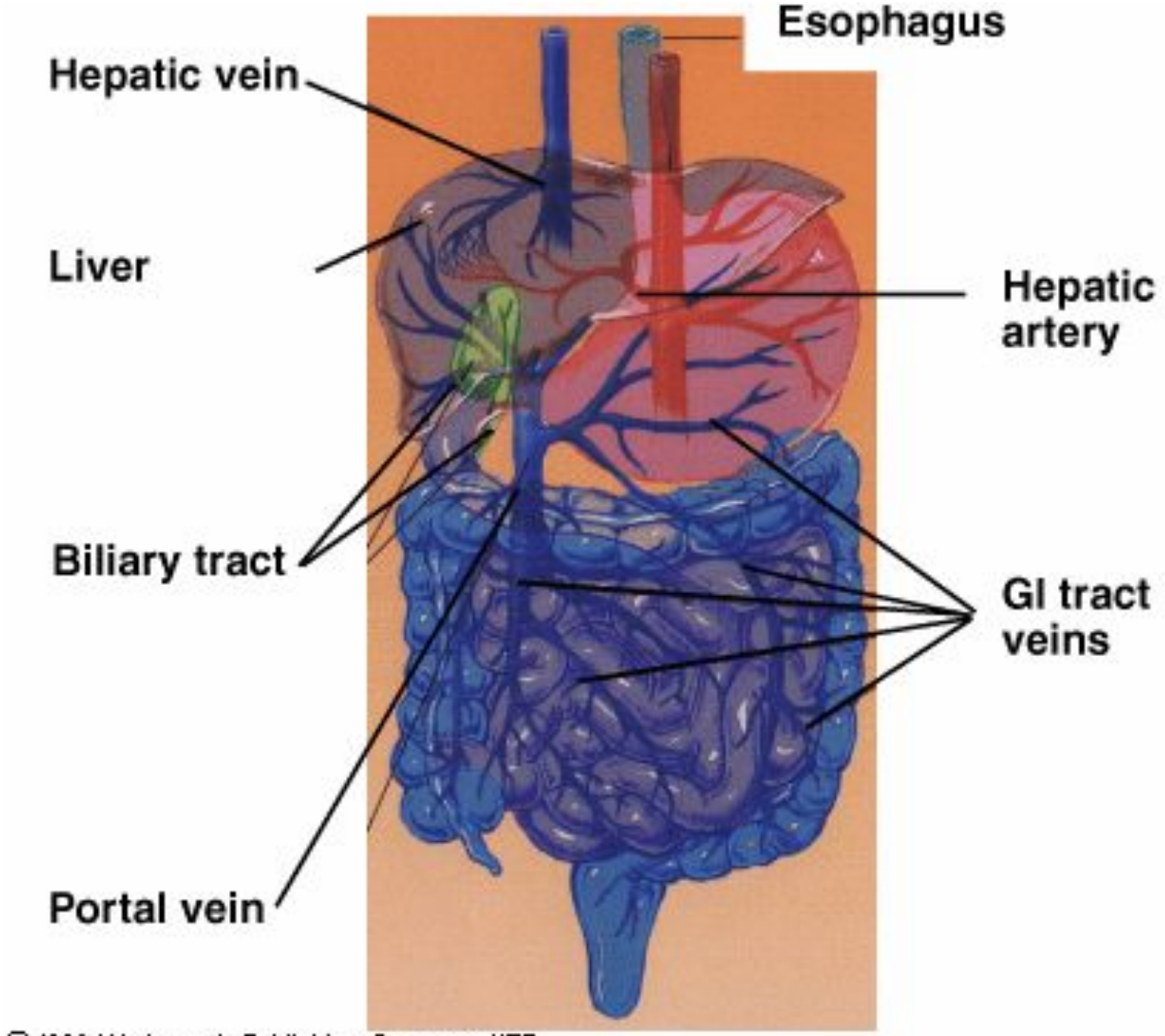
Liver, Biliary, and Exocrine Pancreas Diseases

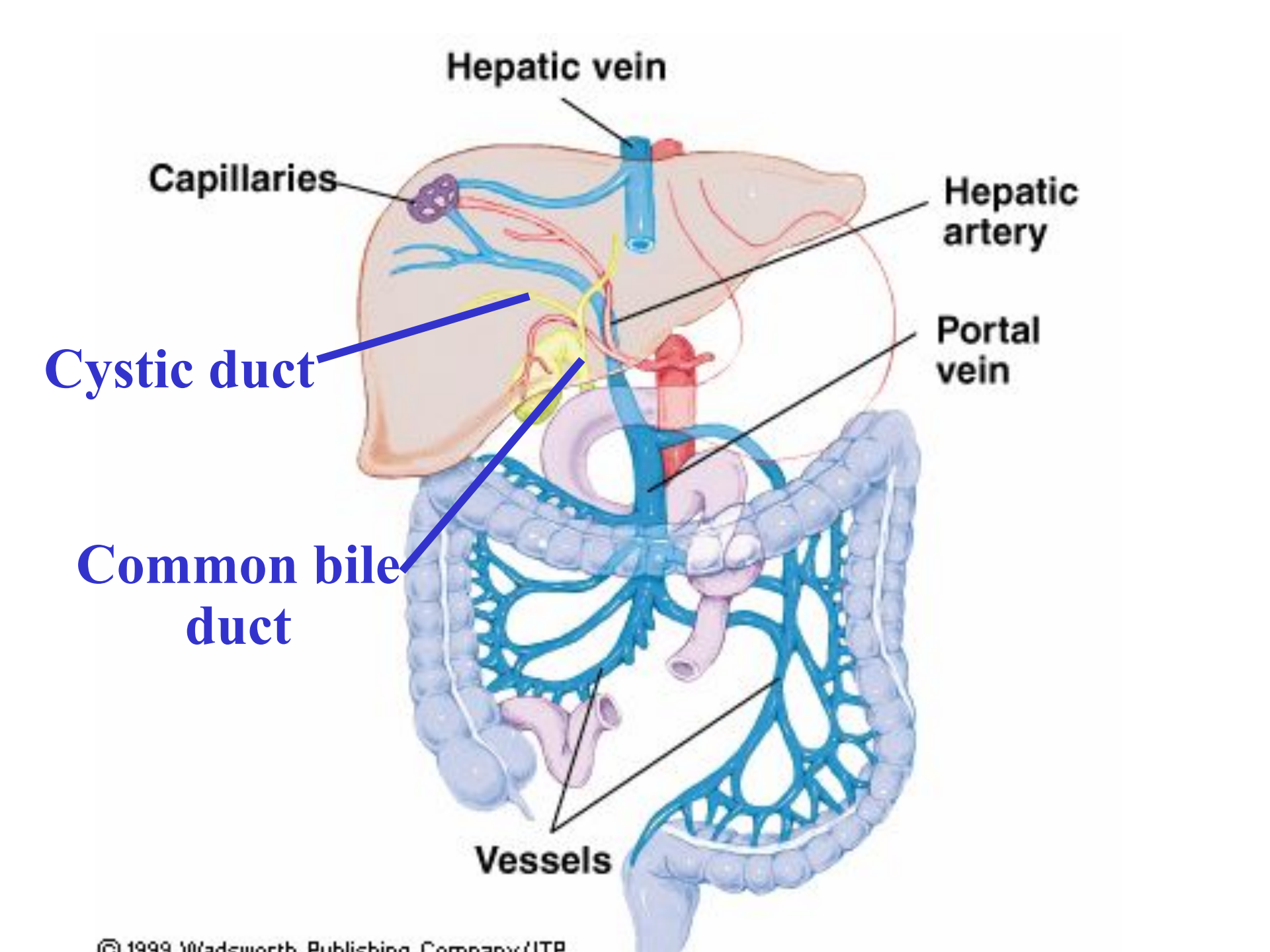
Student – mohd abid

Liver

"The liver ranks first in size, number and complexity of functions. It is involved in almost every aspect of metabolism."

- Need only 10-20% functioning tissue to sustain life
- Hepatocytes: enormous capacity for regeneration
  - Divide in 24 hours (So regeneration is 1° nutritional priority)




Hepatic vein
Capillaries
Hepatic artery
Cystic duct
Portal vein
Common bile duct
Vessels

Functions

A. Metabolism of CHO, Prot, Fat, and EtOH

1. CHO: glycogenesis, glycogenolysis, gluconeogenesis, synthesis of various compounds from CHO intermediates
2. Prot: transamination (to produce NEAAs), deamination of AAs, urea synthesis, synthesis of other N-containing compounds
3. Fat: FA synthesis, formation of TG (lipogenesis), esterification of cholesterol, synthesis of lipoproteins, FA oxidation (beta-oxidation)

B. Detoxification of drugs and other toxic substances

C. Vitamin and Mineral-related functions

1. Vitamin A: Storage of vit. A, retinol binding protein; conversion of carotene to retinol/retinyl esters
2. Vitamins D, E & K: storage (K in small amts); involved in one of the activation steps of vit. D (D_3 → 25-OH- D_3)
3. Iron and Copper storage

D. Blood Reservoir: Acts as a flood chamber between intestinal and general circulation. Can expand/contract.

1. Normally maintains about 650 ml blood
2. In heart failure, can expand to hold more blood
3. In case of blood loss, can compress and push more blood into circulation

E. Formation of bile (conjugates bilirubin)

F. During stress: synthesizes stress factors (and mobilizes glu from glycogen)

Biochemical Markers of Liver Disease

- "True tests of liver function"
  -
- Indicators of liver injury
  -
  -
-
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Disorders of the Liver

A. **Fatty liver**– (hepatic steatosis)
   - Accumulation of fat in hepatocytes
   - Early stage of liver ds.
   - Causes: PEM or alcohol abuse
   - Also: long-term TPN, obesity, small bowel bypass surgery, exposure to toxic substances/drug therapies.

1. Alcohol – induced fatty liver:
   a. Liver cells preferentially use FAs for energy
   b. Also package TG tissues
   c. EtOH present: takes priority (toxin)
   d. FAs/ TG accumulate
   e. Causes liver to enlarge
   f. Biochemical signs:

2. Long-term TPN
   a. Constant TPN infusion can cause chronically high insulin levels
   b.
   c.

B. Hepatitis – Inflammation of hepatocytes 2° virus, obstruction, parasite, drug or other toxin (including EtOH), causing cell injury

1. Hepatitis A:

   a. Symptoms:

   b. Often mild, but may have recurrent relapses

2. Hepatitis B,C can □

3. Nutrition Therapy

a. Abstinence from alcohol

b. Good nutrition status:

c. Malnourished:

d. Persistent anorexia/nausea:

e. Persistent vomiting:

C. Cirrhosis – advanced stage of liver disease

- scar tissue replaces hepatocytes

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Consequences of Cirrhosis:

1. Portal Hypertension: elevated BP in the portal vein 2°obstructed blood flow through the liver.

2. Esophageal Varicies: distended collateral blood vessels that protrude into the esophagus

3. Ascites – edema characterized by the accumulation of fluid, electrolytes and serum proteins in the abdominal cavity

   a. Portal HTN forces plasma out of liver's capillaries into abdominal cavity

   b. Kidneys sense decreased blood flow

4. Hepatic Encephalopathy/Hepatic Coma

a. Hyperammonemia –

Healthy liver converts ammonia urea

–

– Other nitrogenous compounds may contribute as well

b. Psychomotor abnormalities:

c. Fetor hepaticus

– sign of impending coma

d. Chronic disturbance in consciousness can lead to coma

e. Serum AA patterns change:

Nutrition Therapy in Liver Disease

Energy

ESLD without ascites:

Ascites, infection, malabsorption or malnutrition:

CHO

Lipids

Protein

Hepatitis/cirrhosis:

Repletion:

Stress/decompensation/sepsis:

Encephalopathy: restriction is controversial

Vitamins and Minerals

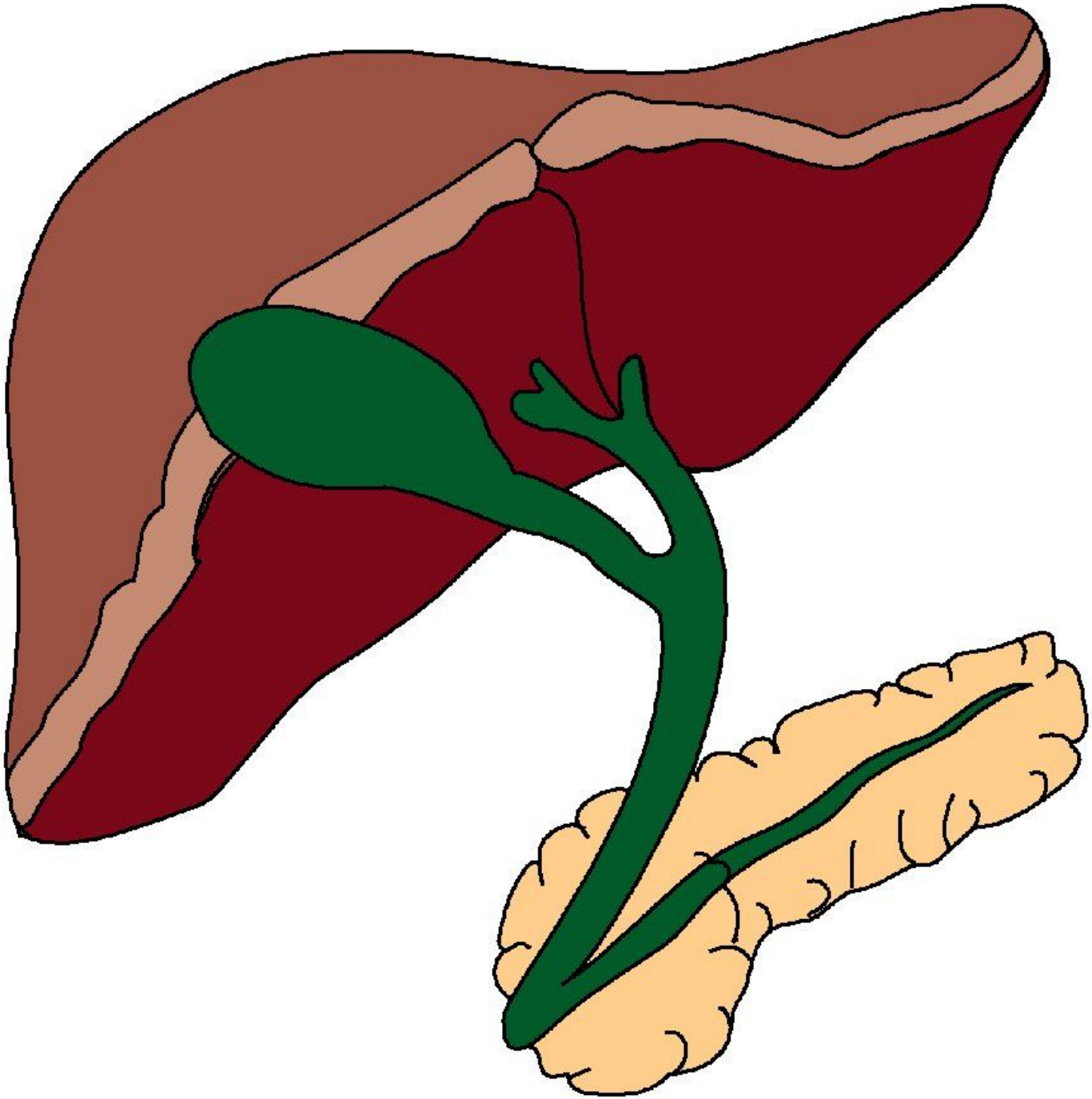
- Steatorrhea: fat-sol vitamins (water-miscible form)
- B vitamins: EtOH liver ds. (Wernicke's Encephalopathy)
- Ca++, Mg++ and Zn++ (2'steatorrhea)

Fluids and Electrolytes

- Sodium and fluid restriction in ascites
- Diuretics are often used
  - Careful:

Monitor

Wt, abdominal girth, BUN/creat, Na+, albumin, and lytes.



Diseases of the Gallbladder

- Cholelithiasis (gallstones)
  - US:
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- Choledocholithiasis
- Cholecystitis
  -

- Acute cholecystitis:
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  -
- Chronic cholecystitis
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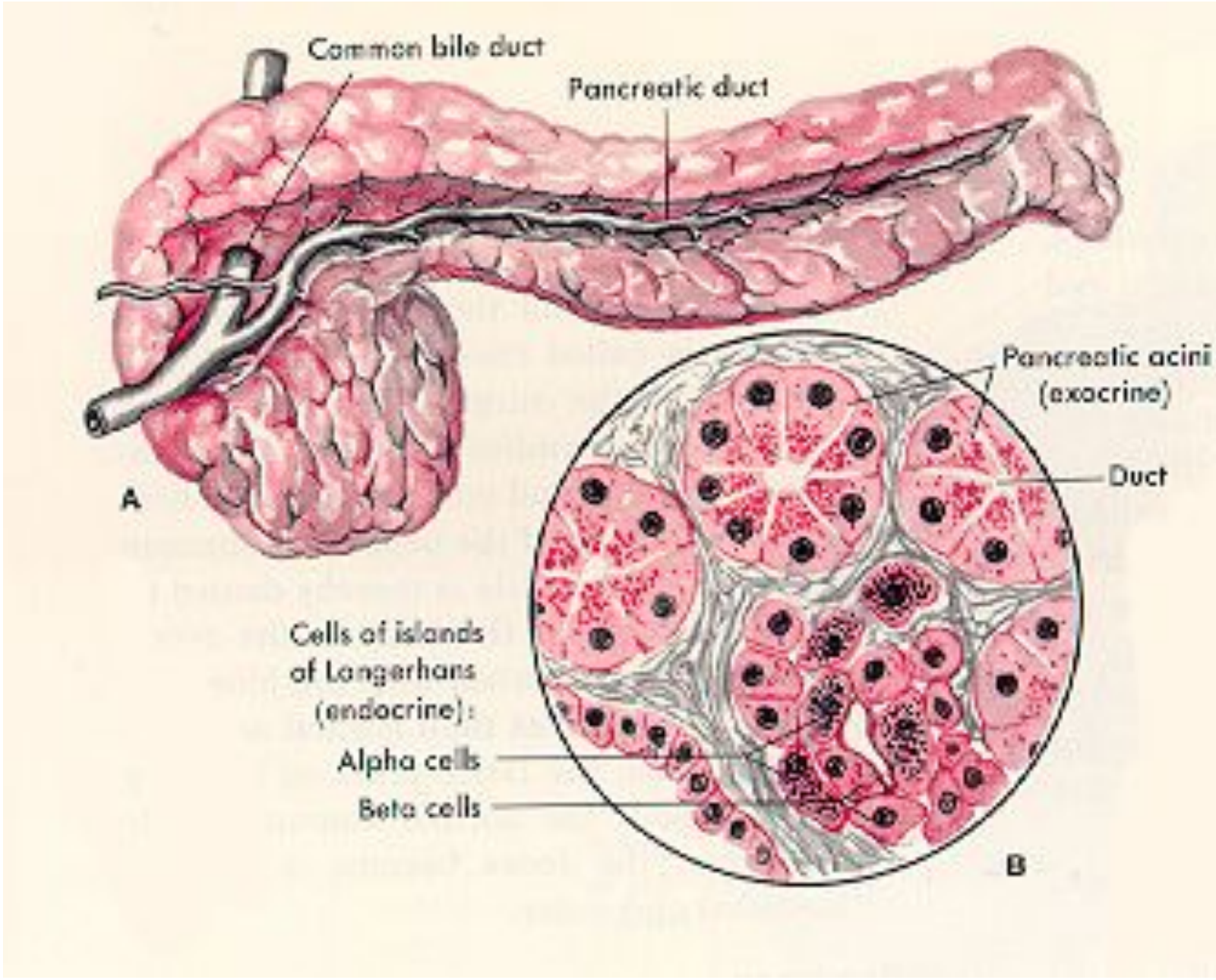
- Cholecystectomy
  - ADAT to regular diet
  - Liver drains directly into duodenum
  - Over time: “simulated pouch” forms in biliary tract


Common bile duct
Pancreatic duct
A
Pancreatic acini
(exocrine)
Duct
Cells of islands
of Langerhans
(endocrine):
Alpha cells
Beta cells
B

Ds. of the Exocrine Pancreas

Pancreatitis

- Exocrine pancreatic secretions:
  - digestive enzymes
  - bicarbonate-rich “juices.”
- Disorders of the pancreas can impair digestion and malabsorption

Acute Pancreatitis

- Causes:

- Also hypertriglyceridemia, hypercalcemia, infections.
- Pancreatic digestive enzymes are activated within the pancreas
- Enzymes into blood:
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- Hallmark symptoms:
- Severe cases:
- Complications:

MNT for Acute Pancreatitis

- NPO w/IV hydration
- Poss. N/G suction

- Mild-to-Moderate cases:

- Severe cases: enteral/TPN:
- _____ TF to ↓ pancreatic stimulation
- TPN if:
  -
  -
  - edema
  - intestinal fistula
  - Drugs: somatostatin inhibits pancratic secretions -- may be added to TPN

Chronic Pancreatitis

- Most commonly 2°
- Persistent or recurrent episodes

- Serum amylase & lipase:
- Pancreatic calcification 2° ongoing necrosis
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MNT for Chronic Pancreatitis

- ↑ energy needs (hypermetabolism)
- Supplemental pancreatic enzymes
- Water-miscible fat-sol vitamins
- Poss B_{12} /MCT oil
- Poss. hydrolyzed enteral formulas

Drugs: antacids, antiulcer agents