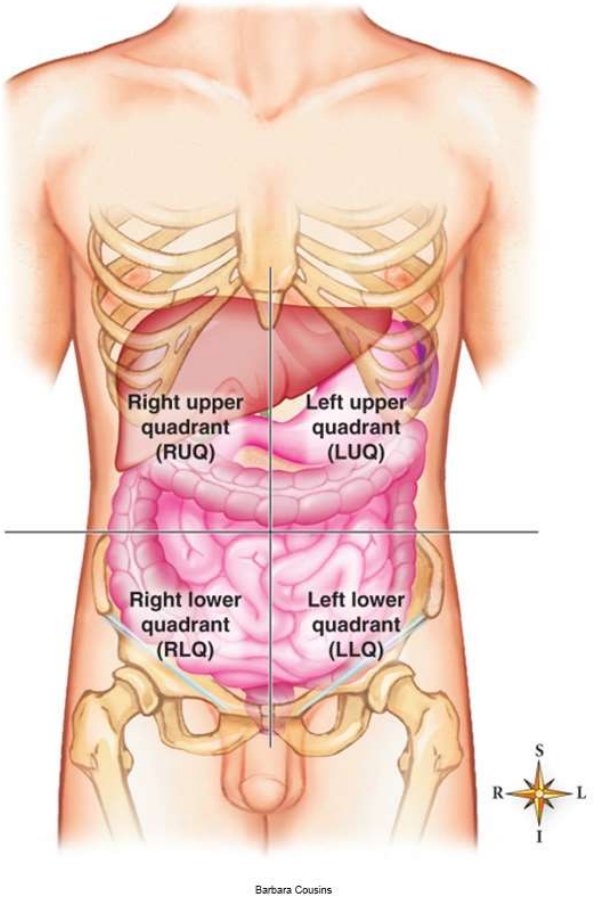
ANPH 252: Hepatobiliary - Anatomy

Hepatobiliary System

- May also be called the biliary tract
- Focusing on all things bile
  - Manufacture, transport and storage
- Often included as part of the digestive system, but it has a distinct role
- Includes:
  - Liver
  - Pancreas
  - Gallbladder

Liver

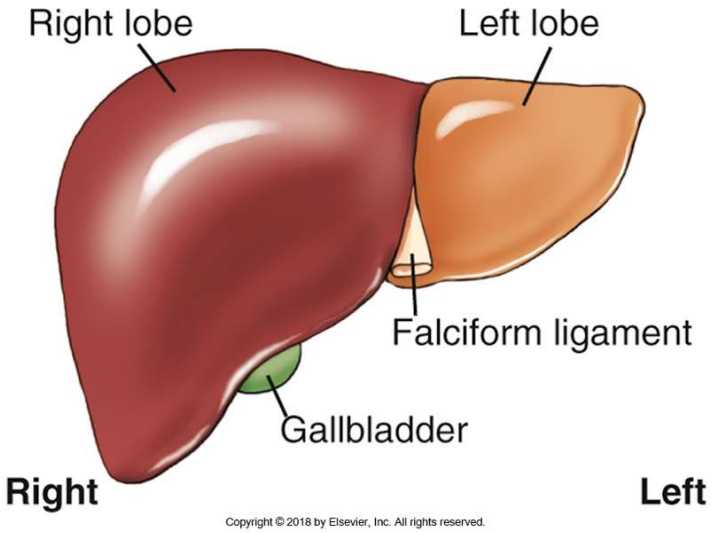
- Is a large organ, located in RUQ of abdominal cavity, and even extends into the left side
- Weighs 3-4 lbs
- Conforms to surrounding anatomy
- Protected by the rib cage
  - Important because it is highly vascular and easily lacerated



Patton & Thibodeau Fig 1.6

Liver – Major lobes

- Has two major and two minor lobes
- From the front, only the two major lobes can be seen
  - Right lobe (larger)
  - Left lobe
    - Separated by the falciform ligament

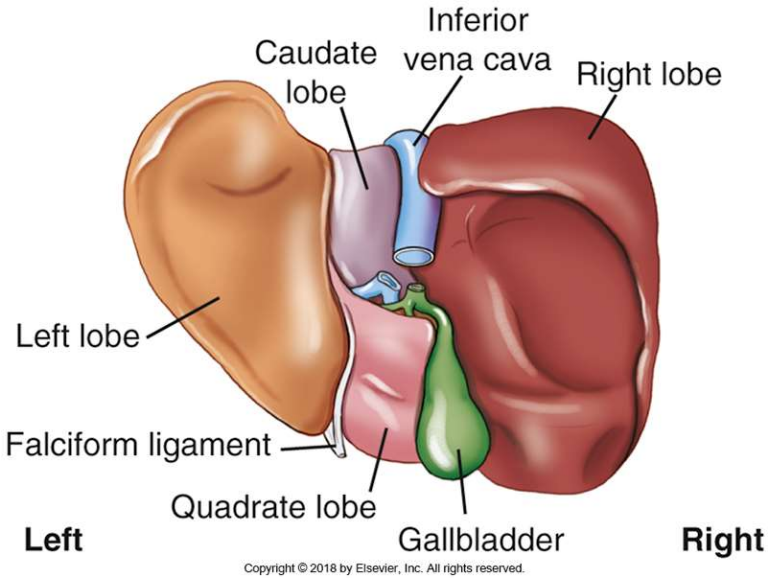


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Bontrager Fig 12.4

Liver – Minor lobes

- Minor lobes located on posterior aspect of the right lobe
  - Quadrate – inferior surface of right lobe, between gallbladder and falciform ligament
  - Caudate – posterior to the quadrate lobe, extends superiorly towards diaphragms



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Bontrager Fig 12.2

Liver - Function

- One of the most important organs
- Has endocrine and exocrine functions
- Performs over 200 metabolic functions including regulation of blood metabolism, detoxification, storing vitamins, iron, glycogen, lipoproteins and triglycerides

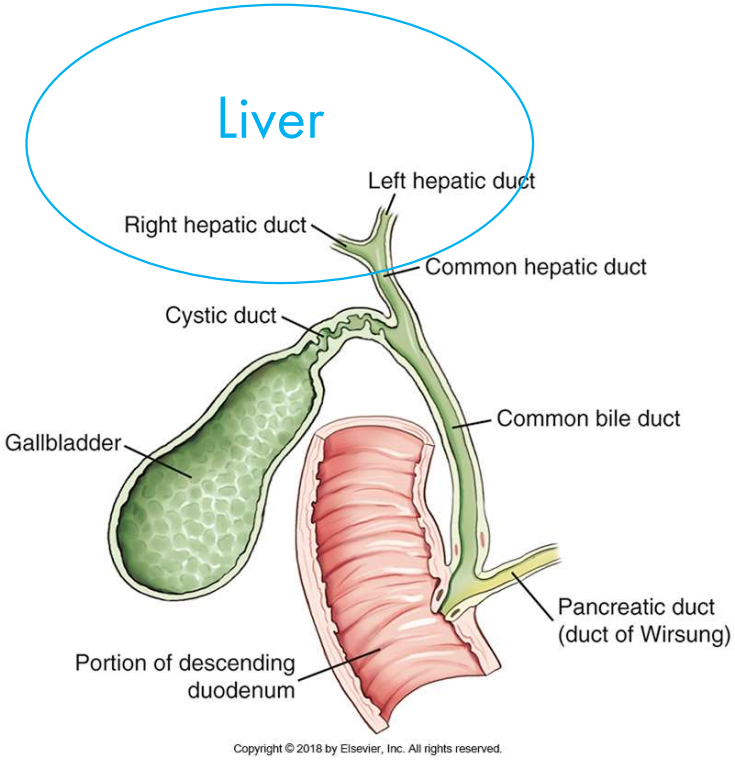
Liver Function

- Digestive system function - forms **bile** (400-1000mL per day
  - Many components, including bile salts, bile pigments, cholesterol and phospholipids
    - Only bile salts and phospholipids aid digestion
  - Bile salts are fat emulsifiers (like soap)
    - Breaks fat down into smaller pieces so it enters the small intestines like small droplets
    - Helps with fat and cholesterol absorption

Liver

- Bile leaves the liver through a system of small bile ducts, that eventually converge to form the right and left hepatic ducts which then converge to form the common hepatic duct (CHD)

- The CHD emerges from the porta hepatis and converges with the cystic duct to form the common bile duct (CBD)



Marieb, Elaine N. and Hoehn, K. 2013. Human Anatomy and Physiology (9th ed.) Glenview Illinois: Pearson Education Inc.

Bontrager Fig 12.5

Liver

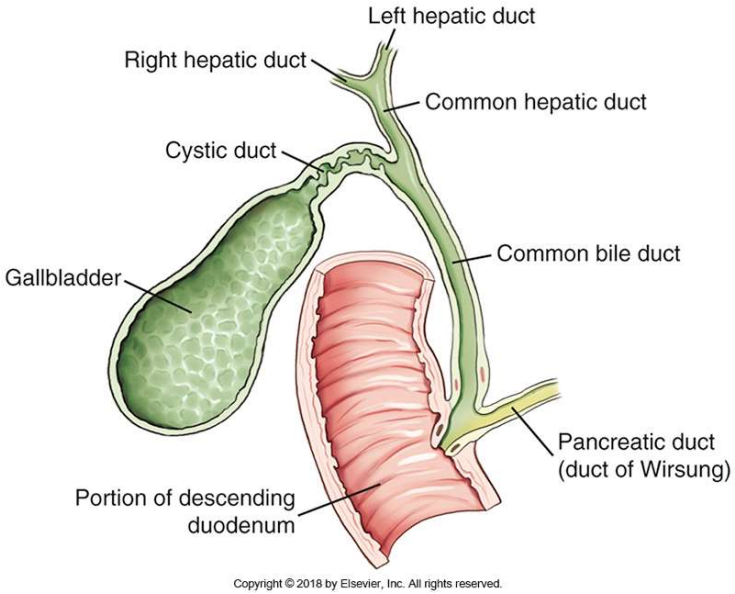
- **Porta hepatis** or "gateway to the liver"
  - Is a fissure in the inferior surface of the liver through where all the neurovascular structures and hepatic ducts enter or leave the liver
  - Gate for ducts, vessels and nerves to enter and exit
    - Hepatic portal system enters the liver through this structure
  - It contains:
    - Hepatic ducts, hepatic artery (oxygenated blood), and portal vein (comes from intestines), hepatic vein leaves liver to heart

Liver

- Has regenerative properties
- If 80% of its mass is lost or removed, can regenerate to its former size in 6-12 months
- When it is injured, growth factors are secreted and hepatocytes multiply to replace dead/dying liver tissue

Liver

- Continuously secretes bile
- If there is no chyme in the duodenum, hepatopancreatic sphincter muscles will remain closed and the bile backs up the common bile duct
- Bile will back up the common bile duct and then into the cystic duct, which leads to the gallbladder
- Gallbladder acts as a reservoir for bile

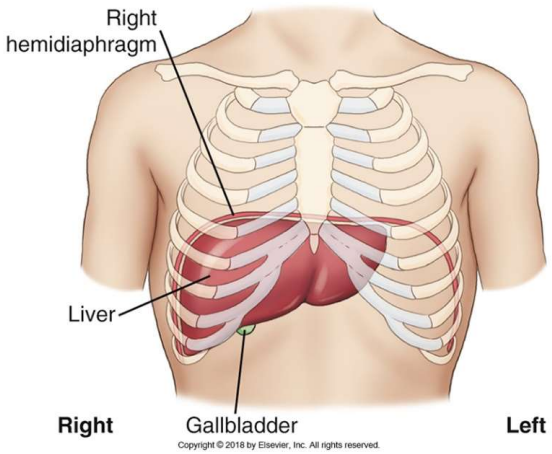


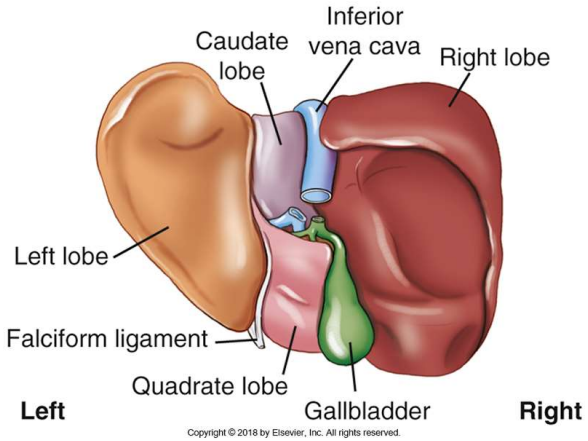
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Bontrager Fig 12.5

Gallbladder

- Pear shaped sac, 7-10 cm long, 3 cm wide
- Lies in a recess on the inferior surface of the right liver lobe
- The location of the gallbladder can change with body habitus

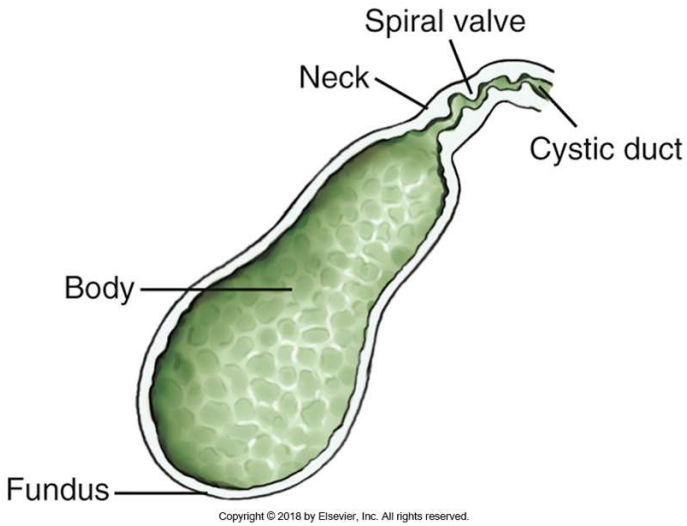




Bontrager Fig 12.1, 12.2

Gallbladder

- Mucosa appears as honeycomb shaped folds when empty, but can expand as it fills (similar to rugae in stomach)
  - Can hold 30-40 mL of concentrated bile
- Composed of three parts
  - Fundus
    - Distal end and the broadest part
  - Body
    - Main section
  - Neck
    - Narrow proximal end that continues as cystic duct



Bontrager Fig 12.6

Gallbladder

- Three primary functions
  - Storage of bile
    - If it is not needed, it is stored for future use
    - In storage form, this bile is concentrated
  - Concentrate bile
    - Concentrates the stored bile by hydrolysis (remove water), and reabsorb it into the blood
    - Concentrated bile is about 5x normal strength
  - Contract
    - If there is something in the duodenum (fatty acids, fats), the gallbladder will contract and expel bile into the cystic duct

Digestion of Fats

- When fatty chyme enters the duodenum, a hormone called cholecystokinin (CCK) is released
- CCK triggers the gallbladder to contract and push bile into the duodenum
- CCK also relaxes the hepatopancreatic sphincter so that bile and pancreatic juices can enter the duodenum
- More fat in chyme = more bile into duodenum

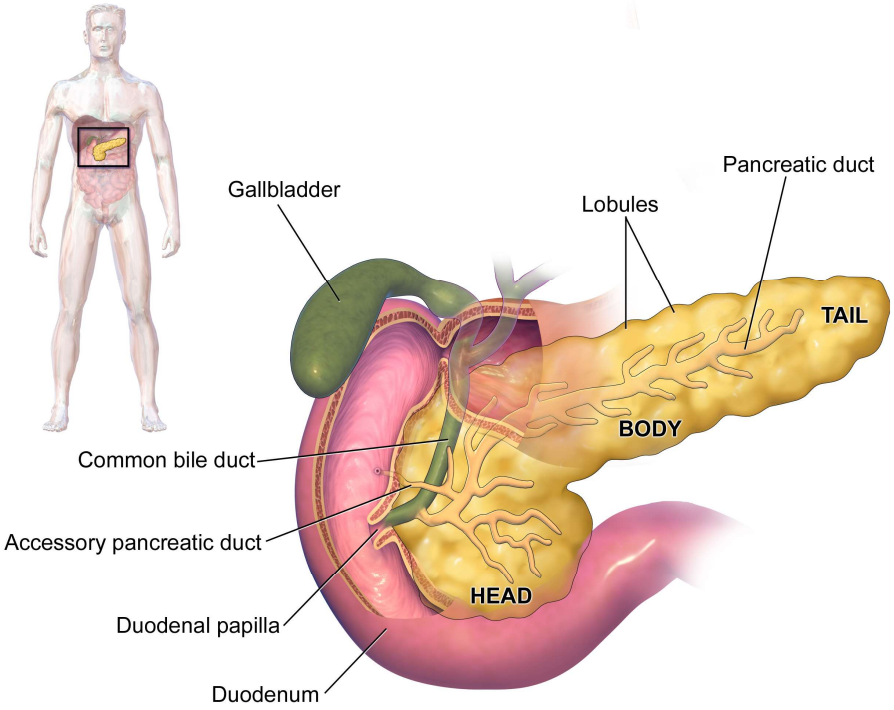
Marieb, Elaine N. and Hoehn, K. 2013. Human Anatomy and Physiology (9th ed.) Glenview Illinois: Pearson Education Inc.

Pancreas

- 4 cm long, lies behind the stomach, mostly retroperitoneal
- Unencapsulated
- Is an exocrine and endocrine gland – produces digestive enzymes ***and*** hormones
  - Exocrine (98% of pancreatic cells)– secretes pancreatic juice into ducts
  - Endocrine (2% of cells)– secretes hormones insulin and glucagon into blood
- Cannot be seen on general x-ray
- Pancreatic duct can be seen on a cholangiogram (will look at this later)

Pancreas

- Four parts: head, neck, body and tail
- Head lies in C-loop of duodenum
- Tail terminates at spleen in LUQ



Blausen.com staff (2014). "Medical gallery of Blausen Medical 2014". *WikiJournal of Medicine* 1 (2). DOI:10.15347/wjm/2014.010. ISSN 2002-4436.

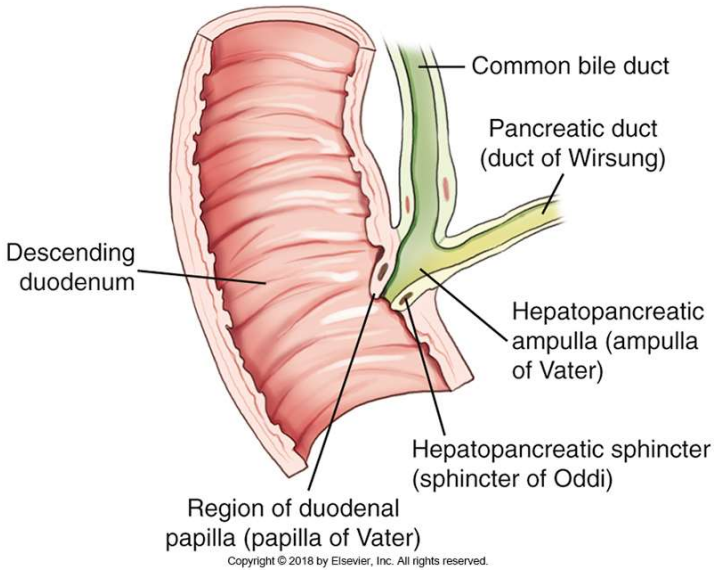
Pancreas

- Pancreatic juice contains enzymes for digestion of carbohydrates, proteins and lipids. (Exocrine)
- Acinar cells secrete amylase, lipase and peptidase (proteolytic) into the pancreatic duct
- Releases sodium bicarbonate to neutralize the hydrochloric acid in the acidic chyme entering the duodenum from the stomach
- Pancreatic juice enters the duodenum at the same place that bile enters

Common Bile Duct and Pancreatic Duct

- Terminal end of the common bile duct is closely associated with the terminal end of the pancreatic duct

- The ducts join to form one common passage into the duodenum
  - Called the hepatopancreatic ampulla or the ampulla of Vater

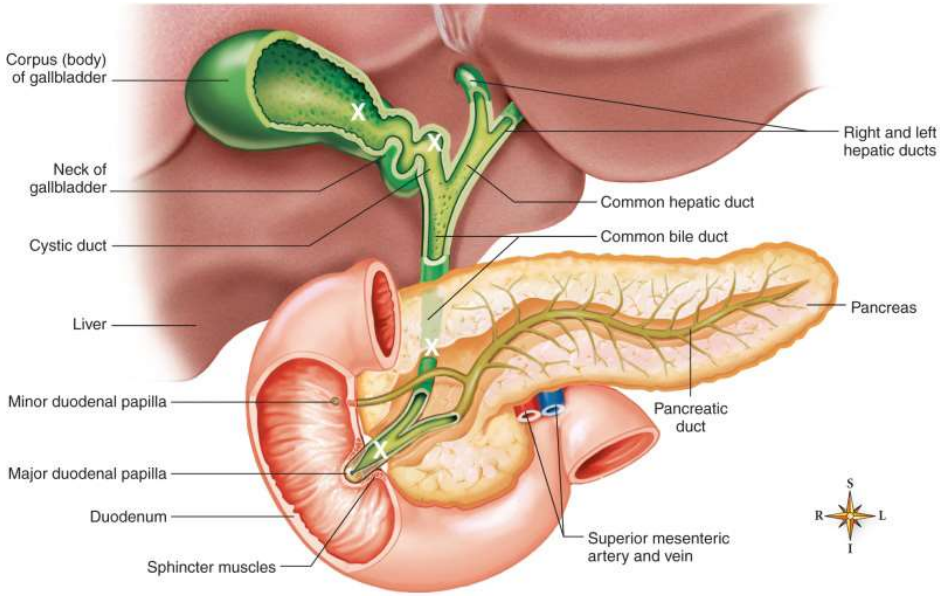


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Bontrager Fig 12.7

Near the terminal opening of the passageway into the duodenum, is the hepatopancreatic sphincter or sphincter of Oddi

CCK causes this sphincter to relax and allow the bile and pancreatic juices to enter the duodenum



(x-ray only): From Abrahams PH, Boon JM, Spratt JD, et al: *McMinn's color atlas of human anatomy*, ed 6, Edinburgh, 2008, Mosby

THANKS