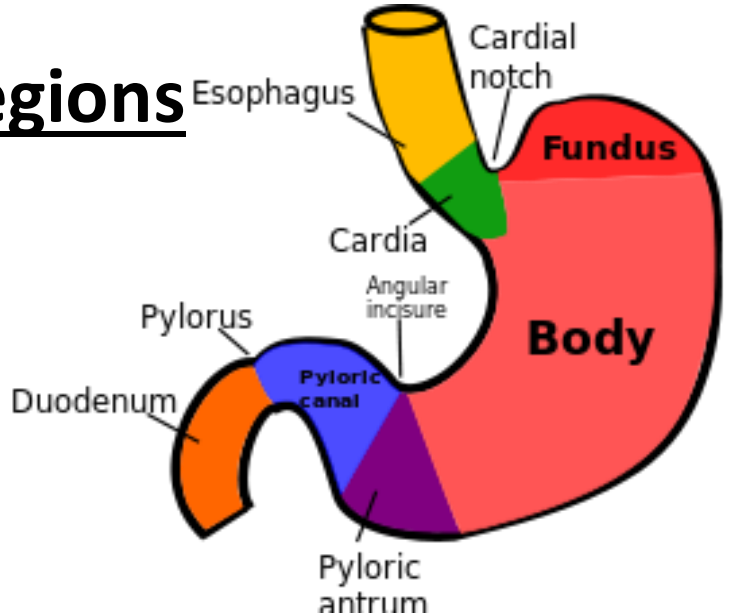
# STOMACH

- Most distensible part of GI tract.
- Located in upper left abdominal quadrant.
- **J - shaped** when empty .
- Continuous with esophagus superiorly & empties into duodenal sphincter inferiorly.
- Serves as **holding organ** for ingested food.
- Food is churned with gastric secretions to form **chyme**

- Stomach is divided into **4 regions**

1. Cardia
2. Fundus
3. Body
4. Pylorus




- **CARDIA** is a narrow upper region immediately below the lower esophageal sphincter.
- **FUNDUS** is dome shaped portion to the left & in direct contact with diaphragm.
- **BODY** is the large central portion.
- **PYLORUS** is the funnel shaped terminal portion.

- **Pyloric sphincter** regulating the movement of chyme into small intestine & prohibiting the backflow.

## BORDERS OF STOMACH

1. Medical concave border is **LESSER CURVATURE**
2. Lateral convex border is **GREATER CURVATURE.**

## SURFACES OF STOMACH

1. Anterior surface
2. Posterior surface

# The stomach

**Read about:**

- Lesser omentum
- Greater omentum

- Layers of peritoneum attached to the stomach:
  - **Lesser omentum:** attaches the liver to the lesser curvature.
  - **Greater omentum:** attaches the greater curvature to the posterior body wall.

## Tunics of Stomach

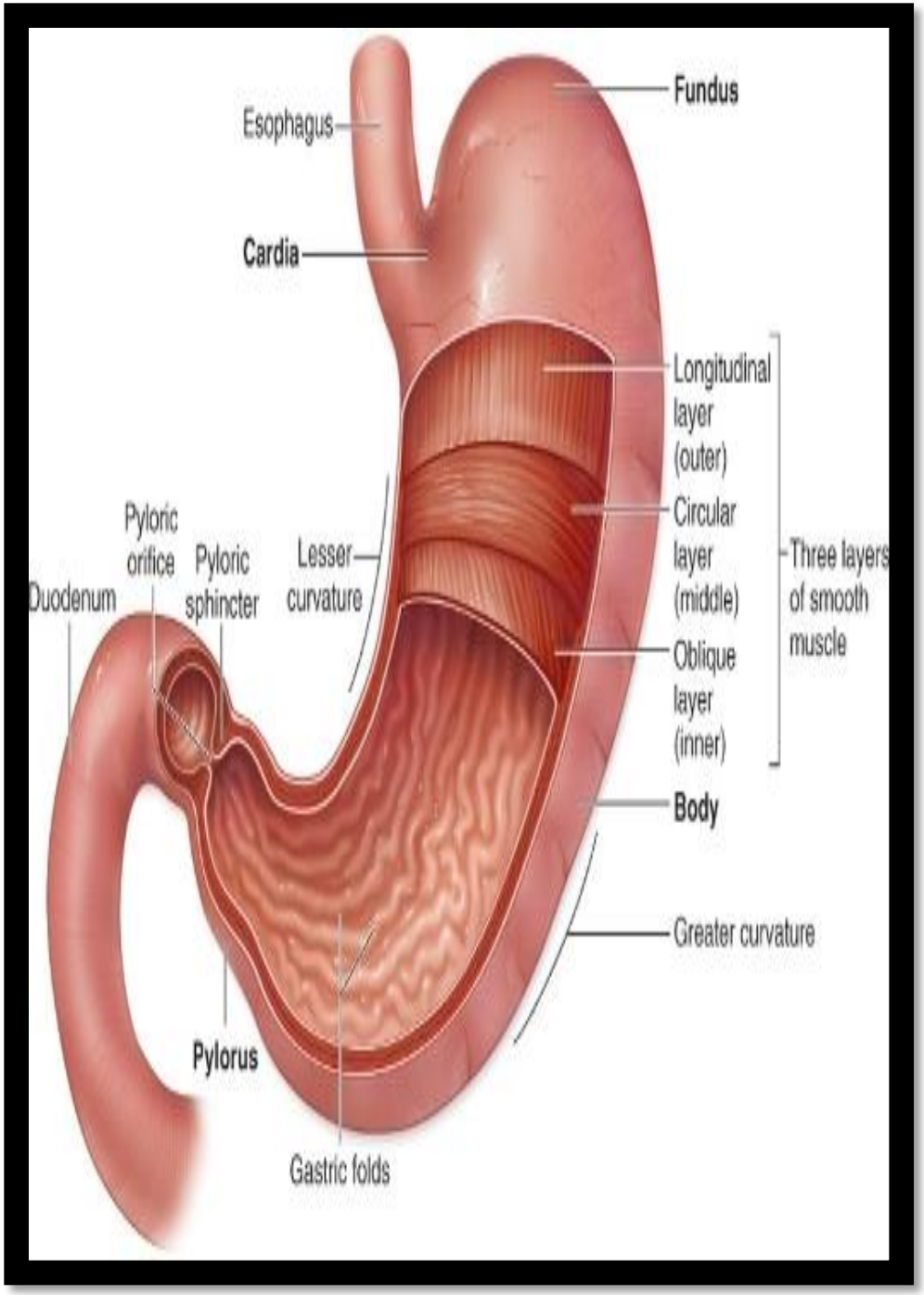
1. **MUCOSA**
2. **SUB MUCOSA**
3. **TUNICA MUSCULARIS**
4. **SEROSA**

2 principle modifications

**I.** extra oblique muscular layer is present in muscularis.

II. Mucosa is thrown into longitudinal folds called **GASTRIC FOLDS / GASTRIC RUGAE**

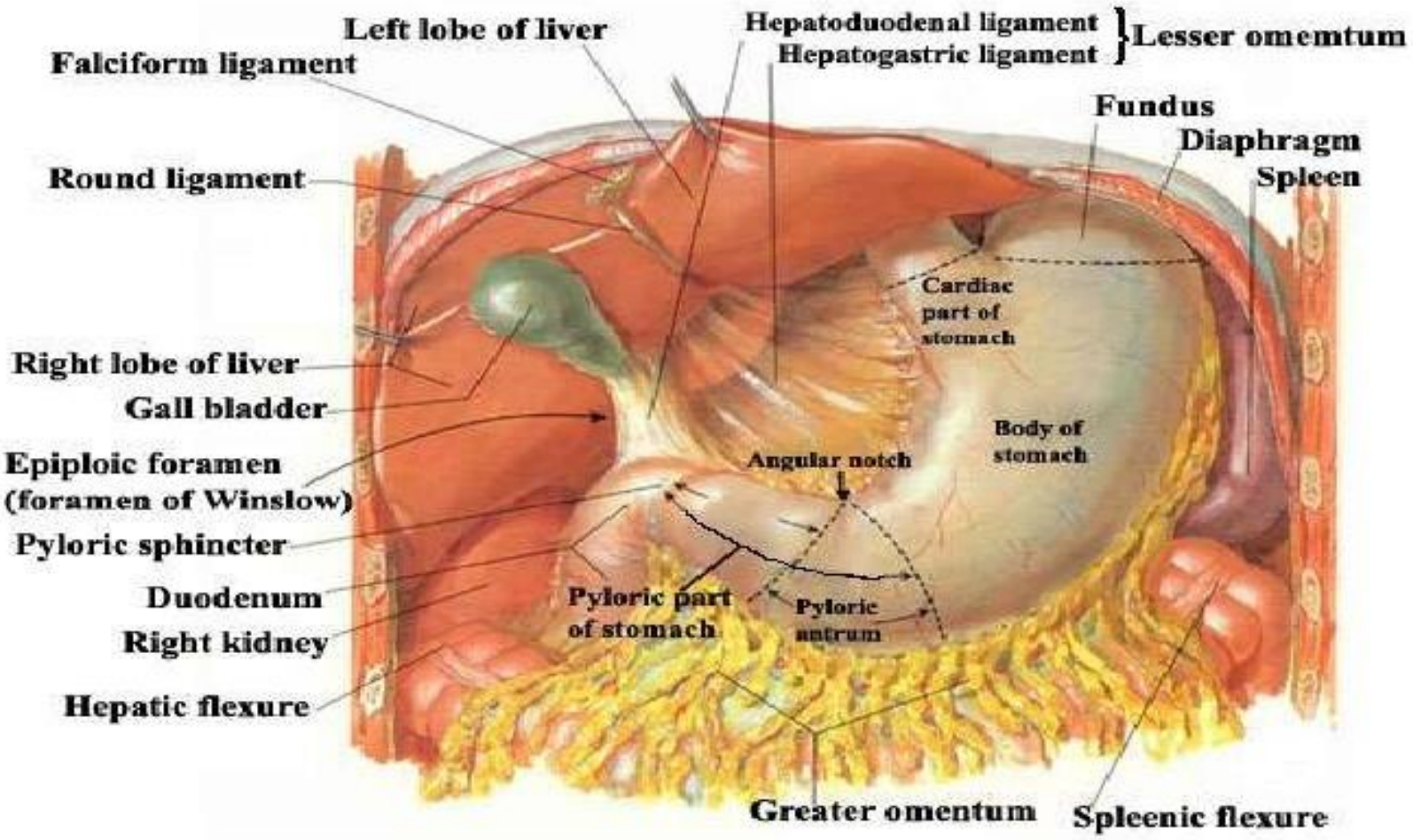
*(further characterized by presence of gastric pits & gastric glands)*



# FIVE TYPE OF CELLS IN GASTRIC GLANDS

1. GOBLET CELLS …… protective mucus
2. PARIETAL CELLS …….. HCL
3. PRINCIPAL CELLS…….`secretes pepsinogen (inactive form of pepsin)
4. ARGENTAFFIN CELLS ……serotonin, histamine
5. ENDOCRINE CELLS…….. Gastrin into blood

# The stomach

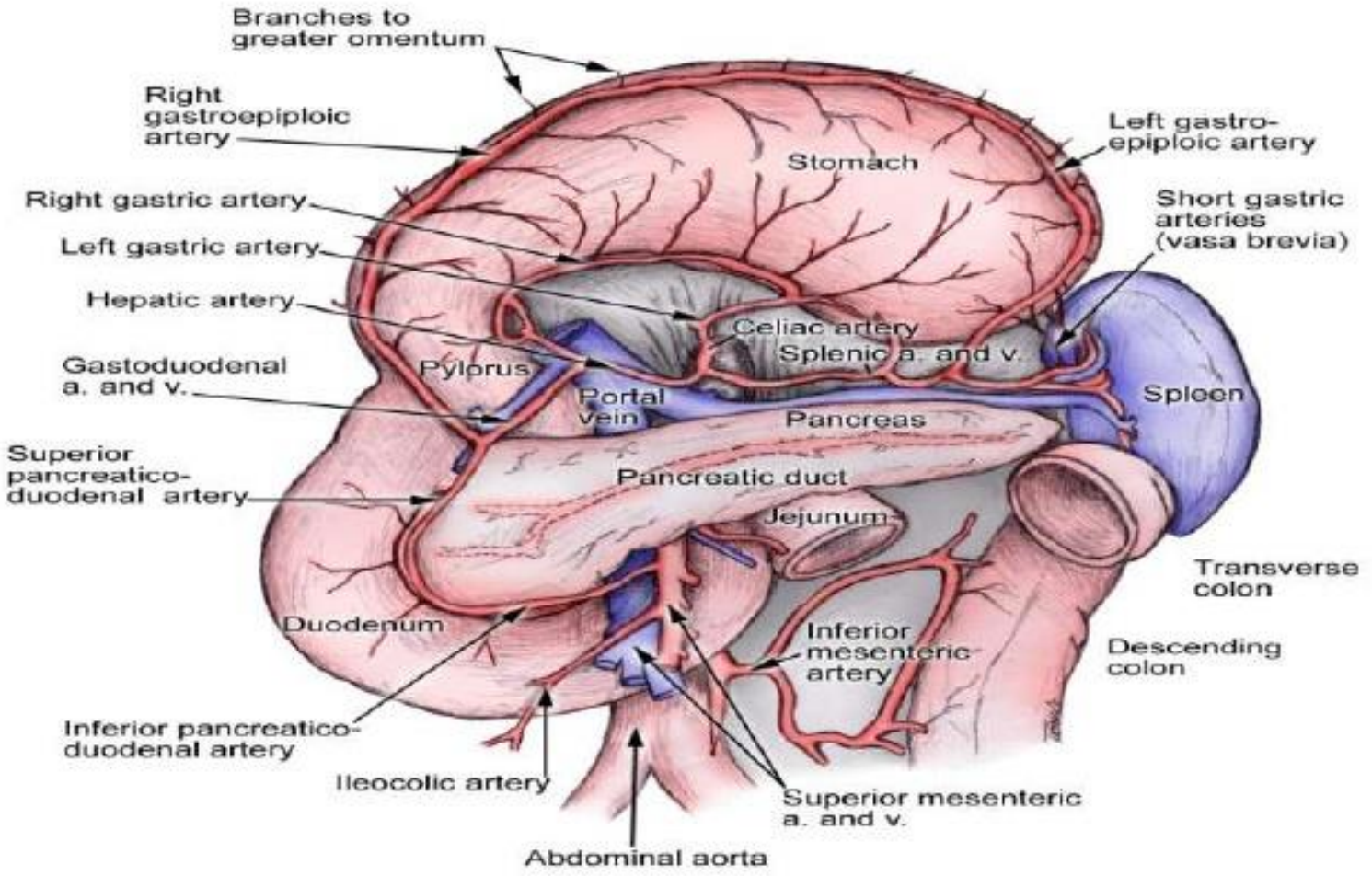

Left lobe of liver
Falciform ligament
Hepatoduodenal ligament
Hepatogastric ligament
Lesser omemtum
Fundus
Diaphragm
Spleen
Round ligament
Cardiac part of stomach
Right lobe of liver
Gall bladder
Body of stomach
Epiploic foramen (foramen of Winslow)
Angular notch
Pyloric sphincter
Duodenum
Pyloric part of stomach
Pyloric antrum
Right kidney
Hepatic flexure
Greater omentum
Spleenic flexure

# Stomach Blood Supply

## Arterial blood supply:

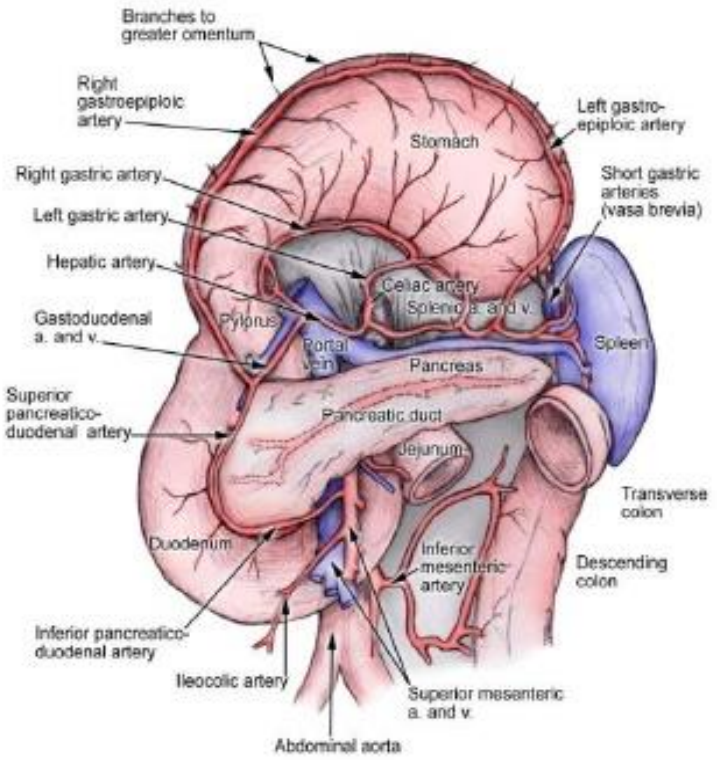
- 3 Branches
  - **Left Gastric Artery**
    - Supplies the cardia of the stomach and distal esophagus
  - **Splenic Artery**
    - Gives rise to 2 branches which help supply the greater curvature of the stomach
      - » Left Gastroepiploic
      - » Short Gastric Arteries
  - Common **Hepatic** or **Proper Hepatic Artery**
    - 2 major branches
      - » Right Gastric- supples a portion of the lesser curvature
      - » Gastroduodenal artery
        - -Gives rise to Right Gastroepiploic artery
          - -helps supply greater curvature in conjunction with Left Gastroepiploic Artery

# Stomach Blood Supply



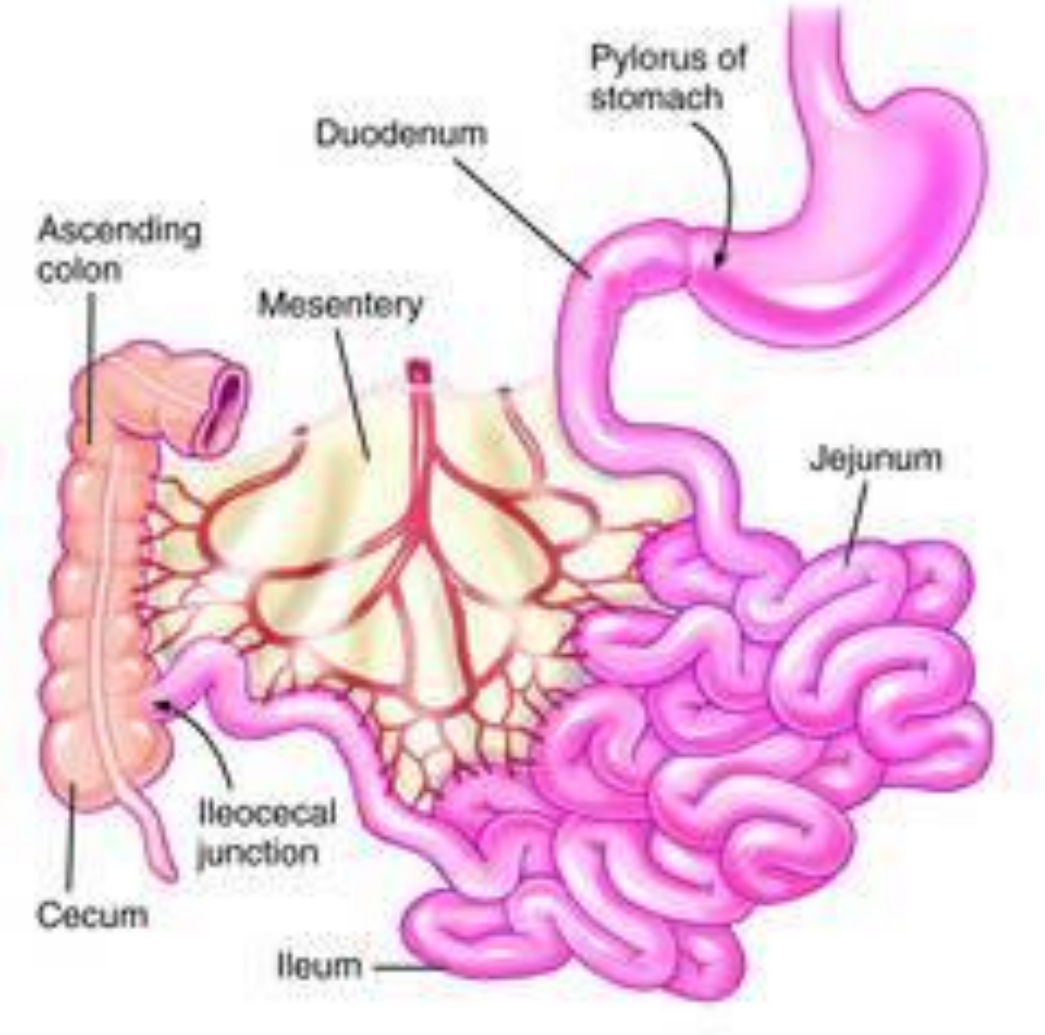
# Stomach Venous Drainage

- **Venous Drainage**
  - Parallels arterial supply
- Rt &Lt gastric veins drain to the portal
- Rt gastroepiploic drains to the SMV
- Lt gastroepiploic drains to the splenic



# SMALL INTESTINES

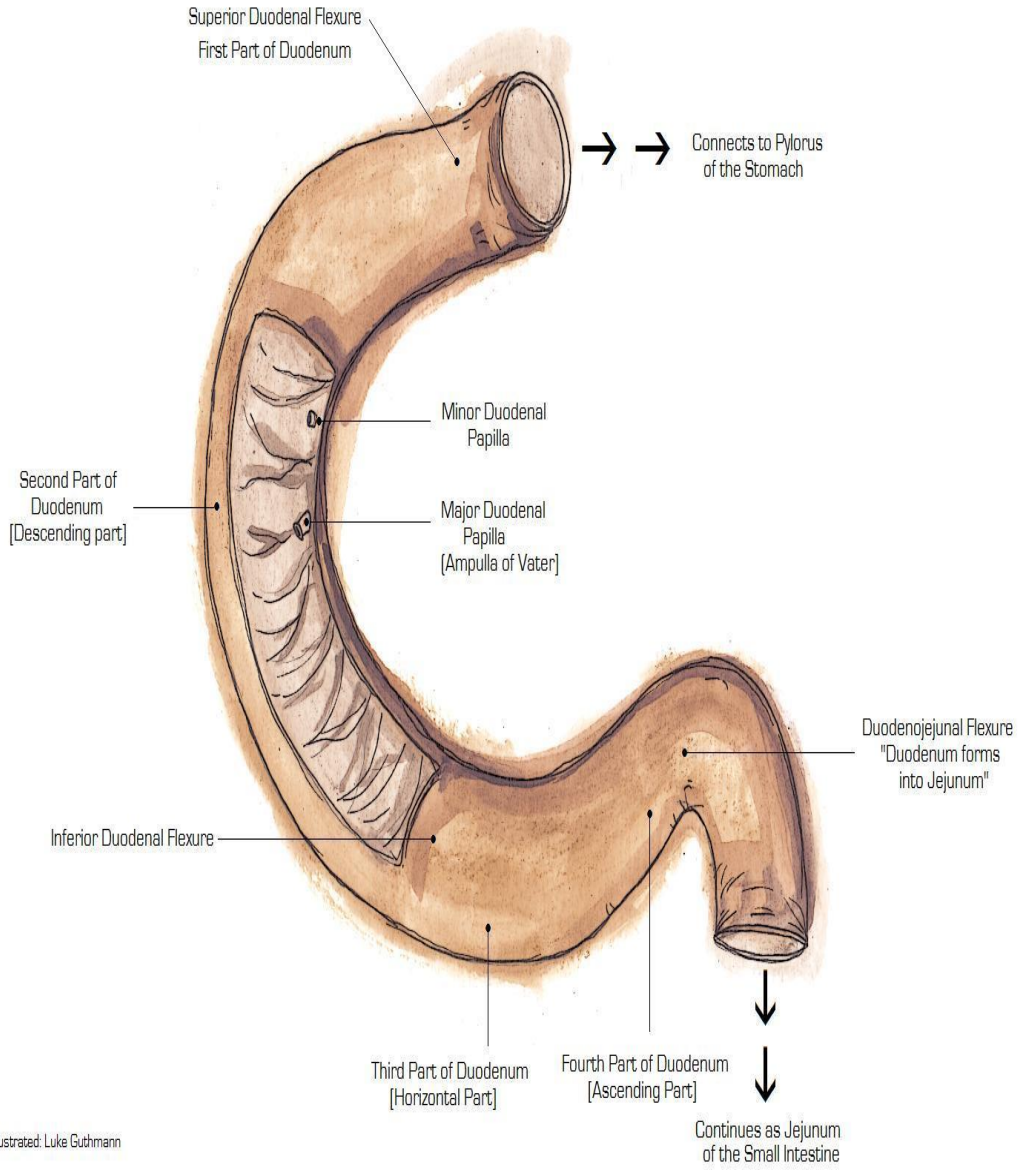
- Portion of GI tract between pyloric sphincter of stomach & ileocecal valve that opens into large intestine.
- Positioned in the central & lower portion of abdominal cavity & is supported ,except for the first portion by the **mesentry**
- Body major digestive organ
- Primary site for nutrient
- absorption
- 3m (12ft) long & 2.4cm (1in) wide.

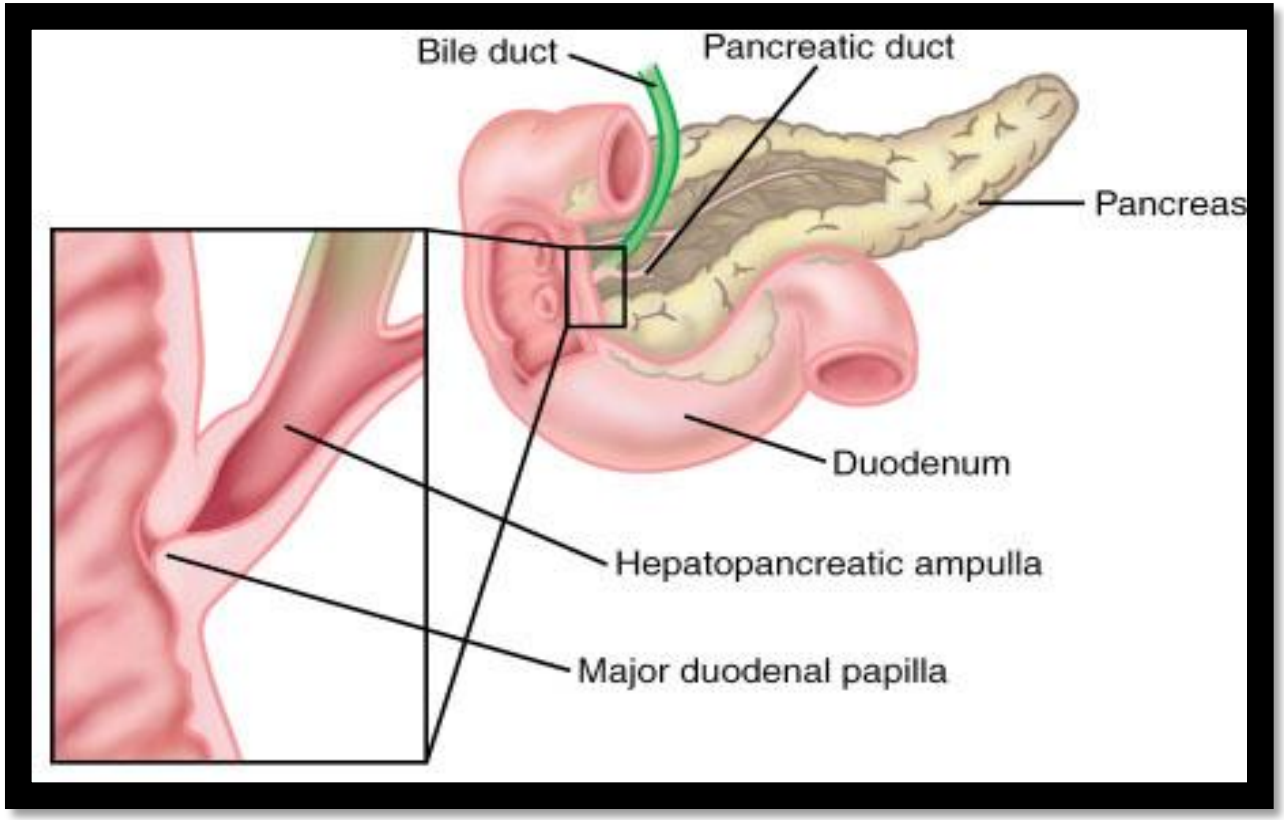


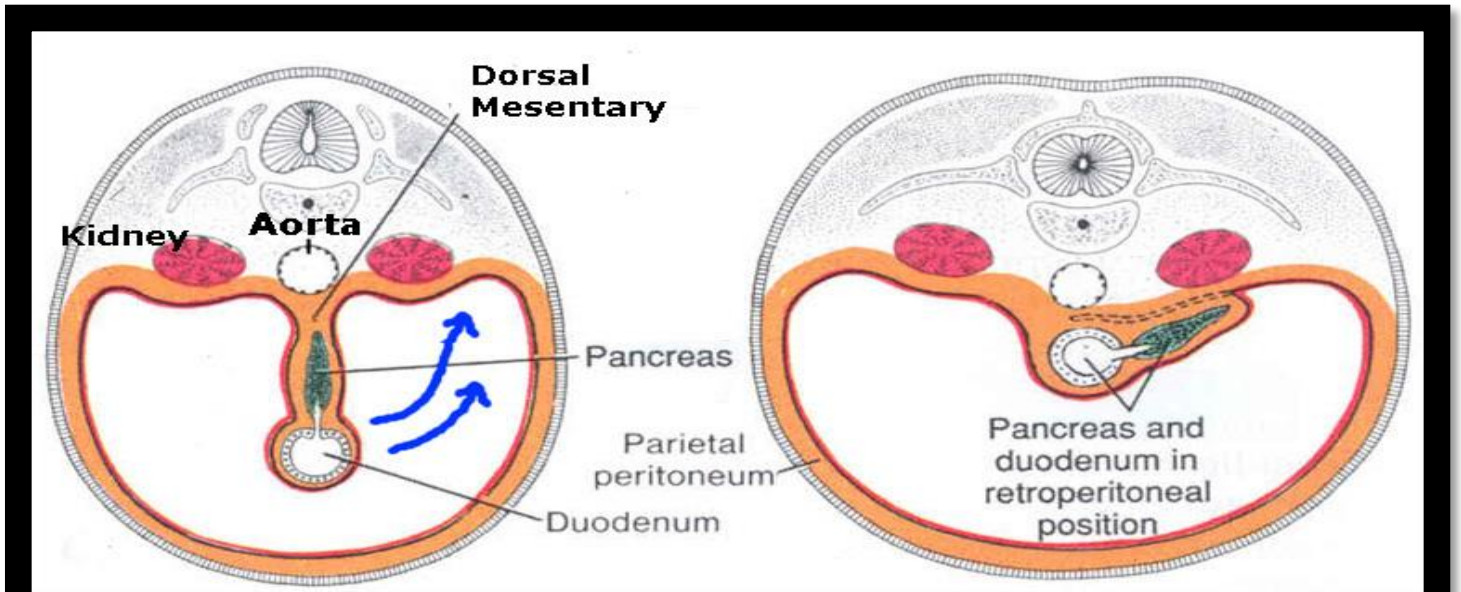
# REGIONS OF SMALL INTESTINES

## i) DUODENUM

- Relatively fixed
- C-shaped tubular organ
- Hepatopancreatic ampulla (ampulla of Vater)
- Histologically differ due to Brunner's gland




Bile duct
Pancreatic duct
Pancreas
Duodenum
Hepatopancreatic ampulla
Major duodenal papilla


Dorsal Mesentary
Kidney
Aorta
Pancreas
Parietal peritoneum
Duodenum
Pancreas and duodenum in retroperitoneal position

## ii) JEJUNUM

- Which extends from duodenum to ileum is app. 1m (3ft)long
- Slightly larger lumen & more intestinal folds than ileum
- Histology similar to that of ileum

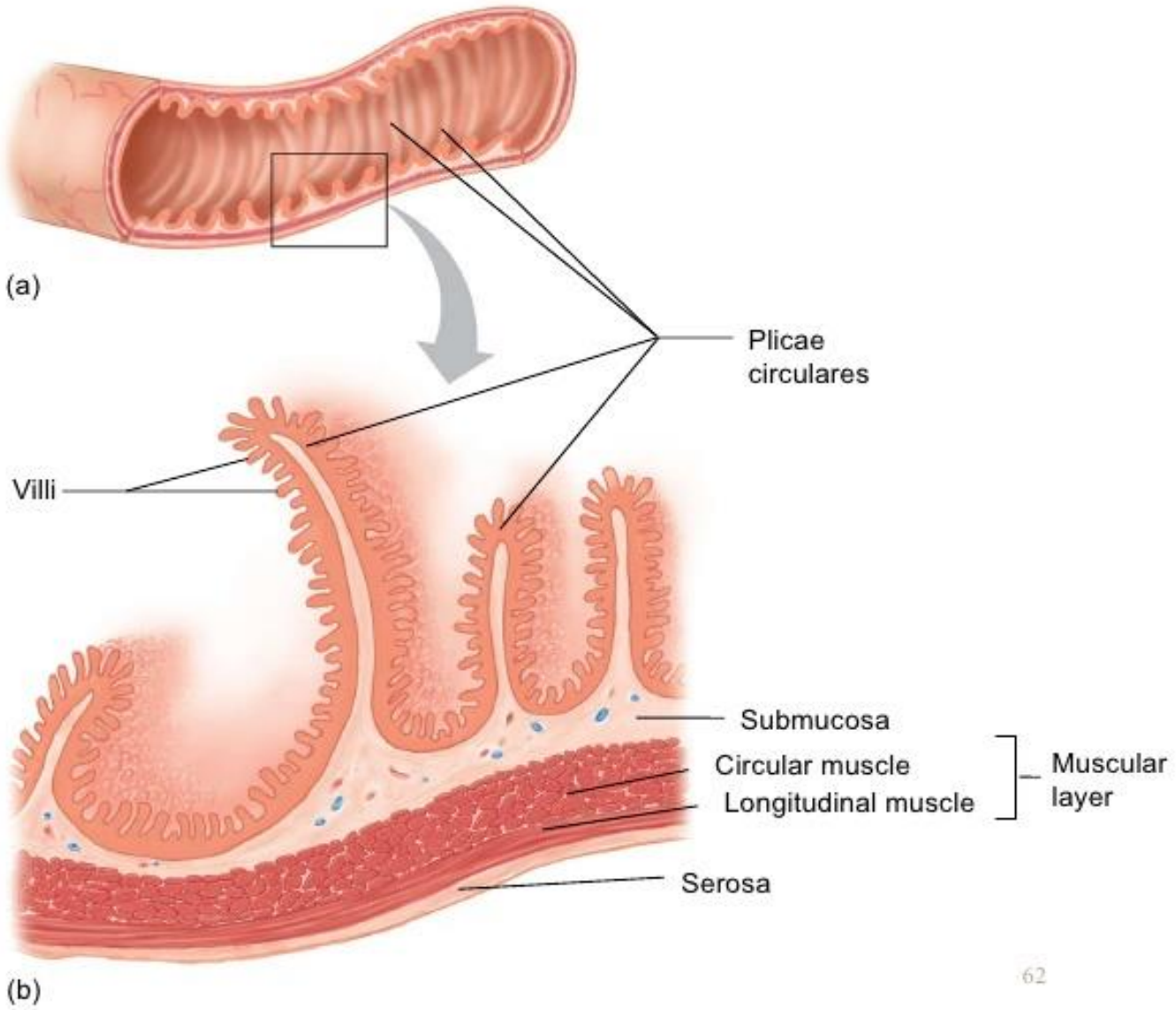
## iii)ILEUM

- Makes up remaining 2m(6-7ft) of the small intestines
- Terminal portion empties into medial side of cecum though the ileocecal valve.
- Lymph nodules called mesenteric **(Peyer's)patches** are abundant in wall of ileum

# Structural Modification of Small Intestines

- Four specializations that increase intestinal surface area.

I. **3 meter length of small intestines**
II. **Plicae circulares**
III. **Intestinal villi**
IV. **Microvilli**



# Mechanical activity of Small Intestines

- Contraction of longitudinal & circular muscles of the small intestines produce three distinct type of movements.

## 1. RHYTHMIC SEGMENTATION:

- Local contractions of circular muscular layer
- Occur at a rate of 12 to 16 per min in region containing chyme
- Churn the chyme with digestive juices & bring it into contact with mucosa.
- During this movement vigorous movement of intestinal villi stirs chyme & facilitates absorption.

## 2.PENDULAR MOVEMENTS:

- Occur in longitudinal muscle layer
- Constrictive wave moves along a segment of small intestine & then reverses & moves in opposite direction, moving chyme back & forth.

## 3.PERISTALSIS:

- Is responsible for propulsive movement of chyme through the small intestines.
- Weak & short contractions
- 3-10 hrs to travel through small intestines
- Both muscle layers involved

# DIGESTIVE ENZYMES OF SMALL INTESTINES

- Salivary Enzymes — Amylase
- Gastric Juice Enzyme — Pepsin

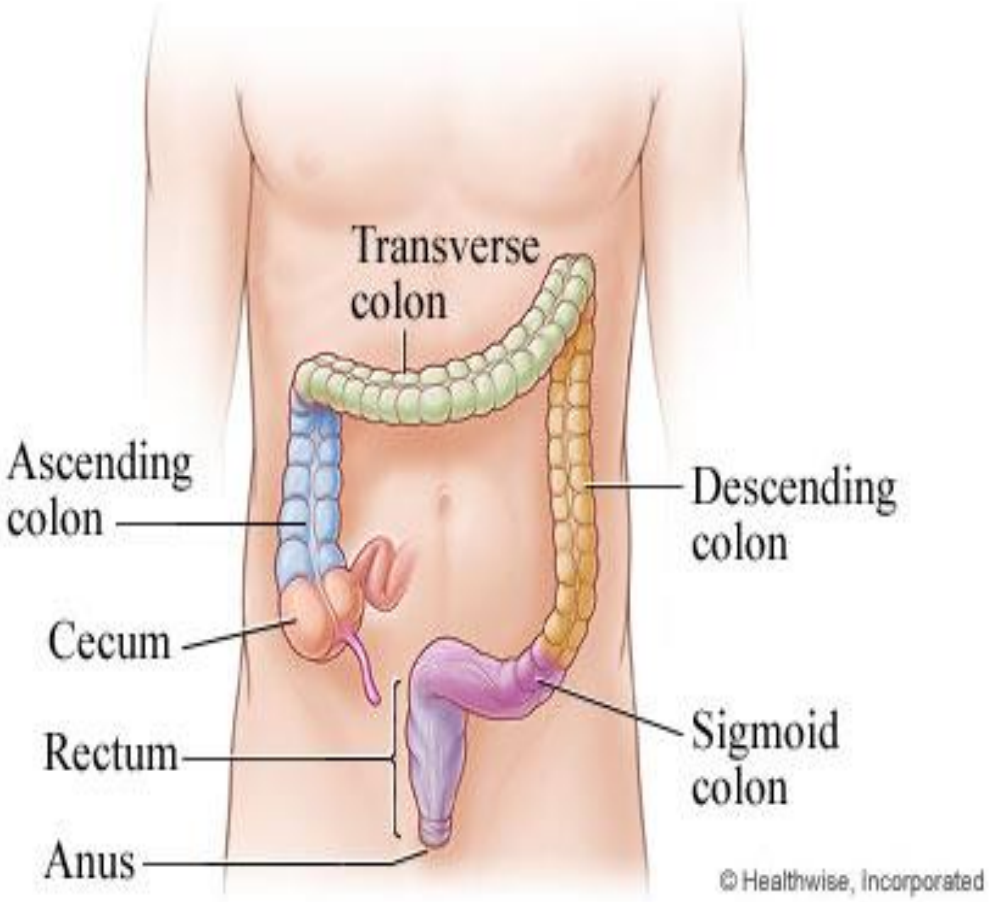
| Intestinal Juice Enzyme | Pancreatic Juices Enzyme |
|---|---|
| I. Peptidase | I. Amylase |
| II. Sucrase | II. Lipase |
| III. Maltase | III. Peptidases |
| IV. Lactase | IV. Trypsin |
| V. Lipase | V. Chymotrypsin |
| VI. Amylase | VI. Carboxypeptidase |
| VII. Nuclease | VII. Nuclease |
| VIII. Enterokinase | |

# LARGE INTESTINES

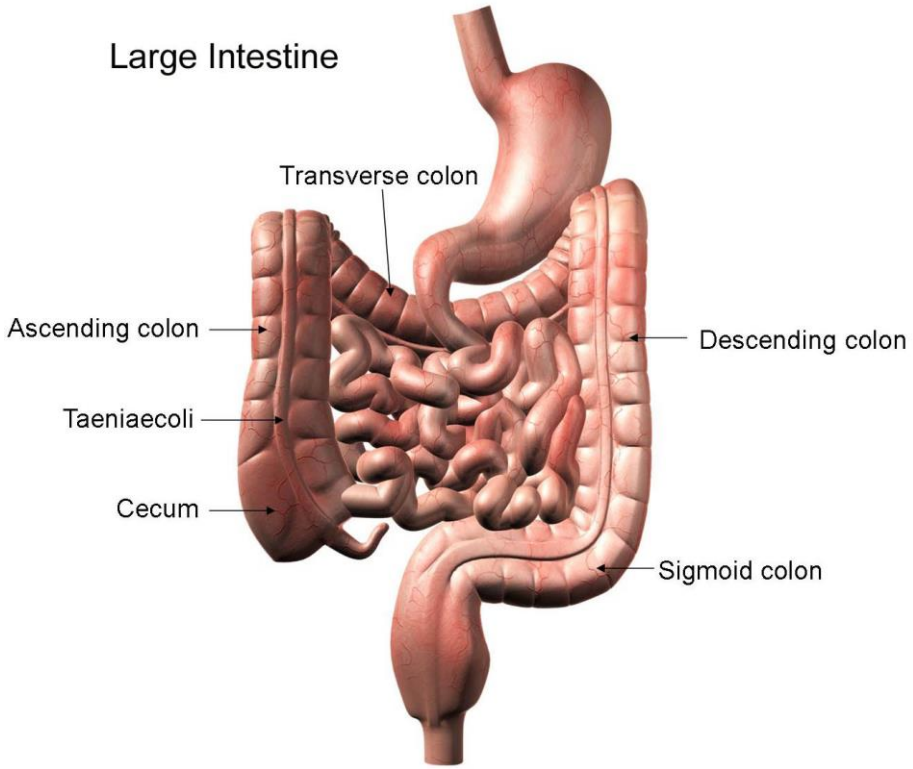
- Receives undigested food from small intestines, abosrbs water & electrolytes from chyme & passes feces out of the GI tract.
- 1.5m (5ft)in length 6.5cm(2.5in)diameter.
- Called large intestine because of large diameter
- Begins at end of **ileum** in lower right quadrant of the abdomen from it leads superiorly on right side to a point just below the liver, it then crosses to the left, descends into the pelvis, and terminates at the anus.

# Regions & Structures of Large Intestines

- Cecum
- Colon
- Rectum
- Anal canal



- Cecum is dilated pouch positioned slightly below the ileocecal valve.
- Finger like projection called **appendix** is attached to inferior medial margin of cecum
- Superior portion is continuous with colon
- Ascending colon
- Hepatic flexure
- Transverse colon
- Splenic flexure
- Descending Colon
- Sigmoid colon



- Terminal 20cm (7.5in)of GI tract is the rectum & the last 2 to 3 cm of the rectum is referred to as **Anal Canal.**
- Rectum lies anterior to sacrum
- Anus is external opening of anal canal.
- **Internal** & **external sphincter** guard anal opening.
- Mucous membrane of anal canal is arranged in highly vascular longitudinal folds called **anal columns**

- Large intestines lacks intestinal villi but have numerous goblet cells.
- Longitudinal muscle layer of the muscularis forms three distinct muscle bands called **Taeniae coli.**
- A series of bulges in walls of large intestine from **sacculations** or **haustra** along its entire length.
- Have numerous fat filled pouches called **epiploic appendages** attached superficially to taeniae coli.

# Mechanical activity of Large Intestines

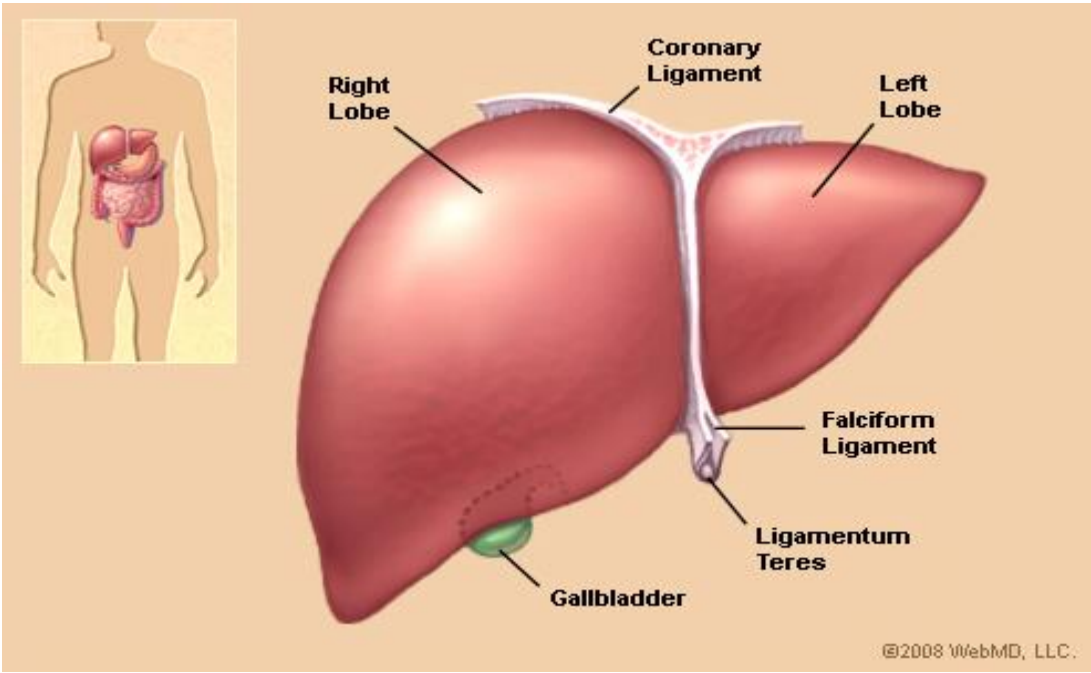
- Peristalsis
- Haustral Churning
- Mass Movement

- Gastroileal Reflex
- Gastrocolic Reflex
- Defecation Reflex

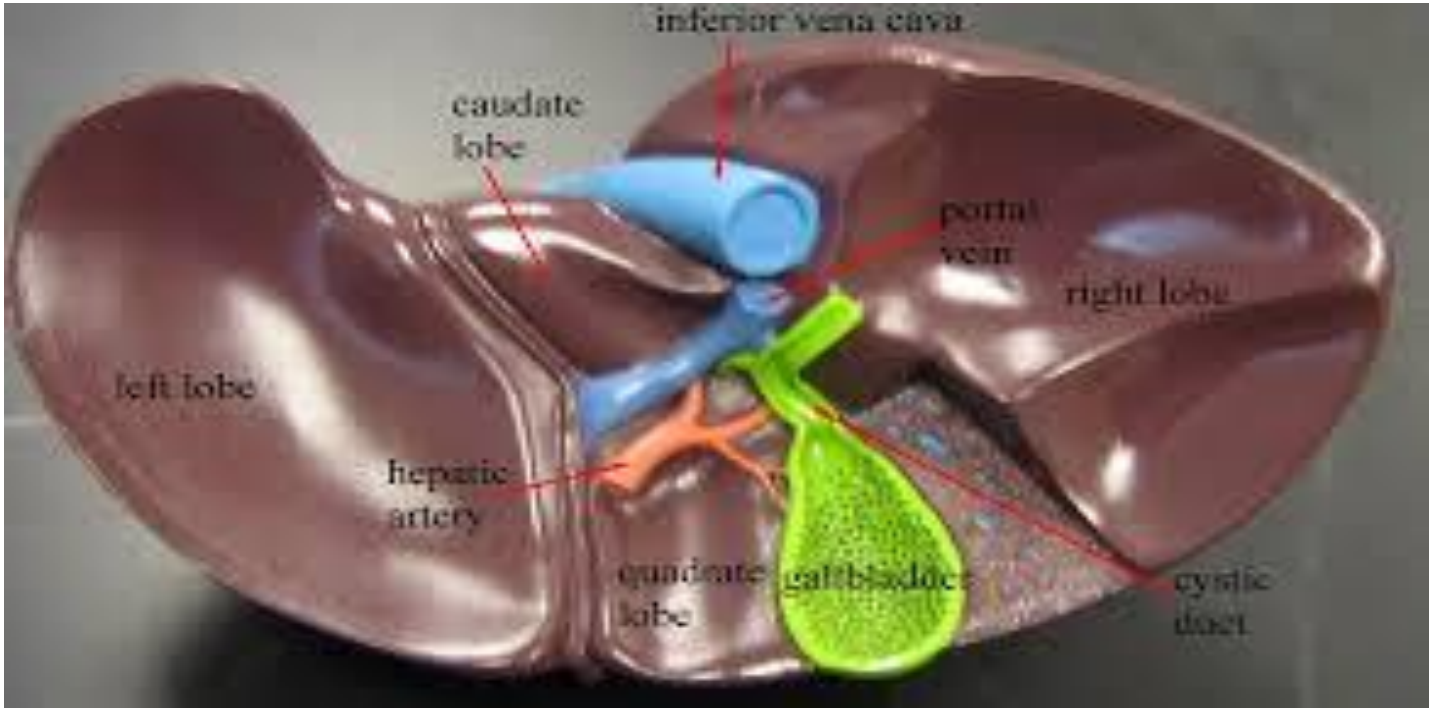
# LIVER

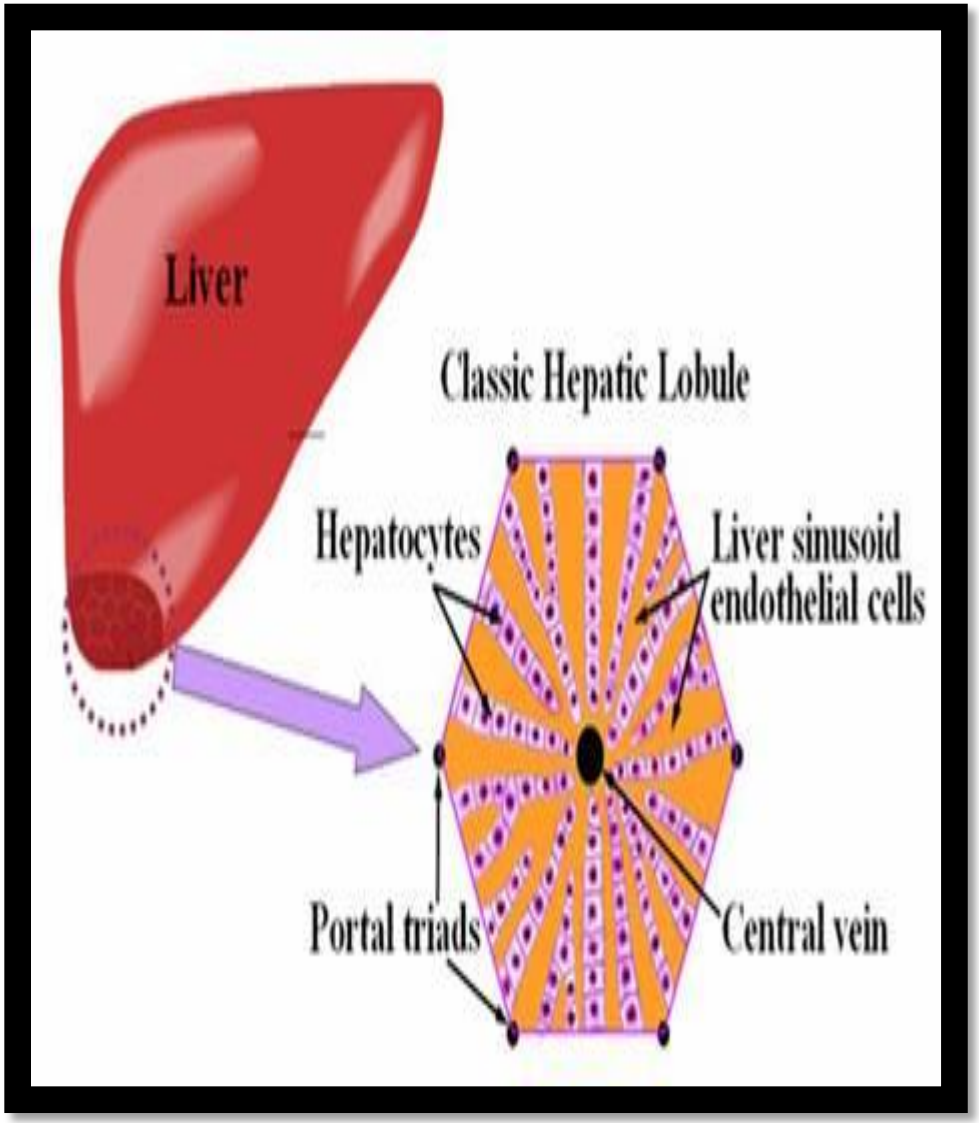
- Consists of four lobes ,processes nutrients & secrete bile,which is stored & concentrated in gall bladder prior to discharge into duodenum.
- Liver is the largest internal organ of the body
- Weight 1.3kg in an adult
- Positioned immediately beneath the diaphragm in epigastric & right hypochondriac regions of abdomen.

- Anteriorly, the right lobe is separated from the smaller left lobe by the falciform ligament.
- Inferiorly,the caudate lobe is positioned near the inferior vena cava
- Quadrate lobe is adjacent to gall bladder
- Falciform ligament attaches to liver to the anterior abdominal wall & the diaphragm.
- Ligament teres(round ligament) extends from the falciform ligament to umbilicus.

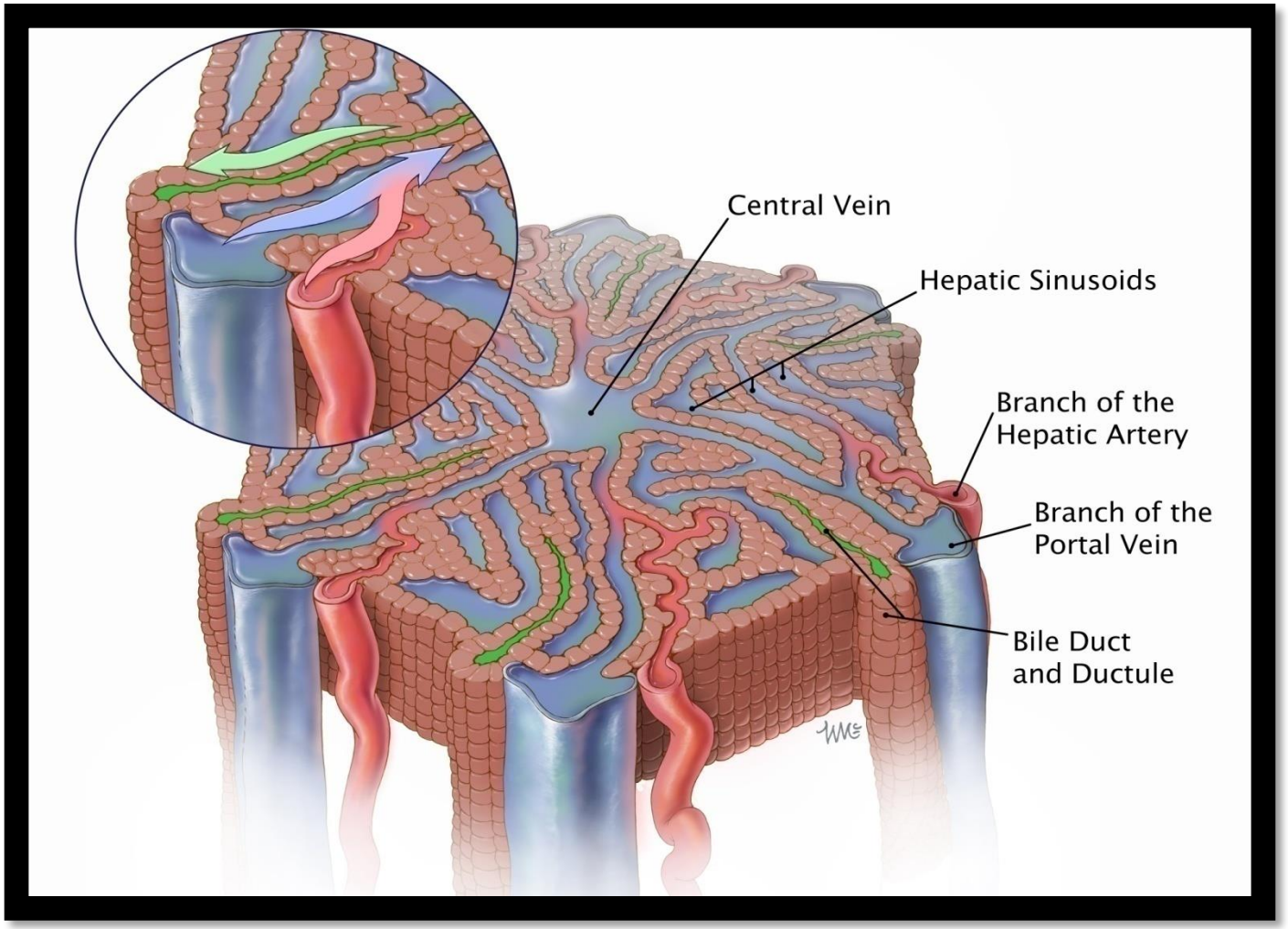


- **<u>Hepatocytes</u>** (1-2 cell thick)
- Hepatocytes separated by liver sinusoids.
- Sinusoids lined with phagocytic **<u>Kupffer cell</u>**
- Hepatic plates are arranged to form functional units called **<u>Liver Lobules</u>**

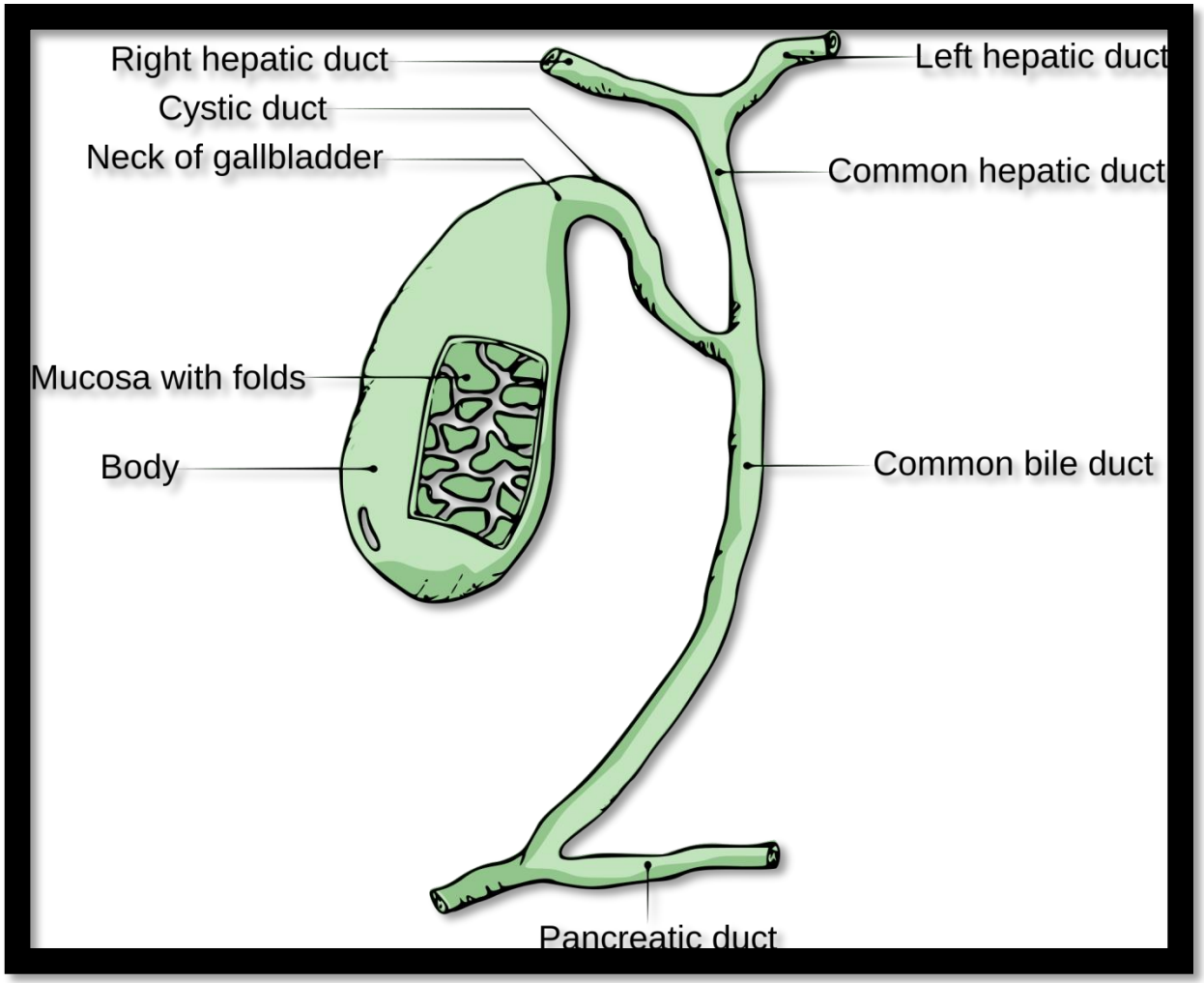



Liver
Classic Hepatic Lobule
Hepatocytes
Liver sinusoid endothelial cells
Portal triads
Central vein

# HISTOLOGY OF LIVER



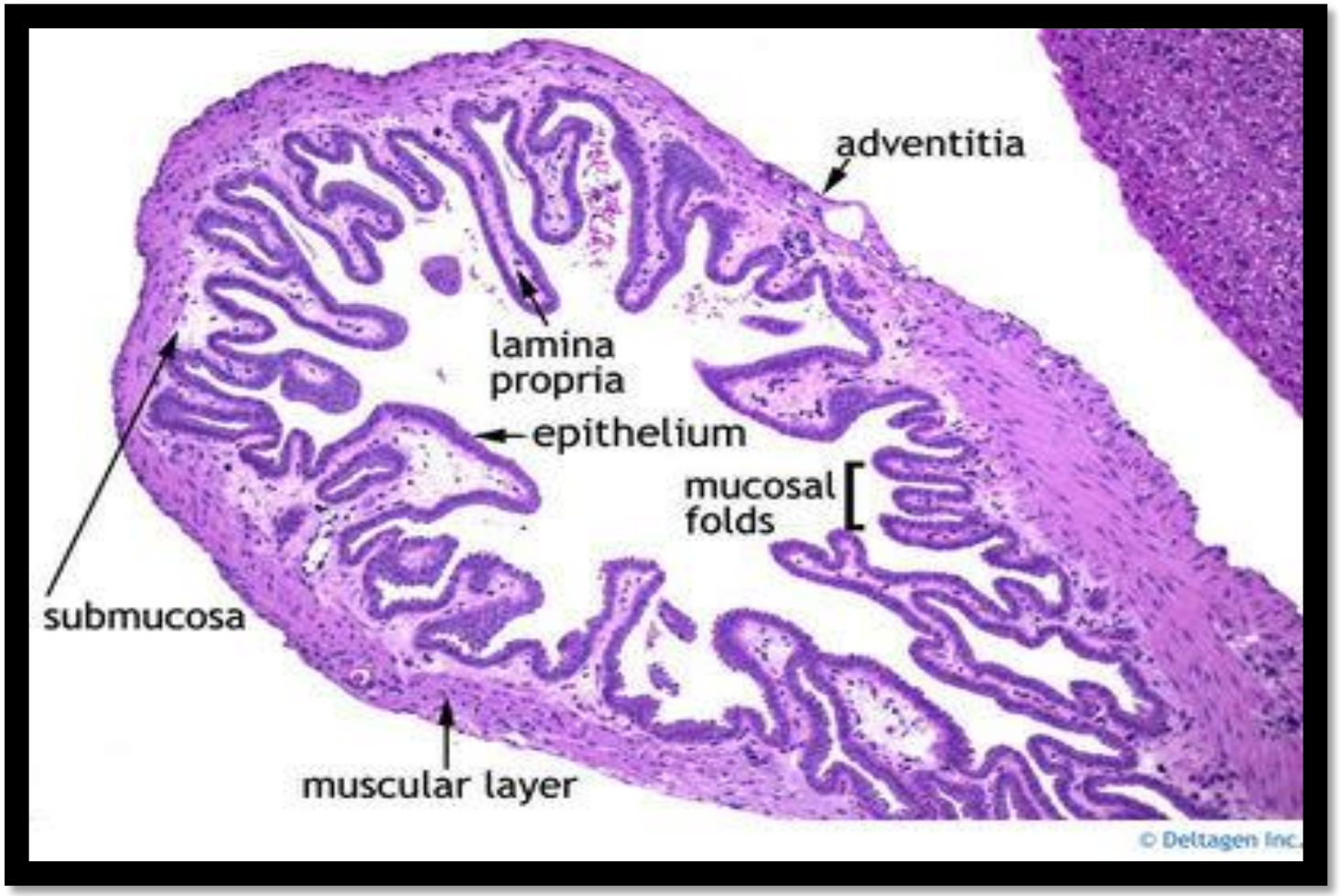
# GALL BLADDER



# Gall Bladder

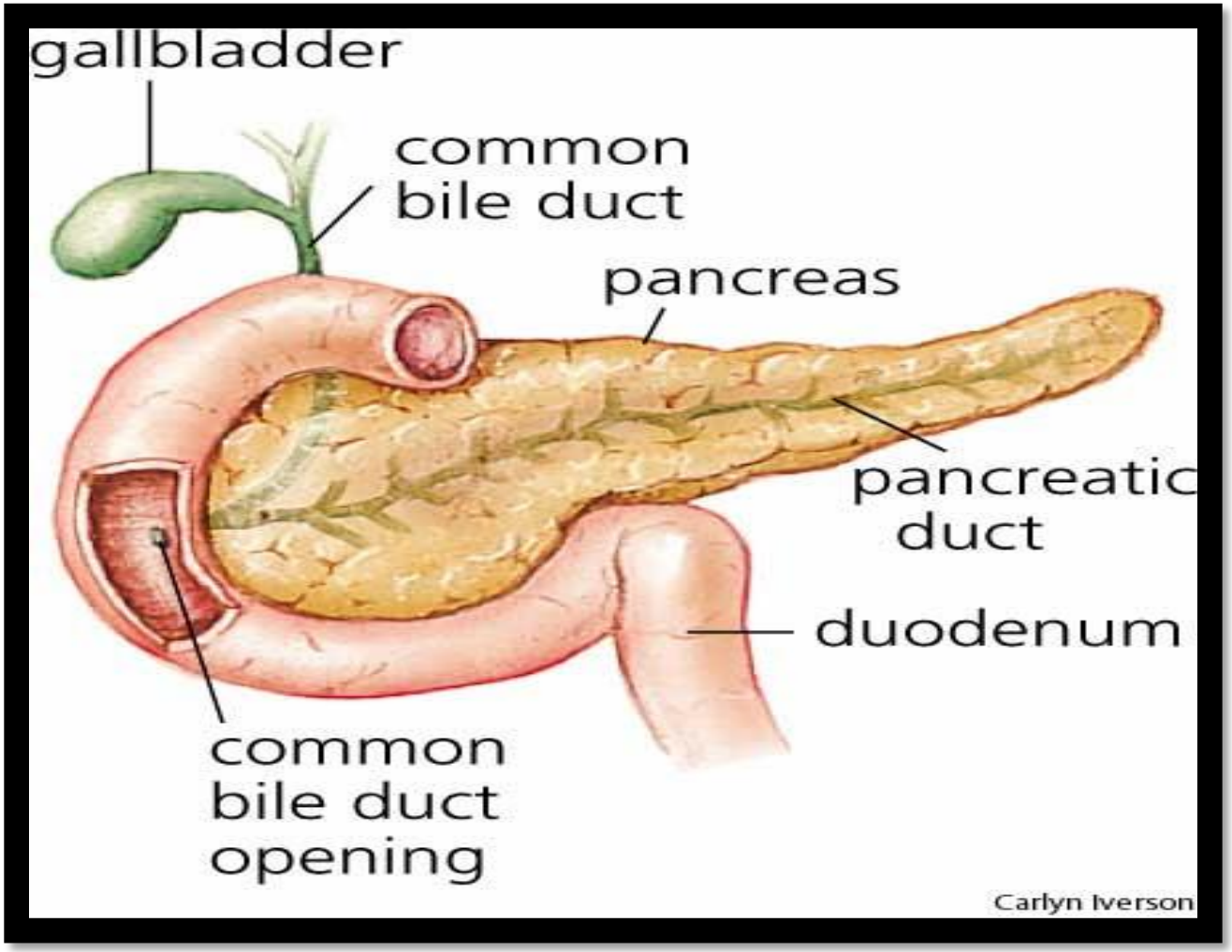
- Sac like organ attached to inferior surface of liver.
- Stores & concentrated biles.
- A sphincter valve at the neck of gall bladder allows storage capacity of about 35-50ml.
- Inner mucosal layer of gall bladder is thrown into folds similar to gastric folds of stomach.
- Bile is yellowish green fluid containing bile salts, bilirubin, cholestrol & other compounds.
- Contraction of muscularis ejects bile from gall bladder.
- Gall bladder is supplied with blood from cystic artery, which branches from the right hepatic artery.
- Venous blood is returned through cystic vein , which empties into hepatic portal vein.
- Autonomic innervation of gall bladder is similar to that of liver both receive parasympathetic innervation from the vagus nerve & sympathetic innervation from thoracolumbar nerves through the celiac ganglia.

# Histology Of Gall Bladder



# PANCREAS

- Soft lobulated pancreas is known as mixed glands because it has both exocrine & endocrine functions.
- Endocrine function is performed by clusters of cells called Pancreatic Islets .
- Islets cells secrete the hormones insulin & glucagon into the blood.
- As an exocrine gland, the pancreas secrete pancreatic juice through pancreatic duct which empties into duodenum.


gallbladder
common
bile duct
pancreas
pancreatic
duct
duodenum
common
bile duct
opening
Carlyn Iverson