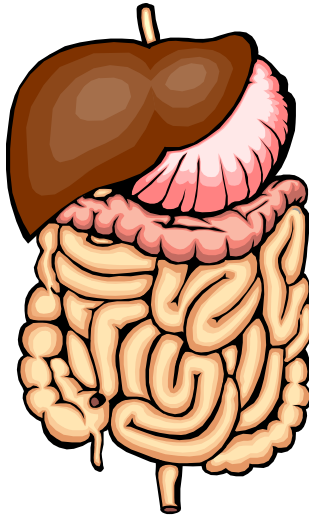


PTA/OTA 106
Unit 2 Lecture 3



Digestive Functions

Ingestion

intake of food

Digestion

breakdown of molecules

Absorption

uptake nutrients into blood/lymph

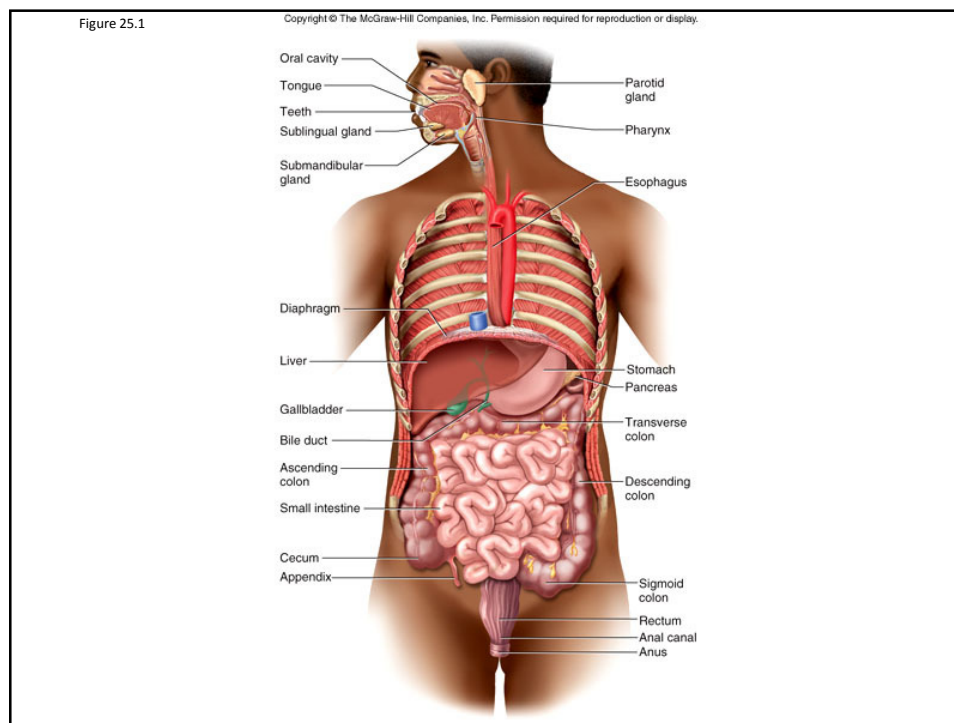
Defecation

elimination of undigested material

Stages of Digestion

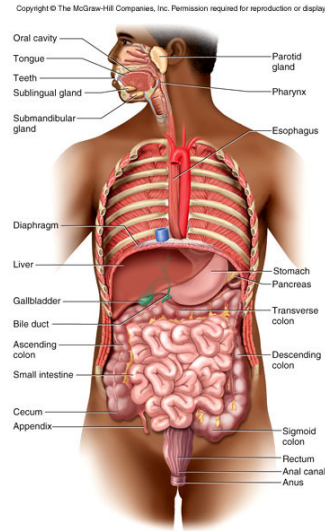
- Mechanical digestion
 - physical breakdown of food into smaller particles
 - teeth and churning action of stomach and intestines
- Chemical digestion
 - series of hydrolysis reactions that break macromolecules into their monomers
 - enzymes from saliva, stomach, pancreas and intestines
 - results
 - polysaccharides into monosaccharides
 - proteins into amino acids
 - fats into glycerol and fatty acids

25-3



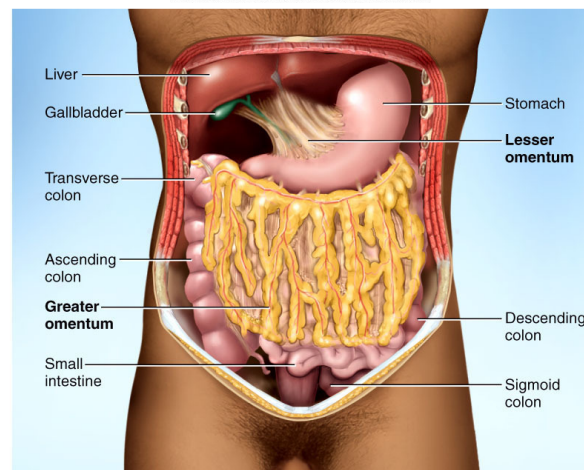
Subdivisions of Digestive System

- Digestive tract (GI tract)
 - 30 foot long tube extending from mouth to anus
- Accessory organs
 - teeth, tongue, liver, gallbladder, pancreas, salivary glands



25-5

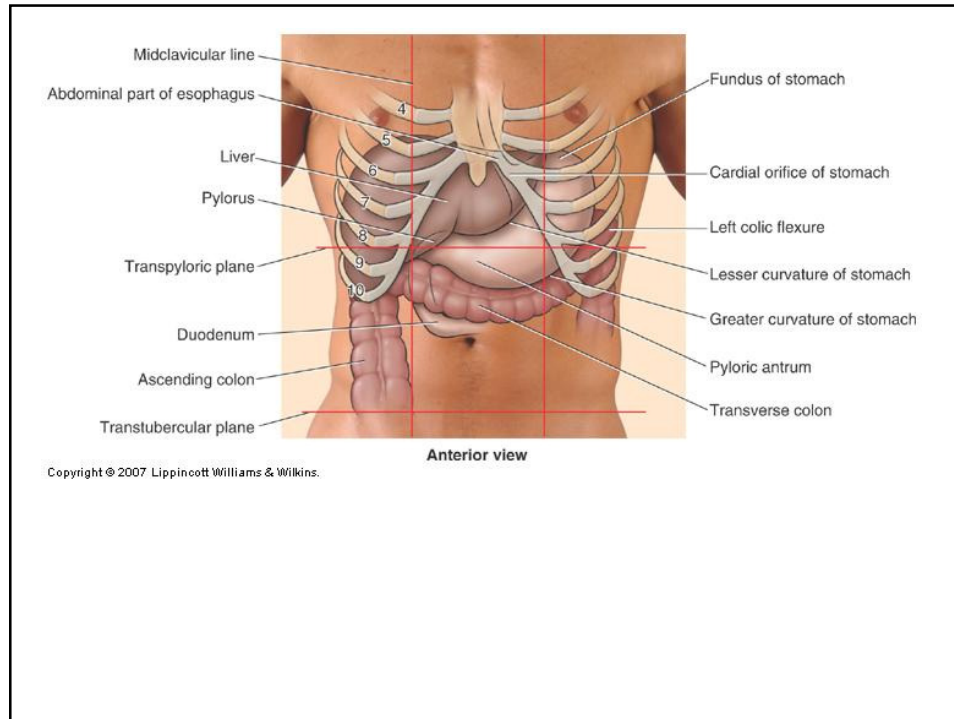
Lesser and Greater Omentum



(a)

- Lesser - attaches stomach to liver
- Greater - covers small intestines like an apron

25-6



Stomach

- Mechanically breaks up food, liquifies food and begins chemical digestion of protein and fat
 - resulting soupy mixture is called chyme
- Does not absorb significant amount of nutrients
 - absorbs aspirin and some lipid-soluble drugs

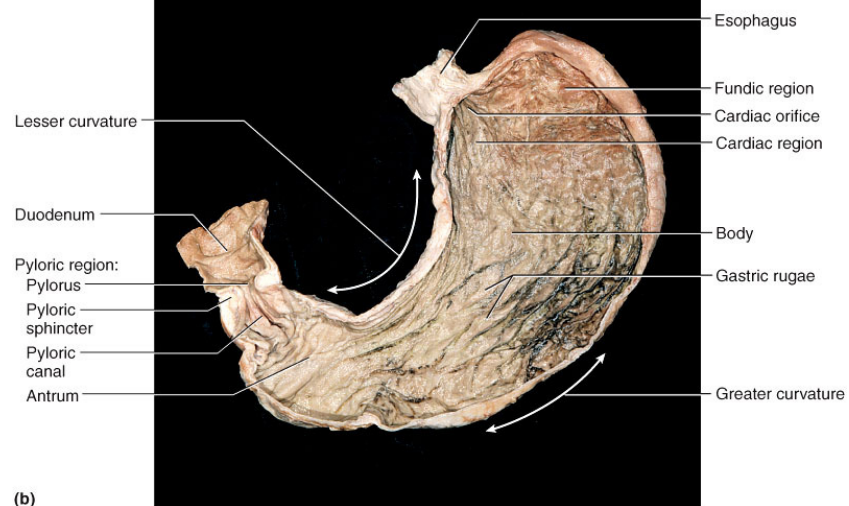
Gross Anatomy of Stomach

- Muscular sac (internal volume from 50ml to 4L)
 - J - shaped organ with lesser and greater curvatures
 - regional differences
 - cardiac region just inside cardiac orifice
 - fundus - domed portion superior to esophageal opening
 - body - main portion of organ
 - pyloric region - narrow inferior end
 - antrum and pyloric canal
- Pylorus - opening to duodenum
 - thick ring of smooth muscle forms a sphincter

25-9

Gross Anatomy of Stomach

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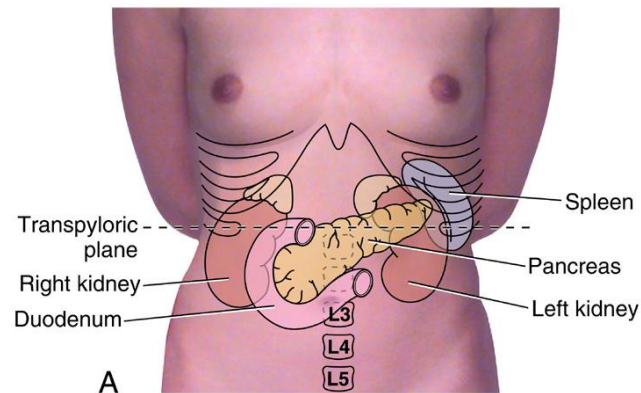


(b)

25-10

Liver, Gallbladder and Pancreas

- All release important secretions into small intestine to continue digestion



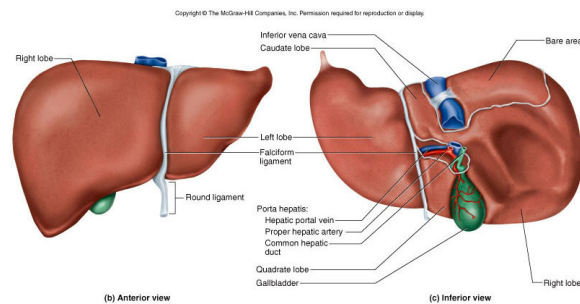
A
Anterior views

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25-11

Gross Anatomy of Liver

- 3 lb. organ located inferior to the diaphragm
- 4 lobes - right, left, quadrate and caudate
 - falciform ligament separates left and right
 - round ligament, remnant of umbilical vein
- Gallbladder adheres to ventral surface between right and quadrate lobes



25-12

Ducts of Gallbladder, Liver, Pancreas

- Bile passes from bile canaliculi between cells to bile ductules to right and left hepatic ducts
- Right and left ducts join outside liver to form common hepatic duct
- Cystic duct from gallbladder joins common hepatic duct to form bile duct
- Duct of pancreas and bile duct combine to form hepatopancreatic ampulla emptying into duodenum at major duodenal papilla
 - sphincter of Oddi (hepatopancreatic sphincter) regulates release of bile and pancreatic juice

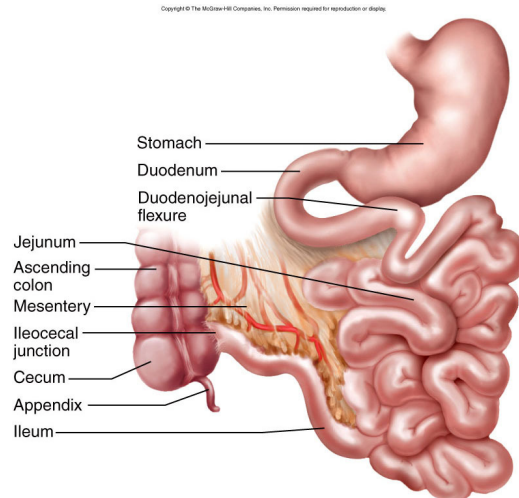
25-13

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25-14

Small Intestine



- Nearly all chemical digestion and nutrient absorption occurs in small intestine

25-15

Small Intestine

- Duodenum curves around head of pancreas (10 in.)
 - retroperitoneal along with pancreas
 - receives stomach contents, pancreatic juice and bile
 - neutralizes stomach acids, emulsifies fats, pepsin inactivated by pH increase, pancreatic enzymes
- Jejunum - next 8 ft. (in upper abdomen)
 - has large tall circular folds; walls are thick, muscular
 - most digestion and nutrient absorption occur here
- Ileum - last 12 ft. (in lower abdomen)
 - has peyer's patches – clusters of lymphatic nodules
 - ends at ileocecal junction with large intestine

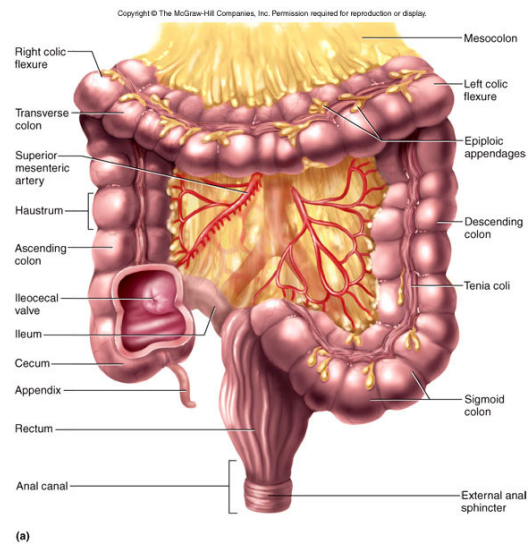
25-16

Water Balance

- Digestive tract receives about 9 L of water/day
 - .7 L in food, 1.6 L in drink, 6.7 L in secretions
 - 8 L is absorbed by small intestine and 0.8 L by large intestine
- Water is absorbed by osmosis following the absorption of salts and organic nutrients
- Diarrhea occurs when too little water is absorbed
 - feces pass through too quickly if irritated
 - feces contains high concentrations of a solute (lactose)

25-17

Anatomy of Large Intestine



25-18

Gross Anatomy of Large Intestine

- 5 feet long and 2.5 inches in diameter in cadaver
- Begins as cecum and appendix in lower right corner
- Ascending, transverse and descending colon frame the small intestine
- Sigmoid colon is S-shaped portion leading down into pelvis
- Rectum - straight portion ending at anal canal

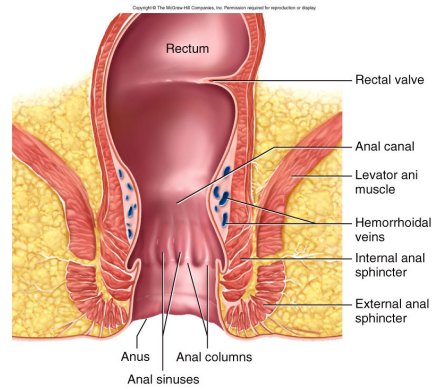
25-19

Absorption and Motility

- Transit time is 12 to 24 hours
 - reabsorbs water and electrolytes
- Feces consist of water and solids (bacteria, mucus, undigested fiber, fat and sloughed epithelial cells)
- Haustral contractions occur every 30 minutes
 - distension of a haustrum stimulates it to contract
- Mass movements occur 1 to 3 times a day
 - triggered by gastrocolic and duodenocolic reflexes
 - filling of the stomach and duodenum stimulates motility
 - moves residue for several centimeters with each contraction

25-20

Anatomy of Anal Canal



(b)

- Anal canal is 3 cm total length
- Anal columns are longitudinal ridges separated by mucus secreting anal sinuses
- Hemorrhoids are permanently distended veins

25-21