CHAPTER 23 DIGESTIVE

Digestive System

- nutrition requires:
  - getting nutrients: musculo-skeletal
  - digesting nutrients: digestive
  - transporting nutrients: circulatory

Digestive System

- alimentary canal ~ gastrointestinal tract (GI)

- accessory organs

- FUNCTIONS:
  - move food
  - digest food
  - absorb food

Digestive System

- alimentary canal 
  - mouth
  - pharynx
  - esophagus
  - stomach
  - small intestine
  - large intestine
  - rectum

- hollow organs

- accessory organs 
  - teeth
  - tongue
  - salivary glands
  - liver
  - gallbladder
  - pancreas

- move food
  - ingestion = stuffing your mouth
  - propulsion moving food thru tract
    - swallowing
    - peristalsis
  - egestion defecation of wastes

- digest food
  - mechanical digestion physically breaking food
  - chemical digestion chemically breaking food

- absorption get nutrients into the body

- defecation egestion of wastes
Peritoneum

- parietal peritoneum
- visceral peritoneum
  - peritoneal cavity, fluid space in between
- retroperitoneal posterior to peritoneum

peritoneal folds

- lesser omentum
- greater omentum
- mesentery proper
- mesocolon
- falciform ligament

oral cavity = buccal cavity

mouth
- strat. squamous epithelium
- labial frenulum connects lip to gum
- soft palate
- uvula

tongue
- intrinsic skeletal muscles mastication
- initiates swallowing
- sensory epithelium
- lingual frenulum connects to floor of mouth

teeth
- primary dentition = deciduous (milk) teeth 20
- permanent dentition = adult teeth 32
- dentin bone + collagen
- crown exposed area
  - enamel mineral crystals
- root within bones
  - root canal + pulp cavity blood vessels; nerves
  - periodontal ligament anchors into bone
- gingiva = gums salivary glands

salivary glands
- saliva
  - mostly water
  - protection defensins
    lysozyme
    bicarbonate buffer
  - digestive enzyme salivary amylase

tooth
- parotid gland
- sublingual gland
- submandibular gland
pharynx
• (nasopharynx not part of alimentary canal)
• oropharynx
  — tonsils
• laryngopharynx
• swallowing = deglutition
  — pharyngeal constrictor muscles
  — reflex CN IX, X, XII

esophagus
• stratified squamous epith.
• muscle
  — skeletal muscle
  — smooth muscle
    • peristalsis
• upper esophageal sphincter
• esophageal hiatus
• cardiac orifice
• gastroesophageal sphincter = cardiac sphincter
• GERD
• Hiatal Hernia

Stomach - anatomy
• cardia
  — cardiac orifice
  — cardiac sphincter
• fundus
• body
• pyloric region
• pyloric sphincter
• greater curvature
• lesser curvature
• rugae

small intestine
• ~ 8-13 feet long

chemical digestion
  — produces enzymes
  — receives enzymes from pancreas and liver

most absorption

small intestine - gross anatomy
• 3 parts
  — duodenum 1st 10 in.
  most digestion and absorption
  — jejunum proximal ½
  — ileum distal ½
**gross anatomy**

- hepatopancreatic ampulla from pancreas and bile ducts
- duodenal papilla
- ileocecal valve connect to large intestine (cecum)

  to increase absorption

- plicae circulares circular folds of entire wall
- villi smaller folds of plicae
  - lined with absorptive cells
  - capillaries
  - lacteals
- microvilli folds of cell membrane
  - = brush border

**large intestine**

- = colon
- functions:
  - absorb H₂O
  - absorb vitamins
  - normal flora (e.coli) produce Vit K, Vit B’s
- general features
  - teniae coli 3 longitudinal strips of thick muscle
  - haustra several sac along length of colon

**large intestine anatomy**

- cecum
  - ileocecal valve
  - appendix
- ascending colon
- right colic (hepatic) flexure
- transverse colon
- left colic (splenic) flexure
- descending colon
- sigmoid colon

**rectum and anal canal**

- feces undigested food
  - water
  - dead epithelia
  - bacteria
- internal anal sphincter
- external anal sphincter
- anal canal
- defecation reflex
  - stim = stretch of rectum wall
  - relaxes internal anal sphincter
Liver

- 4 lobes
  - right and left lobe
  - quadrate lobe
  - caudate lobe

- digestive function
  produces bile salts
  emulsify fats
  cholic acid + bilirubin

Liver

- porta hepatis area where vessels connect
  - hepatic portal vein
  - hepatic artery
  - hepatic ducts remove bile

- falciform ligament divides R & L lobe
- ligamentum teres remnant of umbilical vein

Gall bladder and Biliary tree

- stores and concentrates bile

Biliary tree

- common hepatic duct from liver
- cystic duct from gall bladder
- common bile duct

Pancreas

- exocrine functions pancreatic juices
  - enzymes pancreatic amylase lipase trypsin
  - buffer sodium bicarbonate
- main pancreatic duct to hepatopancreatic duct
- accessory pancreatic duct to duodenum

histology

- What tissue?
  - If we want to contact an opening?
    - if we want protection from that opening
    - if we want to secrete and absorb
  - If we have epithelia, we should also have …
  - If we need defense?
  - If we need stretch and recoil?
  - If we want to move stuff through the tract?
  - If we want to hold it all together?
  - If we want to transport the absorbed stuff?
• 4 layers of hollow organs - alimentary canal
  — mucosa
  — submucosa
  — muscularis externa
  — outer covering
• organ = the wall

mucosa - mucous membrane

- epithelium contact lumen
  — esophagus, rectum
    • tissue ??
  — stomach, intestines
    • tissue ??
• lamina propria support epithelium
  • tissue ??
  — capillaries and lymph (lacteals)
  — MALT
• muscularis mucosae smooth muscle

other layers:

• submucosa
  • areolar; elastic c.t.
  • blood, lymph vessels
  • nerves
• muscularis externa
  • peristalsis
  • nerves
• outer covering serosa adventitia

nerve plexuses

• ANS
  — myenteric nerve plexus in muscularis externa
    • to smooth muscle
  — submucosal nerve plexus in submucosa
    • to digestive glands
• enteric nervous system
  — reflex arcs within alimentary wall
peristalsis and gland secretions

stomach lining

• gastric pits
  — surface epithelium simple columnar
    secretes bicarbonate
  — mucus neck cells secrete mucous
  — gastric glands

• muscularis externa 3 layers
• serosa
• gastric glands
  – parietal cells
  – chief cells
  – G cells

• small intestine histology
  – mucosa
  – simple columnar absorption produce enzymes
  – goblet cells mucus
  – enteroendocrine cells produce hormones
  – lamina propria areolar ct capillaries lacteals
  – Peyer’s patches

• submucosa
  – duodenal glands
    • secrete bicarbonate
• muscularis and serosa same as elsewhere

• large intestine histology
  – simple columnar epithelium
  – many Goblet cells
  – no villi
  – lymph tissue

• Liver - microanatomy
  – liver lobules
    – hepatocytes perform most functions
    – sinusoids
      • Kupffer cells destroy bacteria and toxins
    – central vein
  – portal triad
    – hepatic artery
    – hepatic portal vein
    – bile duct

• Pancreas
  – exocrine functions pancreatic juices
  – acinus exocrine glands
    – secrete into ducts to the duodenum
  – pancreatic islets endocrine cells
  = islets of Langerhans