The Digestive System

We need food for cellular utilization:
→nutrients as **building blocks** for synthesis
→sugars, etc to break down for **energy**

most food that we eat cannot be directly used by the body
→too large and complex to be absorbed
→chemical composition must be modified to be useable by cells

Functions of Digestive System:
1. physical and chemical digestion
2. absorption
3. collect & eliminate nonuseable components

Anatomy of Digestive System

organs of digestive system form essentially:

a long continuous tube open at both ends

→ **alimentary canal** (gastrointestinal tract)

mouth→pharynx→esophagus→stomach→small intestine→large intestine

attached to this tube are assorted **accessory organs**
and structures that aid in the digestive processes

salivary glands
teeth
liver
gall bladder
pancreas
mesenteries

The GI tract (digestive system) is located mainly in **abdominopelvic cavity**

surrounded by **serous membrane** = visceral peritoneum

this serous membrane is continuous with parietal peritoneum and extends between digestive organs as **mesenteries**

→ hold organs in place, prevent tangling

The **wall** of the alimentary canal consists of 4 layers:

outer **serosa**:
visceral peritoneum,
mainly fibrous and areolar CT

muscularis
several layers of smooth muscle

submucosa
blood vessels, lymphatic vessels, nerves,
connective tissue

inner **mucosa**:
mucous membrane lining

these layers are modified within various organs
→ some have muscle layers well developed
→ some with mucous lining modified for secretion of digestive juices
→ some with mucous lining modified for absorption

1. Mouth (Buccal Cavity, Oral Cavity)

bordered above by **hard** and **soft palate**
forms partition between mouth and nasal passages

fauces
opening of buccal cavity into throat

uvula
is suspended from rear of soft palate
blocks nasal passages when swallowing

tongue
lines ventral border of mouth cavity

is skeletal muscle covered with mucous membrane

rough elevated projections = **papillae**

types of papillae: fungiform, foliate, vallate

on some are taste buds

frenulum is thin fold of mucous membrane on ventral surface of tongue
that anchors the tongue to the floor of the mouth

short frenulum → "tongue tied"

Teeth

two sets

deciduous (=baby teeth)

20

begin at 6 months; shed 6-13 yrs

permanent teeth

32

each tooth has a **crown** (above gum) and a **root** (below gum)

neck is the line where crown, gum and root meet

imbedded in socket = **alveolus**

gingivitis = inflammation of gum surrounding teeth; can lead to periodontal disease

kinds of teeth modified for specific functions

incisors –cut, knip
canines –holding onto prey
premolars –cutting, crushing
molars –chewing, grinding, crushing

each tooth is composed of several layers:

enamel

very hard
outer surface
on upper exposed crown only
not living tissue, noncellular secretion deposited before tooth erupts from gum
resists bacterial attack
cannot regenerate if damaged

dentin

below enamel
living connective tissue with cells that line pulp cavity that send processes into the calcified matrix through tiny parallel tubes
less hard, similar to bone matrix
decays quickly of enamel is penetrated

pulp

living portion of tooth

consists of blood vessels, nerves

cementum
on root of tooth only
outer surface
living connective tissue with cells in lacunae
holds root into socket in jaws

Salivary Glands

3 Pairs of **salivary glands**:
sublingual
submandibular
parotid
largest, below ears
mumps = acute infection of parotid gland

secrete saliva (enzymes and mucous for digestion)

2. Pharynx (throat)

already discussed

3. Esophagus

collapsible tube ~ 10" long

extends from pharynx to stomach
→gets food through thorax to abdominal cavity

pierces diaphragm

posterior to trachea and heart

uses peristalsis to move food to stomach
→ can swallow upsidedown

4. Stomach

muscular sac just below diaphragm and liver

alimentary canal expands to form stomach

divided into regions:
fundus
body
pyloris

Muscle layers are very well developed in stomach
- **circular**
- **longitudinal**
- **oblique**

Help to break up food by churning action

results in milky white liquid = **chyme**

sphincter muscles close both stomach openings

cardioesphageal sphincter

pyloric sphincter

within the mucous lining of stomach are glandular tubes called **gastric pits**

→within gastric pits are numerous microscopic **gastric glands**:

epithelial cells → secrete **mucous** for protection
chief cells → secretes various **digestive enzymes**
parietal cells → secretes **HCl**

5. <u>Small Intestine</u>

longest part of alimentary canal:
→ 1" diameter x 10' long (living) or 20' long (cadaver)

small intestine fills most of abdominal cavity

held in place by **mesenteries** (=serous membranes)

subdivided into 3 functional regions:

duodenum
- 10" long
- uppermost
- drains pyloric stomach
- receives ducts from gall bladder and pancreas

jejunum
- 8'
- central portion
- mostly in umbilical region

ileum

12’
mainly in hypogastric region
joins to caecum of large intestine

6. Large Intestine

2.5” diameter x 6’ long

valve like sphincter separates small from large intestine = **ileocecal valve**

subdivided into 3 regions:

cecum

blind ended sac that extends from point of attachment to small intestine

contains appendix → ~3.5” (9cm) long
significant source of lymphocytes

herbivorous primates such as gorillas and orangutans have an enormous cecum packed with bacteria that digest plant fiber

colon

subdivided into:
ascending colon
transverse colon
descending colon
sigmoid colon

rectum

last 7-8”

ends at anus
external anal sphincter of skeletal muscle

7. Serous Membranes

body wall and organs of abdomen are lined with **peritoneum**
→parietal peritoneum
→visceral peritoneum

most, but not all, of the visceral organs are completely lined with visceral peritoneum

when an organ is lying against the dorsal body wall
and is covered by serosa on the ventral side only = **retroperitoneal**

eg. duodenum, most of pancreas, parts of large intestine

these layers are continuous with thin flaps of serous tissues = **mesenteries**

mesenteries
allow free movement while holding organs in place and prevent them from tangling

greater omentum
fold of mesentery extending from stomach and duodenum
loosely covers the small intestine like an apron
contains fat deposits

lesser omentum
smaller fold of mesentery between liver and stomach

Accessory Organs of Digestive Tract

A. Liver
is the largest gland in body
lies immediately under the diaphragm
consist of 2 **lobes** separated by **falciform ligament**

B. Gall Bladder
lies on undersurface of liver
→gall bladder stores and concentrates bile

C. Pancreas

most digestion is carried out by pancreatic enzymes

in curve of duodenum and dorsal to greater curvature of the stomach

composed of 2 kinds of glandular tissue:
endocrine → secretes hormones
islets = 2% of total mass of pancreas
their secretions pass into circulatory system
secrete insulin and glucagon
exocrine → digestive function

pancreatic digestive secretions are collected in **pancreatic duct**

and usually a smaller accessory pancreatic duct that both drain into the duodenum