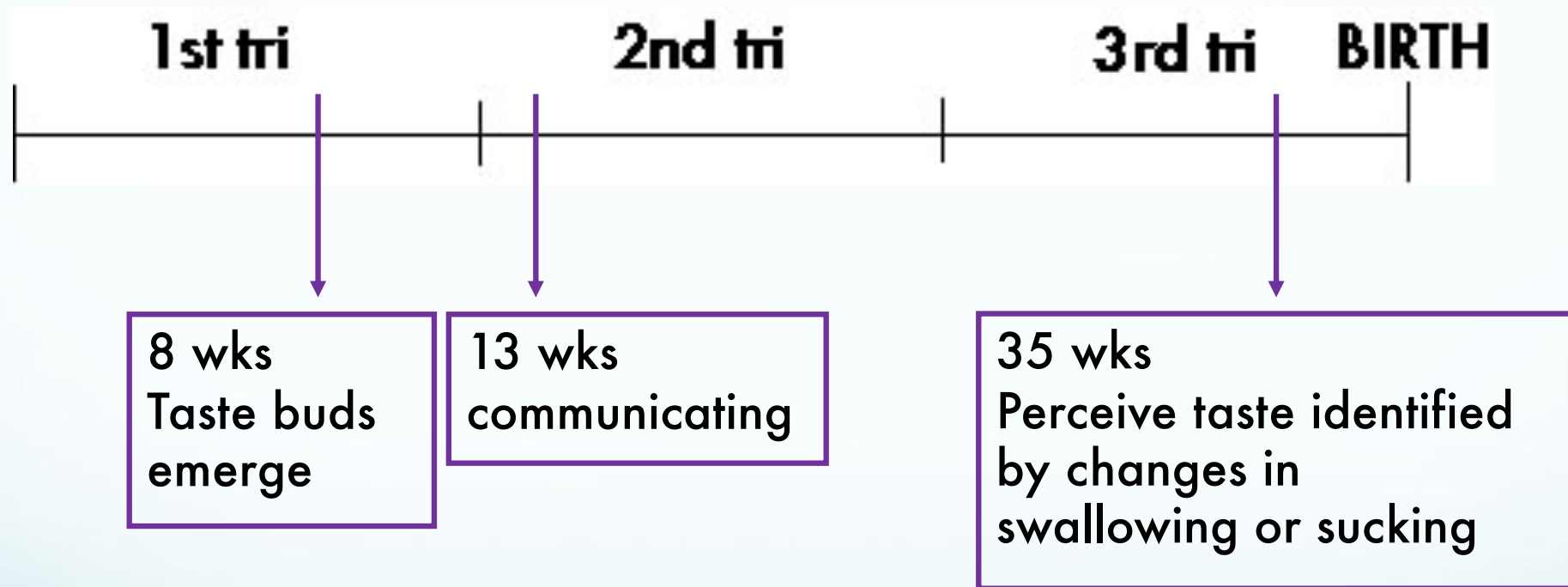


Taste Development



- At birth the ability to taste is fully developed
- There is an increase in the number of taste buds

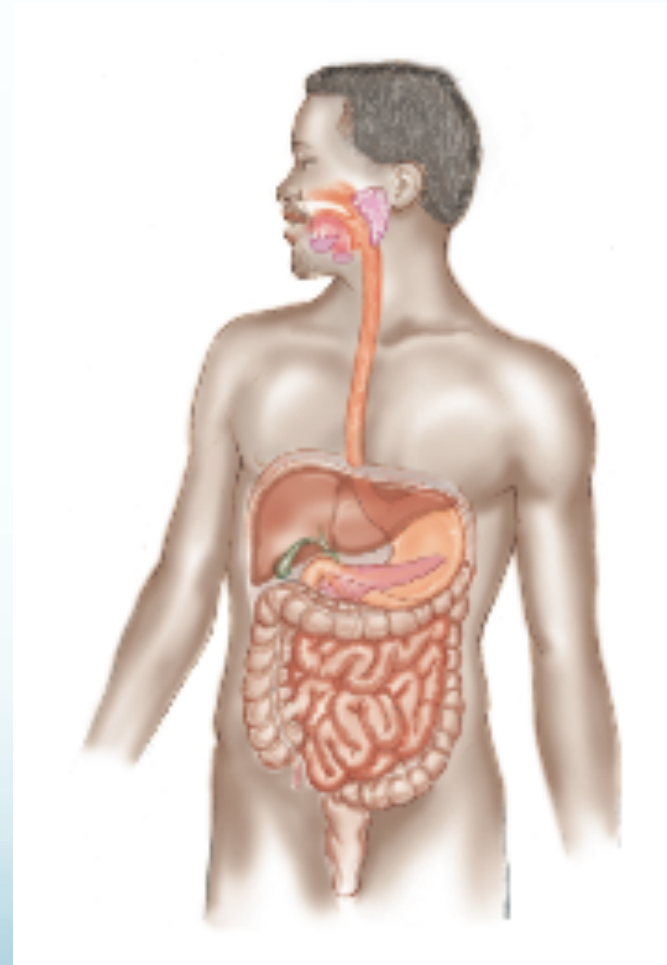
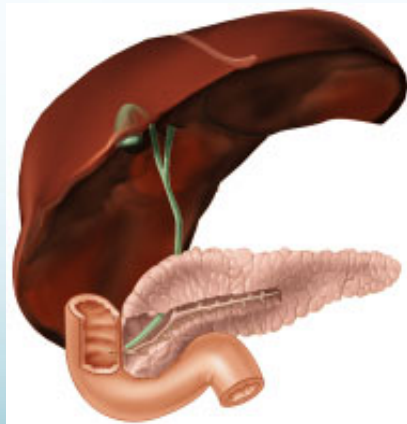
Things go horribly awry

- **Ageusia**
 - Loss of sense of taste
 - From neural damage
- **Anosmia**
 - a loss of the sense of smell.
 - It results when one can't smell due to damage to the olfactory nerve or zinc deficiency.
 - Uncinate fits- detect imaginary smells caused by damage to olfactory nerve or epileptic aura.
- **Hypogeusia**
 - Many diseases can produce hypogeusia.
 - In addition, drugs such as captopril and penicillamine, which contain sulfhydryl groups, cause temporary loss of taste sensation.



The Gastrointestinal (GI) Tract

- Organization
 - Parts (mouth → anus)
 - Mouth, esophagus, stomach, small intestine, large intestine, rectum
 - Accessory organs
 - Salivary glands, liver, gallbladder, and pancreas

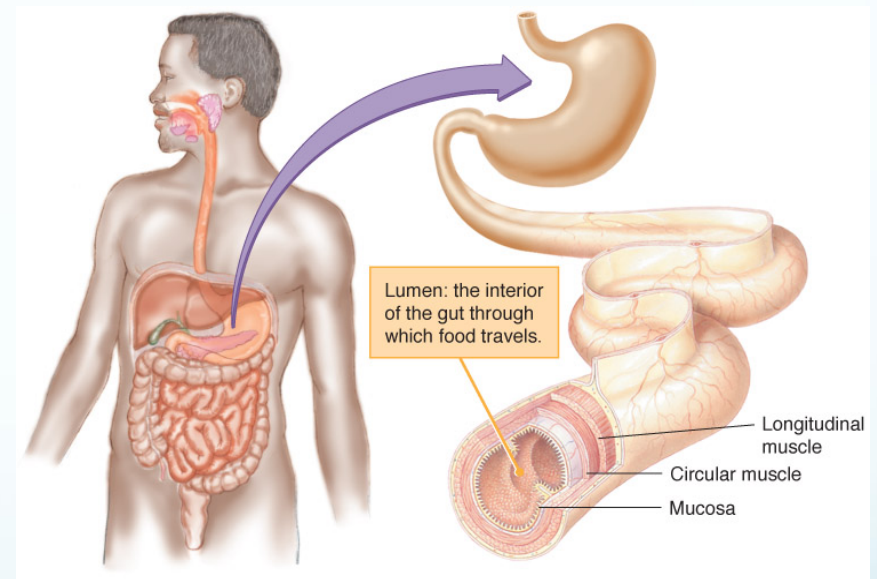


Organization of the GI Tract

- Functions:
 1. Ingestion (the receipt and softening of food)
 2. Transport of ingested food
 3. Secretion of digestive enzymes, acid, mucus, and bile
 4. Absorption of end products of digestion
 5. Movement of undigested material
 6. Elimination of waste material

Organization of the GI Tract

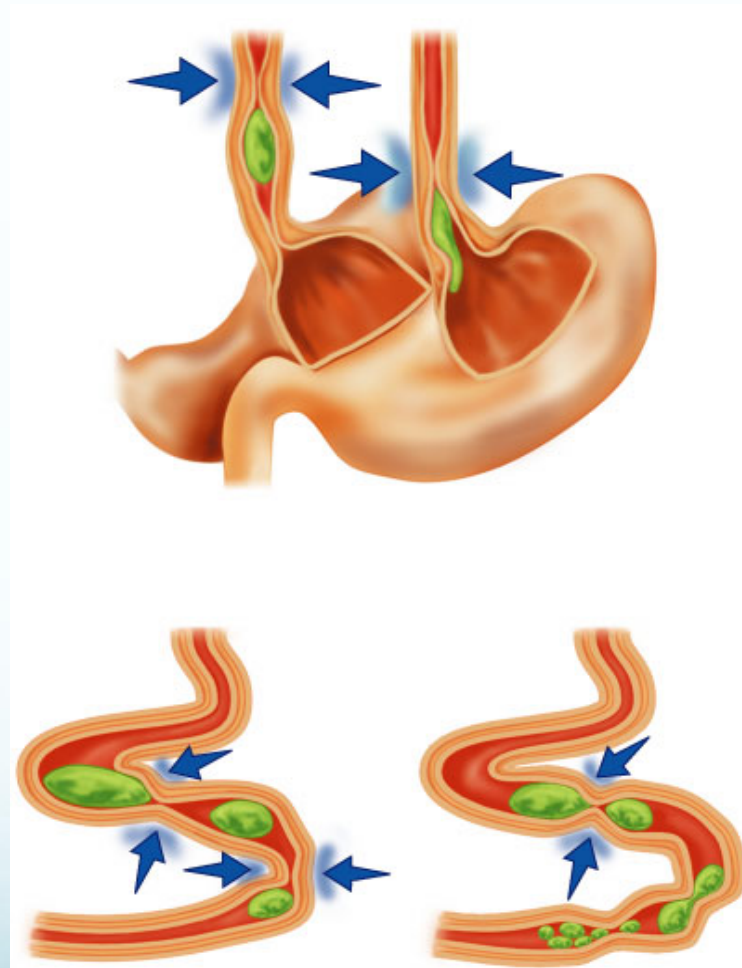
- Structural organization of the GI tract
 - Mucosa (innermost layer)
 - Glands and absorptive cells
 - Circular muscle and longitudinal muscle
 - Mix and move the food
 - Sphincter: valve that controls the movement of food material so that it travels through the GI tract in only one direction.



Overview of Digestion

- Mouth
 - Chewing → break food into smaller pieces
 - Saliva → lubricates the food → bolus
- Down the GI tract:
 - Physical movement
 - Peristalsis: waves of muscular contraction that helps push food down the GI tract
 - Segmentation: a periodic muscle contractions in the small intestine that move the content forward and backward.

Overview of Digestion



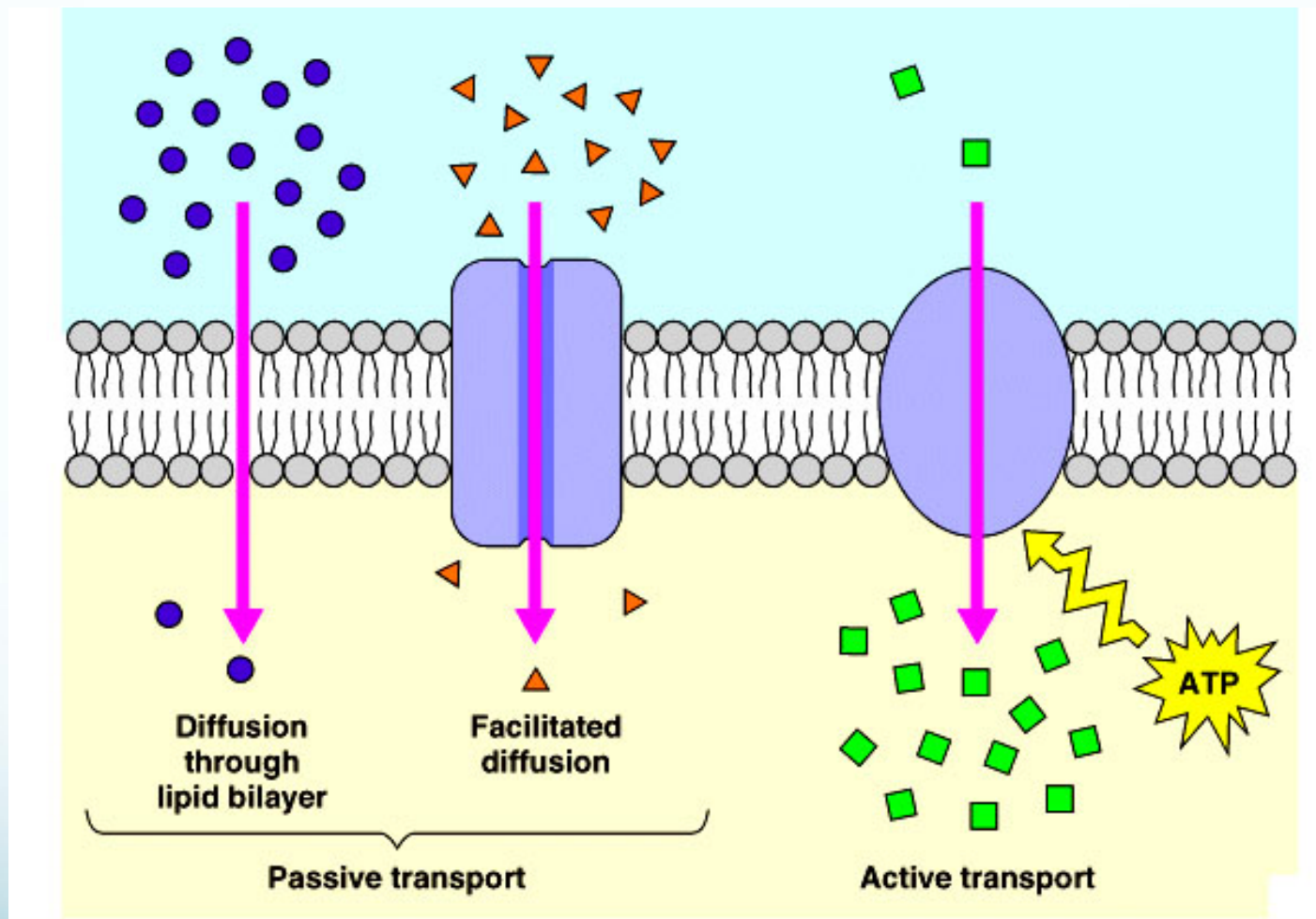
Overview of Digestion

- Chemical breakdown:
- Bolus → **Chyme**
- **Enzymes**: are proteins that **catalyze** (speed up) reactions but are not altered in the process.
 - Examples: amylase, lipase, etc.
- Other secretions:
 - Stomach Acid
 - Base
 - Bile
 - Mucus

Overview of Absorption

- 3 Main processes allow nutrients to be absorbed from GI tract → blood/circulation
 - Passive Diffusion: movement of molecules through cell membrane from high to low concentration gradient without energy use
 - Facilitated Diffusion: movement of molecules through cell membrane from high to low concentration gradient with a help of a transport protein
 - Active Transport: movement of molecules through cell membrane requiring both energy (ATP) and protein.

Overview of Absorption



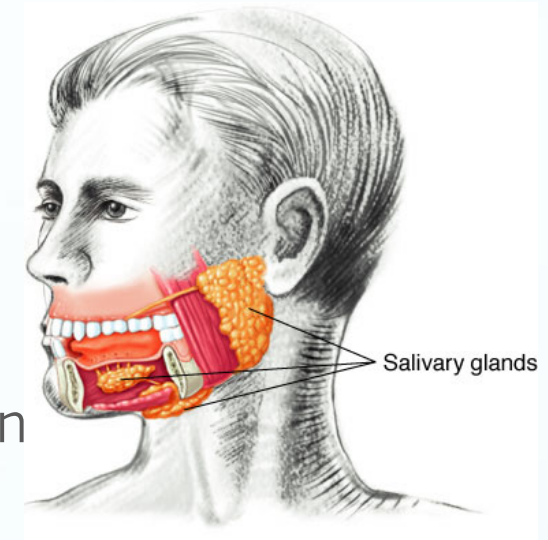
Assisting/Accessory Organs

1. Salivary glands

- Moisten food
- Supply enzymes

2. Liver

- Produce bile (fat emulsifier)
- “Detox center:” filters toxins in blood → kidn
- “Chemical factory”: >500 chemicals
 - Produce blood proteins, cholesterol, sugar
- “Dynamic Warehouse”: stores hormones, cholesterol, minerals, sugar, etc.

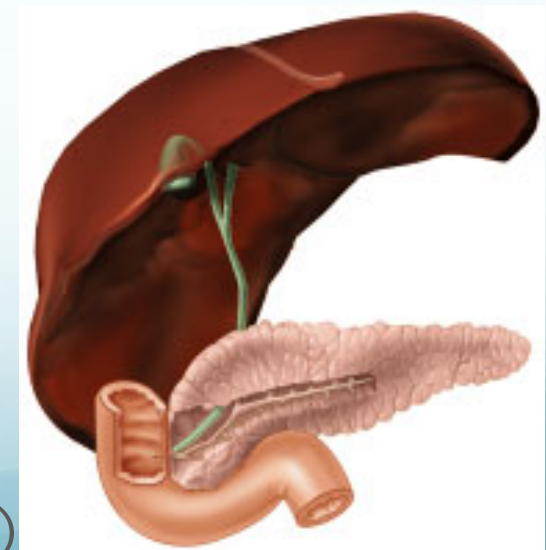


3. Gallbladder

- Stores and excretes bile
- **Bile’s Enterohepatic circulation:**
 - Liver → Gallbladder → Intestine → Liver

4. Pancreas

- Secretes bicarbonate, digestive enzymes
- Secretes hormones (insulin and glucagon)



- Mouth
 - Enzymes
 - **Salivary amylase**
 - **Lingual lipase**
 - Saliva
 - Moistens food for swallowing → **bolus**
- Esophagus
 - Transports food to stomach
 - Esophageal sphincter (“cardiac sphincter”)
 - “Heartburn”

- Stomach Enzymes:

- **Hydrochloric acid/gastric acid**

1. kills bacteria
2. prepares protein for digestion

1. breaks down 3D structure of protein

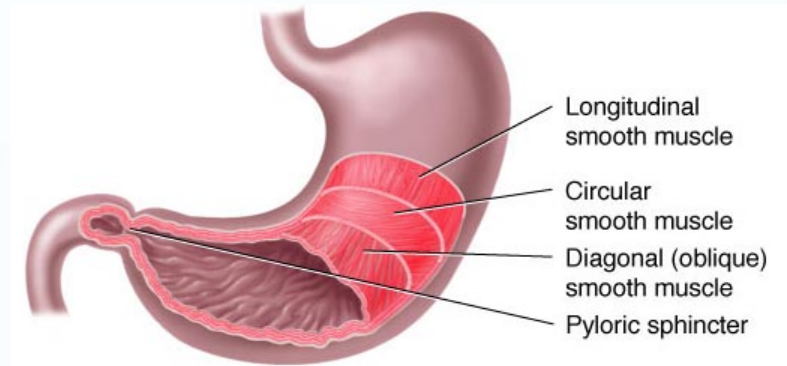
2. **Pepsinogen** (inactive) → Pepsin (active)

- **Pepsin**: breaks down protein into smaller pieces

- **Gastric lipase**: some fat digestion

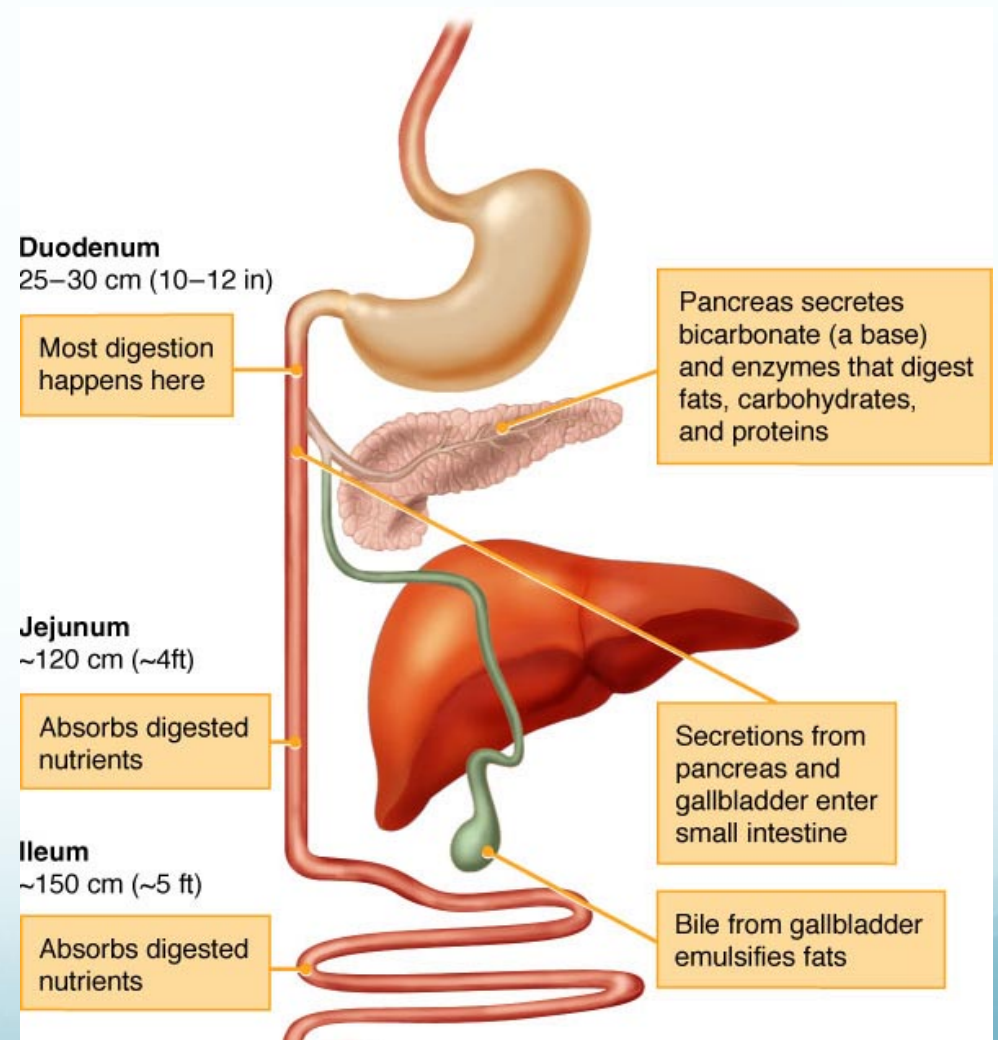
- **Gastrin** (hormone) stimulates gastric secretion and movement

- **Intrinsic factor** is needed for vitamin B12 absorption.



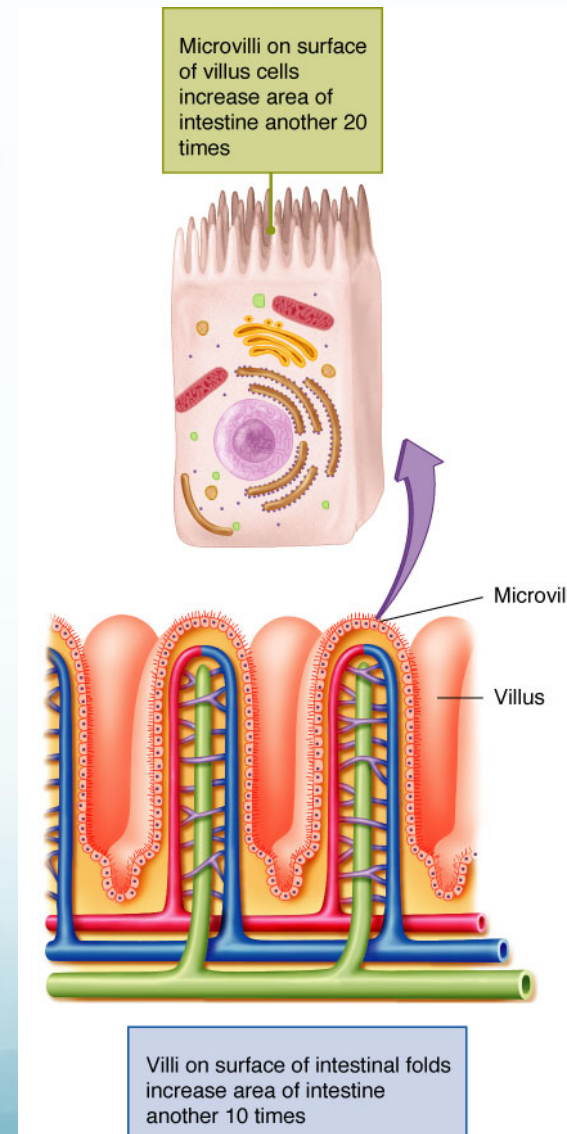
Putting It All Together: Digestion and Absorption

- Small intestine (~10ft)
 - **Pyloric Sphincter**
 - Sections of small intestine:
 - **Duodenum**
 - **Jejunum**
 - **Ileum**
 - Nutrient digestion
 - **Bicarbonate** neutralizes stomach acid
 - Pancreatic and intestinal enzymes to digest carbohydrates, lipids, and proteins.



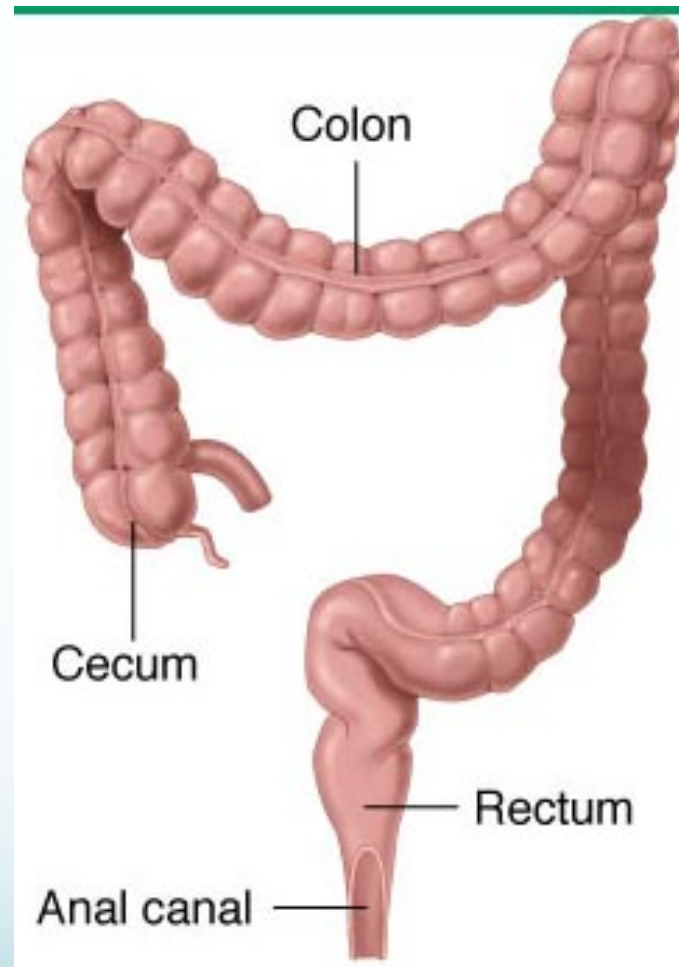
Putting It All Together: Digestion and Absorption

- Small intestine
 - Completes absorption:
 - **Folds, villi, microvilli** expand absorptive surface
 - 600x fold increase/tennis court!
 - Most nutrients absorbed here
 - Fat-soluble nutrients → lymphatic system (**lymphatic vessel in the intestinal villus**)
 - Water-soluble nutrients → **bloodstream**.



Putting It All Together: Digestion and Absorption

- Large Intestine
 - **Ileocecal valve**
 - Sections
 - Cecum, colon, rectum, and anal canal
 - Digestion
 - Peristaltic movement is slow, taking 18-24 hours for material to travel
 - Some bacterial activity (e.g. fiber digestion)

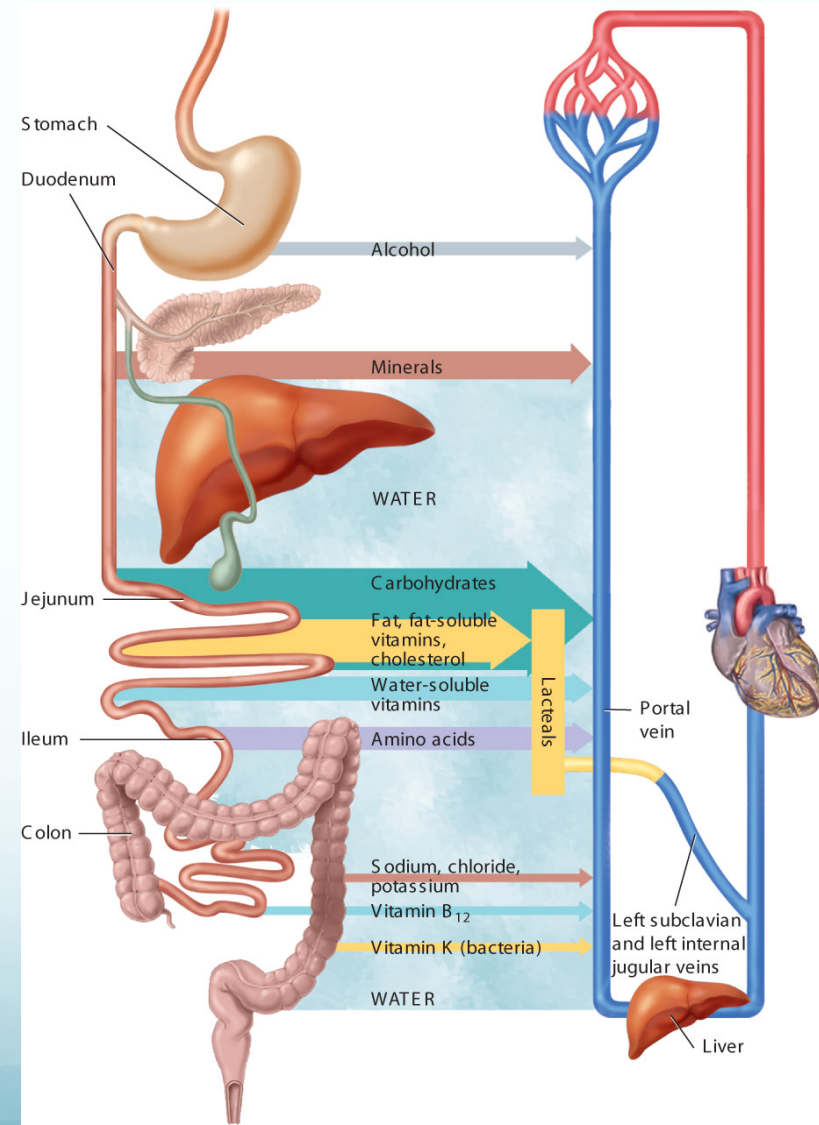


Beans, Beans, Beans!

- Beans are made up of oligosaccharides (e.g. *raffinose* and *stachyose*), a component of fiber.
- They are ignored until they are met by 700+ species of bacteria in your large intestine.
 - Bacteria digests these sugars → gases accumulate → **flatulence**

Putting It All Together: Digestion and Absorption

- Large Intestine:
 - Absorption
 - Water
 - Na, K, Cl
 - Vitamin K (produced by bacteria)
 - Elimination at anal sphincter
 - Feces: 60% solid (bacteria, dietary fiber, digestive secretions), 40% water



Circulation of Nutrients

Vascular System

- Veins and arteries
- Water soluble nutrients are absorbed into the capillaries of the intestines.
- Blood carries nutrients through portal vein to the liver before dispensing them through the body.

Lymphatic system

- Vessels that drain **lymph** (clear fluid formed in the spaces between cells)
- Fat soluble-vitamins are absorbed into lymph vessels in the intestine.
- Bypasses liver and delivers nutrients to veins in the neck → enter blood

Circulation of Nutrients

