

Chapter 15

Food and Digestion

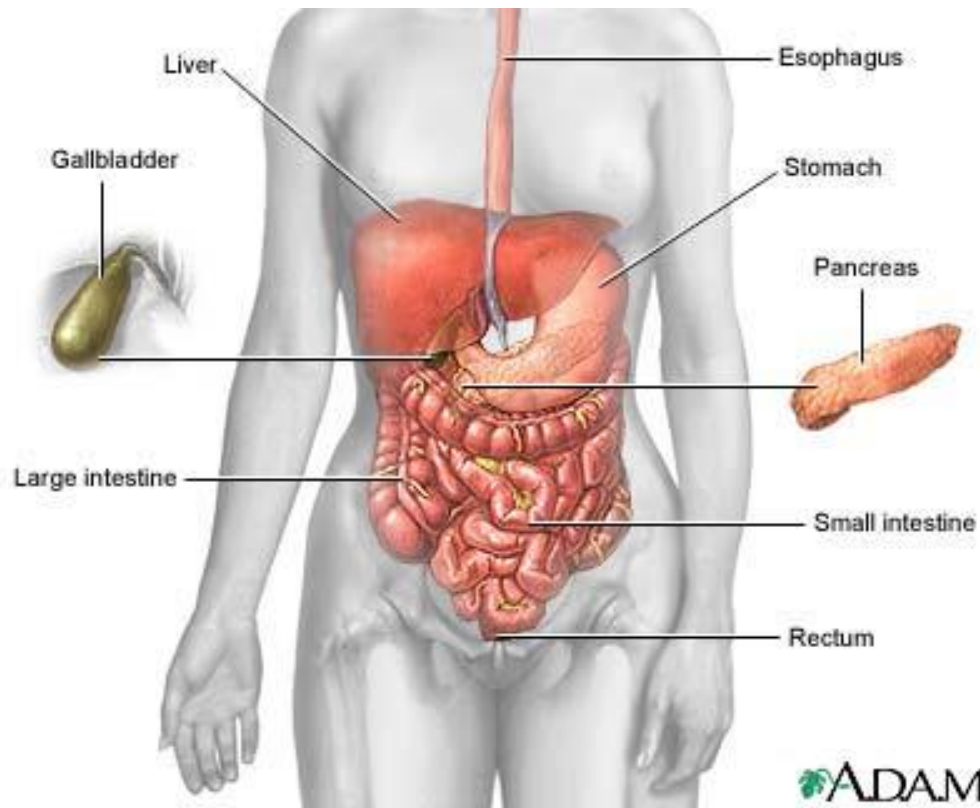
Activity:

- Use Qualitative Observations (5 senses) to describe:
 - What happens when you see candy?
 - How does it smell?
 - How do you chomp it into smaller pieces or swallow candy pieces whole? Where does it go?
 - Are there any nutrients in candy? Any negative substances?



15.1A

Food and Energy



Functions of Nutrients

- a. Growth
- b. Repair/replacement
- c. Cell regulation
- d. Energy
 - Calories = amt. of energy in food
 - RDA depends on age, gender, size and activity level

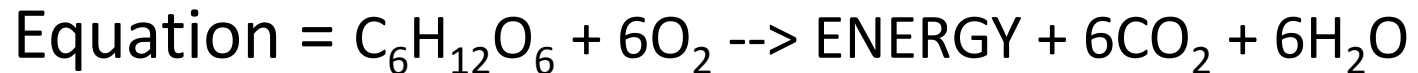


Types of Nutrients

(includes carbs, proteins, lipids, water, vitamins & minerals)

• **Carbohydrates**

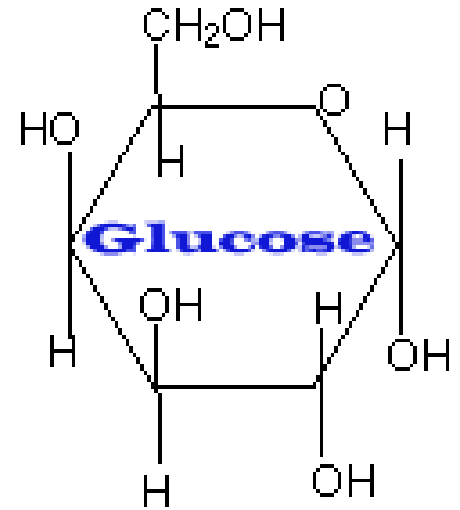
- a. Used for Energy (in the Mitochondria)
- b. Made of sugars
- c. Energy stored in the chemical bonds of glucose
- d. **Cellular respiration** breaks bonds & releases cellular energy (ATP)



- Stage one in the cytoplasm; stage 2 in the mitochondria

Types of Carbohydrates

- a. Simple sugars = $C_6H_{12}O_6$
 - i. Glucose, fructose, galactose



- b. Complex sugars = 2 simple sugars joined
 - i. sucrose (table sugar) is glucose + fructose



Types of Carbohydrates

c. Complex Carbohydrates

- i. Long complex chains of SS
- ii. rice, pasta, potatoes, bread, veggies
- iii. Contain nutrients other than just sugars.



Types of Carbohydrates

d. **Cellulose** = very complex chains of SS found in plant cell wall

- i. humans cannot digest
- ii. provides **fiber** to clean digestive syst., esp. colon

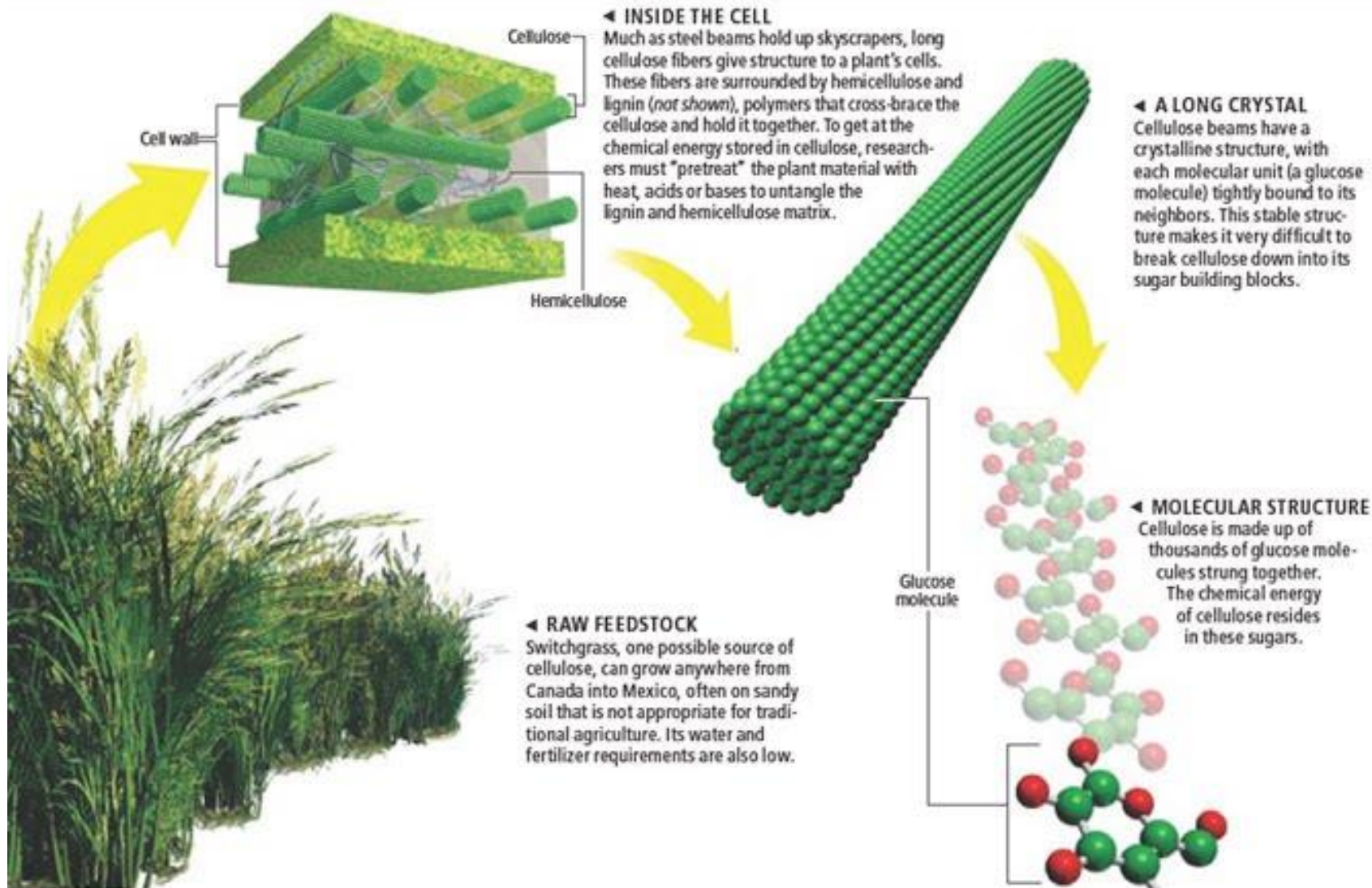


[BASICS]

Cellulose Scaffolding

In nature, cellulose supports a plant's vertical growth. It has a crystalline molecular structure that is both rigid and highly resistant to decomposi-

tion. Those features lend the plant stiffness but pose difficulties for those who would convert it into useful fuel.



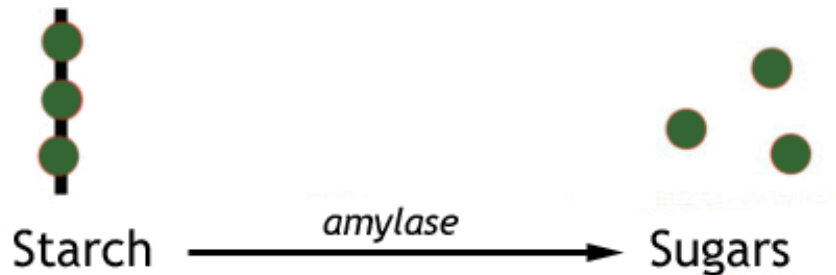
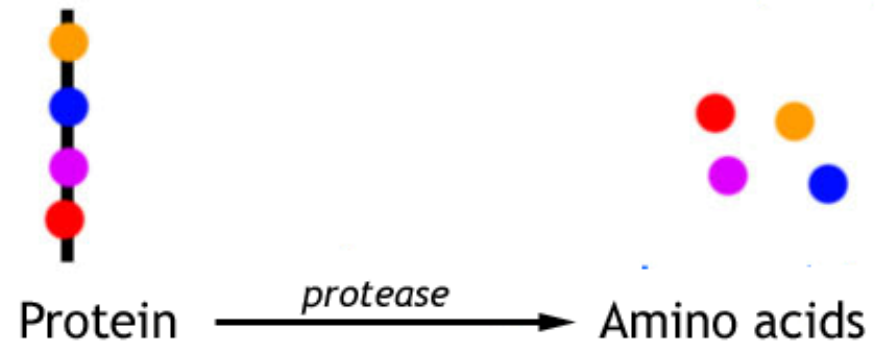
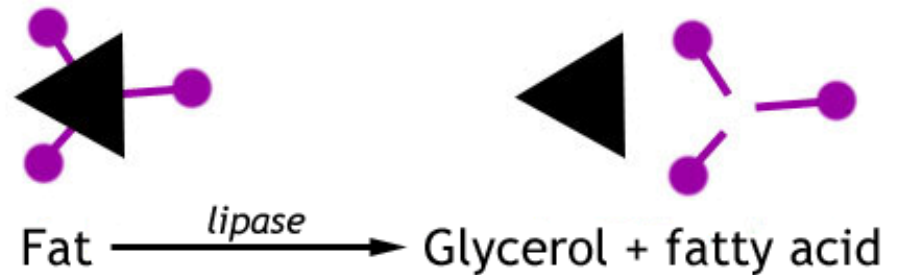
e. Excess Carbs

- i. Stored first as starch (glycogen) in liver and muscles
- ii. when they are full - converted to fat and stored in adipose tissue (fat tissue)



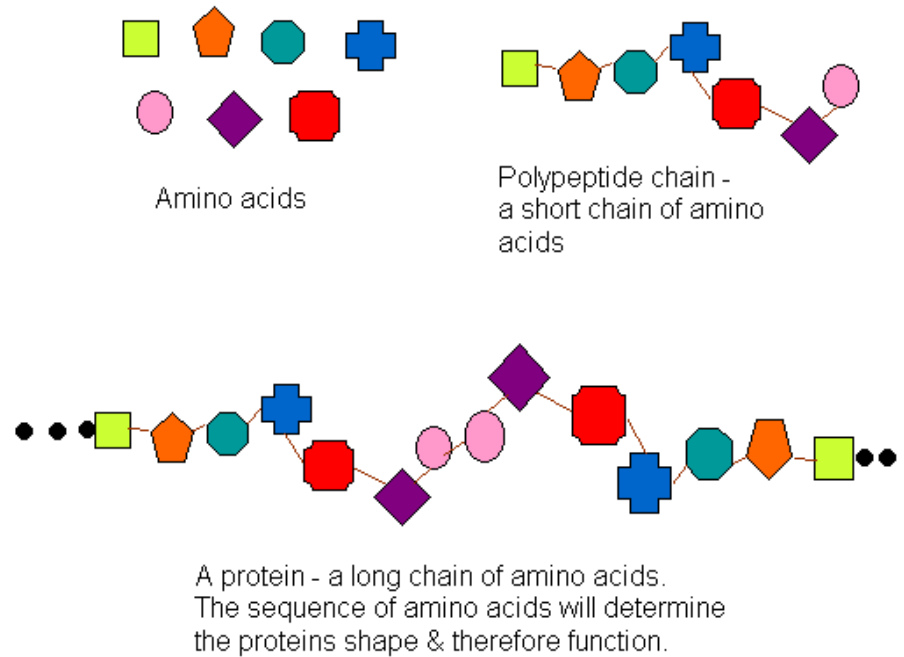
Functions of Proteins

- a. Growth
- b. Repair/replacement
- c. **Enzymes**
 - i. Control/ speed up chemical reactions



Structure of Proteins

- a. Made of chains of amino acids (AA)
- b. 20 amino acids needed
 - i. 12 can be made by human cells
 - ii. 8 must be ingested = essential AAs
- c. Body breaks down protein into AAs then reassembles.



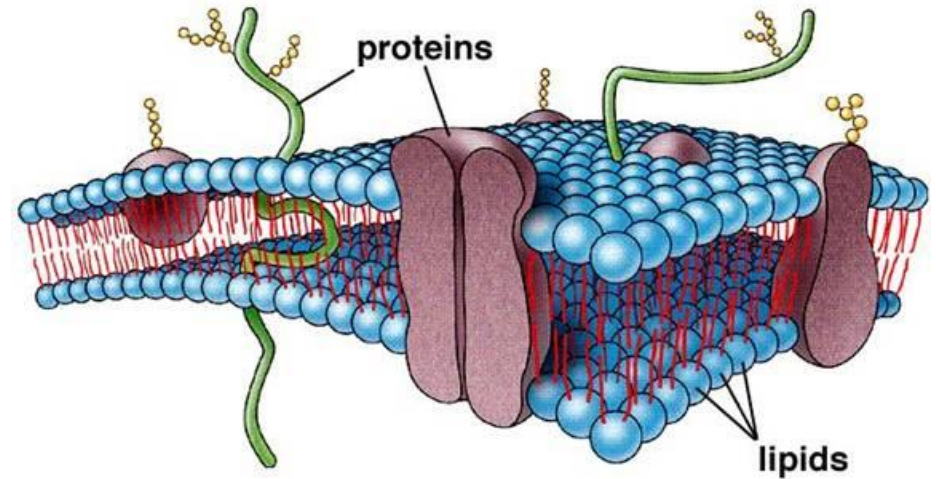
Types of Proteins

- a. Complete Proteins = contain all 8 essential AAs
examples: meats, fish, eggs, and milk
- b. Incomplete proteins = only some essential AAs
examples: beans, peas, nu



Fats

Small Portion of a Plasma Membrane



- a. Insulation/ protection
- b. Storage of energy & fat-soluble Vitamins
- c. Saturated vs. Unsaturated fats



Types of Fats

- a. Saturated fats
 - i. animal
 - ii. cause high cholesterol & heart disease
- b. Unsaturated fats
 - i. plant oils
 - ii. liquid at room temp.
- c. 2x as many calories as carbs or proteins

GOOD FATS VS. BAD FATS

<ul style="list-style-type: none">* Absorb Nutrients* Lubricate Joints* Maintain Cell Membranes	<ul style="list-style-type: none">* Increases Weight* Heart Disease* Cancer
<p>Omega 3 & 6 Polyunsaturated Fat Oil: Corn, Soybean Fatty Fish: Salmon, Tuna, Mackerel</p> 	<p>Bacon & Bacon Grease Stick Butter Whipped Cream Ice Cream Lard & Salt Pork Palm & Palm Kernal Oil</p> 
BEST FATS	WORST FATS
<p>Oils: Canola, Olive, Peanut Avacado Nuts Olives Peanut Butter Sesame Seed</p> 	 <p>Margarine Transfat Shortening Non Dairy Creamers Hydrogenated Fats</p>

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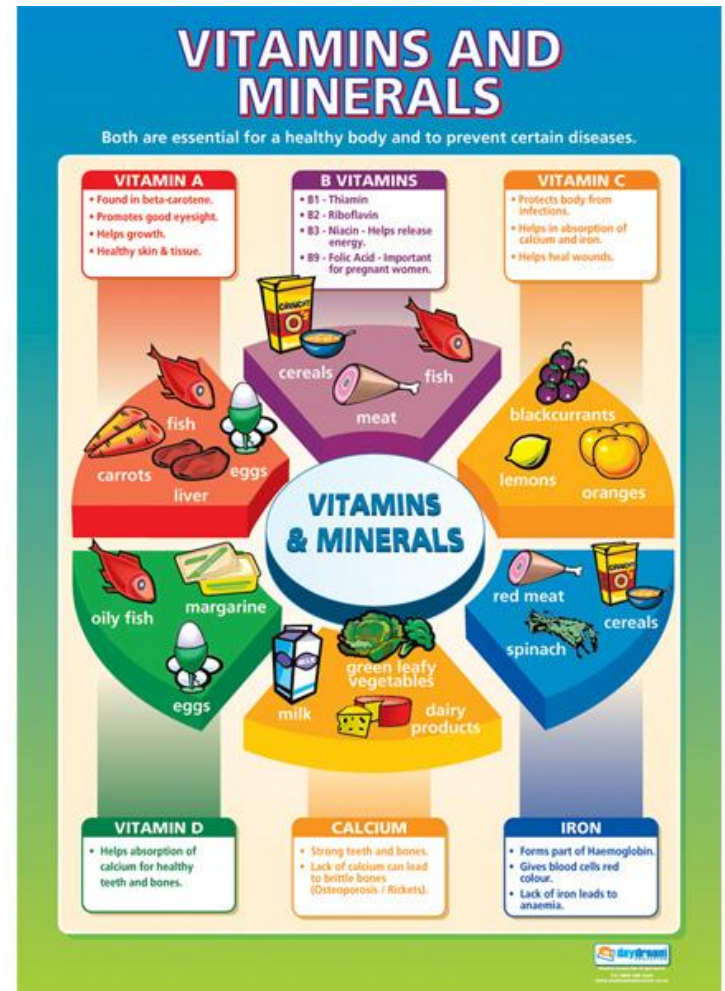
Vitamins

- **Vitamins** - Organic nutrients needed in small amounts.
- Types of Vitamins:
 - a. water-soluble = dissolve in water; excess washed out
 - b. fat-soluble = do not dissolve in water; accumulate in fatty tissue; can be toxic
- Balanced diet supplies enough
- **Deficiency** - lack of adequate amounts



Minerals

- Minerals - Inorganic nutrients needed in small amounts
 - Elements on the Periodic Table
- Come from soil
- Functions to keep you healthy:
 - a. build cells – calcium (Ca) & phosphorus (P)
 - b. send nerve impulses - sodium & potassium pump (Na +/ K+)
 - c. carry oxygen – iron (Fe)
 - d. Immune system- zinc (Zn)



Water

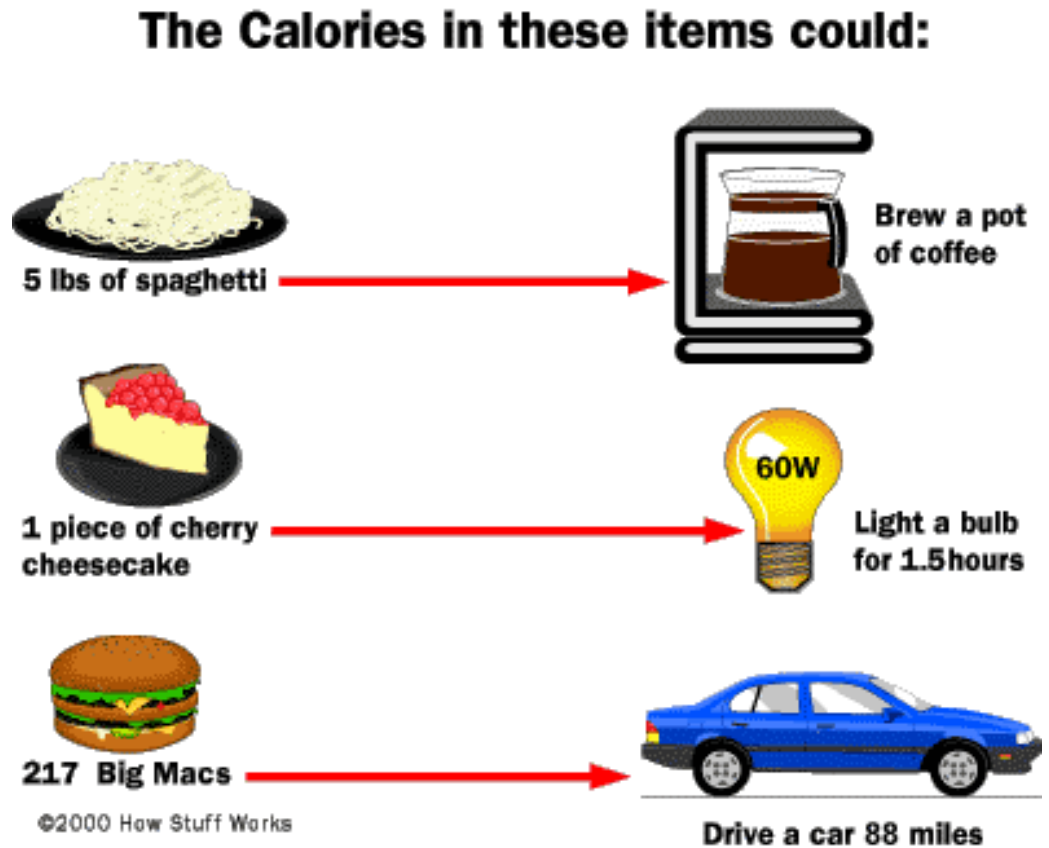
- Body is 60% water.
- Functions:
 - a. solvent
 - b. medium for chem. rxns.
 - c. transport
 - d. waste removal
 - e. cooling



Section 15.1B

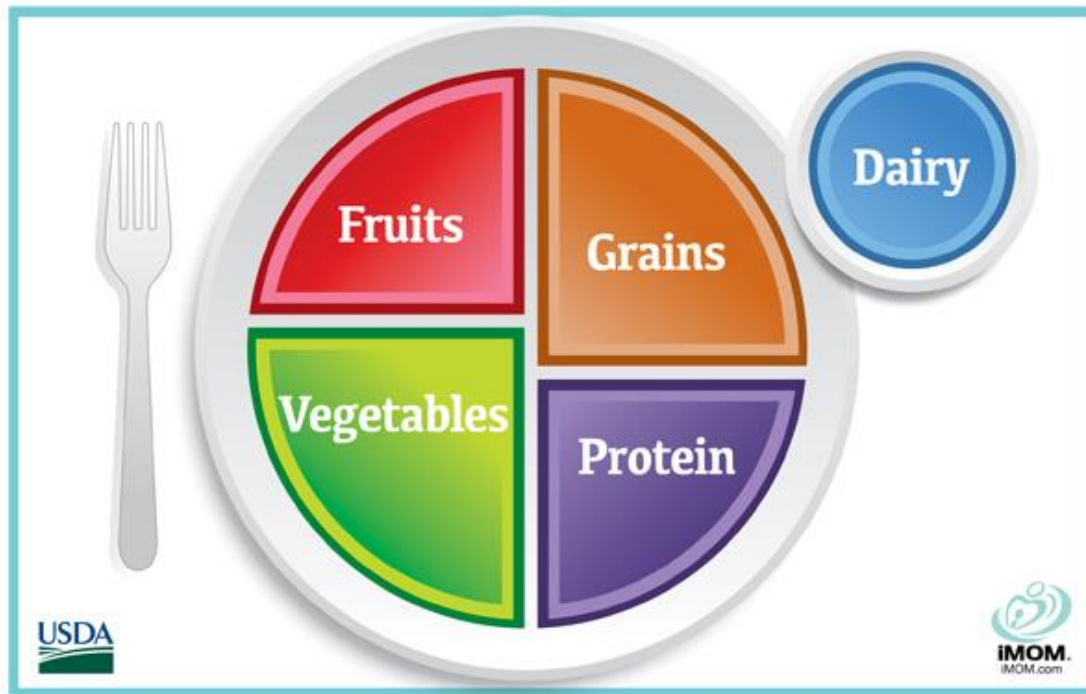
Guidelines for a Healthy Diet

- Calorie needs depend on physical activity
 - i. 13 year old girls
 - 1600-2200 calories/ day
 - ii. 13 year old boys
 - 1800-2400 calories/ day



Choose My Plate

- The Food Plate is a visual reference to help people make well balanced food choices at meal time.



My Daily Food Plan



Make half your grains whole

Aim for at least **3 ounces** of whole grains a day

Vary your veggies

Aim for these amounts **each week:**

Dark green veggies
= 1 1/2 cups

Red & orange veggies
= 5 1/2 cups

Beans & peas
= 1 1/2 cups

Starchy veggies
= 5 cups

Other veggies
= 4 cups

Focus on fruits

Eat a variety of fruit

Choose whole or cut-up fruits more often than fruit juice

Get your calcium-rich foods

Drink fat-free or low-fat (1%) milk, for the same amount of calcium and other nutrients as whole milk, but less fat and Calories

Select fat-free or low-fat yogurt and cheese, or try calcium-fortified soy products

Go lean with protein

Twice a week, make seafood the protein on your plate

Vary your protein routine—choose beans, peas, nuts, and seeds more often

Keep meat and poultry portions small and lean

Find your balance between food and physical activity

Be physically active for at least **150 minutes** each week.

Know your limits on fats, sugars, and sodium

Your allowance for oils is **6 teaspoons** a day.

Limit Calories from solid fats and added sugars to **260 Calories** a day.

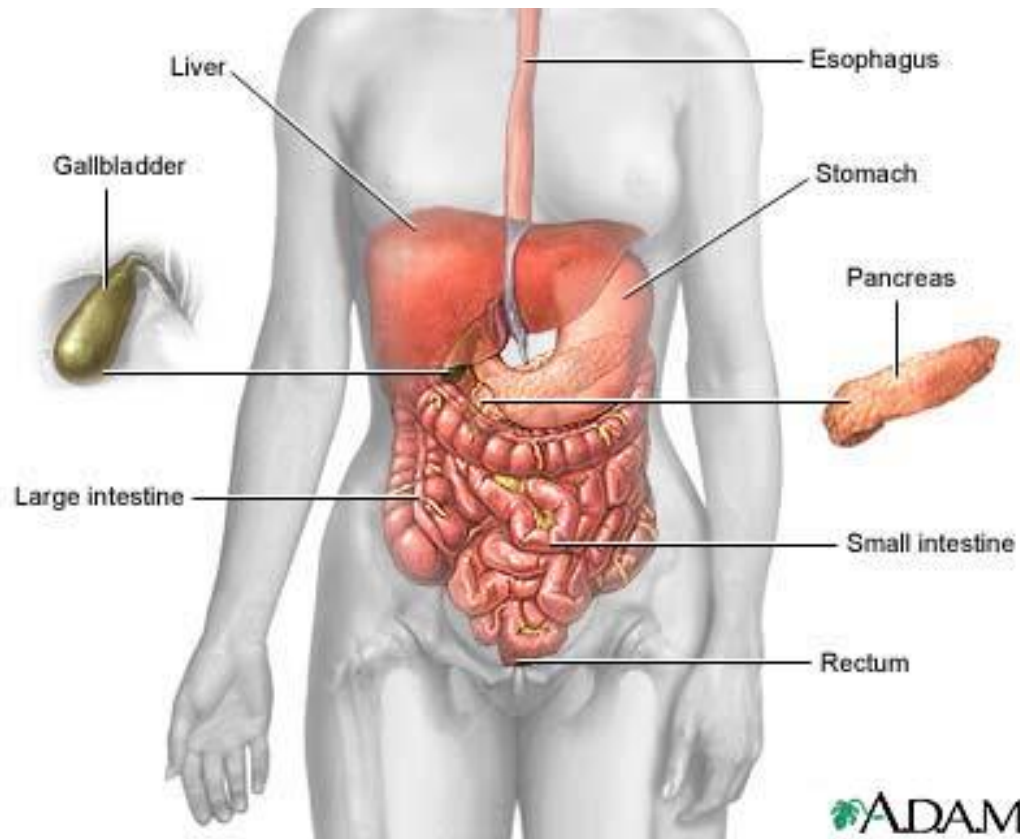
Reduce sodium intake to less than **2300 mg** a day.

Food Labels

- a. Serving Size = size of a single serving and how many servings in container
- b. Calories = how much energy from one serving
- c. % Daily Value = nutritional content in food for one day
- d. Ingredients = listed in order of weight, starting with main ingredient

Nutrition Facts	Amount/serving	%DV*	Amount/serving	%DV*
Serv. Size 1 cup (249g) Servings About 2 Calories 250 Fat Cal. 110 <small>*Percent Daily Values (DV) are based on a 2,000 calorie diet.</small>	Total Fat 12g	18%	Sodium 940mg	39%
	Sat. Fat 6g	30%	Total Carb. 24g	8%
	Polyunsat. Fat 1.5g		Dietary Fiber 1g	4%
	Monounsat. Fat 2.5g		Sugars 1g	
	Cholest. 60mg	20%	Protein 10g	20%
	Vitamin A 0% • Vitamin C 0% • Calcium 6% • Iron 8%			
	INGREDIENTS: WATER, CHICKEN STOCK, ENRICHED PASTA (SEMOLINA WHEAT FLOUR, EGG WHITE SOLIDS, NIACIN, IRON, THIAMINE MONONITRATE [VITAMIN B1], RIBOFLAVIN [VITAMIN B2] AND FOLIC ACID), CREAM (DERIVED FROM MILK), CHICKEN, CONTAINS LESS THAN 2% OF: CHEESES (GRANULAR, PARMESAN AND ROMANO PASTE (PASTEURIZED COW'S MILK, CULTURES, SALT, ENZYMES), WATER, SALT, LACTIC ACID, CITRIC ACID AND DISODIUM PHOSPHATE), BUTTER (PASTEURIZED SWEET CREAM (DERIVED FROM MILK) AND SALT), MODIFIED CORN STARCH, SALT, WHOLE EGG SOLIDS, SUGAR, DATEM, RICE STARCH, GARLIC, SPICE, XANTHAN GUM, CHEESE FLAVOR (PARTIALLY HYDROGENATED SOYBEAN OIL, FLAVORINGS AND SMOKE FLAVORING), MUSTARD FLOUR, ISOLATED SOY PROTEIN AND SODIUM PHOSPHATE.			

15.2—digestion



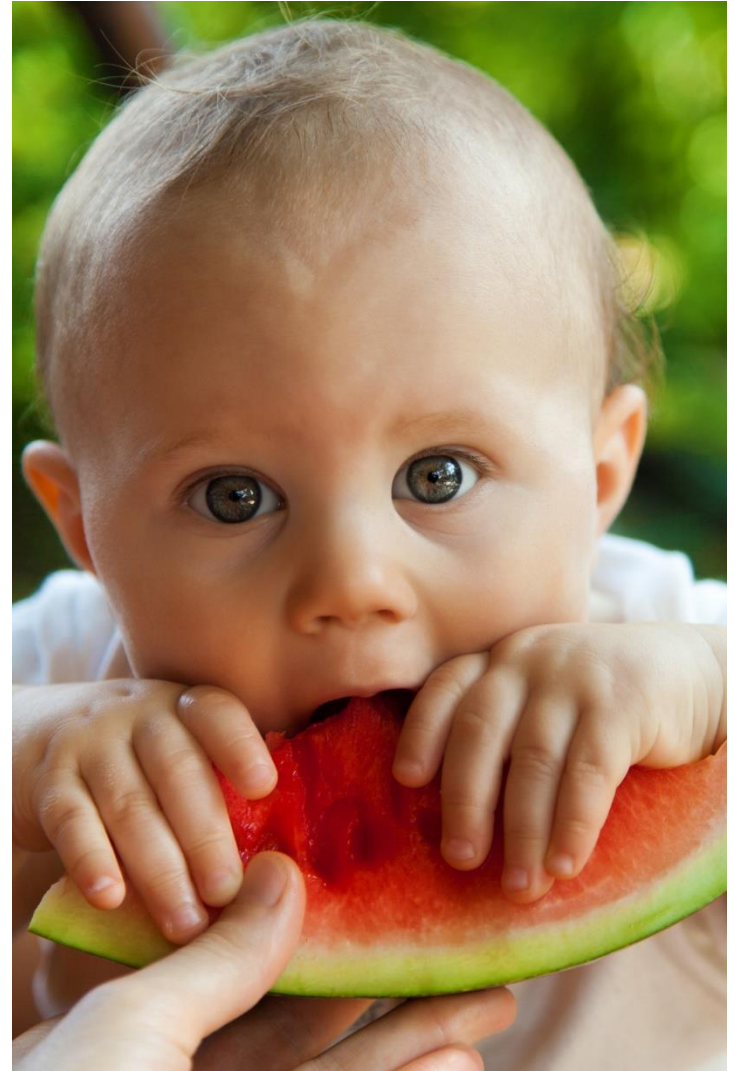
Functions of the Digestive System

a. Digestion- Breaking down food into nutrients;

2 forms: Physical & Chemical

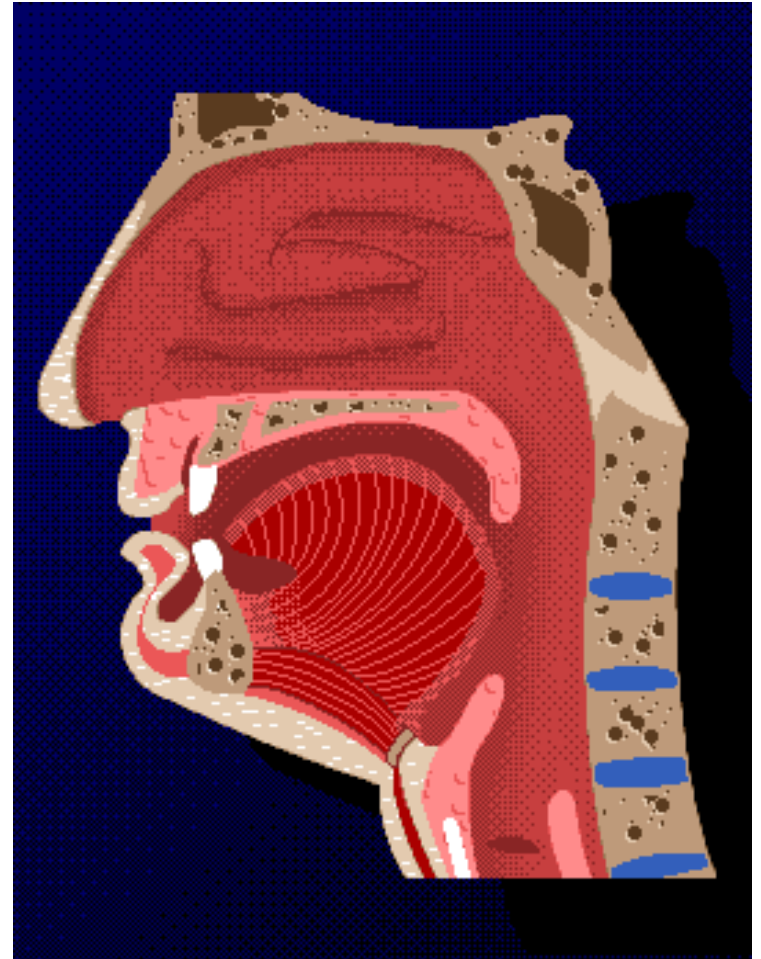
b. Absorption- Nutrients move into blood

c. Elimination- Waste products leave the body



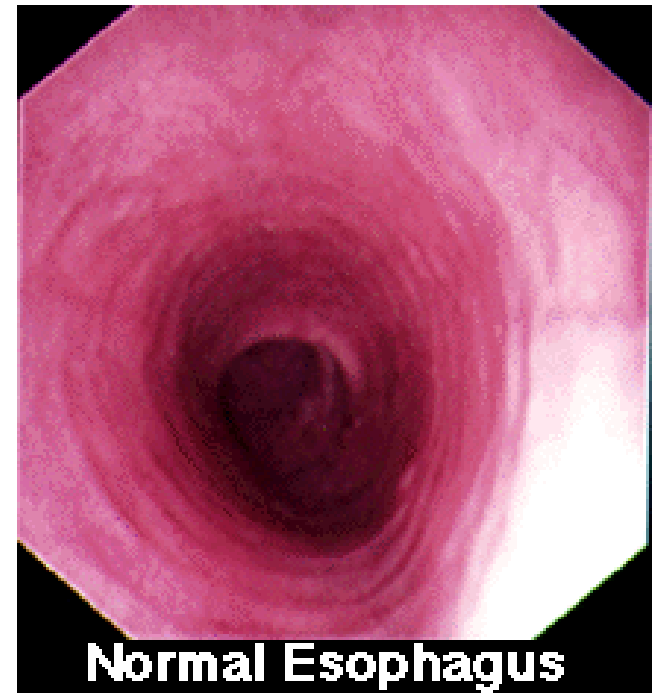
Parts of the Digestive System

- a. **Mouth** (teeth, tongue, saliva)
 - i. Mechanical + Chemical Digestion both begin here
 - 1. **Mechanical** = physical change (chewing into smaller pieces)
 - 2. **Chemical** = molecular bonds are broken (carbs → sugar)
 - ii. **Enzymes** = proteins that speed up chemical reactions
 - 1. Found in saliva (amylase to break carbs to glucose)



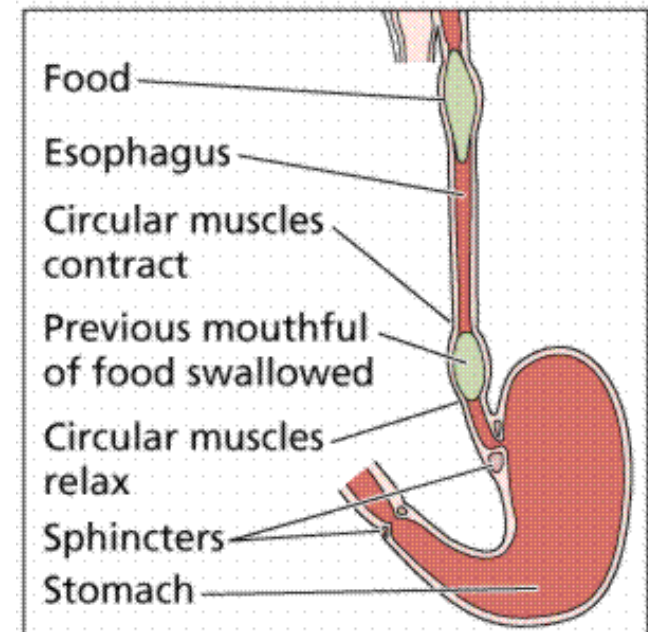
b. Esophagus

- i. Muscular, connects mouth to stomach
- ii. Lined with mucus to ease swallowing and movement
- iii. **Epiglottis** = flap that covers windpipe, prevents choking
- iv. **Peristalsis** = wave-like muscular contractions of smooth muscle to move food through GI tract



Normal Esophagus

Peristalsis



c. Stomach = j-shaped, muscular pouch

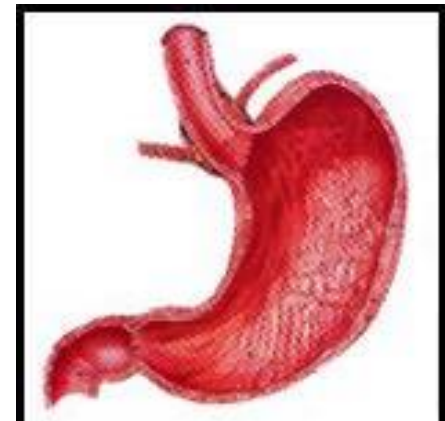
i. Mechanical Digestion

- food is churned + becomes chyme

ii. Chemical Digestion

- gastric juices containing pepsin breaks down proteins into amino acids
- Hydrochloric acid (HCl) kills bacteria

iii. Mucus lining protects lining from acid

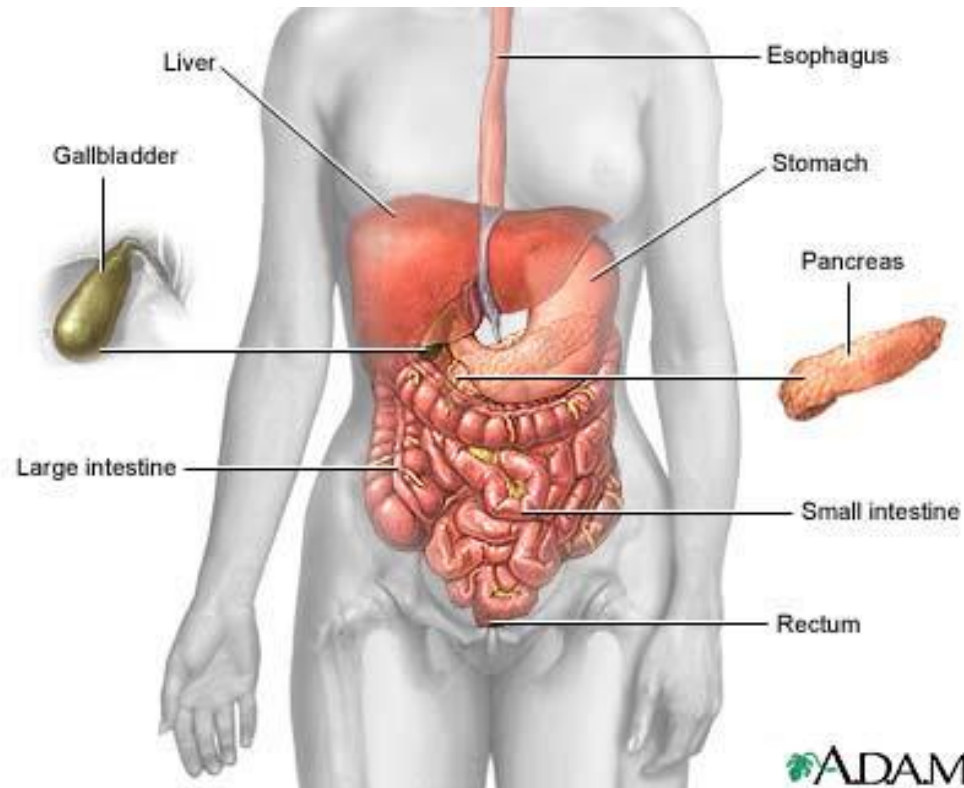


This schematic of the Stomach shows the Esophagus leading into the Stomach which empties into the Small Intestine. The Stomach is in the abdomen with the Esophagus in the chest. The Diaphragm, or breathing muscle, separates the two.



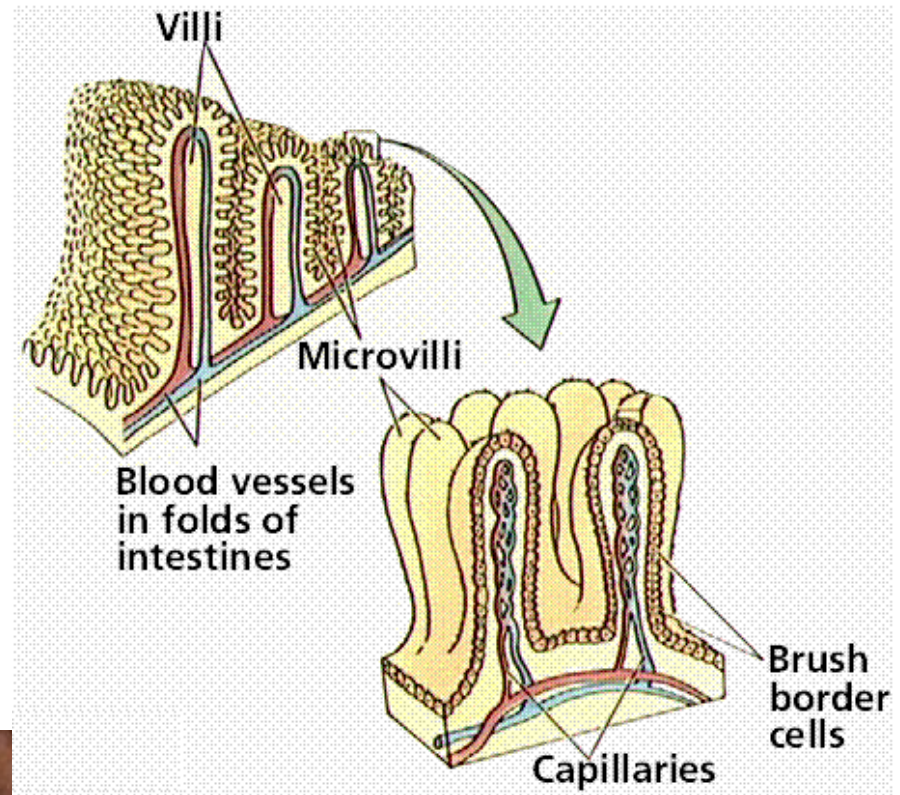
Normal Stomach Lining

15.3—Final Digestion and Absorption



d. Small Intestine

- i. Responsible for the *most* chemical digestion
- ii. **Villi and microvilli** increase surface area to absorb nutrients into bloodstream



*** Accessory Organs ***

e. Liver= largest and heaviest organ

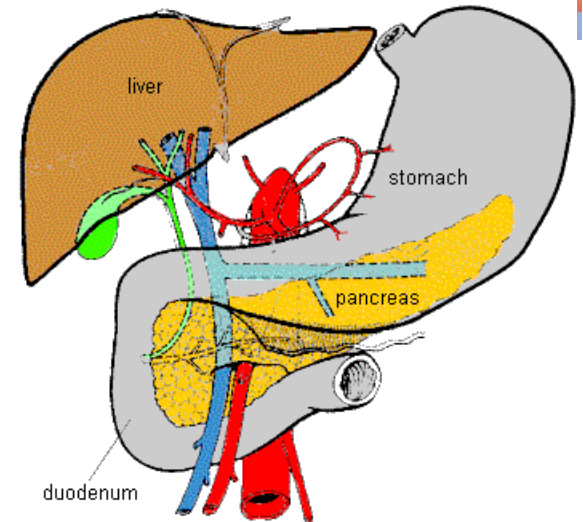
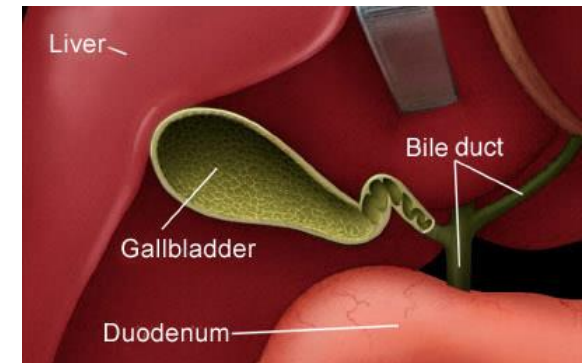
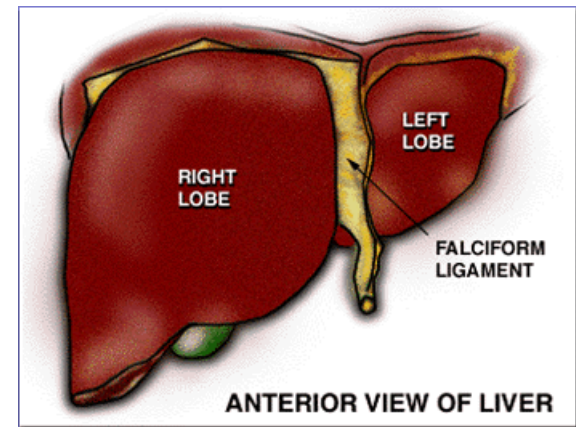
- i. Breaks down medicines, toxins
- ii. Produces **Bile** = breaks down fats
- iii. Stores excess carbs as glycogen for energy

f. Gall Bladder - small sac

- stores bile

g. Pancreas = Triangular organ between upper SI and stomach

- i. Produces enzymes that are secreted into SI that break down starches, proteins, fats and Produces – ***insulin**



h. Large Intestine = aka. Colon

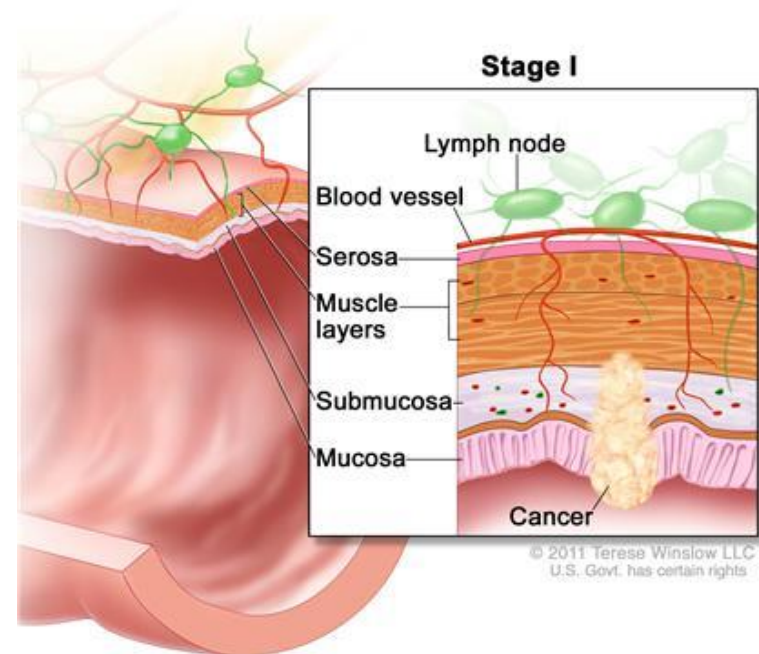
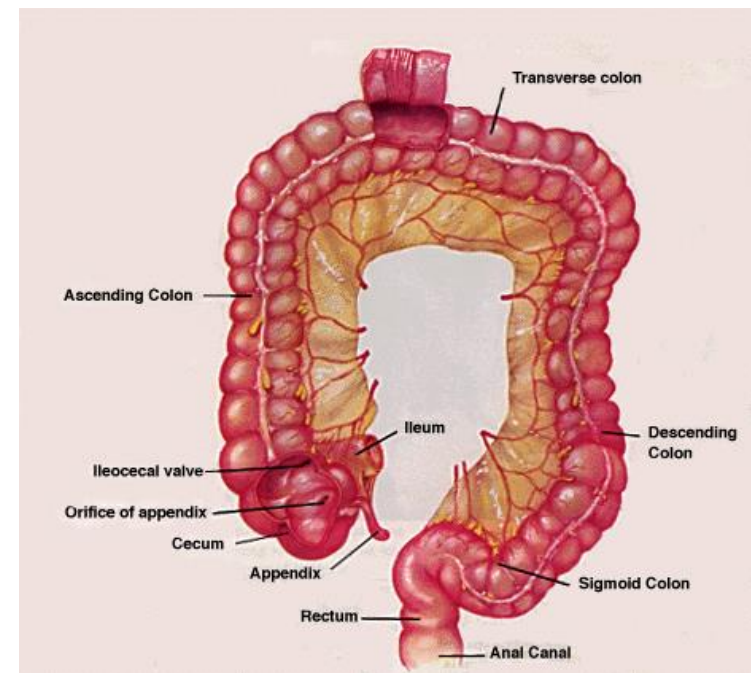
- i. Water is absorbed here
- ii. Contains bacteria that makes Vitamin K (blood clotting)

i. Rectum = short tube at the end of LI

- i. Waste storage

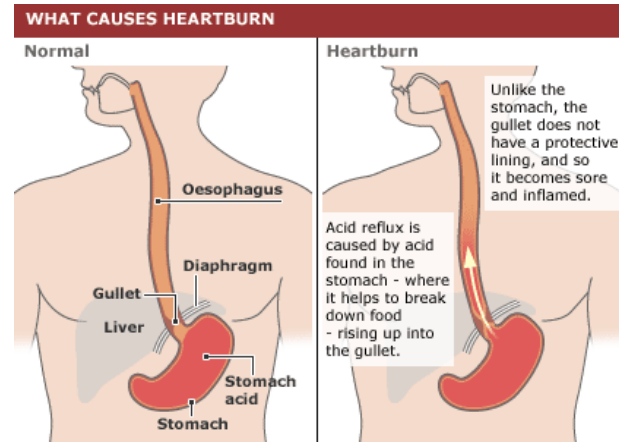
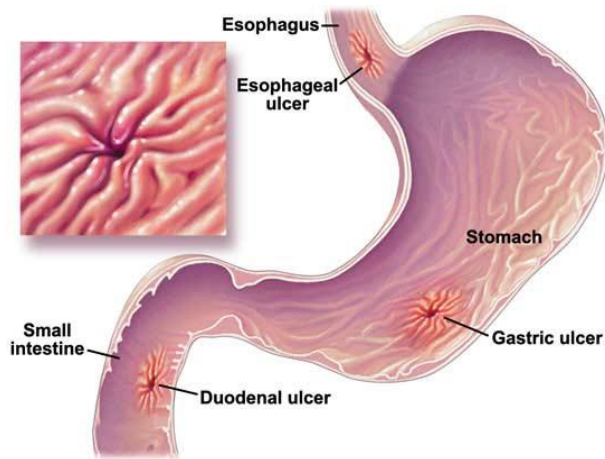
j. Anus = opening

- i. Where solid waste is excreted



Digestive System Disruptions

- a. Ulcer: wearing down of stomach lining
- b. Heartburn: stomach acid into esophagus



CLOSE TO HOME

BY JOHN McPHERSON

