

# *Inquiry into Life*

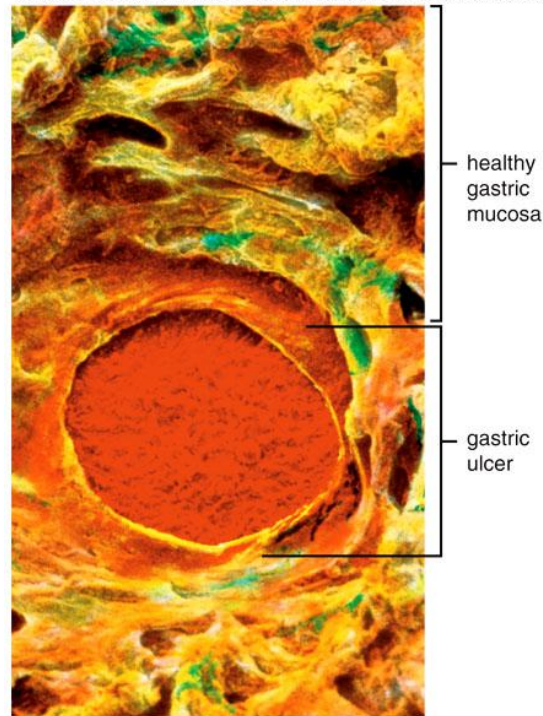
*Eleventh Edition*

**Sylvia S. Mader**

## Chapter 14 Lecture Outline

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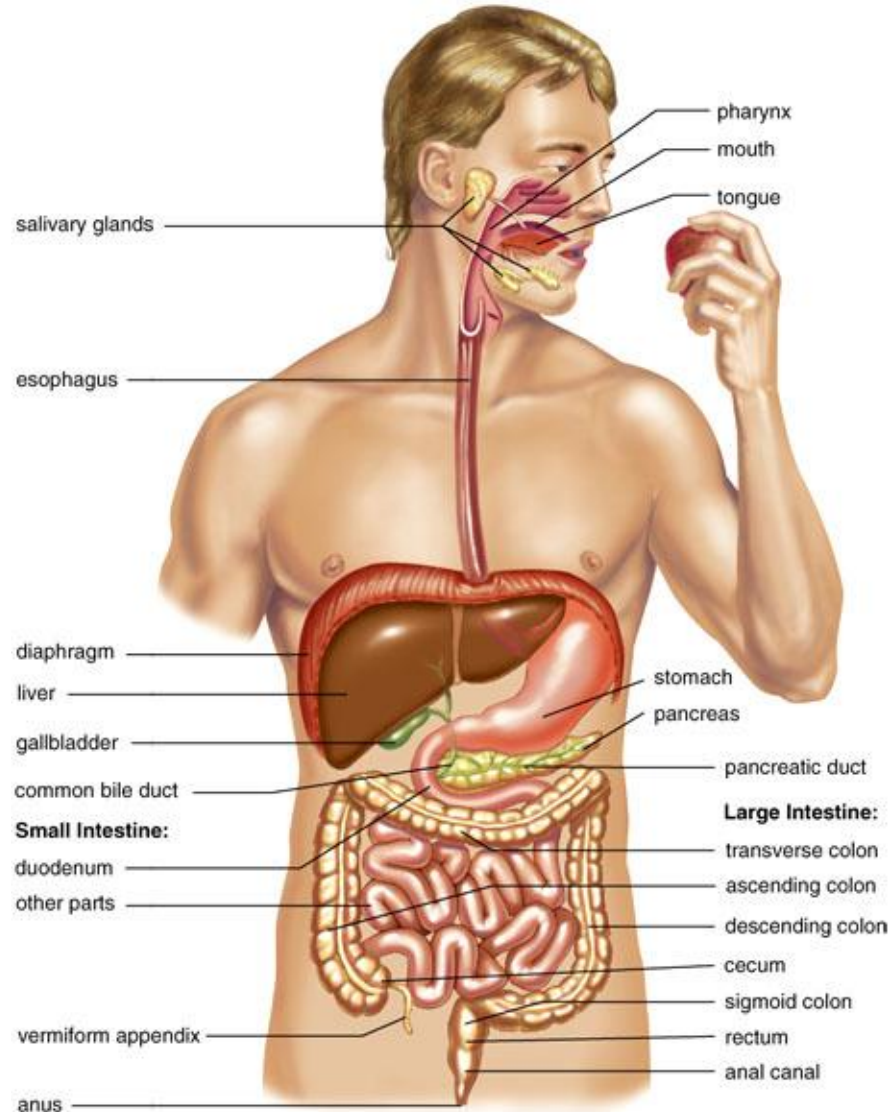


# 14.1 The digestive tract

- Overview of digestive tract
  - Begins at mouth and ends with the anus
  - Functions
    - Ingest food
    - Digestion
    - Absorption of nutrients
    - Elimination of wastes
  - 2 main processes
    - Mechanical digestion
      - Breaks food into small pieces
        - » Increases surface area for enzyme action
    - Chemical digestion
      - Enzymatic breakdown to small organic molecules

# The digestive tract

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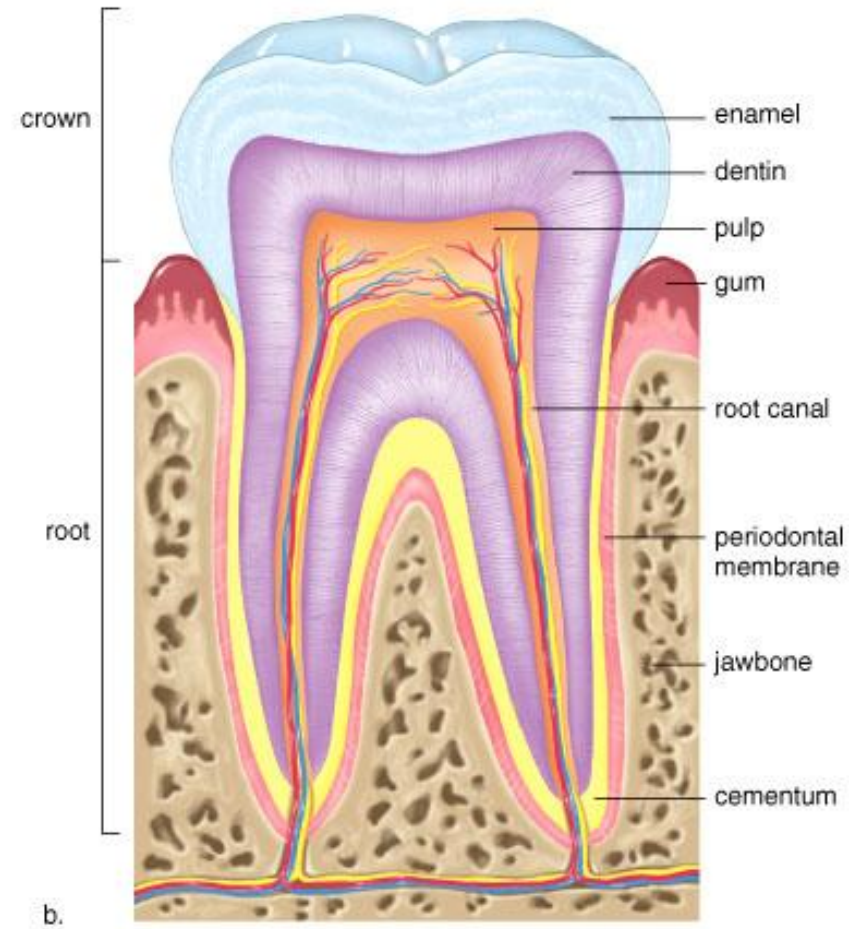
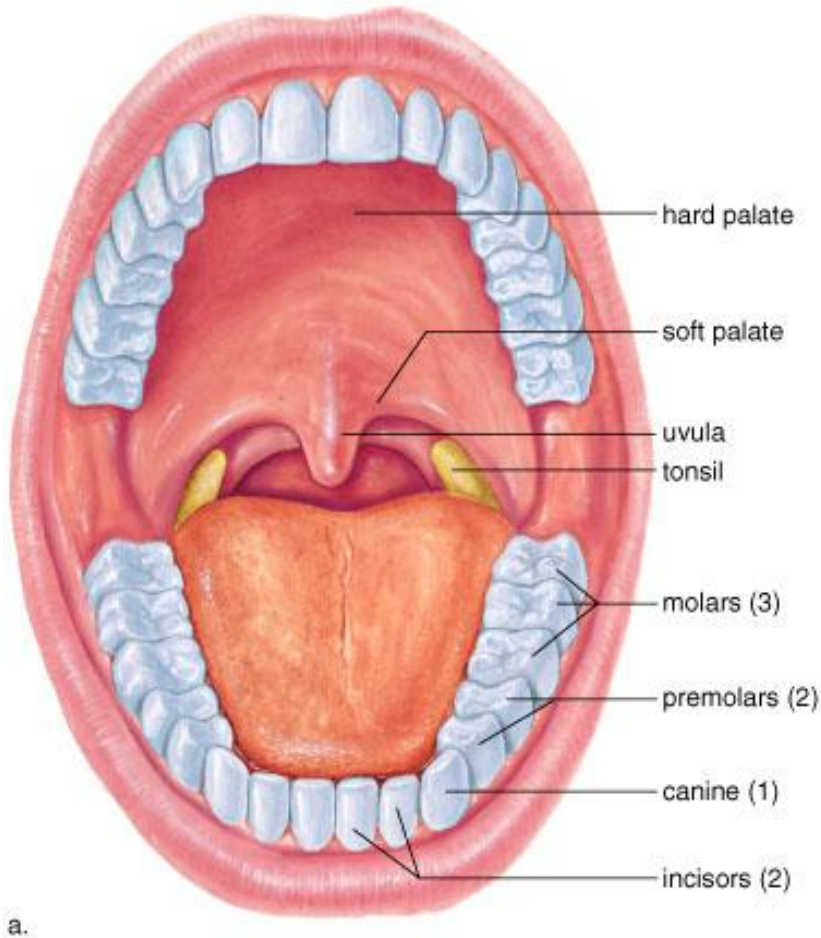
• Fig. 14.1

# The digestive tract cont'd.

- The mouth
  - Receives food
  - Tongue
    - Taste buds- chemical sensation of taste
    - Rough surface- aids in mechanical digestion
    - Composed of skeletal muscle
  - Roof of mouth
    - Hard palate- composed of bone
      - ridges for mechanical digestion
    - Soft palate- composed of muscle
      - uvula
        - » Closes off nares during swallowing

# Adult mouth and teeth

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- Fig. 14.2

# The digestive tract cont'd.

- Mouth cont'd.

- Tonsils

- Lymphoid tissue
    - Palatine- on both sides of pharynx
    - Pharyngeal- in nasopharynx
    - Lingual- at base of tongue
    - Help protect against infection
    - Tonsillitis- inflammation of tonsils

- Salivary glands

- 3 pairs
    - Collective secretions are called saliva
    - Contains amylase enzyme for starch digestion

# The digestive tract cont'd.

- Mouth cont'd.
  - Teeth
    - Mechanical digestion
    - 20 Deciduous teeth-first 2 years of life
    - 32 adult teeth
    - Tooth structure
      - Crown
        - » Outer enamel covering
        - » Dentin
        - » pulp
      - Root
        - » Dentin
        - » pulp

# The digestive tract cont'd.

- Mouth cont'd.
  - Dental caries
    - Cavities in teeth
    - Prevented by flouride
    - Brushing and flossing can help prevent development
  - Overall functions of mouth
    - Mechanical digestion
      - Chewing food
      - Mixing with saliva
      - Bolus formation
    - Chemical digestion
      - Begin digestion of starches to dissaccharides

# Path of food

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**TABLE 14.1** PATH OF FOOD

Organ	Function of Organ	Special Feature(s)	Function of Special Feature(s)
Oral cavity	Receives food; starts digestion of starch	Teeth Tongue	Chew food Forms bolus
Pharynx	Passageway	—	—
Esophagus	Passageway	—	—
Stomach	Storage of food; acidity kills bacteria; starts digestion of protein	Gastric glands	Release gastric juices
Small intestine	Digestion of all foods; absorption of nutrients	Intestinal glands Villi	Release fluids Absorb nutrients
Large intestine	Absorption of water; storage of indigestible remains	—	—

- Table 14.1

# The digestive tract cont'd.

- Pharynx

- Receives air from nasal cavity and food from mouth
- Swallowing reflex
  - Uvula closes off nares
  - Trachea moves upward under epiglottis
  - Airways close off
  - Bolus of food moves down esophagus

- Esophagus

- Passes from pharynx to stomach
- Peristalsis
  - Rhythmic wave of contraction throughout tract
  - Propels bolus down esophagus

# The digestive tract cont'd.

- **Esophagus cont'd.**
  - Sole purpose is conduction of food
  - **Sphinctors**
    - Muscles that encircle tubes
    - Act like valves
      - Contraction-closes tube
      - Relaxation- opens tube
  - **Esophageal sphinctor**
    - At entrance to stomach
    - Not well developed
    - Relaxes with peristaltic wave
    - Bolus pushed through into stomach

# The digestive tract cont'd.

- **Esophagus cont'd.**
  - **Heartburn**
    - Gastroesophageal reflux
    - Acidic contents enter esophagus
    - Causes irritation
  - **Vomiting**
    - Abdominal muscles contract
    - Diaphragm contracts
    - Positive pressure pushes stomach contents upward through esophagus

# The digestive tract cont'd.

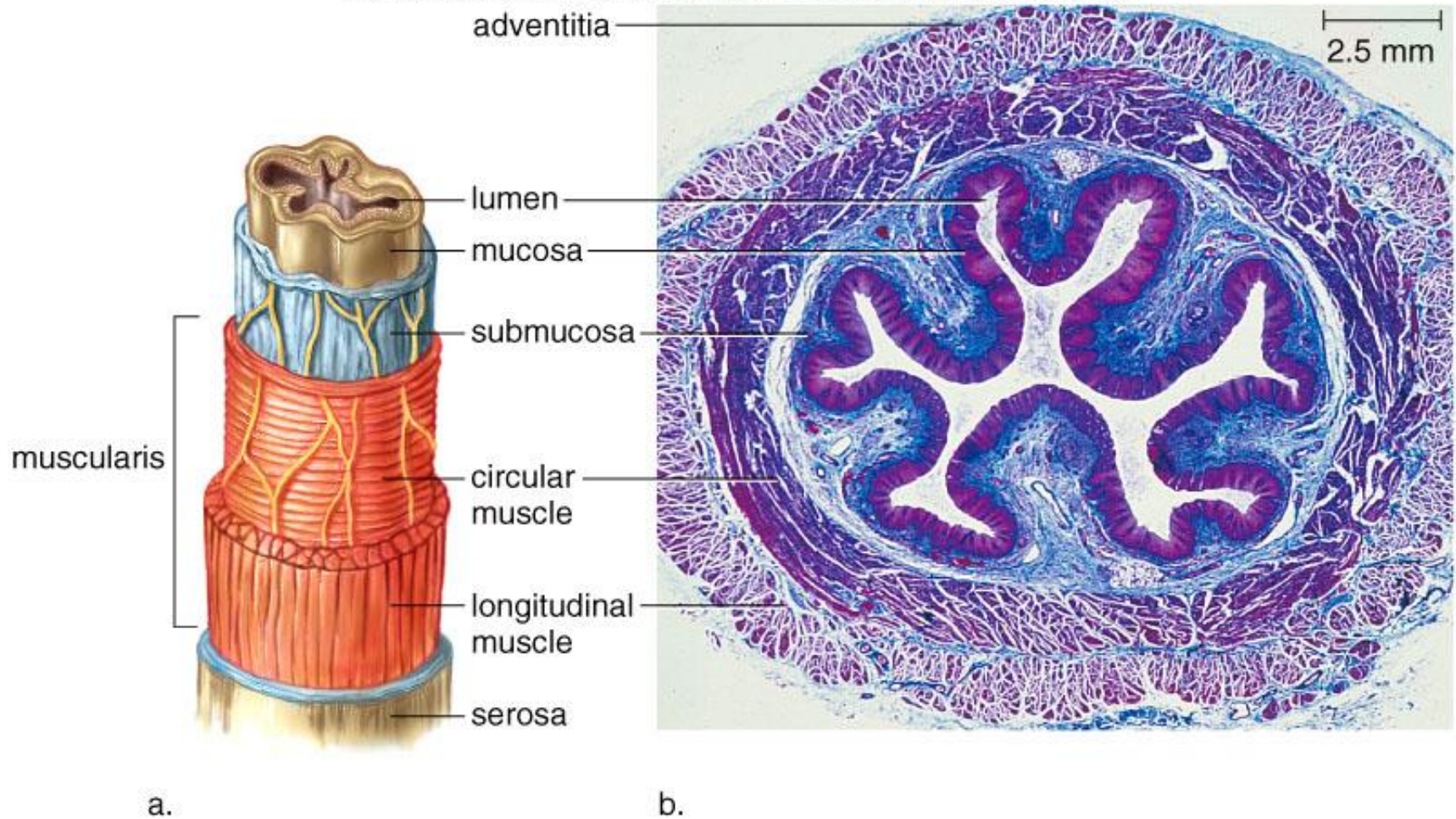
- The wall of the digestive tract
  - Mucosa
    - Epithelium supported by connective tissue
    - Lines lumen
    - Glandular epithelial cells produce enzymes
    - Goblet cells produce mucus
  - Submucosa
    - Loose connective tissue
    - Contains blood vessels
    - Lymph nodes- Peyer's patches
  - Muscularis- 2 layers of smooth muscle
    - Longitudinal –outer, runs along length of gut
    - Circular-inner, encircles tube

# The digestive tract cont'd.

- The wall of the digestive tract cont'd.
  - Serosa
    - Squamous epithelium
    - Supported by connective tissue
    - Secretes serous fluid
    - Lacking in esophagus

# Wall of digestive tract

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- Fig. 14.4

# The digestive tract cont'd.

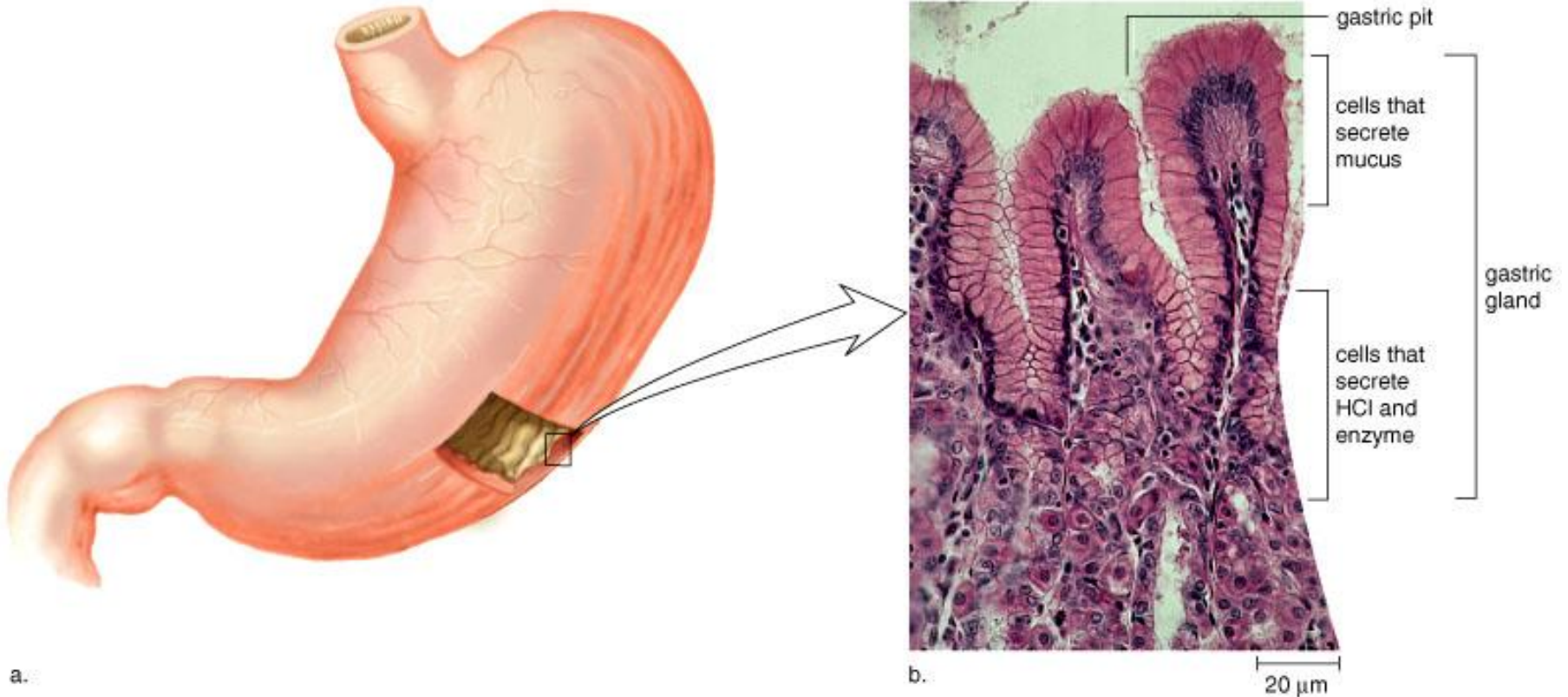
- The stomach
  - Thick-walled J-shaped organ
  - Lies on left side of abdomen
  - **Rugae**-folds in wall
    - Mechanical digestion-friction
    - Allows expansion
  - 3 muscle layers
    - Longitudinal
    - Oblique
    - Circular

# The digestive tract cont'd.

- The stomach cont'd.
  - Gastric glands
    - Produce gastric juice
    - Chief cells
      - Pepsinogen
        - » Inactive form of proteolytic enzyme
    - Parietal cells
      - HCl
        - » Activates pepsinogen to pepsin
        - » Decreases bacterial growth
  - Mucous cells
    - Produce thick protective mucus layer

# Anatomy and histology of the stomach

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- Fig. 14.5

# The digestive tract cont'd.

- The stomach cont'd.
  - Ulcers
    - Open sore in stomach wall
    - *Helicobacter pylori*
    - Infection decreases mucus production
  - Overall function of the stomach
    - Mechanical digestion
      - Mixing of food with gastric juice
      - Forms semi-liquid called chyme
    - Chemical digestion
      - Initiation of protein digestion
    - Storage of food

# The digestive tract cont'd.

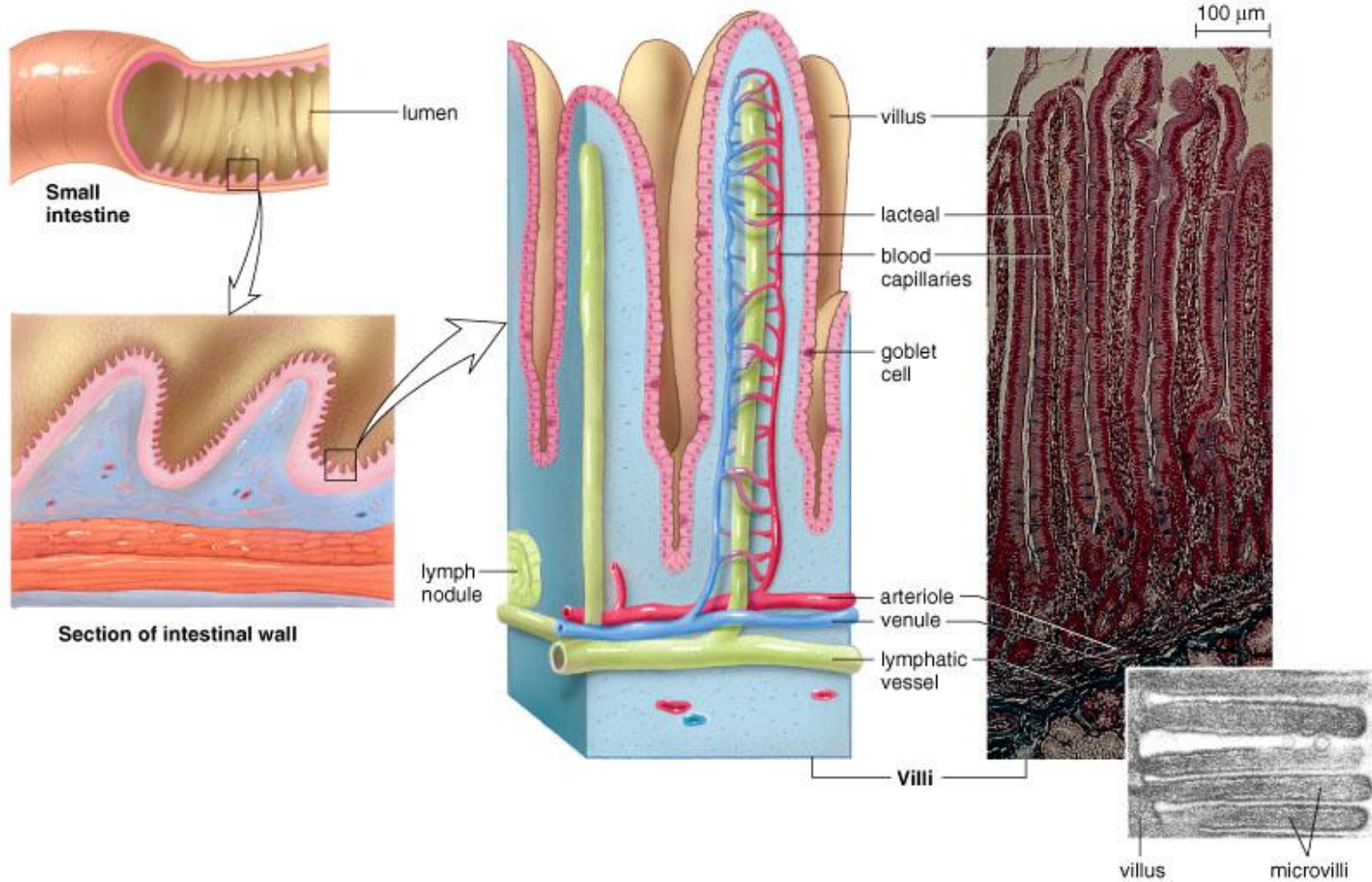
- **Small intestine**
  - Duodenum
    - First 25 cm of sm intestine
    - Principal site of digestion of nutrients
    - Receives bile from the liver
      - Emulsification of fats
    - Receives pancreatic juice from pancreas
      - Many enzymes for digestion of nutrients
      - Bicarbonate to neutralize pH

# The digestive tract cont'd.

- Small intestine cont'd.
  - Jejunum and ileum
    - Principal site of absorption of nutrients
    - Lining has villi
      - Increases surface area
      - Outer layer of columnar epithelium
        - » Cells have microvilli- more surface area
      - Villi contain lymph lacteals
        - » Absorb fatty acids and glycerol
      - Villi contain blood capillaries
        - » Absorb sugars and amino acids

# Anatomy of the small intestine

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- Fig. 14.6

# The digestive tract cont'd.

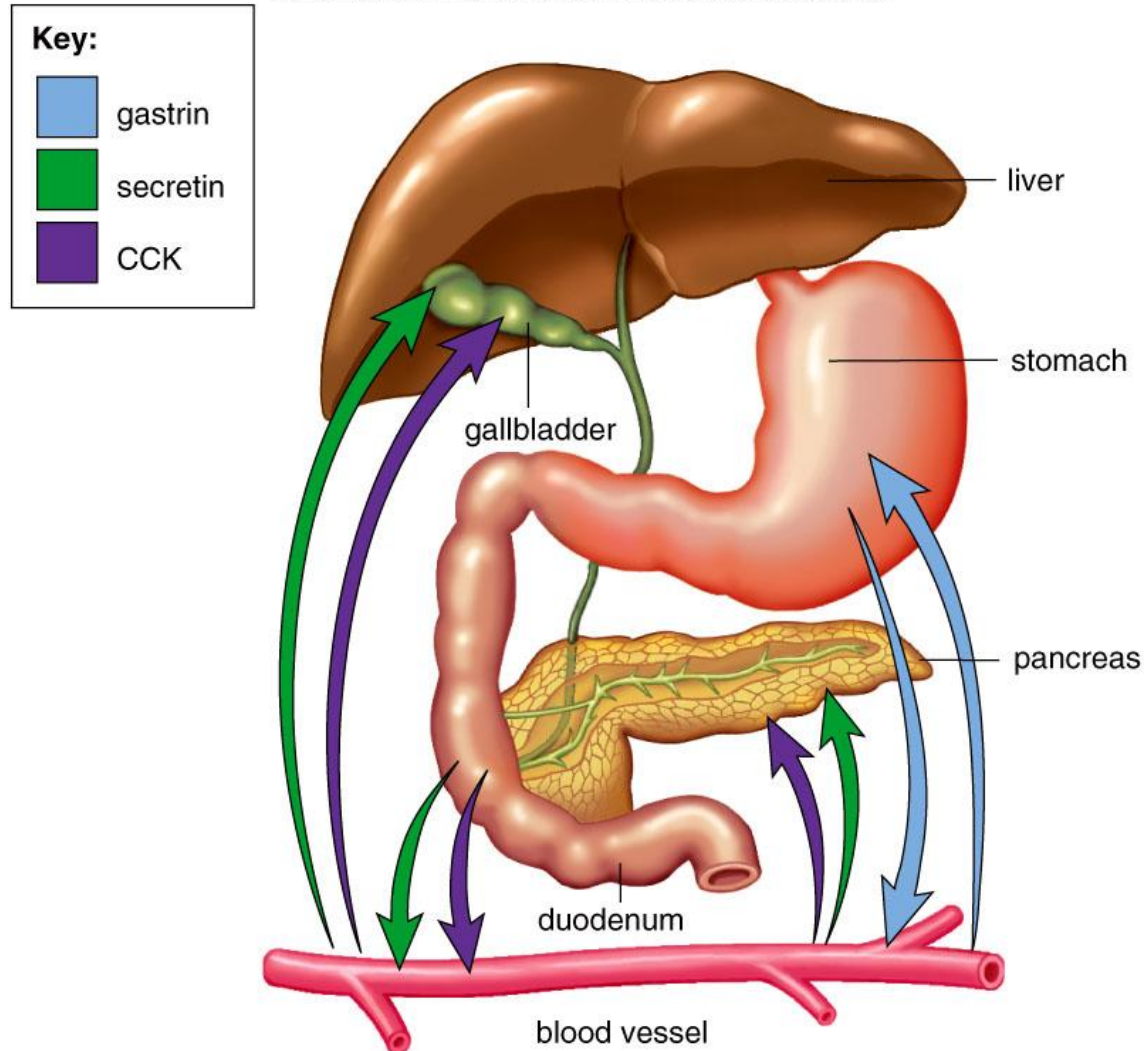
- Regulation of digestive secretions
  - Neurological control
    - Pressure and distension
    - Presence of particular types of food
  - Hormonal control
    - Gastrin
      - Produced by stomach
      - Stimulates gastric secretion
    - GIP
      - Produced by duodenum
      - Gastric inhibitory peptide
      - Inhibits gastric secretion

# The digestive tract cont'd.

- Regulation of digestive secretions cont'd.
  - Secretin and CCK
    - Produced by duodenum
    - Acid stimulates secretin release
    - Digested protein and fat stimulate CCK
    - Effects of both hormones
      - Increased pancreatic secretion
      - Increased bile secretion

# Hormonal control of digestive gland secretions

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• Fig. 14.7

# The digestive tract cont'd.

- The large intestine

- Cecum

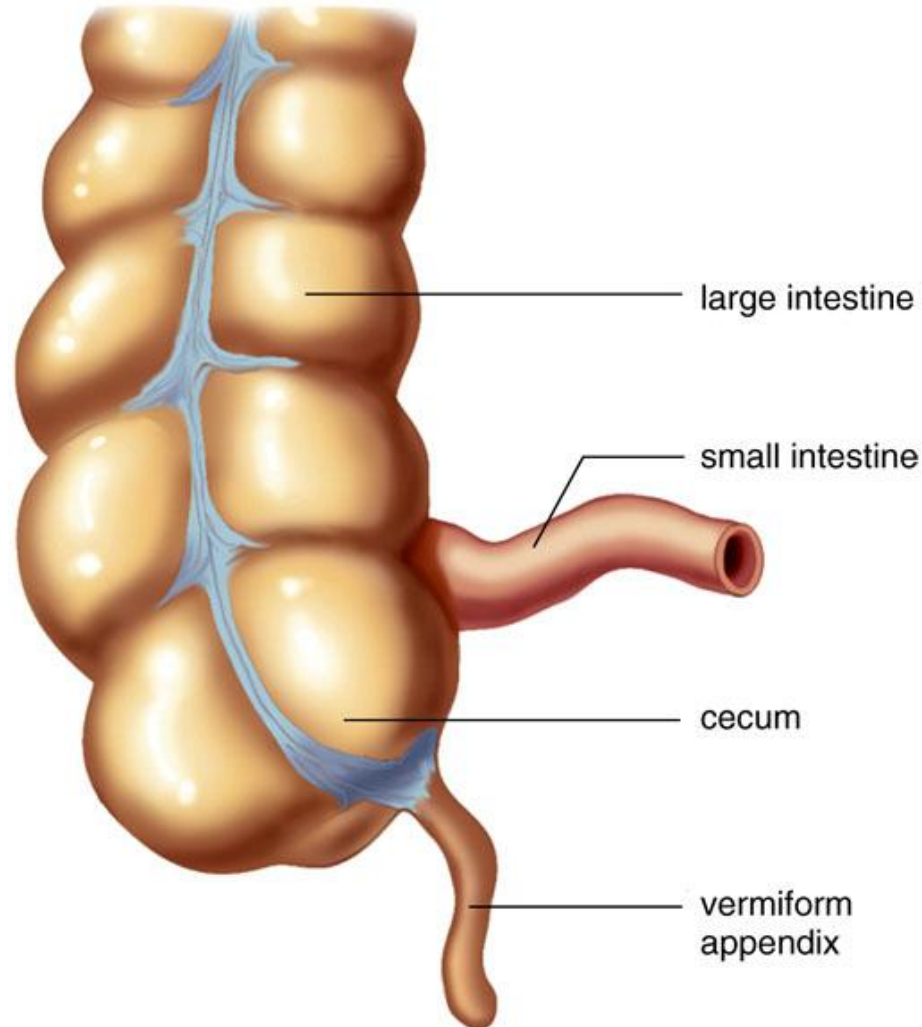
- Blind end of the large intestine
    - Appendix
      - Projection of cecum
      - May play a role in fighting infections
      - Rupture may cause peritonitis

- Colon

- Ascending, transverse, and descending portions
    - Absorption of water, salts
    - Terminates at the rectum

# Junction of the small intestine and large intestine

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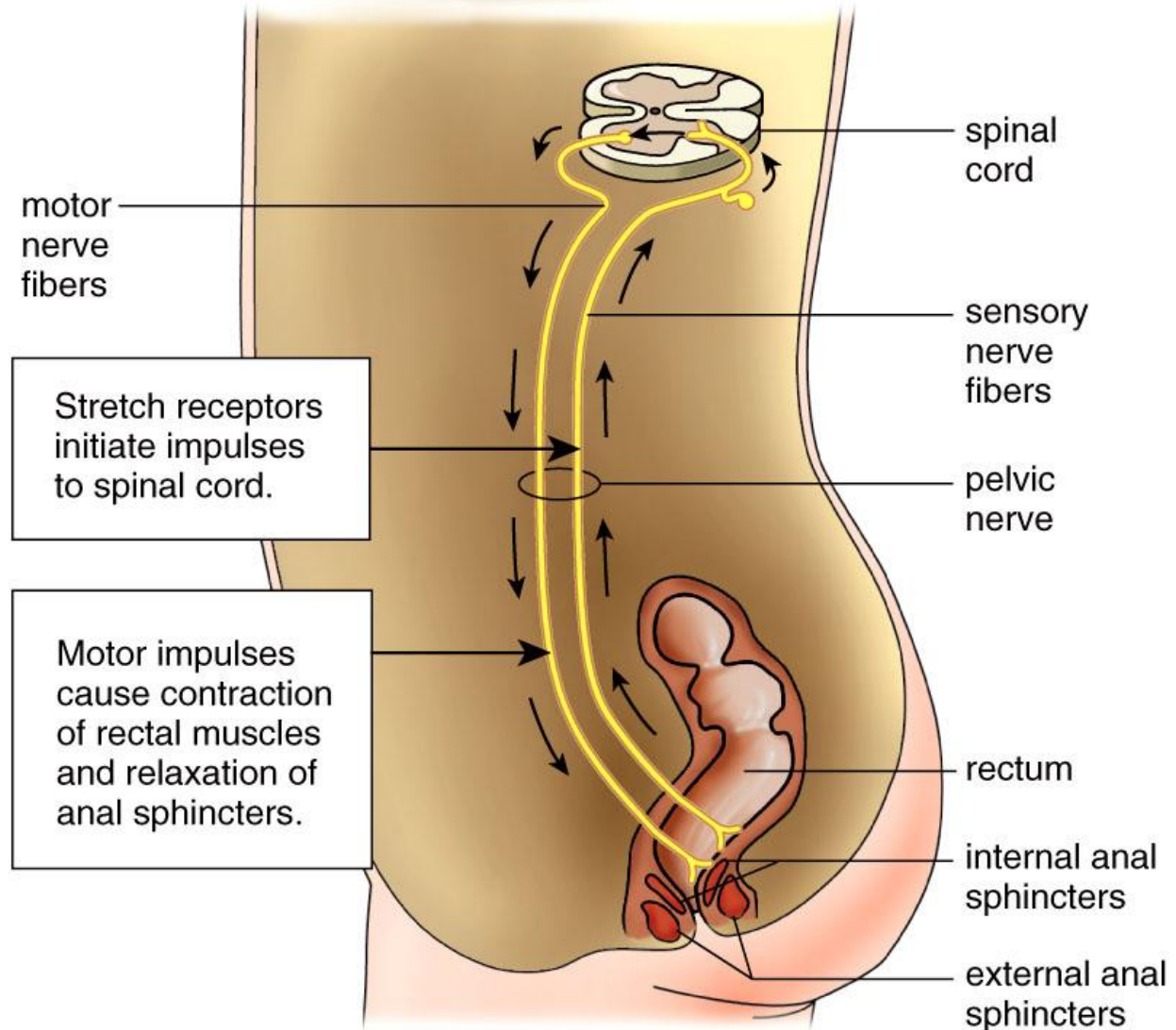
- Fig. 14.8

# The digestive tract cont'd.

- The large intestine cont'd.
  - Defecation reflex
    - Feces forced into rectum by peristalsis
    - Stretching of walls initiates reflex
    - Rectal muscles contract
    - Anal sphincters relax
    - Defecation occurs
  - Fecal composition
    - 75% water
    - Indigestible materials
    - Bacteria
    - Color from breakdown of bilirubin and oxidized iron

# Defecation reflex

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• Fig. 14.9

# The digestive tract cont'd.

- Large intestine cont'd.
  - Intestinal flora
    - 99% facultative anaerobes
    - Produce vitamin K

# 14.2 Three accessory organs

- The pancreas
  - Endocrine function
    - Insulin and glucagon
    - Regulate blood glucose
  - Exocrine function
    - Sodium bicarbonate
    - Pancreatic amylase-starch digestion
    - Trypsin-protein digestion
    - Lipase-fat digestion

# Three accessory organs cont'd.

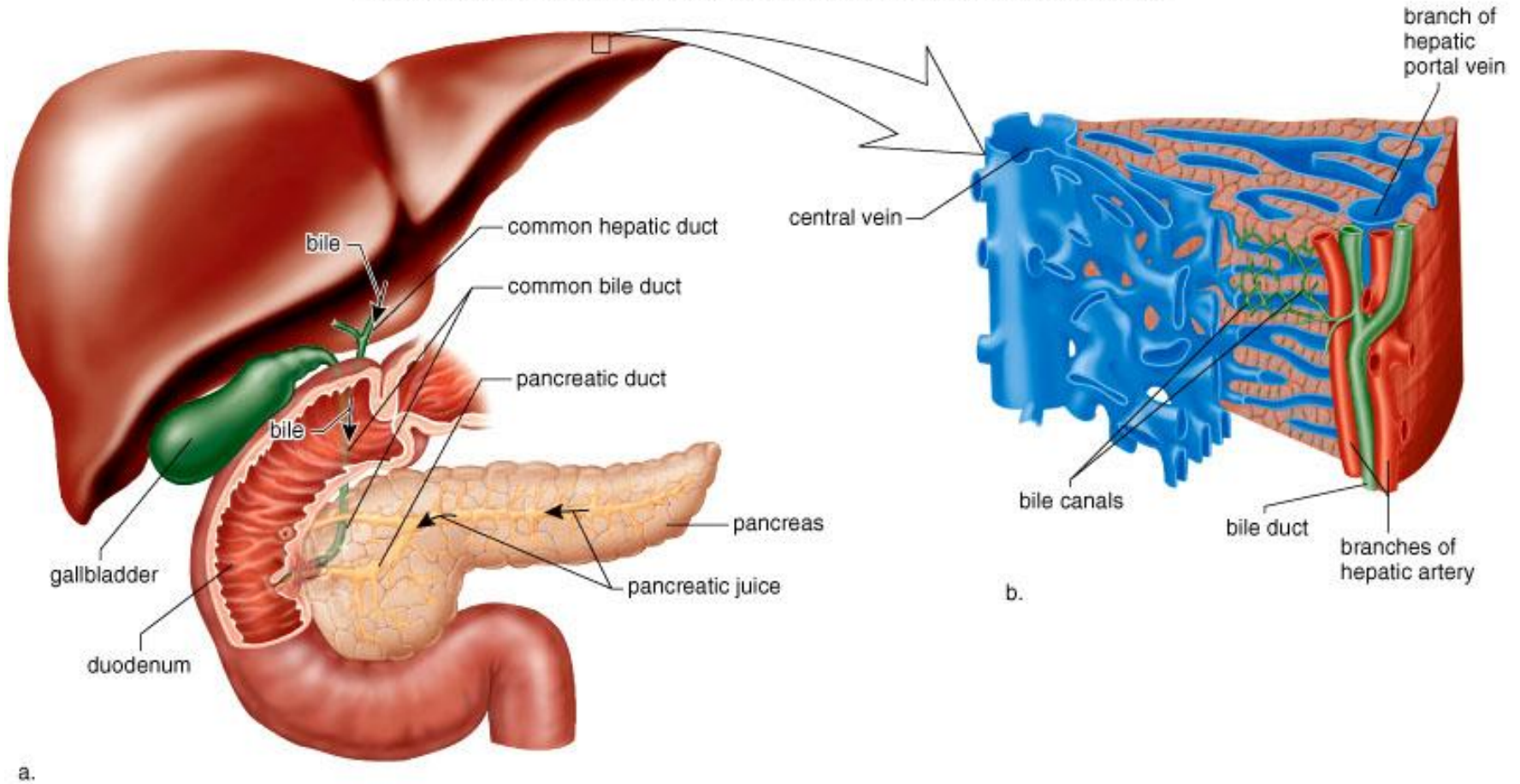
- **The liver**
  - Largest gland in the body
  - **Lobules**-structural and functional units
    - **Triads**
      - Located in lobules
        - » A bile duct
        - » A branch of the hepatic artery
        - » A branch of the hepatic portal vein
    - **Detoxifies poisonous substances in blood**
    - **Removes and stores iron and vit. A, D, E, K, and B<sub>12</sub>**
    - **Makes plasma proteins**
    - **Regulates cholesterol**

# Three accessory organs

- The liver cont'd.
  - Glucose regulation
    - Excess glucose stored as glycogen in the liver
    - Glycogen broken down to glucose when needed
    - When glycogen is depleted
      - Converts fats and amino acids to glucose
      - Requires deamination of amino acids
        - » Liver combines ammonia with carbon dioxide
        - » Forms urea

# Hepatic lobules

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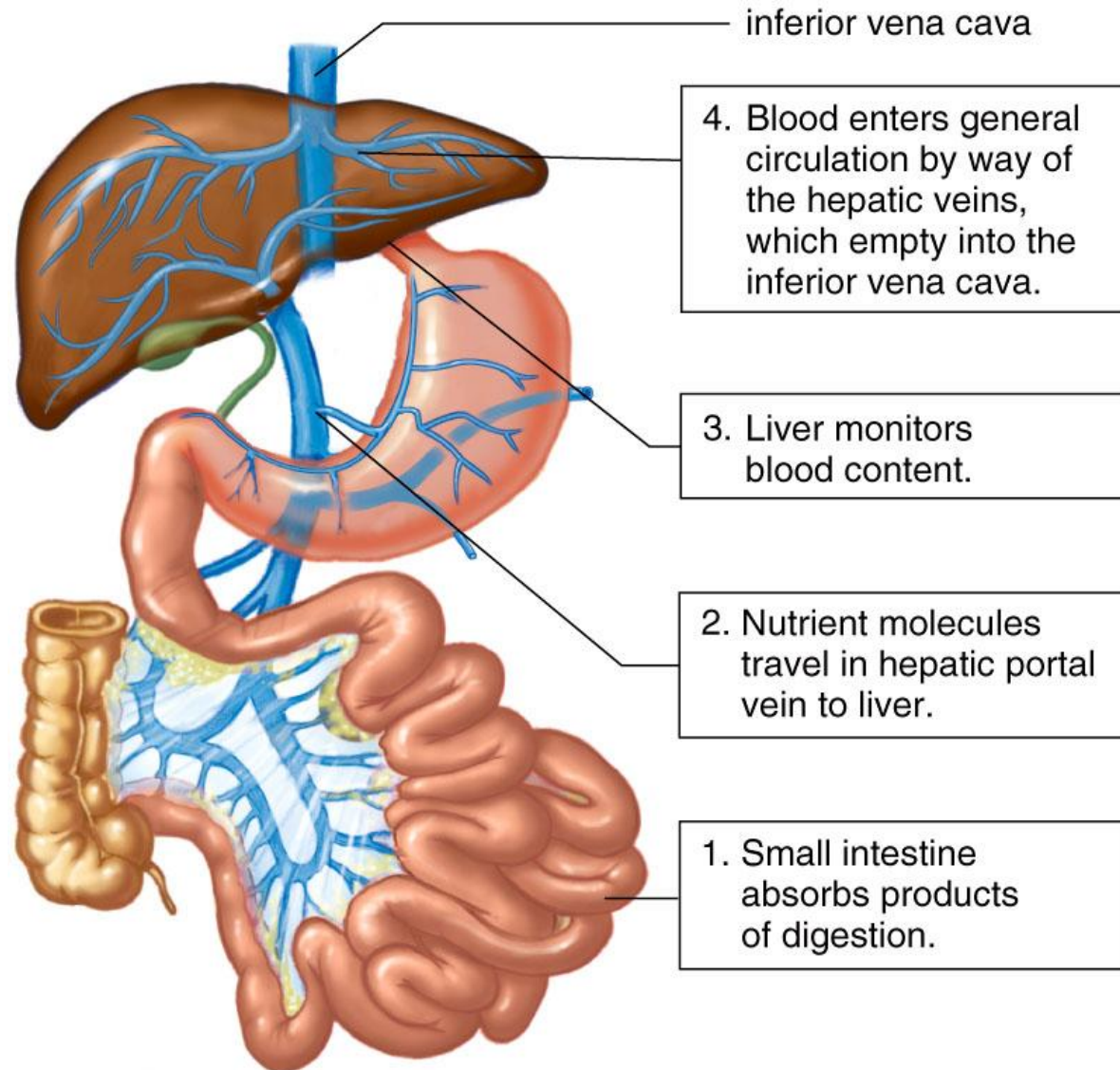
- Fig. 14.10

# Three accessory organs cont'd.

- The liver cont'd.
  - Bile production
    - Stored in gall bladder
    - Composition
      - Bilirubin
        - » From breakdown of hemoglobin
        - » Greenish color
      - Bile salts
        - » Derived from cholesterol
        - » Emulsify fats

# Hepatic portal system

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• Fig. 14.11

# Three accessory organs cont'd.

- The gall bladder
  - Excess bile stored
  - Secreted through common bile duct
  - Cholesterol can precipitate out of solution
    - Forms crystals
    - Can become gall stones
    - Obstructive jaundice

# 14.3 Digestive enzymes

- Digestive enzymes
  - Hydrolytic
  - Break macromolecules to monomers
  - Have optimum pH for activity
    - Maintains shape of molecule
    - Specific for substrate
- Salivary amylase
  - Catalyzes the reaction  $\text{starch} + \text{H}_2\text{O} \rightarrow \text{maltose}$ 
    - Starch hydrolyzed to disaccharides
    - Occurs in the mouth

# Digestive enzymes cont'd.

- **Pepsin**

- Catalyzes the reaction  $\text{protein} + \text{H}_2\text{O} \rightarrow \text{peptides}$ 
  - Pepsinogen activated to pepsin by  $\text{pH} < 2$
  - Occurs in the stomach in presence of HCl

- **Pancreatic amylase**

- Catalyzes the reaction  $\text{starch} + \text{H}_2\text{O} \rightarrow \text{maltose}$ 
  - Occurs in duodenum
    - pH in duodenum is slightly basic from sodium bicarbonate
    - Optimal pH for pancreatic amylase
  - Completes digestion of starches to disaccharides

# Digestive enzymes cont'd.

- **Trypsin**

- Catalyzes the reaction  $\text{protein} + \text{H}_2\text{O} \rightarrow \text{peptides}$ 
  - Occurs in duodenum
  - Produced by pancreas as trypsinogen- inactive
  - Activated in duodenum by enterokinase

- **Lipase**

- Catalyzes the reaction  $\text{fats} + \text{H}_2\text{O} \rightarrow \text{glycerol} + 3 \text{ fatty acids}$
- Emulsification by bile salts occurs first
- Occurs in duodenum
- Glycerol and fatty acids absorbed into villi
- Rejoined and packaged as lipoproteins-
  - absorbed into lacteals

# Digestive enzymes cont'd.

- Peptidases

- Catalyze reaction  $\text{peptides} + \text{H}_2\text{O} \rightarrow \text{amino acids}$ 
  - Occurs in small intestine
  - Absorbed into villi

- Maltase

- Catalyzes reaction  $\text{maltose} + \text{H}_2\text{O} \rightarrow \text{glucose} + \text{glucose}$ 
  - Occurs in small intestine
  - Each disaccharide has its own enzyme
  - Lack of any one of these can cause illness
    - Lactose intolerance-lack of lactase enzyme

# Major digestive enzymes

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**TABLE 14.3** MAJOR DIGESTIVE ENZYMES

Enzyme	Produced By	Site of Action	Optimum pH	Digestion
Salivary amylase	Salivary glands	Mouth	Neutral	Starch + H <sub>2</sub> O → maltose
Pancreatic amylase	Pancreas	Small intestine	Basic	
Maltase	Small intestine	Small intestine	Basic	Maltose + H <sub>2</sub> O → glucose + glucose
Pepsin	Gastric glands	Stomach	Acidic	Protein + H <sub>2</sub> O → peptides
Trypsin	Pancreas	Small intestine	Basic	
Peptidases	Small intestine	Small intestine	Basic	Peptide + H <sub>2</sub> O → amino acids
Nuclease	Pancreas	Small intestine	Basic	RNA and DNA + H <sub>2</sub> O → nucleotides
Nucleosidases	Small intestine	Small intestine	Basic	Nucleotide + H <sub>2</sub> O → base + sugar + phosphate
Lipase	Pancreas	Small intestine	Basic	Fat droplet + H <sub>2</sub> O → glycerol + fatty acids

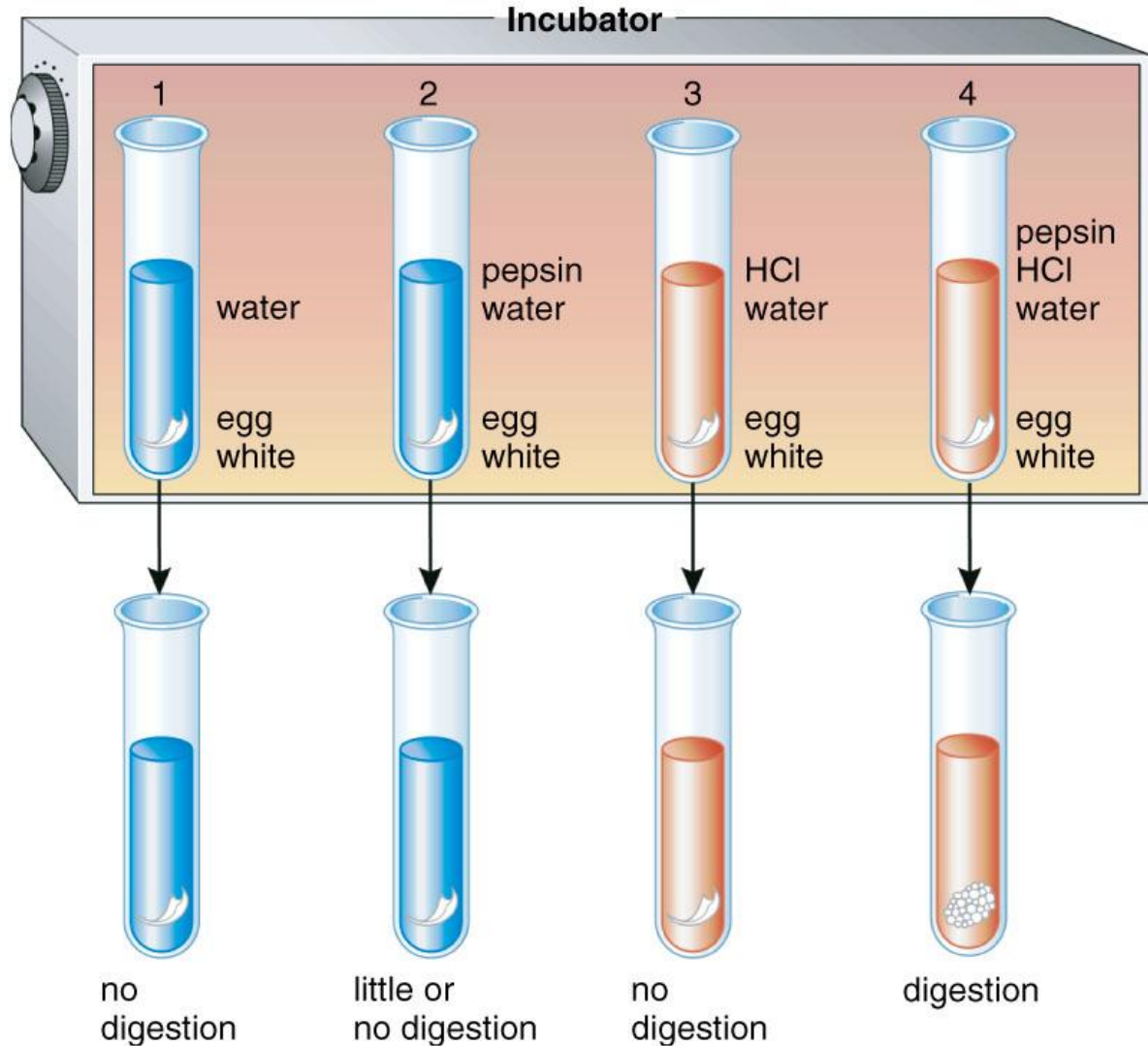
- Table 14.3

# Digestive enzymes cont'd.

- Conditions for digestion
  - Environmental conditions must be optimum
  - Warm temperature
    - Most function well at normal body temperature
  - Correct pH
    - Each enzyme has its own optimal pH
      - Most function at near neutral pH
      - Some exceptions
        - » Ex: pepsinogen requires acidic pH

# Digestion experiment

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• Fig. 14.12

# 14.4 Nutrition

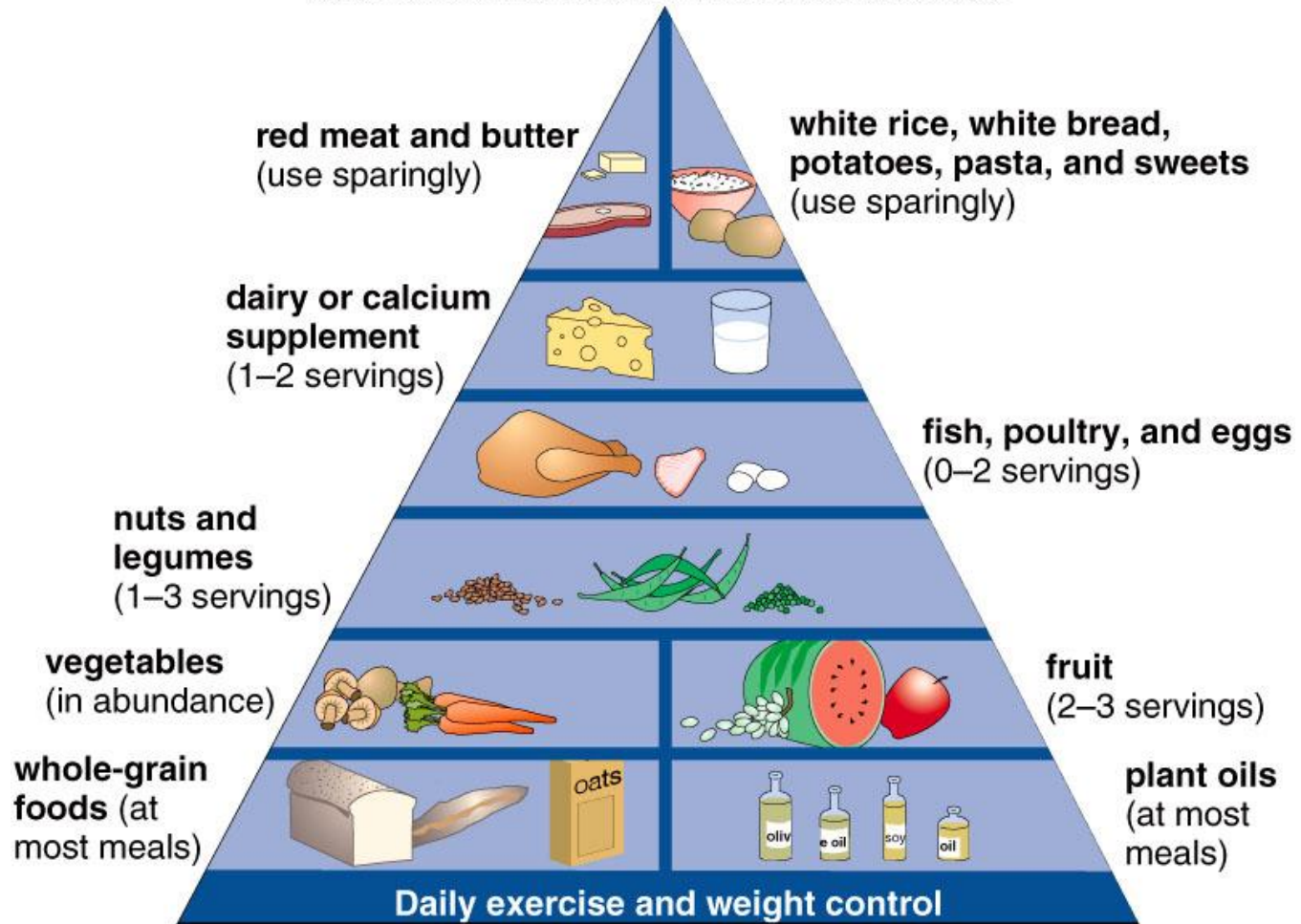
- **Nutrition**
  - Science of foods and nutrients
    - Nutrient- component of food that performs physiological function
  - All body functions depend on proper nutrition
- **Nutrients**
  - **Carbohydrates**
    - Primary energy source
  - **Fats**
    - Energy storage
  - **Proteins**
    - Growth and development
    - Regulate metabolism
    - Can be energy source

# Nutrition cont'd.

- Nutrients cont'd.
  - Water
    - Cells are 70-80% water
  - Vitamins and minerals
    - Coenzymes and cofactors
- Food pyramid
  - Guides food choices to fulfill needs
  - Emphasize foods in broad base areas
  - Minimize foods at tip
  - Guidelines change as nutritionists gain information

# Food guide pyramids

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• Fig. 14.13

# Nutrition

- Guidelines

- Balance energy input with energy output to maintain weight
- Eat a variety of foods
- A healthy diet
  - A moderate total fat intake low in saturated fats and cholesterol
  - Whole grains, legumes, vegetables for fiber and complex carbs
  - Low in refined carbs
  - Low in salt and sodium
  - Adequate protein from poultry, fish, plants
  - Low or moderate alcohol consumption
  - Adequate vitamins and minerals
    - Avoid questionable supplements-may be contraindicated

# Nutrition cont'd.

- Carbohydrates
  - **Glucose**- most readily available energy source
    - Stored by liver as glycogen
      - Between meals liver can keep blood glucose constant by
        - » Glycogenolysis
        - » Conversion of amino acids and fat to glucose
    - Body cells can use fatty acids for energy
      - Brain cells can ONLY use glucose
  - **Complex carbohydrates**
    - Gradually broken down to glucose
    - Contain fiber
      - Insoluble fiber-may protect against cancer
      - Soluble fiber-combines with bile acids and cholesterol

# Nutrition cont'd.

- Carbohydrates cont'd.
  - Simple sugars
    - High glycemic index-elevate blood sugar rapidly
    - Pancreas releases overload of insulin
    - Sugar taken up rapidly- hunger returns
    - Could lead to insulin resistance

# Reducing high glycemic index carbohydrates

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**TABLE 14.4 REDUCING HIGH GLYCEMIC INDEX CARBOHYDRATES**

**To reduce dietary sugar:**

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1. Eat fewer sweets, such as candy, soft drinks, ice cream, and pastry.
2. Eat fresh fruits or fruits canned without heavy syrup.
3. Use less sugar—white, brown, or raw—and less honey and syrups.
4. Avoid sweetened breakfast cereals.
5. Eat less jelly, jam, and preserves.
6. Drink pure fruit juices, not imitations.
7. When cooking, use spices, such as cinnamon, instead of sugar to flavor foods.
8. Do not put sugar in tea or coffee.
9. Avoid potatoes and processed foods made from refined carbohydrates, such as white bread, rice, and pasta.

- Table 14.4

# Nutrition cont'd.

- **Proteins**
  - Used to make structural proteins
    - Muscle, hair, skin, nails
  - Synthesis of other proteins
    - Hemoglobin
    - Plasma proteins
    - Enzymes
    - Hormones
  - Synthesis of body proteins
    - Requires all 20 amino acids
    - 8 must be supplied in diet-essential amino acids
    - Remaining 12 can be synthesized by the body

# Nutrition cont'd.

- Proteins cont'd.
  - Complete proteins
    - Contain all 20 amino acids
    - Eggs, meat, milk
  - Incomplete proteins
    - Proteins of plant origin
    - Each lacks at least essential amino acids
    - Vegetarians must combine plant protein sources
      - Protein complementarity
      - Legumes with grains-provides all 20 amino acids

# Nutrition cont'd.

- **Proteins**
  - Amino acids are not stored
  - Must take in daily supply
  - Too high intake of protein can be harmful
    - Deamination of amino acids produces urea
    - Urea excretion requires water
    - Dehydration especially if individual is exercising
    - Can also cause calcium loss
  - Some protein foods also are high in saturated fats
    - Red meat
    - Can lead to cardiovascular disease

# Complementary proteins

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**TABLE 14.5** COMPLEMENTARY PROTEINS\*

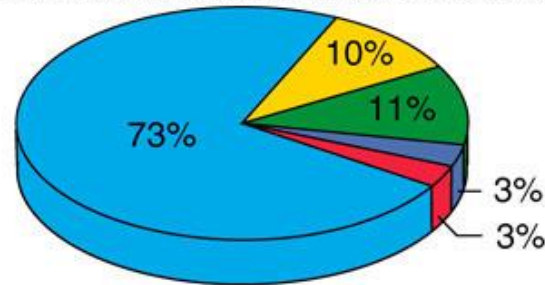
<b>Legumes</b>	<b>Seeds and Nuts</b>	<b>Grains</b>	<b>Vegetables</b>
Green peas	Sunflower seeds	Wheat	Leafy green (e.g., spinach)
Navy beans	Sesame seeds	Rice	Broccoli
Soybeans	Macadamia nuts	Corn	Cauliflower
Black-eyed peas	Brazil nuts	Barley	Cabbage
Pinto beans	Peanuts	Oats	Artichoke hearts
Lima beans	Cashews	Rye	
Kidney beans	Hazelnuts		
Chickpeas	Almonds		
Black beans	Nut butter		

\*Combine foods from any two or more columns to acquire all of the essential amino acids.

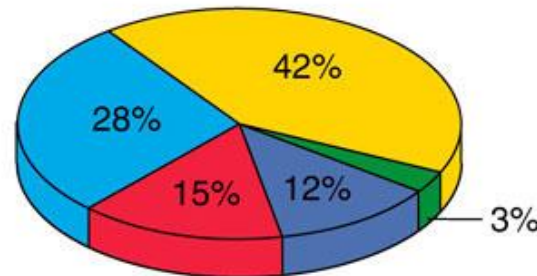
- Table 14.5

# Ancient versus modern diet of native Hawaiians

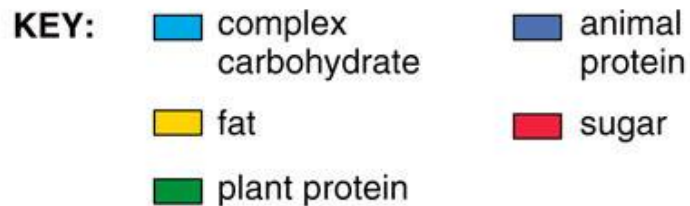
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**Ancient**



**Modern**



- Fig. 14.15

# Nutrition cont'd.

- Lipids

- Saturated fats

- Solids at room temperature
    - Animal origin
      - Exceptions: palm oil, coconut oil
    - Associated with cardiovascular disease
    - Trans fatty acids are worst
      - Hydrogenated unsaturated fatty acids
      - May reduce ability to clear cholesterol

- Unsaturated fats

- Oils have percentage of mono- and polyunsaturated fats
    - Polyunsaturated oils contain essential fatty acids
      - Linoleic and linolenic acid

# Nutrition cont'd.

- Lipids cont'd.
  - Omega-3 fatty acids
    - Double bond in third position
    - Especially protective against heart disease
    - Cold water fish, flax seed oil
  - Fats that cause disease
    - Plaques- form in arteries
      - Contain cholesterol and saturated fats
    - Cholesterol
      - Carried in blood by low density lipoprotein (LDL) and high density lipoprotein (HDL)
      - LDL- "bad" cholesterol- transports from liver to cells
      - HDL- "good" cholesterol- transports to liver to make bile salts

# Nutrition cont'd.

- Lipids cont'd.
  - Trans-fats
    - In commercially packaged foods
    - Linked to diabetes melitis and heart disease

# Reducing certain lipids

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**TABLE 14.6 REDUCING CERTAIN LIPIDS**

**To reduce saturated fats and trans fats in the diet:**

---

1. Choose poultry, fish, or dry beans and peas as a protein source.
2. Remove skin from poultry and trim fat from red meats before cooking and place on a rack so that fat drains off.
3. Broil, boil, or bake rather than fry.
4. Limit your intake of butter, cream, trans fats, shortenings, and tropical oils (coconut and palm oils).\*
5. Use herbs and spices to season vegetables instead of butter, margarine, or sauces. Use lemon juice instead of salad dressing.
6. Drink skim milk instead of whole milk, and use skim milk in cooking and baking.

**To reduce dietary cholesterol:**

---

1. Avoid cheese, egg yolks, liver, and certain shellfish (shrimp and lobster). Preferably, eat white fish and poultry.
2. Substitute egg whites for egg yolks in both cooking and eating.
3. Include soluble fiber in the diet. Oat bran, oatmeal, beans, corn, and fruits, such as apples, citrus fruits, and cranberries are high in soluble fiber.

- Table 14.6

\*Although coconut and palm oils are from plant sources, they are mostly saturated fats.

# Nutrition cont'd.

- Vitamins
  - Organic compounds
    - Many are coenzymes
    - Deficiencies produce specific symptoms
  - 13 vitamins
    - Fat soluble- A,D,E,K
    - Water soluble- remaining 9
  - Antioxidants-defend against free radicals
    - Vitamins C,E, and A
    - Cell metabolism generates free radicals
      - $O_2^-$  and  $OH^-$
      - Bind to DNA, proteins to stabilize
      - Cause cell damage

# Nutrition cont'd.

- Vitamins cont'd.
  - Vitamin D
    - Converted in skin to active form by UV light
    - Further modification in kidneys and liver
      - Becomes calcitrol
      - Promotes calcium absorption from intestines
    - Deficiency causes ricketts

# Fat-soluble vitamins

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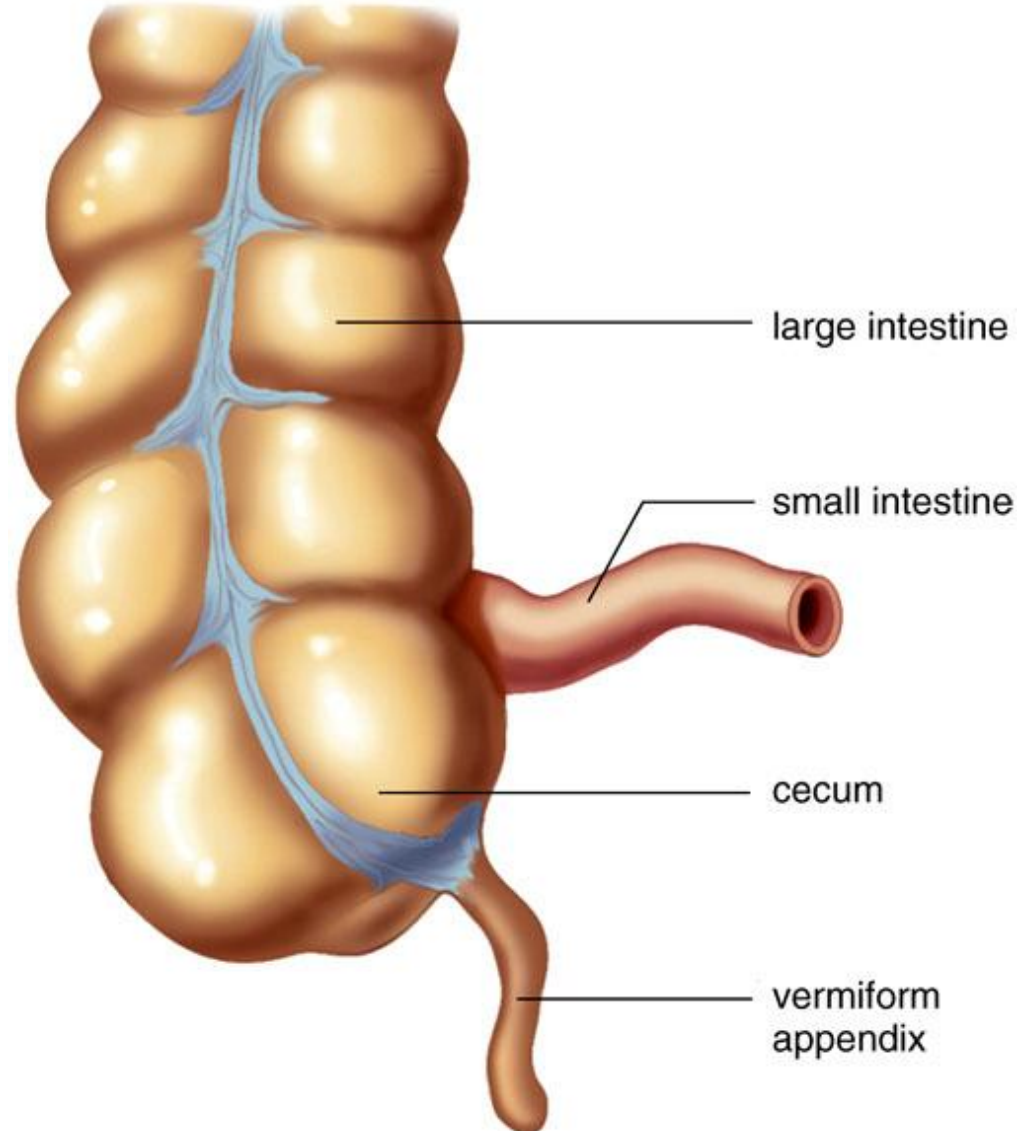
**TABLE 14.7 FAT-SOLUBLE VITAMINS**

Vitamin	Functions	Food Sources	Conditions With	
			<i>Too Little</i>	<i>Too Much</i>
Vitamin A	Antioxidant synthesized from beta-carotene; needed for healthy eyes, skin, hair, and mucous membranes, and for proper bone growth	Deep yellow/orange and leafy, dark green vegetables, fruits, cheese, whole milk, butter, eggs	Night blindness, impaired growth of bones and teeth	Headache, dizziness, nausea, hair loss, abnormal development of fetus
Vitamin D	A group of steroids needed for development and maintenance of bones and teeth	Milk fortified with vitamin D, fish liver oil; also made in the skin when exposed to sunlight	Rickets, bone decalcification and weakening	Calcification of soft tissues, diarrhea, possible renal damage
Vitamin E	Antioxidant that prevents oxidation of vitamin A and polyunsaturated fatty acids	Leafy green vegetables, fruits, vegetable oils, nuts, whole-grain breads and cereals	Unknown	Diarrhea, nausea, headaches, fatigue, muscle weakness
Vitamin K	Needed for synthesis of substances active in clotting of blood	Leafy green vegetables, cabbage, cauliflower	Easy bruising and bleeding	Can interfere with anticoagulant medication

- Table 14.7

# Water-soluble vitamins

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- Fig. 14.8

# Nutrition cont'd.

- Minerals

- Major minerals

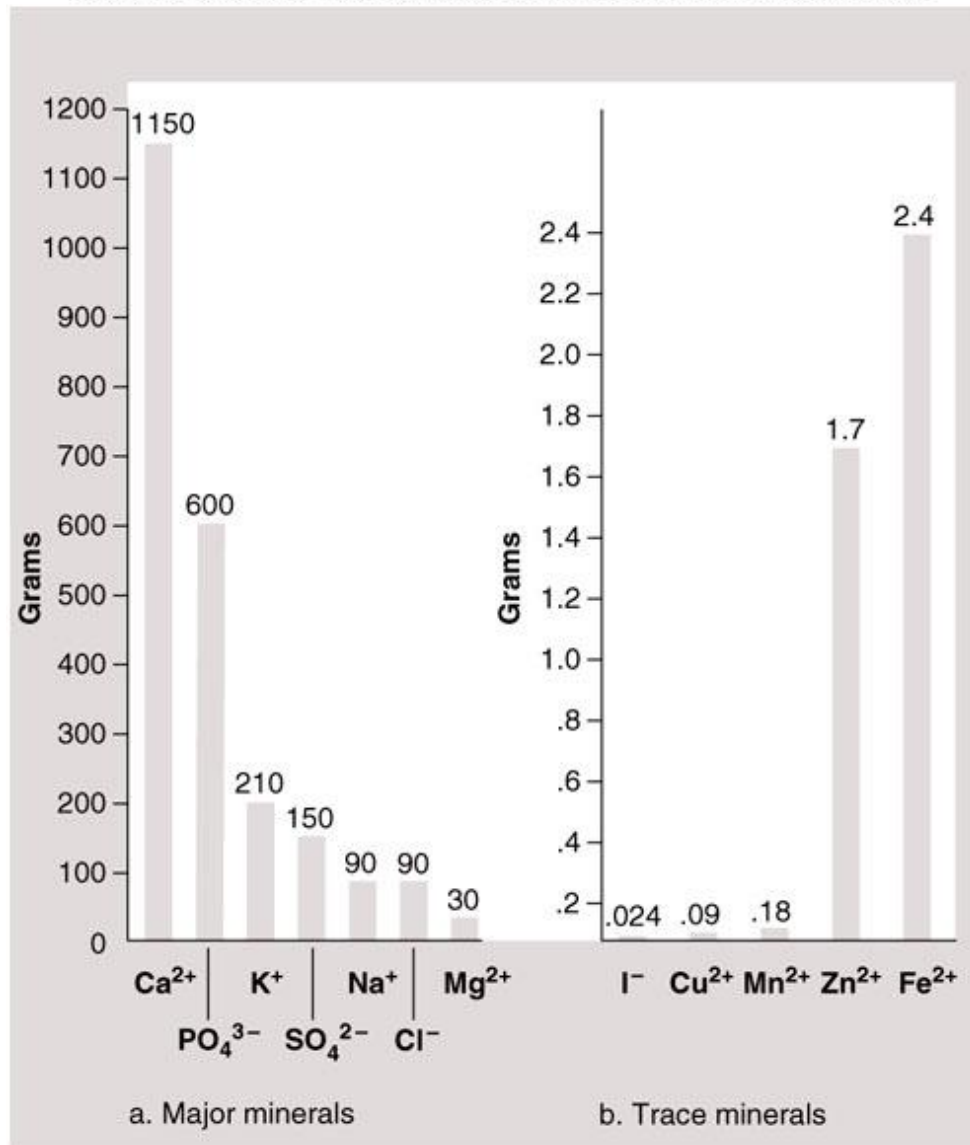
- Body contains more than 5 grams
    - Constituents of cells
    - Structural components

- Trace minerals

- Body contains less than 5 grams
    - Components of larger molecules
      - Iron- part of hemoglobin
      - Iodine- part of thyroxine
      - Zinc, copper, selenium-components of enzymes

# Minerals in the body

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- Fig. 14.17

# Nutrition cont'd.

- Minerals cont'd.

- Calcium

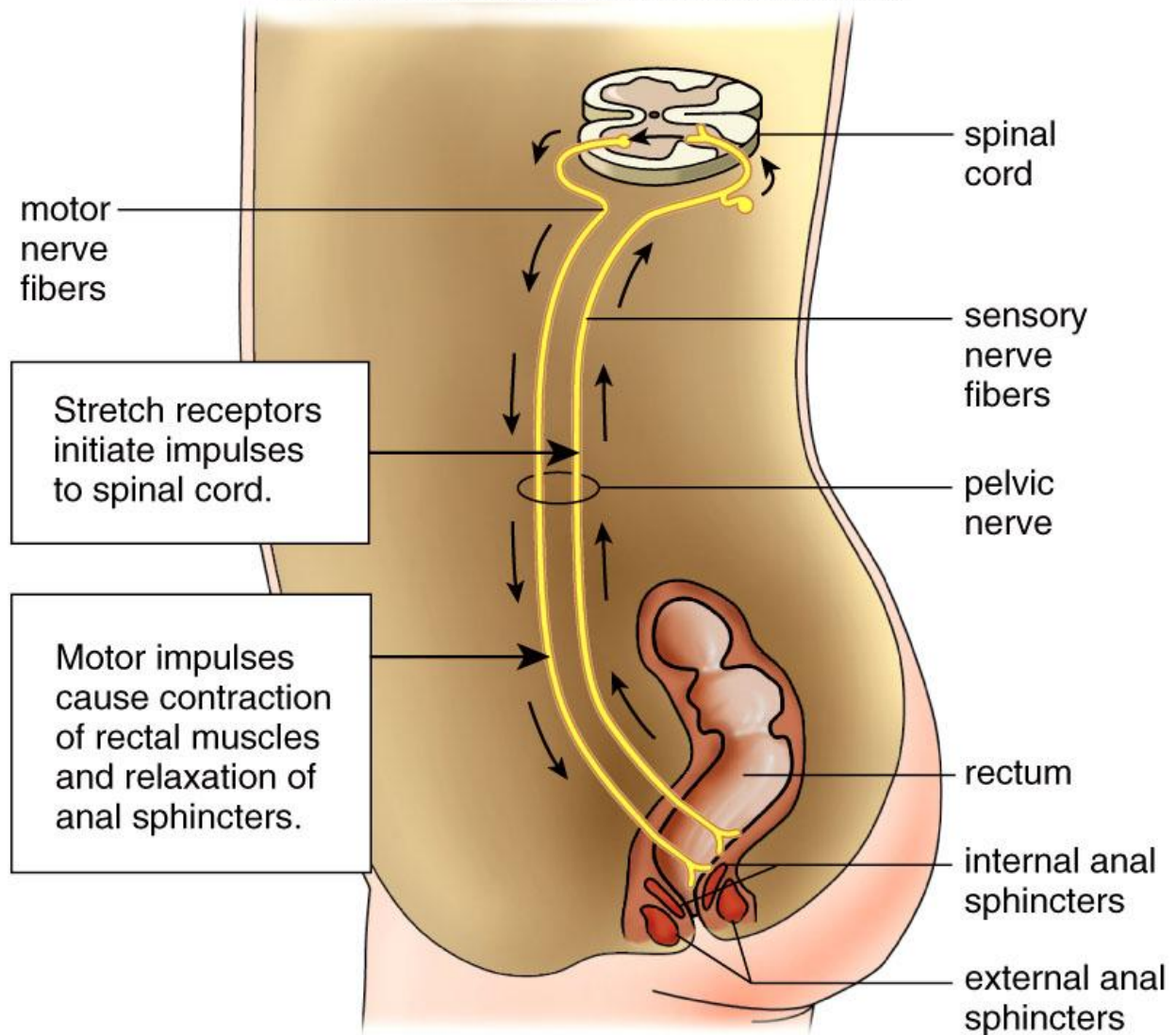
- Deficiency causes osteoporosis
      - Osteoclasts more active than osteoblasts
      - Bones become porous
      - Fracture easily
    - Calcium intake can slow bone loss
    - Requirements
      - Men and premenopausal women-1000 mg/day
      - Postmenopausal women-1300 mg/day
      - Smoking, excess caffeine increase risk
    - Vitamin D is essential companion to calcium

# Nutrition cont'd.

- Minerals cont'd.
  - Sodium
    - Requirement is 500 mg/day
    - Average intake in US is 4000-5000 mg/day
      - May be linked to hypertension
    - Only 1/3 is naturally occurring in diet
      - 1/3 added in processing
      - 1/3 added as table salt

# Minerals

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• Fig. 14.9

# Reducing dietary sodium

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**TABLE 14.10 REDUCING DIETARY SODIUM**

**To reduce dietary sodium:**

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1. Use spices instead of salt to flavor foods.
2. Add little or no salt to foods at the table, and add only small amounts of salt when you cook.
3. Eat unsalted crackers, pretzels, potato chips, nuts, and popcorn.
4. Avoid hot dogs, ham, bacon, luncheon meats, smoked salmon, sardines, and anchovies.
5. Avoid processed cheese and canned or dehydrated soups.
6. Avoid brine-soaked foods, such as pickles or olives.
7. Read labels to avoid high-salt products.

# Nutrition cont'd.

- Eating disorders

- Obesity

- Body weight 20% above normal
    - 28% women and 10% men in US are obese
    - Hormonal, metabolic, and social factors
      - May be linked to lack of leptin- satiety hormone
    - Behavior modification is usual treatment
    - Avoid cycle of gaining and losing weight

- Bulimia Nervosa

- Can coexist with obesity or anorexia
    - Binging and purging-damage from vomiting
    - Overly concerned about body shape and weight
    - Can damage kidneys and cause fatal arrhythmias
    - Psychotherapy and medication are treatments

# Recognizing Bulimia

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Persons with bulimia nervosa have

- recurrent episodes of binge eating characterized by consuming an amount of food much higher than normal for one sitting and a sense of lack of control over eating during the episode.
- an obsession about their body shape and weight.
- increase in fine body hair, halitosis, and gingivitis.

Body weight is regulated by

- a restrictive diet, excessive exercise.
- purging (self-induced vomiting or misuse of laxatives).



• Fig. 14.19

# Recognizing anorexia nervosa

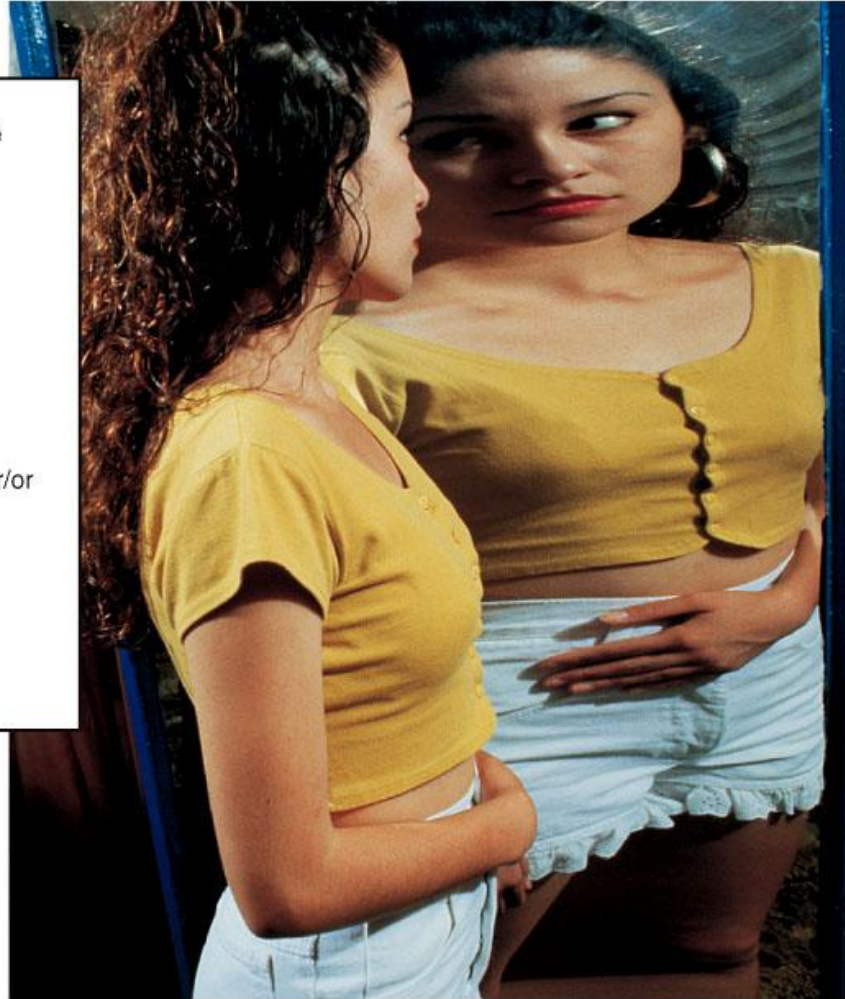
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Persons with anorexia nervosa have

- a morbid fear of gaining weight; body weight no more than 85% normal.
- a distorted body image so that person feels fat even when emaciated.
- in females, an absence of a menstrual cycle for at least three months.

Body weight is kept too low by either/or

- a restrictive diet, often with excessive exercise.
- binge eating/purging (person engages in binge eating and then self-induces vomiting or misuses laxatives).



• Fig. 14.20

# Nutrition cont'd.

- Eating disorders cont'd.
  - Anorexia Nervosa
    - Morbid fear of gaining weight
    - Athletes at risk
    - Distorted self-image
    - All symptoms of starvation
      - Low blood pressure
      - Constant chilliness
      - Irregular heartbeat
    - Can result in death
    - Force-feeding and psychotherapy are critical