Nutrition for Health & Fitness

Chapter 8 of Total Fitness & Wellness Textbook

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Learning Outcomes

1. Define the terms *nutrition* and *nutrient* and explain how nutrients are classified.
2. Describe the function of the four macronutrients in the body and list common dietary sources for each.
3. Explain what micronutrients are and why they are important for health.
4. Outline the guidelines for a healthy diet.
5. List several resources that can be helpful in planning a healthy diet.

Learning Outcomes Continued

6. Explain why children, pregnant women, vegetarians, and those with food allergies or intolerances have special dietary needs and how these needs can be addressed.

7. Describe how rigorous exercise training alters a person's nutrition requirements.

8. List the pros and cons of dietary supplement use.

9. Describe the major issues of food safety and how changes in food technology affect the food we consume.

Some Updates

- Visual dictionaries/Vocab. words

What is Nutrition and Why is it so Important

1. Define the terms *nutrition* and *nutrient* and explain how nutrients are classified.

Nutrition

The study of nutrients – their digestion, their absorption, and metabolism and their effect on health and disease.

- Nutrients: substances in food that are necessary for survival and health.

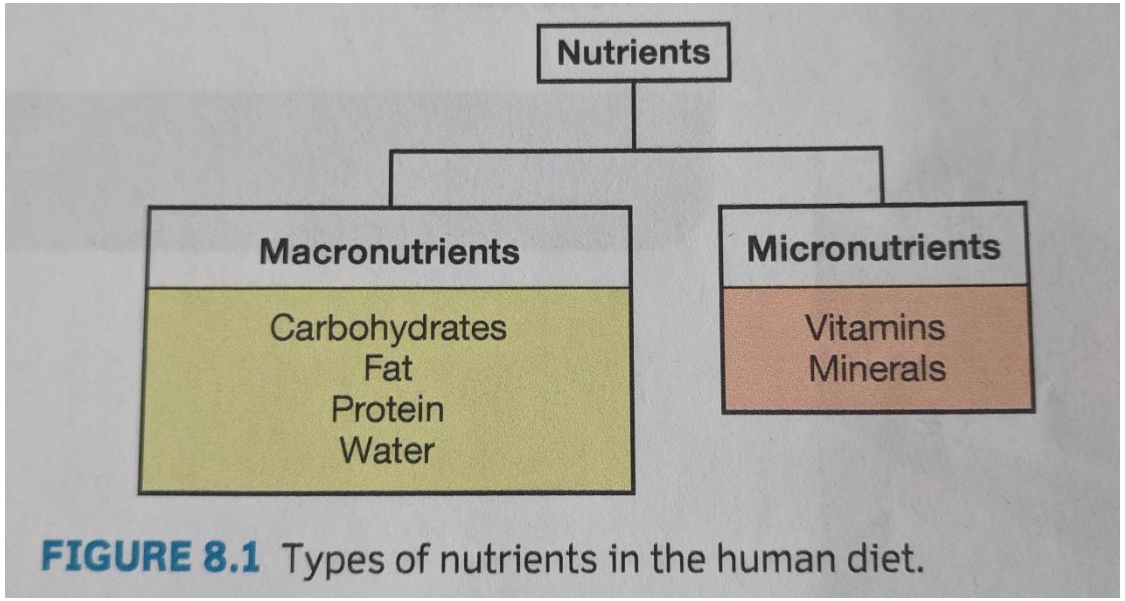


FIGURE 8.1 Types of nutrients in the human diet.

- Diets high in
  - Calories
  - Sugar
  - Fat
  - Sodium

    risk of
    - Cardiovascular disease
    - Cancer
    - Obesity
    - Diabetes
- Over ½ of all U.S. deaths are linked to poor nutrition and 1/5 in Canada

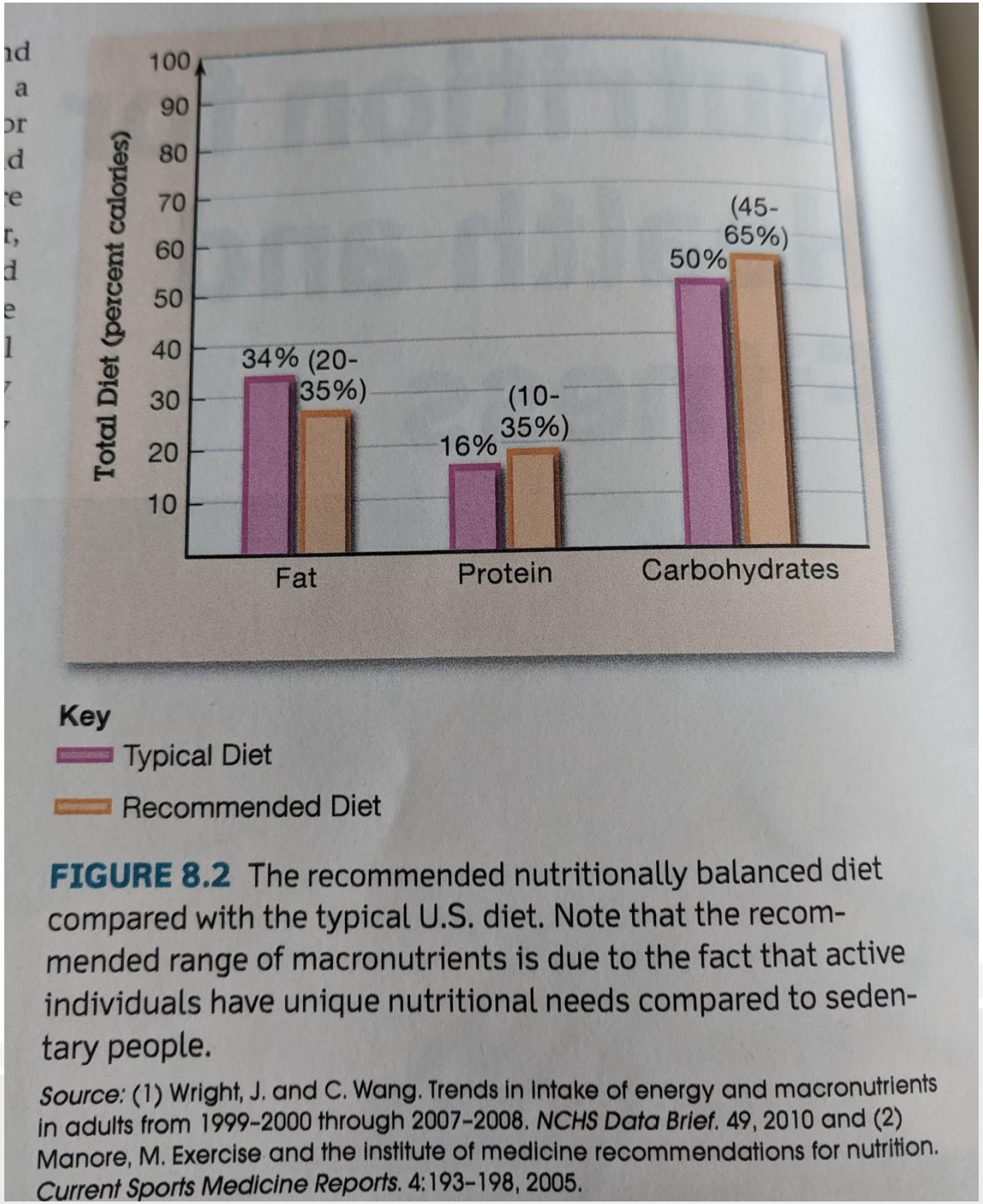


FIGURE 8.2 The recommended nutritionally balanced diet compared with the typical U.S. diet. Note that the recommended range of macronutrients is due to the fact that active individuals have unique nutritional needs compared to sedentary people.

Source: (1) Wright, J. and C. Wang. Trends in intake of energy and macronutrients in adults from 1999–2000 through 2007–2008. *NCHS Data Brief.* 49, 2010 and (2) Manore, M. Exercise and the institute of medicine recommendations for nutrition. *Current Sports Medicine Reports.* 4:193–198, 2005.

Think critically…

- It is common knowledge that food has a huge impact on health and disease
  - What is preventing people from adopting a healthier diet?

Discuss… and write 3 of your answers on the whiteboard.

- Produce spoils faster than buying processed foods
- Very expensive to buy organic foods
- Lack of education/expertise
- Allergies
- Fast food restaurants are faster and cheaper
- Easier to get full with unhealthy foods

Image from: https://en.wikipedia.org/wiki/Fast_food

Macronutrients

Concept 2: Describe the function of the four macronutrients in the body and list common dietary sources for each.

Macronutrients

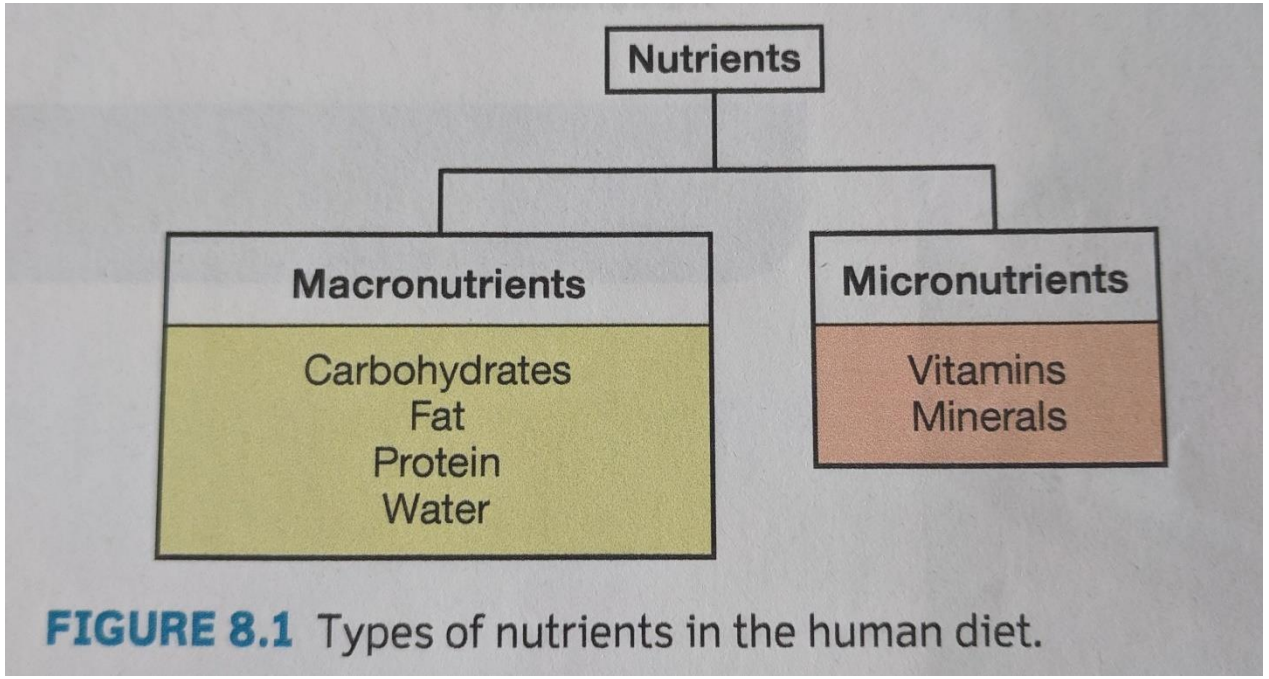


FIGURE 8.1 Types of nutrients in the human diet.

- Nutrients that are required in relatively large amounts – carbohydrates, fats, proteins, and water; necessary for building and maintaining body tissues and providing energy.

Macronutrients continued

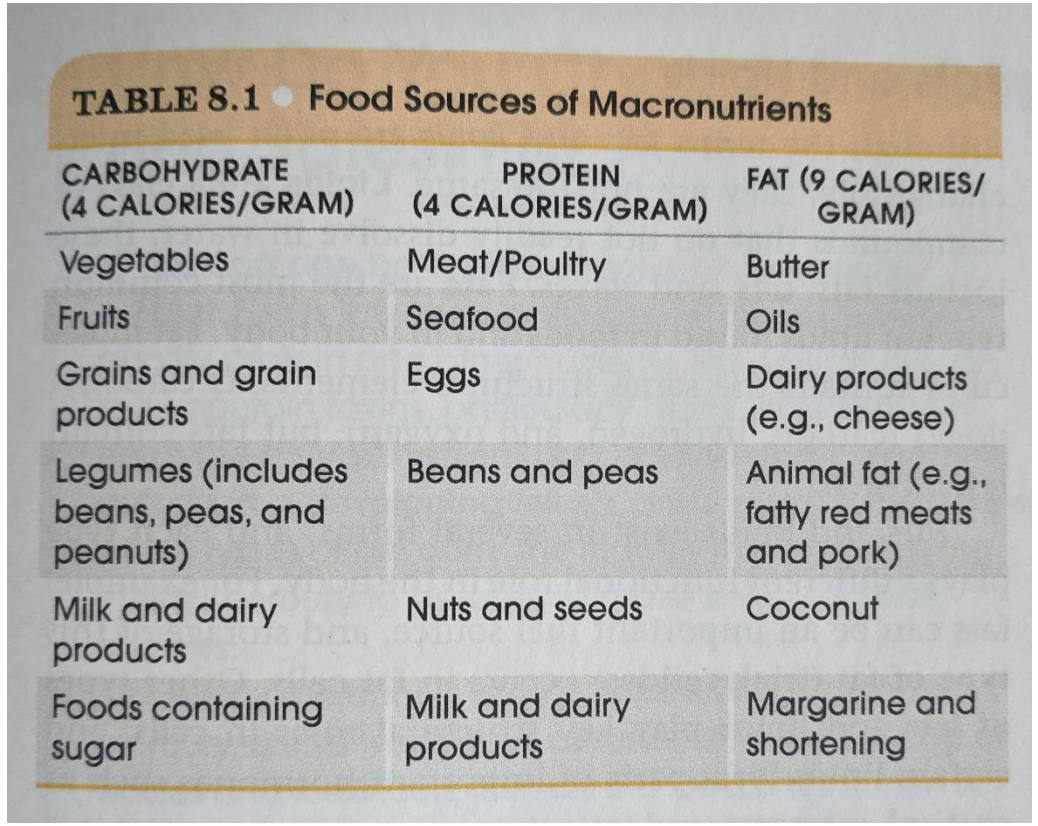


TABLE 8.1 Food Sources of Macronutrients

CARBOHYDRATE (4 CALORIES/GRAM)	PROTEIN (4 CALORIES/GRAM)	FAT (9 CALORIES/ GRAM)
Vegetables	Meat/Poultry	Butter
Fruits	Seafood	Oils
Grains and grain products	Eggs	Dairy products (e.g., cheese)
Legumes (includes beans, peas, and peanuts)	Beans and peas	Animal fat (e.g., fatty red meats and pork)
Milk and dairy products	Nuts and seeds	Coconut
Foods containing sugar	Milk and dairy products	Margarine and shortening

- Note that:
  - Carbohydrates and protein have 4 calories per gram
  - Fats have 9 calories per gram

What does this mean?

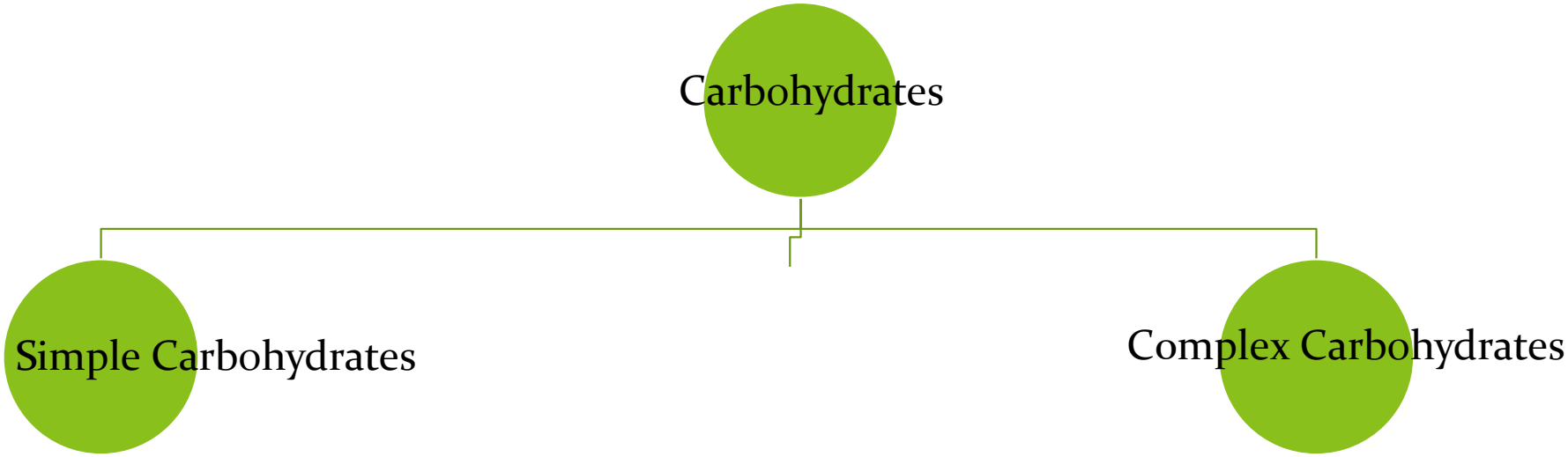
- Fats take longer to break down than protein and carbohydrates

Which would you eat if you wanted to get a quick supply of energy?

Macronutrients continued

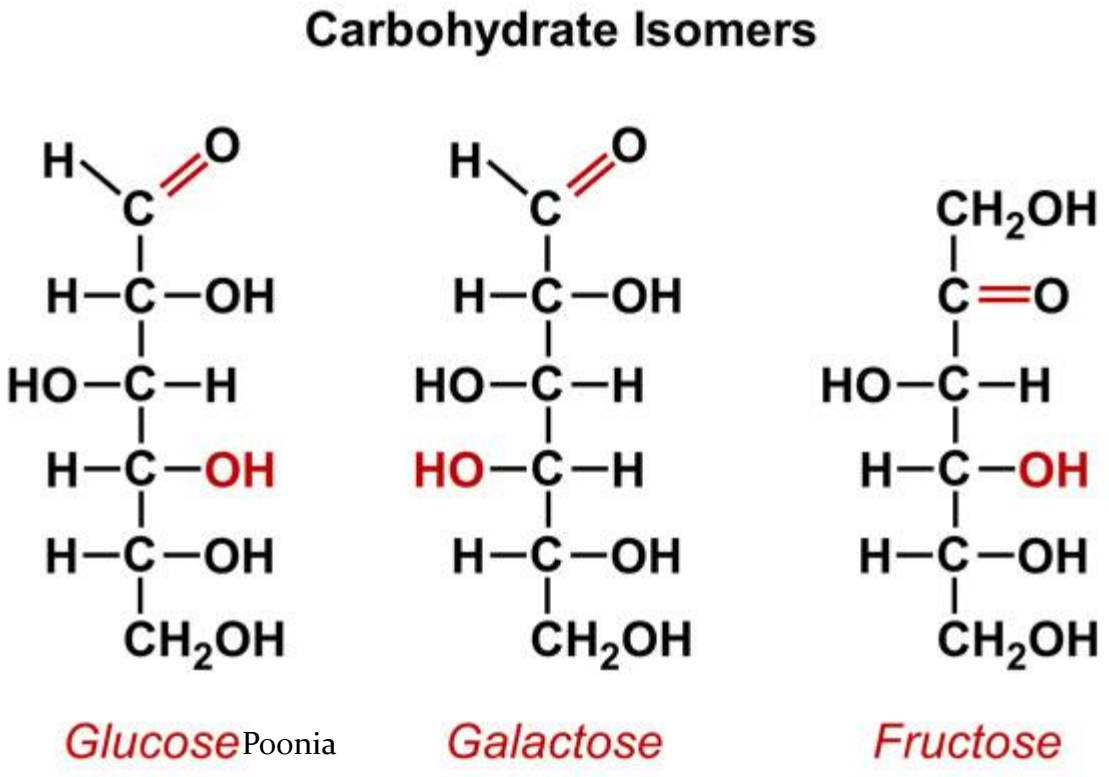
- Major function is to provide energy for the body
- The energy contained in foods is measured in **kilocalories** (also known as a Calorie).
- Carbohydrates and fats provide the bulk of energy you require
- Protein in the body is used to support growth and development (*building blocks for all cells)*
- Metabolism: sum total of all of the chemical events that occur in cells

1. Carbohydrates



Carbohydrates – Simple Sugars

- Consist of chains of one or two simple sugars
- Common sugars: glucose, fructose, and galactose



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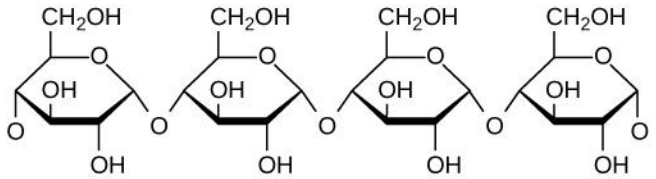
Simple Carbohydrates - Glucose

- A simple carbohydrate (sugar) that can be used as fuel
- Stored in skeletal muscles and the liver as a complex carbohydrate called **glycogen**
- Some of the glucose gets used immediately
  - The rest of it will be stored as fat
- If not enough glucose, body will break down protein

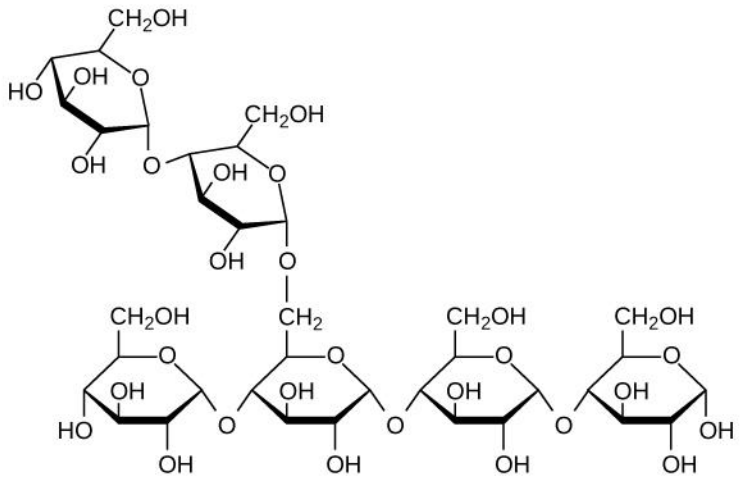
Complex Carbohydrates

- Long chains of sugar units linked together to form glycogen, starch, or fiber

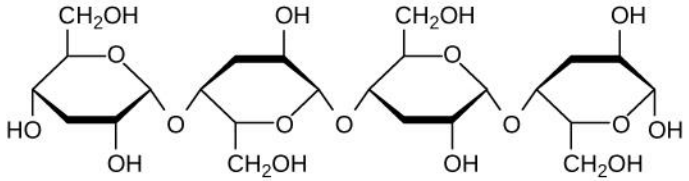
Starch



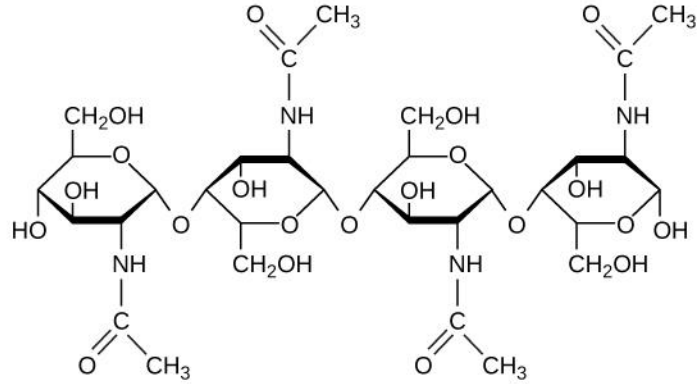
Glycogen

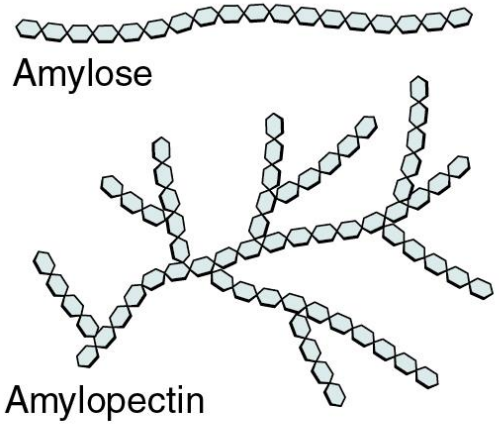


Cellulose

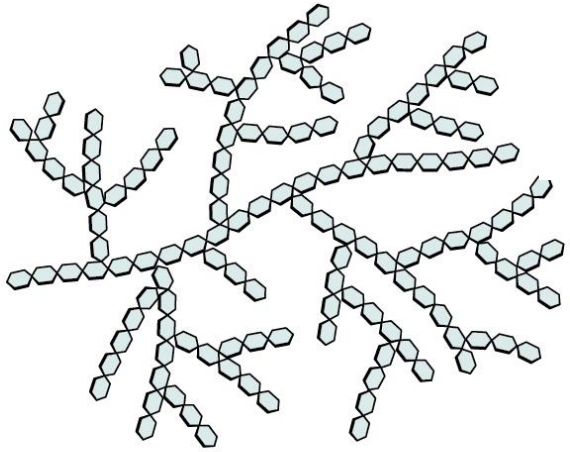


Chitin

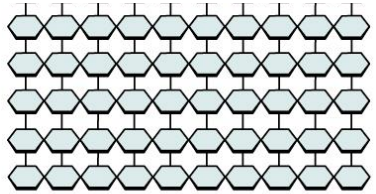




Starch



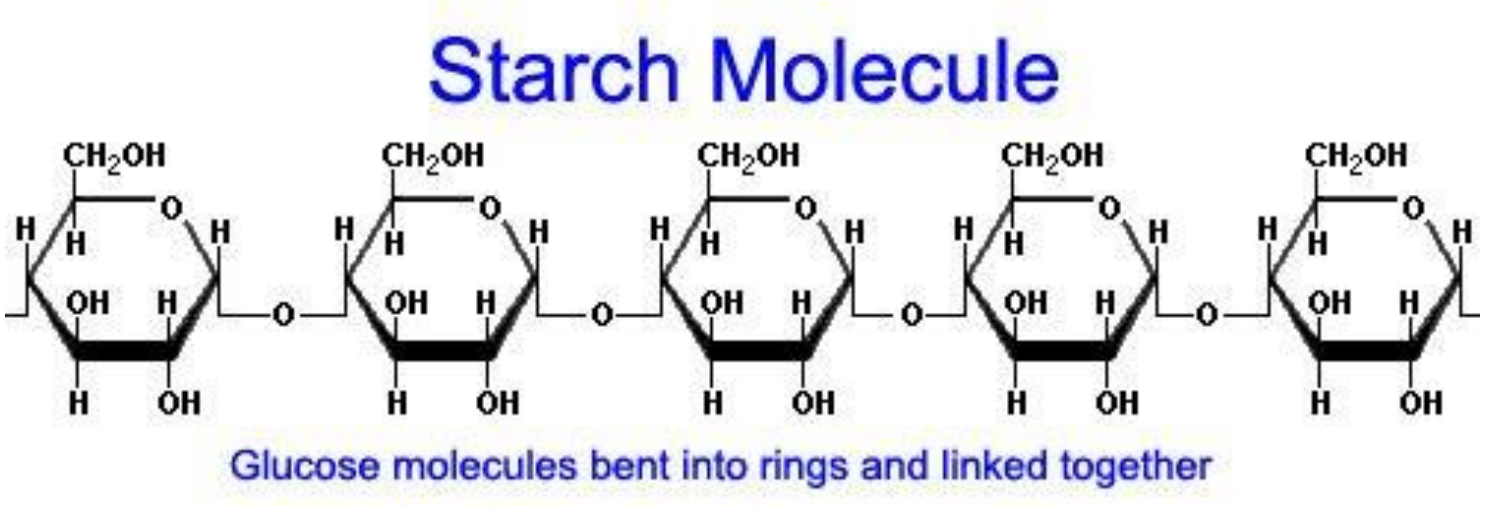
Glycogen



Cellulose (fiber)

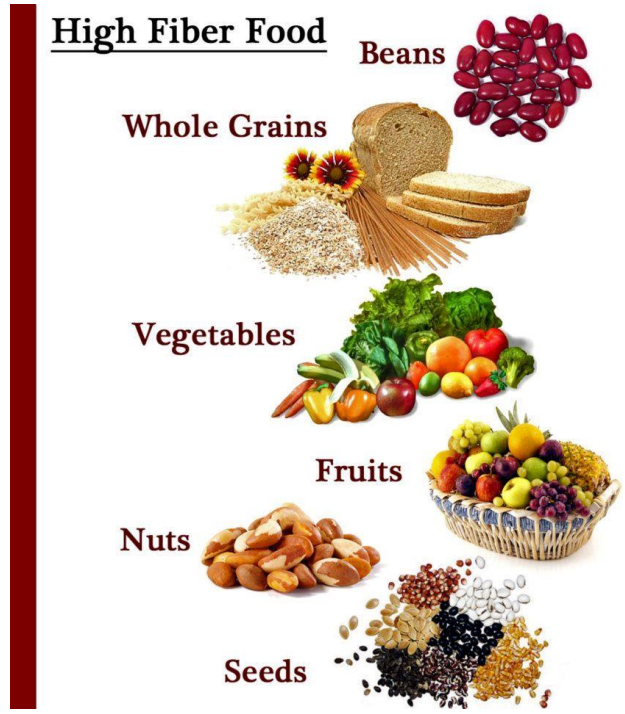
Complex Carbohydrates - Starch

- Long chains of glucose units; found in foods such as corn, grains, and potatoes
- Storage form of carbohydrates found in plants



Complex Carbohydrate - Fiber

- Undigestible carbohydrate found in plants
  - Not a fuel source but still important
  - Aids in formation and elimination of waste products
    - Decreases risk of colon cancer, cardiovascular disease, and type 2 diabetes
      - By reducing the digestion and absorption of selected macronutrients and decreasing the contact time of cancer-casing agents within the digestive system



Dietary Fiber

- Soluble fiber
  - Viscous fiber that dissolves in water; slows stomach emptying
  - Found in legumes, oats, flaxseeds, and certain fruits and vegetables
  - Attracts water and forms a gel – delays stomach emptying – may reduce appetite
  - Lowers blood cholesterol
- Insoluble fiber
  - Adds bulk and passes through the gastrointestinal tract largely intact
  - Speeds up “transit” time
  - Founds in whole grains, nuts, seeds, and certain fruits and vegetables

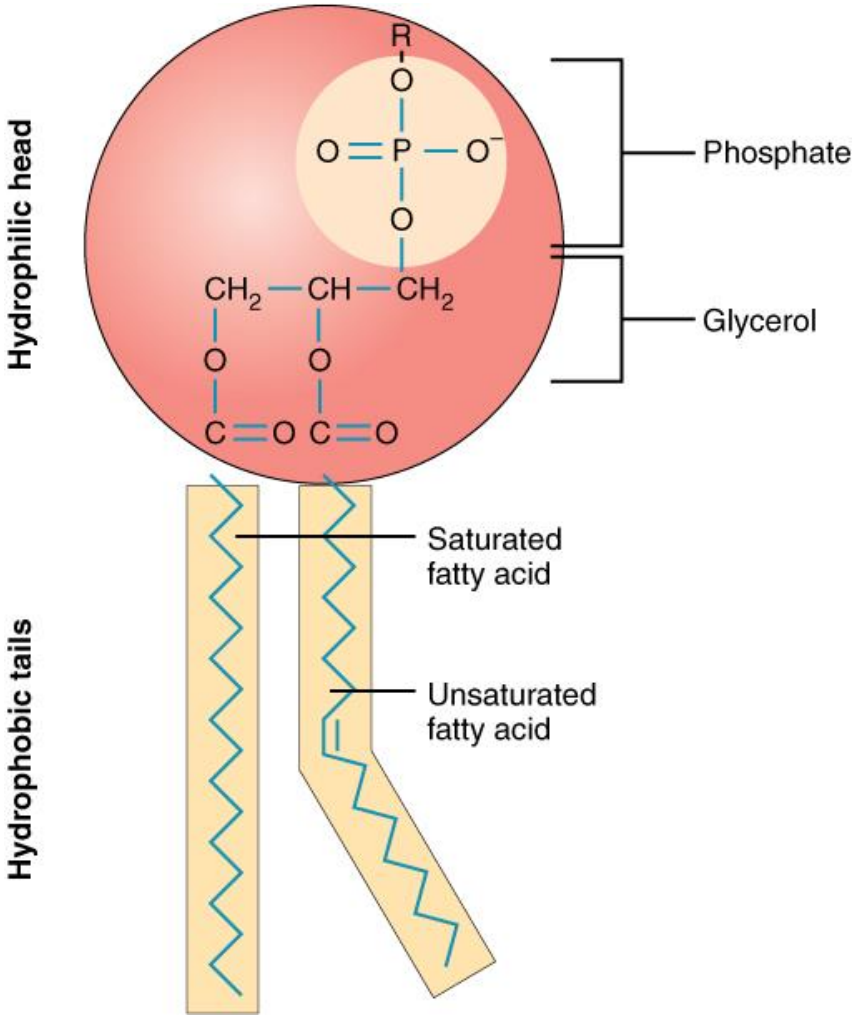
Recommended fiber intake is 25-38 grams per day for most people

Carbohydrates in Foods

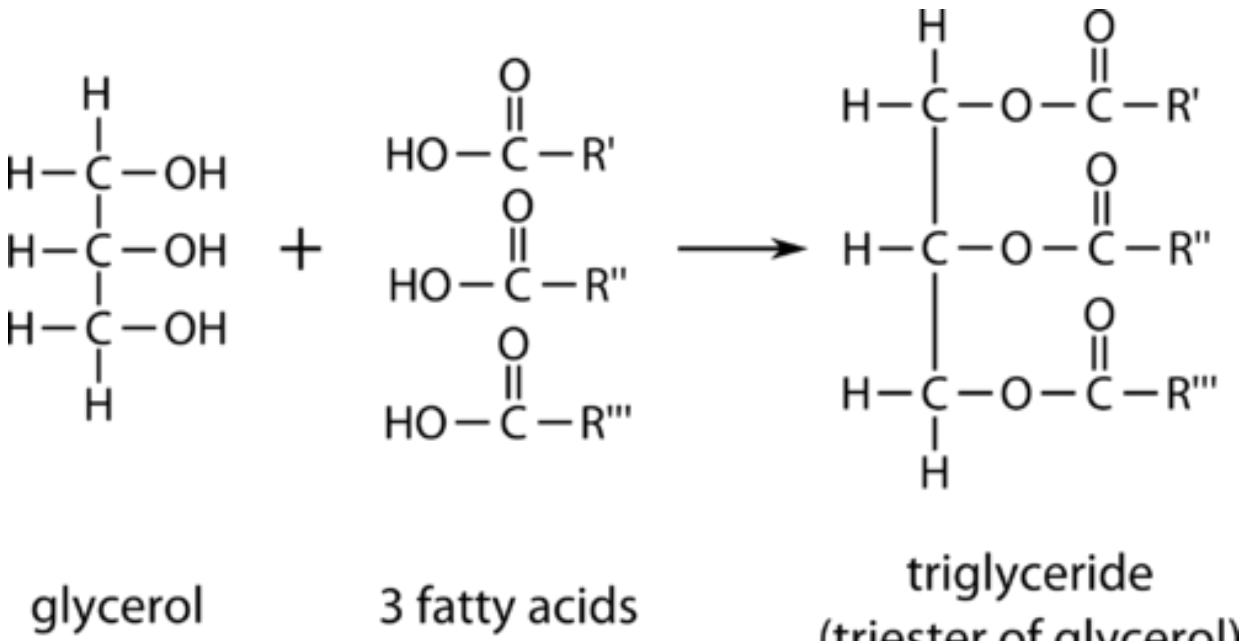
- Healthiest sources for carbohydrates are whole foods such as vegetables and fruits
  - Starch- potatoes, corn, bread and rice
  - Fiber – all plant derived foods
  - Simple sugars found in food: fructose, galactose, lactose, maltose, and sucrose
    - Fructose – found in fruits
    - Galactose and lactose – found in dairy products
    - Maltose – found in some grains
    - Sucrose – table sugar – mostly in processed foods

2. Fats and Lipids

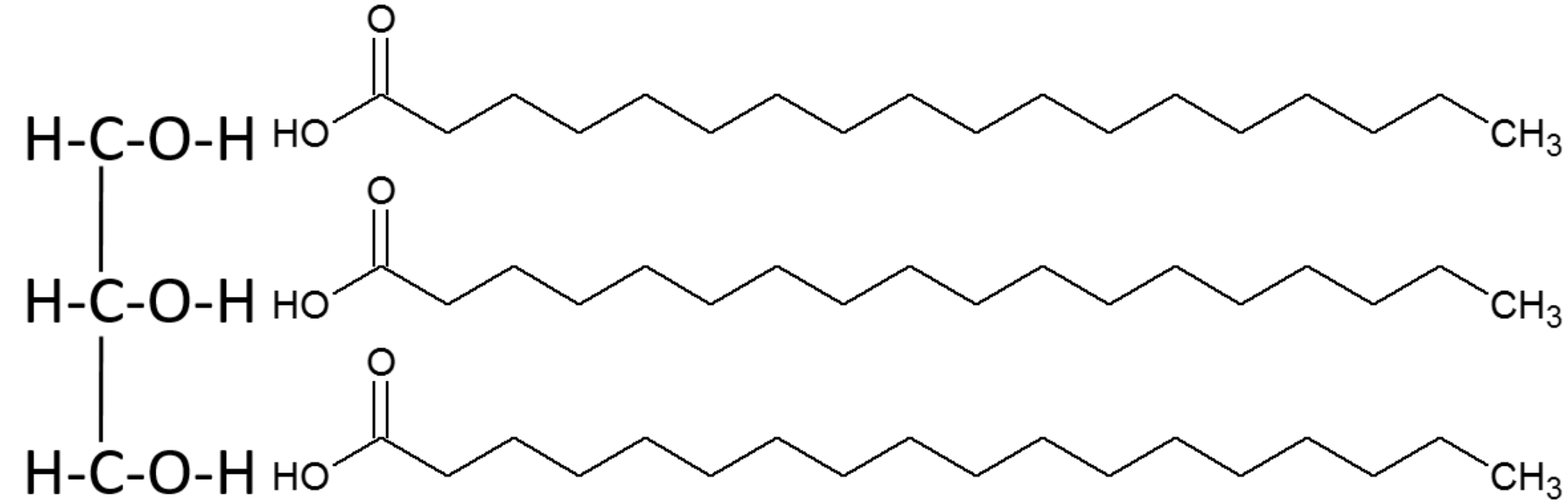
- Lipids: group of insoluble compounds that includes fats and cholesterol
- Fats: the most common type of lipids found in foods and your body
  - Fats and carbohydrates have a similar composition (carbon, hydrogen, oxygen), however, fats contain less oxygen.
  - Have a diverse range of use in the body: hormones, fuel source, storage, structural roles



Types of Fats



1. Fatty acid: consists of a small chain of carbon, hydrogen and oxygen atoms. The most basic structure of most fats.
2. Triglycerides: made up of three fatty acids attached to a glycerol backbone. It is a form of lipid that is broken down in the body and used to produce energy to power muscle contractions during exercise.



Glycerol 3 Fatty Acids

Types of Fats continued

Fatty acids are further classified into *saturated fatty acids* and *unsaturated fatty acids*.

- Unsaturated fatty acids: type of fatty acid that comes primarily from plant sources and is liquid at room temperature
  - Shown to lower LDL ("bad" cholesterol), typically due to Omega-3 fatty acid consumption
- Omega-3 fatty acids: family of polyunsaturated fatty acids; increased consumption of several members of the omega-3 fatty acid family is associated with a decreased risk for heart disease.

Polyunsaturated fatty acids

- Linoleic acid and alpha-linolenic acid
  - Essential fatty acids
  - Found in several sources: cooking oils: coconut oil, butter fat, beef fat, and palm oil

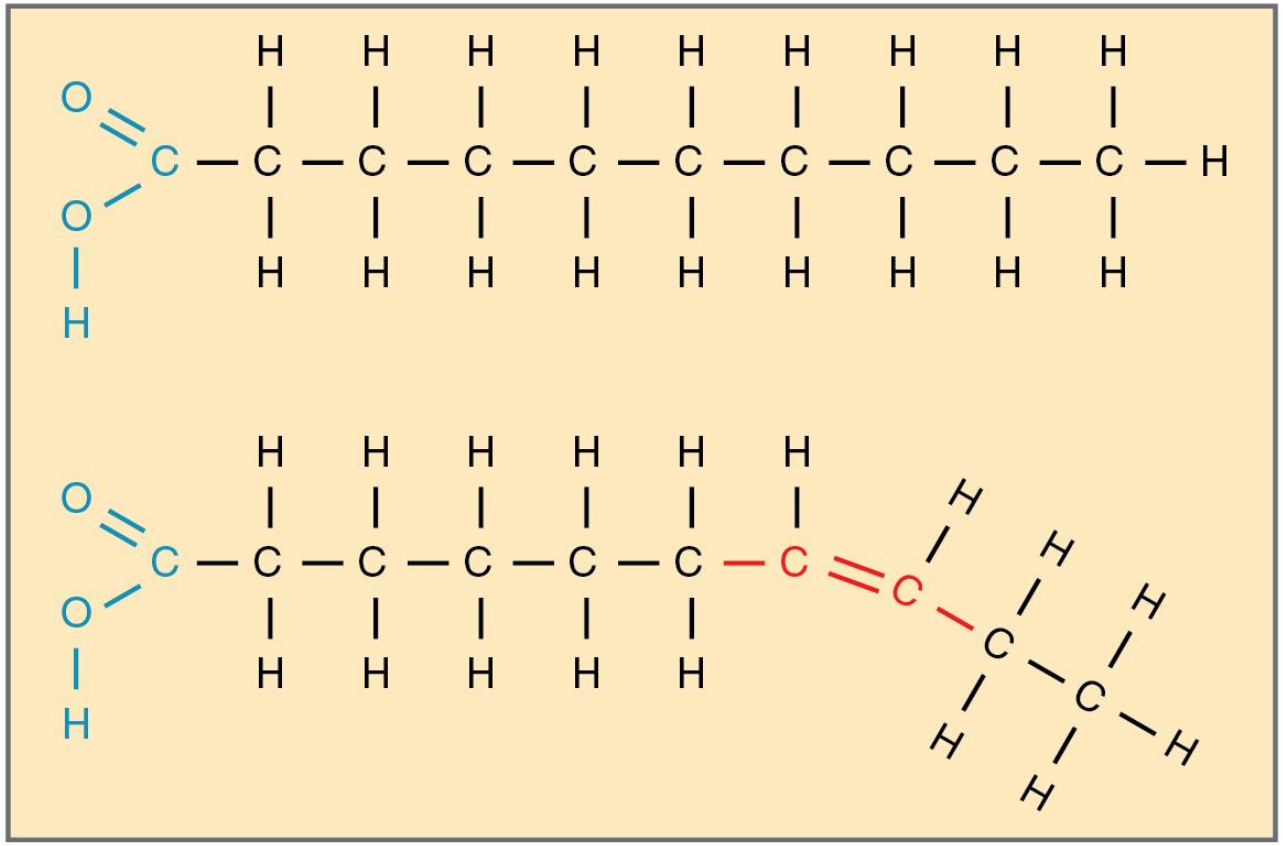
If you eat a lot of fish….

- Consider reading the blurb about “How Do You Choose the Best and Safest Fish” on page 219 of the textbook.
- Due to the amount of omega-3 fatty acids in fish, researchers recommend 2-3 servings per week
  - Be aware of mercury content

Saturated Fat versus Unsaturated Fat

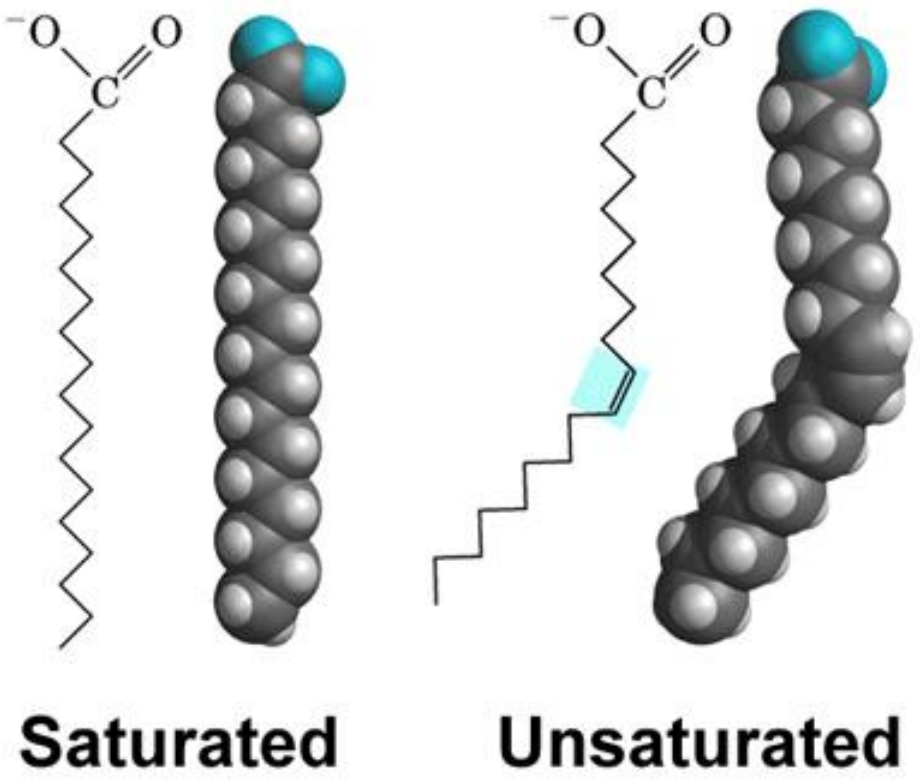
(a) Saturated

(b) Unsaturated



Saturated Fatty Acids

- Solid at room temperature
- Found in meat, dairy and plant sources
- Shown to increase total cholesterol and LDL cholesterol which can lead to heart disease



Trans fatty acids

- AKA Trans fats
- Converted from unsaturated fatty acids
- Found in fried foods, fast-food products, and processed snack foods and baked goods
- Increase total cholesterol level and LDL cholesterol, increasing heart disease risk

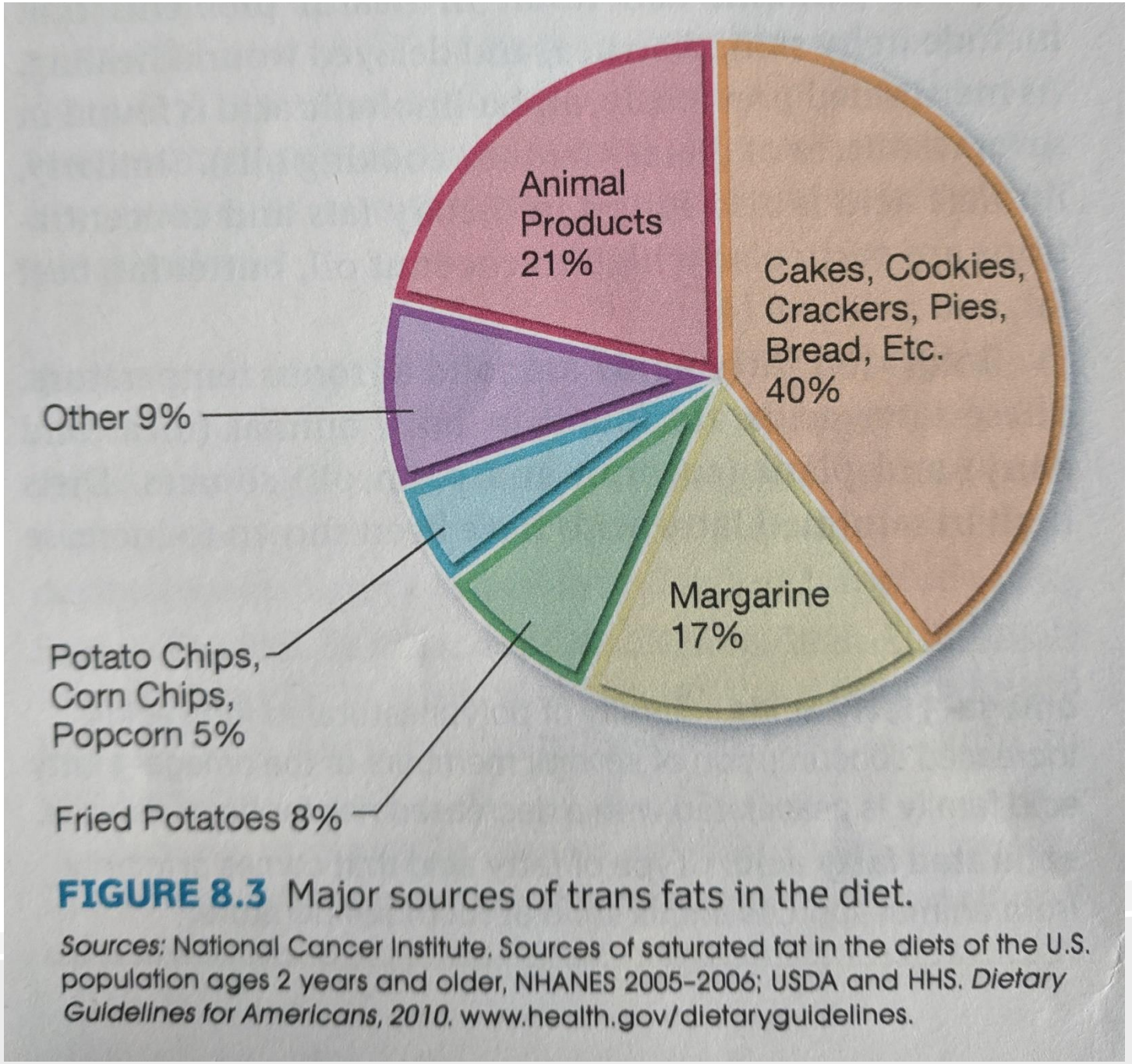
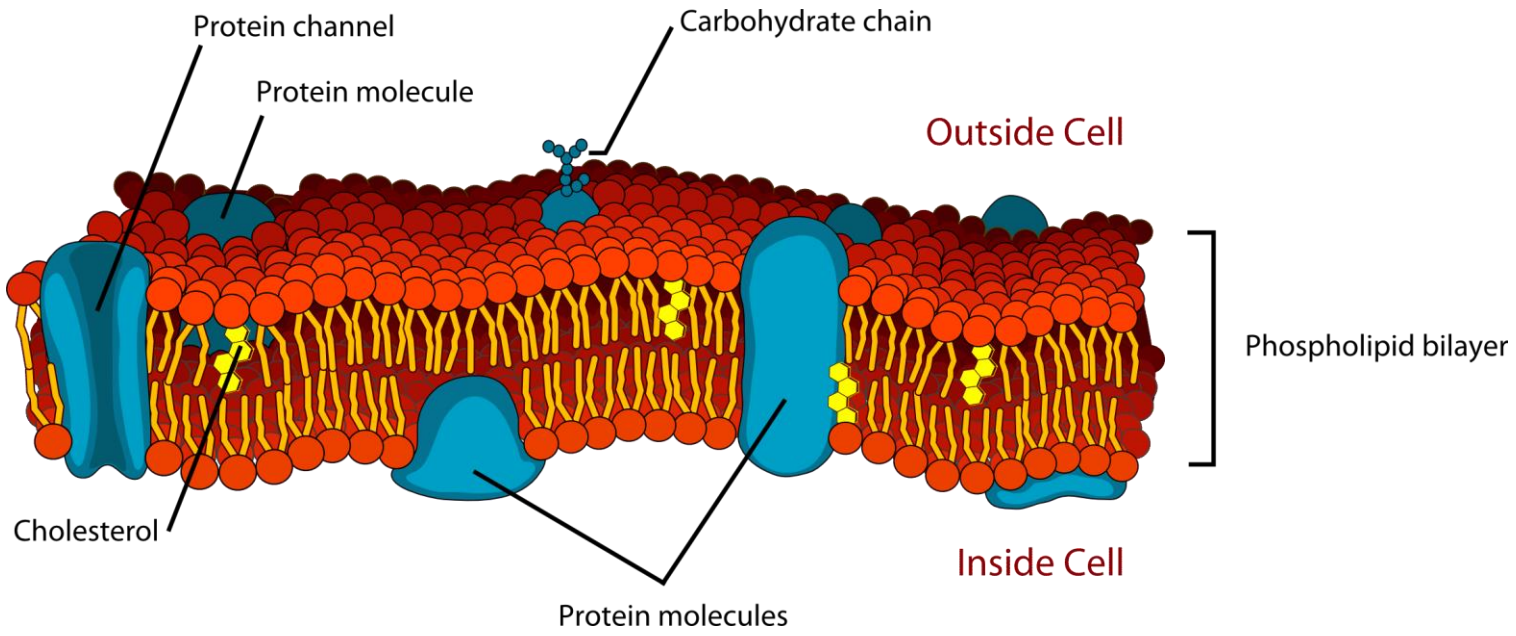


FIGURE 8.3 Major sources of trans fats in the diet.

Sources: National Cancer Institute. Sources of saturated fat in the diets of the U.S. population ages 2 years and older, NHANES 2005–2006; USDA and HHS. *Dietary Guidelines for Americans, 2010.* www.health.gov/dietaryguidelines.

Other Major Types of Lipids

- Phospholipids: lipid molecules that contain phosphorus and is an important component of the cell membrane
- Emulsifier (allow fat and water to mix) and aid in digestion and absorption

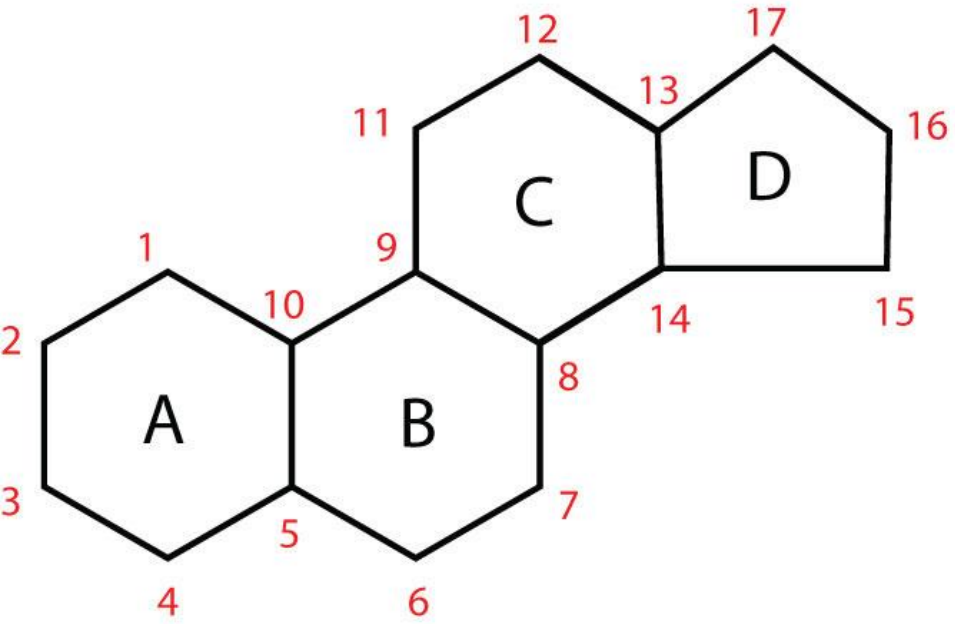


Other major lipids: Sterols

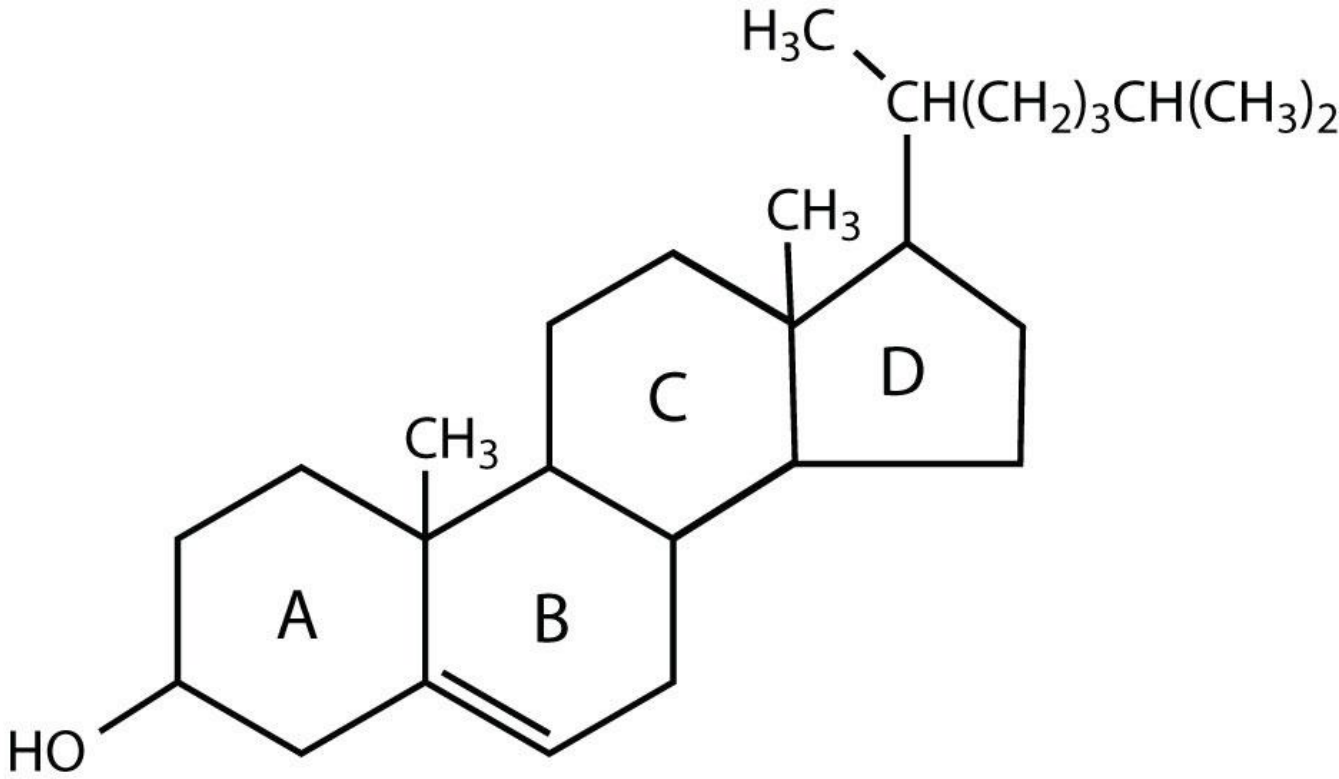
- Type of lipid that does not contain fatty acids; cholesterol is the most commonly known sterol
- Cholesterol: a lipid that is a component of cells and used to manufacture hormones.
  - High cholesterol = high risk of heart disease
  - Cholesterol is transported in the form of lipoproteins
    - High-density lipoprotein (HDL) = “good” cholesterol
    - Low-density lipoprotein (LDL) = “bad” cholesterol

Fats and Lipids in Foods

- Need very little to maintain health
  - "healthy" fats can be found in fish, seeds, nuts, and vegetable oils
  - "unhealthy" fats can be found in fatty meats, butter, lard, fried foods, and in many baked items
  - Cholesterol is found mainly in animal products – meats, shellfish, and dairy products
    - Diets high in saturated fats and trans fatty acids cause an increase in cholesterol production
  - Plants do not produce cholesterol



(a) Steroid skeleton



(b) Cholesterol

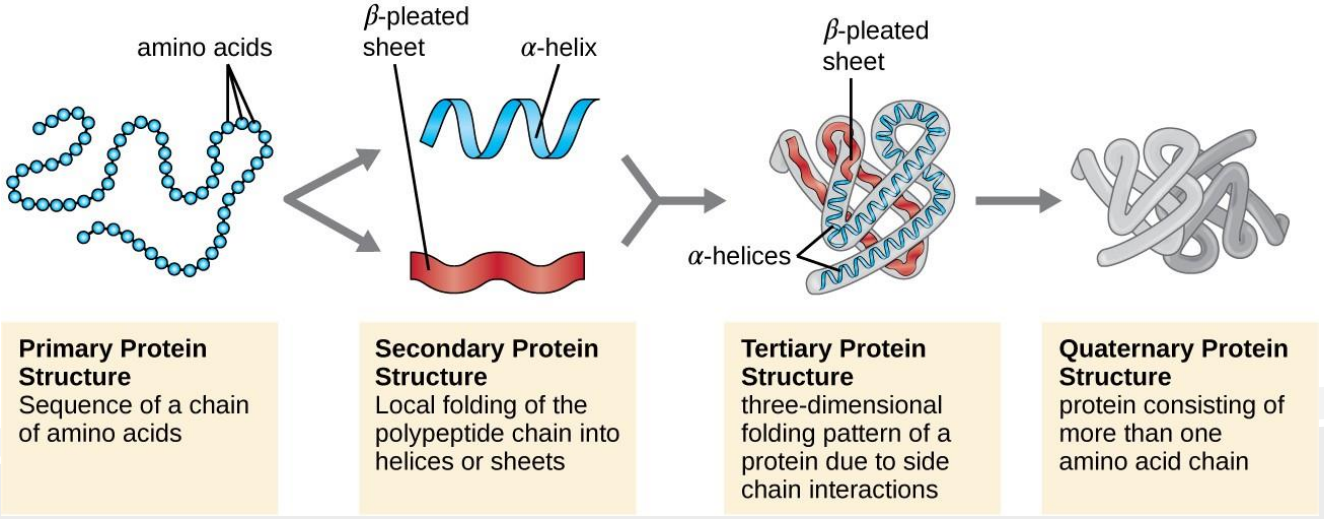
3. Proteins

- Form a major part of lean tissue
  - Totalling about 17%-20% of body weight

- Primary role is to serve as the structural unit to build and repair body tissues.
- Important for: producing enzymes, hormones, and antibodies
  - Aid in regulating metabolism and provide protection from disease

Protein Structure

- Amino acid: basic structural units of protein; 20 different amino acids can be linked in carious combinations to create different protein
- Essential amino acids: 9 amino acids that cannot be made by the body and must be consumed through diet
- Nonessential amino acids: 11 amino acids that the body can make and are not required in the diet



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Essential	Non-Essential
Histidine	Alanine
Isoleucine	Arginine
Leucine	Asparagine
Lysine	Aspartic acid
Methionine	Cysteine
Phenylalanine	Glutamic acid
Threonine	Glutamine
Tryptophan	Glycine
Valine	Proline
	Selenocysteine
	Serine
	Tyrosine

Table 2.1 - Essential and non-essential amino acids

Essential Amino Acids	WHO-Recommended Daily Intake (mg/kg body weight)	WHO-Recommended Daily Intake for a 120 lb adult (mg)	EAAs in 1 Medium 250g Potato (mg)	EAAs in 5 Potatoes (mg)	% of RDI Supplied by 5 Potatoes
Phenylalanine and Tyrosine	14	762	423	2115	278
Valine	10	544	292	1460	268
Threonine	7	381	188	940	247
Tryptophan	3	163	80	400	245
Isoleucine	10	544	210	1050	193
Leucine	14	762	310	1550	203
Methionine and Cysteine	13	707	148	740	105
Lysine	12	653	315	1575	241

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Protein in Foods

- Complete proteins: contain all of the essential amino acids that are present only in animal foods and soy products
- Incomplete proteins: are missing one or more essential amino acids, present in vegetable sources

Calculating Your Protein Needs

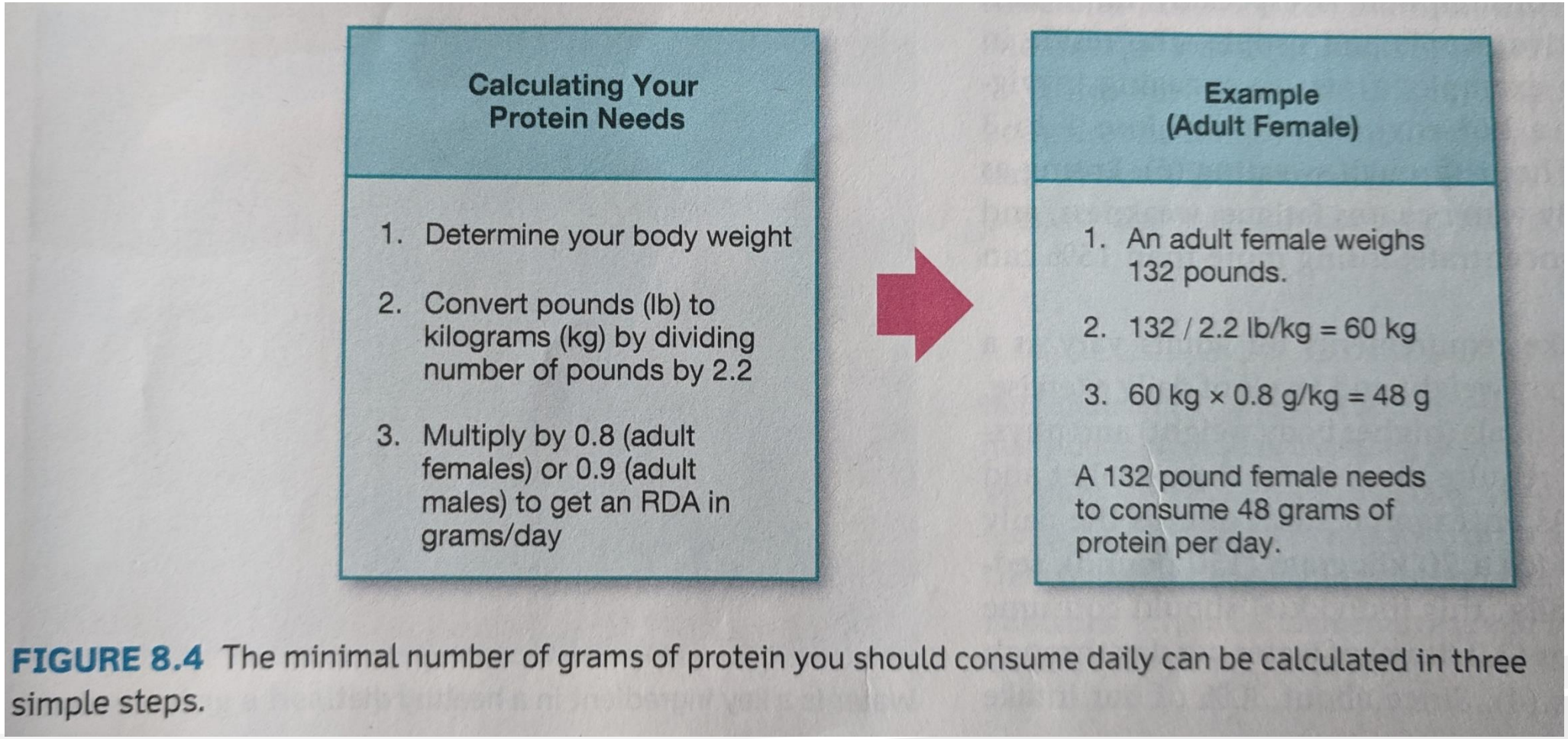

FIGURE 8.4 The minimal number of grams of protein you should consume daily can be calculated in three simple steps.

Water

- Makes up 60-70% of total body weight
- Important for: temperature regulation, digestion, nutrient absorption, blood formation, and waste elimination
- Losing 5% of body water causes fatigue, weakness, and inability concentrate
  - Losing 15% can be fatal

Water continued

- Water intake varies
  - Function of body weight
  - Levels of daily exercise
- 30% of water intake comes from food
- 10% is produced by metabolism

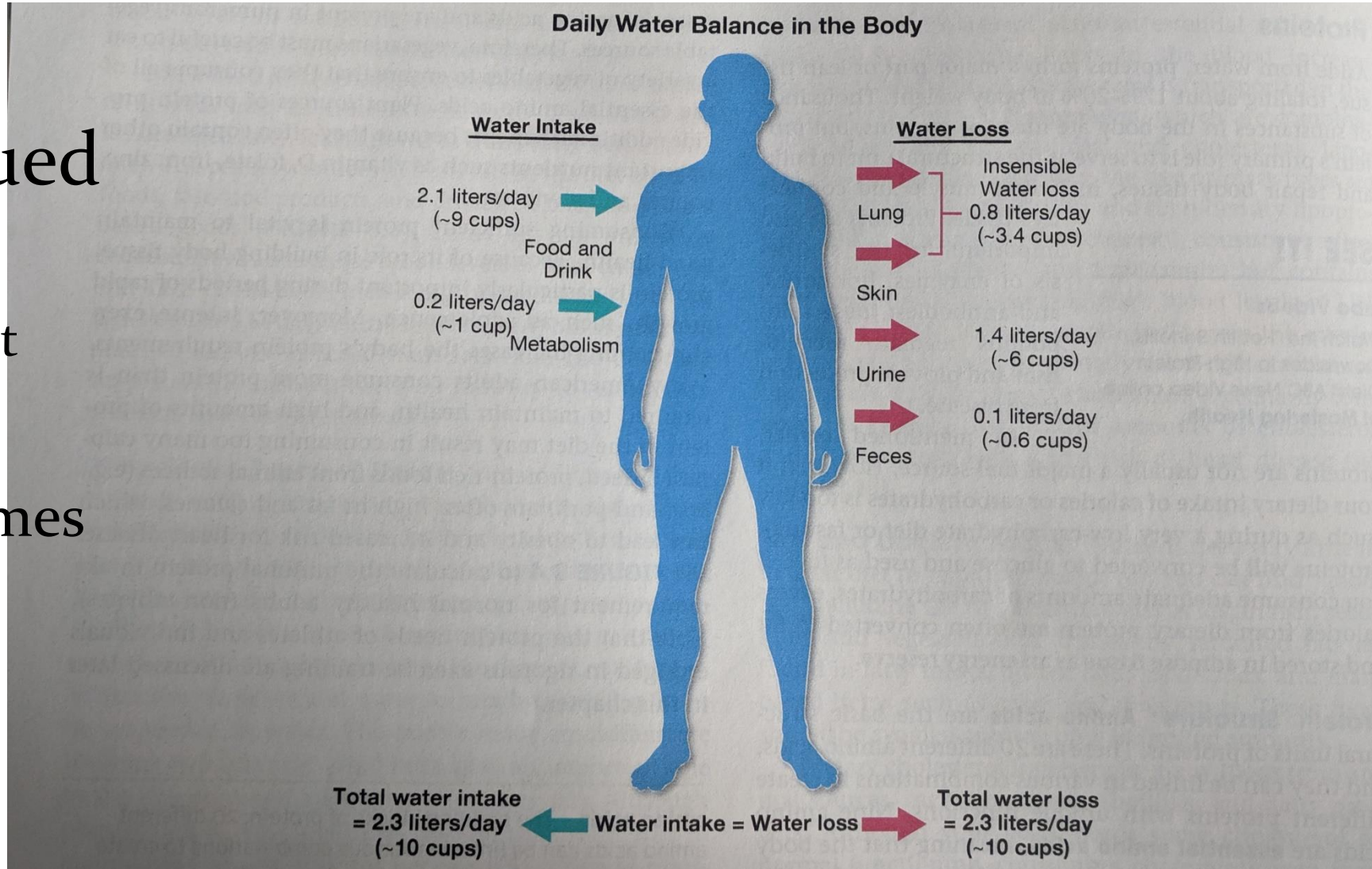

FIGURE 8.5 The amount of water you consume in food and beverages and that you produce during metabolism is about equal to the amount you excrete in urine, sweat, and feces and through exhalation and insensible water loss.

Micronutrients

Concept 3: Explain what micronutrients are and why they are important for health.

Micronutrients

- Nutrients that are required in small amounts – vitamins and minerals; they are involved in many body processes, including regulating cell function
- They do not supply energy
- Required for maintaining a healthy body

Micronutrients - Vitamins

- Essential organic substances that are required in the diet for normal function, growth, and maintenance of body tissues
  - Must be consumed via diet
  - Water soluble vitamins include B vitamins and vitamin C
    - Not stored in the body and are eliminated by the kidneys
  - Vitamins A, D, E, and K are fat soluble
    - Stored in body fat and can accumulate in body tissue
    - Vitamin A toxicity is the most likely to occur

Minerals

- Chemical elements required by the body in small amounts for normal functioning

- Major minerals: calcium, phosphorus, potassium, sulfur, sodium, chloride, & magnesium
- Trace minerals: iron, manganese, copper, zinc, iodine, fluoride, & selenium

Minerals Continued

Important minerals

- Calcium: bone formation
  - Deficiency: osteoporosis
- Iron: component of hemoglobin (transport oxygen in red blood cells)
  - Deficiency: iron-deficiency anemia → chronic fatigue
- Sodium: muscle and nerve function
  - Deficiency: hypertension

TABLE 8.2 Selected Vitamins: Food Sources, Functions, and Deficiency and Toxicity Symptoms

VITAMIN	SELECTED FOOD SOURCES	SELECTED FUNCTIONS	DEFICIENCY SYMPTOMS	TOXICITY SYMPTOMS
FAT-SOLUBLE				
A 	Liver, spinach, carrots, sweet potatoes; other orange and green leafy vegetables	Necessary for vision, bone growth, fertility	Night blindness, impaired immunity, infertility	Birth defects, loss of appetite, blurred vision, hair loss, liver damage
D	Fortified milk; produced in the skin under sunlight	Regulates blood calcium levels; bone health; cell differentiation	Rickets in children, bone weakness and increased fractures in adults	Hypercalcemia, calcium deposits in kidneys and liver
E	Vegetable oils, whole grains, nuts, seeds	Antioxidant; improves absorption of vitamin A	Anemia, impaired nerve transmission, muscle weakness	Inhibited blood clotting
K	Green leafy vegetables; cabbage, cauliflower	Helps with blood clotting	Reduced ability to form blood clots	No known symptoms
Water-soluble				
Thiamin (B_1) 	Whole grains, organ meat, lean pork	Coenzyme in carbohydrate metabolism and some amino acid metabolism	Beriberi, weight loss, confusion, muscle weakness	No known symptoms
Riboflavin (B_2)	Dairy products, enriched breads and cereals, lean meats, poultry, fish	Coenzyme; helps maintain mucous membranes	Sore throat, swelling of the tongue, anemia	No known symptoms
Niacin (B_3)	Eggs, poultry, fish, milk, whole grains, nuts, enriched breads and cereals	Coenzyme in carbohydrate and fatty acid metabolism; plays role in DNA replication and repair and cell differentiation	Pellagra, rash, vomiting, constipation or diarrhea	Flushing, liver damage, glucose intolerance, blurred vision
Vitamin B_6	Eggs, poultry, fish, whole grains, liver, kidney, pork	Coenzyme involved in amino acid and carbohydrate metabolism; synthesis of blood cells	Dermatitis, anemia, convulsions	Skin lesions 
Vitamin B_{12}	Meat, fish, poultry, fortified cereals	Coenzyme that assists with blood formation and nervous system function	Pernicious anemia, pale skin, fatigue, shortness of breath, dementia	No known symptoms
Folate	Green leafy vegetables, yeast, oranges, whole grains, legumes	Coenzyme involved in DNA synthesis and amino acid metabolism	Macrocytic anemia, weakness and fatigue, headache, neural tube defects in developing fetus	Masks symptoms of vitamin B_{12} deficiency; neurological damage
Vitamin C 	Citrus fruits, peppers, spinach, strawberries, tomatoes, potatoes	Antioxidant; assists with collagen synthesis; enhances immune function; enhances iron absorption	Scurvy, bleeding gums and joints, loose teeth, depression, anemia	Nausea and diarrhea, nosebleeds, abdominal cramps

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Micronutrients in the Diet

- The brighter the fruit and vegetable, the higher its vitamin and mineral content
- Some water-soluble vitamins can be destroyed during cooking or processing

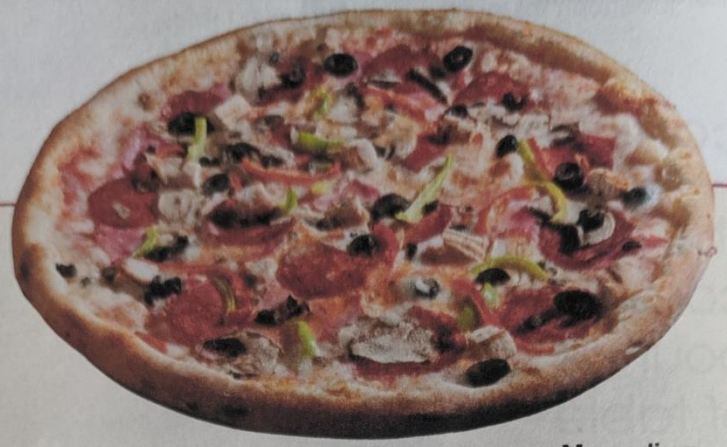
What Are the Guidelines for a Healthy Diet?

Concept 4: Outline the guidelines for a healthy diet.

Follow the instructions in your note package.

TABLE 8.4 Examples of Low or Nonfat Alternatives

HIGH-FAT CHOICE	LOW OR NONFAT OPTION
Whole milk	1% or skim milk
Whole-milk cheese	Part skim or fat-free cheese
Fried chicken with the skin	Skinless baked or broiled chicken
Creamy Italian or ranch dressing	Vinaigrette dressing
Mayonnaise	Mustard
Alfredo sauce	Marinara sauce
Shortening or butter	Cooking spray or olive oil



Ingredients	Mg sodium
Crust	
Pre-made from Pillsbury Hot Roll Mix (whole box)	1536
Sauce	
8 oz. Contadina Pizza Sauce	1350
Toppings	
Mozzarella (8–10 oz at 150 mg/oz)	1200–1500
Pork sausage (170 mg/oz) 6 oz	1020
Canadian bacon 2 oz	1450
Pepperoni 2 oz	1100
Black olives, 5 (sliced)	200
Mushrooms (raw sliced 1/2 cup)	5
Onion (1/2 cup raw)	6
Green pepper (1/2 cup raw)	10
Seasonings/herbs/spices (1 tsp)	500
Total = 8677mg sodium	

FIGURE 8.6 The amount of sodium in a typical medium pizza with "the works" will probably surprise you. Even if you eat only two slices, you are still likely consuming more than 1000 mg of sodium! Cutting back on the meat toppings and loading up on veggies will significantly lower the sodium.

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Use Available Resources to Plan Healthy Meals

Concept 5: List several resources that can be helpful in planning a healthy diet.

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Resources

1. Recommended Dietary Allowance (RDA): RDAs are the amount of nutrient that will meet the needs of almost every healthy person within a specific age and gender group (See table 8.5 on page 231 of textbook)
2. Adequate Intake (AI): This value is an "educated guess." It is used when the RDA is not known because the scientific data isn't strong enough to produce a specific recommendation, yet there is enough evidence for a general guideline.

Resources Continued

3. Estimated Average Requirement (EAR): This is the average daily amount of nutrient that is estimated to satisfy the needs of 50% of people in a given age group

4. Tolerable Upper Intake Level (UL): This is the highest average nutrient intake level that a person can consume without risking adverse health effects. Anything above this amount can result in toxicity.

FOOD LABEL SMARTS

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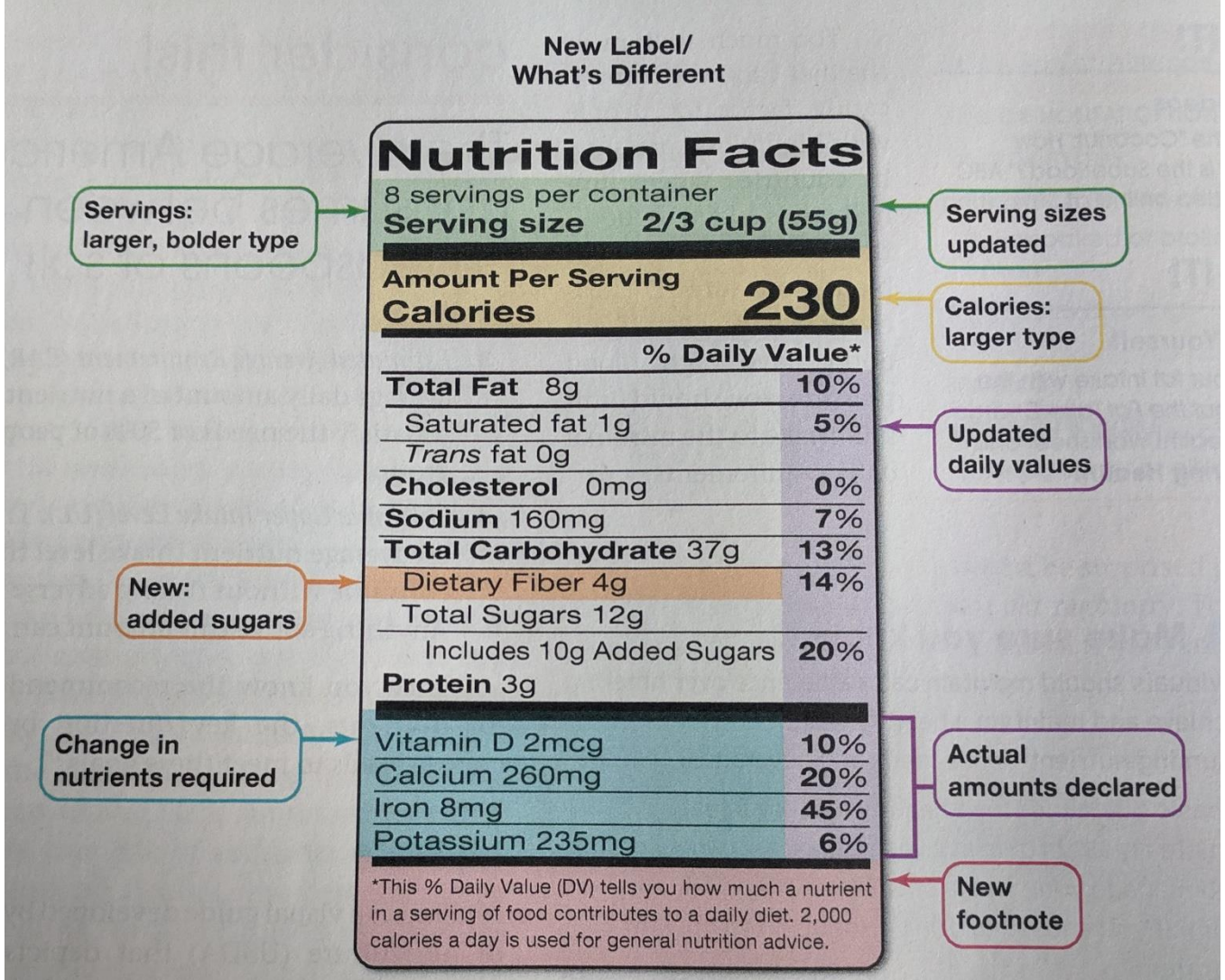

FIGURE 8.8 Nutrition Facts on food labels can help you select foods that are low in fat, cholesterol, sodium, sugar, and calories and that are adequate in protein, carbohydrates, and selected micronutrients. The % Daily Value (DV) helps you determine how good a source a food is for a given nutrient. In general, foods with less than 5% of the DV are considered low in a nutrient, while those with more than 20% of the DV are considered high in that nutrient.

Source: U.S. Department of Agriculture. *Dietary Guidelines for Americans 2016.* Washington, DC: U.S. Government Printing Office.

a. Food labels must appear on all packaged foods except those produced by small businesses and those in packages too small to accommodate the information. This label from a macaroni-and-cheese product illustrates how the Nutrition Facts panel and the ingredient list can help you to evaluate the nutritional contribution this food will make to your diet.

Standard serving sizes are required to allow consumers to compare products. For example, the number of kilocalories in one serving of macaroni and cheese can be compared with the number of kilocalories in one serving of packaged rice because the values for both are for a standard 225-g (1-cup) serving.

Food labels must list the "% Daily Value" for total fat, saturated fat, cholesterol, sodium, carbohydrate, dietary fibre, vitamins A and C, calcium, and iron. A % Daily Value of 5% or less is considered low, and a value of 20% or more is considered high.

The label provides information about the amounts of nutrients whose intake should be moderated or minimized—total fat, saturated fat, trans fat, cholesterol, and sodium.

The label provides information about the amounts of nutrients that tend to be low in the Canadian diet—fibre, vitamins A and C, calcium, and iron.

The ingredients are listed in descending order by weight, from the most abundant to the least abundant. The wheat flour in the macaroni is the most abundant ingredient in this product.

Nutrition Facts
Valeur nutritive

Per 1 cup (220 g)/par 1 tasse (225 g)

Amount / Teneur	% Daily Value / % valeur quotidienne
Calories / Calories 250	
Fat / Lipides 12 g	18%
Saturated / saturés 3 g + Trans / trans 1.5 g	15%
Cholesterol / Cholestérol 30 mg	10 %
Sodium / Sodium 470 mg	20 %
Carbohydrate / Glucides 31 g	10%
Fibre / Fibres 0 g	0 %
Sugars / Sucres 5 g	
Protein / Protéines 5 g	
Vitamin A / Vitamine A	4 %
Vitamin C / Vitamine C	2 %
Calcium / Calcium	20 %
Iron / Fer	4 %

Ingredients
Enriched macaroni product (wheat flour, niacin, ferrous sulfate [iron], thiamine mononitrate, riboflavin, folic acid); cheese sauce mix (whey, modified food starch, milk fat, salt, milk protein concentrate, contains less than 2% of sodium tripolyphosphate, cellulose gel, cellulose gum, citric acid, sodium phosphate, lactic acid, calcium phosphate, milk, yellow 5, yellow 6, enzymes, cheese culture)

Labels must contain basic product information, such as the name of the product, the weight or volume of the contents, and the name and place of business of the manufacturer, packager, or distributor.

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Grosvenor, M. B., & Smolin, L. A. (2018). *Visualizing nutrition: everyday choices*. Hoboken, NJ: Wiley.

Kahoot Link

https://play.kahoot.it/v2/?quizId=6518851d-1515-4139-b944-9c2277705f215gameMode=ghost&startTime=1572547222234

Healthy Food Choice

- More tips from the Government of Canada
- https://food-guide.canada.ca/en/healthy-food-choices/

Special Dietary Considerations

Concept 6: Explain why children, pregnant women, vegetarians, and those with food allergies or intolerances have special dietary needs and how these needs can be addressed.

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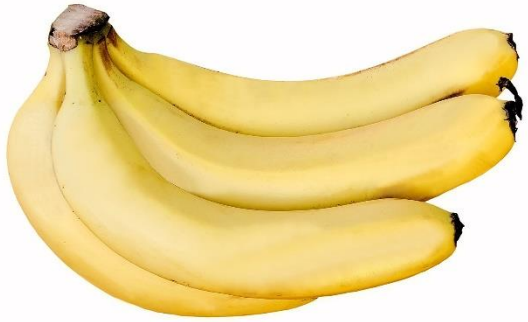
Probiotics and Health

- Prebiotics: compounds that feed your gut bacteria stimulating growth of healthy bacteria in the gut; prebiotics are contained in many fruits and vegetables
  - Asparagus, legumes, bananas, raw garlic, onions, leeks, apples



- Probiotics: live microorganisms such as bacteria or yeast; probiotics can be obtained in the diet (i.e., fermented foods) or through dietary supplements
  - Yogurt, pickles, capsules or gummies containing probiotics

Health Benefits

1. Maintenance of a healthy immune system
2. Control of blood pressure
3. Synthesis of select vitamins (e.g. Vitamin K)
4. The breakdown of food to extract nutrients for the body

Vitamins: B12, D, and Folate

- Vegans - may be deficient in B12
- Anyone who lives in Canada (or gets less than 15-30 minutes of exposure to sunlight every few days) – may be deficient in Vitamin D
- Pregnant Women – folic acid supplements reduce risk of birth defects

Glycemic Index

- Ranking system for carbohydrates based on a food's effect on blood glucose levels

Bread	Glycemic index	Cereals	Glycemic index	Fruits	Glycemic index	Vegetables	Glycemic index	Dairy	Glycemic index
White bread	70	Rice	55	Watermelon	72	Carrot	71	Milk	34
Rye bread	50	Corn	55	Mango	64	Pumpkin	75	Yogurt	36
Oat bread	47	Wheat	40	Banana	53	Sweet potato	51	Ice cream	36
Macaroni	45	Chickpeas	33	Kiwi	52	Peans	48	White sugar	59
Spaghetti	35	Lentils	29	Apple	36	Potatoes	70	Fructose	20
White beans	31	Special K®	54	Pear	33	Tomatoes	38	Honey	87
Fresh beans	29	Cornflakes	85	Plum	24	Beet	64	Soja milk	18

Minerals: Iron and Calcium

- Iron deficiency: can be a problem for individuals who are menstruating, pregnant or nursing
  - Eat legumes, fresh fruits, whole-grain cereals, and broccoli
  - Foods high in vitamin C (assists iron absorption)
  - Eat lean red meats at least 2-3 times a week
  - Eat iron-rich organ meats such as liver 1-2 times per month
  - Don't drink tea with meals, it interferes with iron absorption

Gluten-free diet

- Discuss:
  - If you do not suffer from celiac disease or from gluten allergies, is a gluten-free diet healthier than a diet that contains gluten?

Does Exercise Alter Your Nutrition Requirements?

Concept 7: Describe how rigorous exercise training alters a person's nutrition requirements.

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Nutrition for Exercise

- 3 Rs after exercising: rehydrate, replenish, and repair
- Good nutritional practices benefit in the following way:
  - Replacing body fluid and electrolytes lost during exercise
  - Providing fuel for the exercise
  - Promoting optimal fitness gains
  - Enhanced recovery between workouts
  - Achieving and maintain a desired body composition
  - Health benefits from healthy diet

Does Exercise Increase Your Need for Carbohydrates and Fat?

- Central idea: more exercise = more carb-rich diet
- Sport nutritionists recommend increasing the complex carbohydrates from 58%-70% of total calories consumed for people participating in daily exercise
  - Fat intake is reduced to 18% of total caloric intake

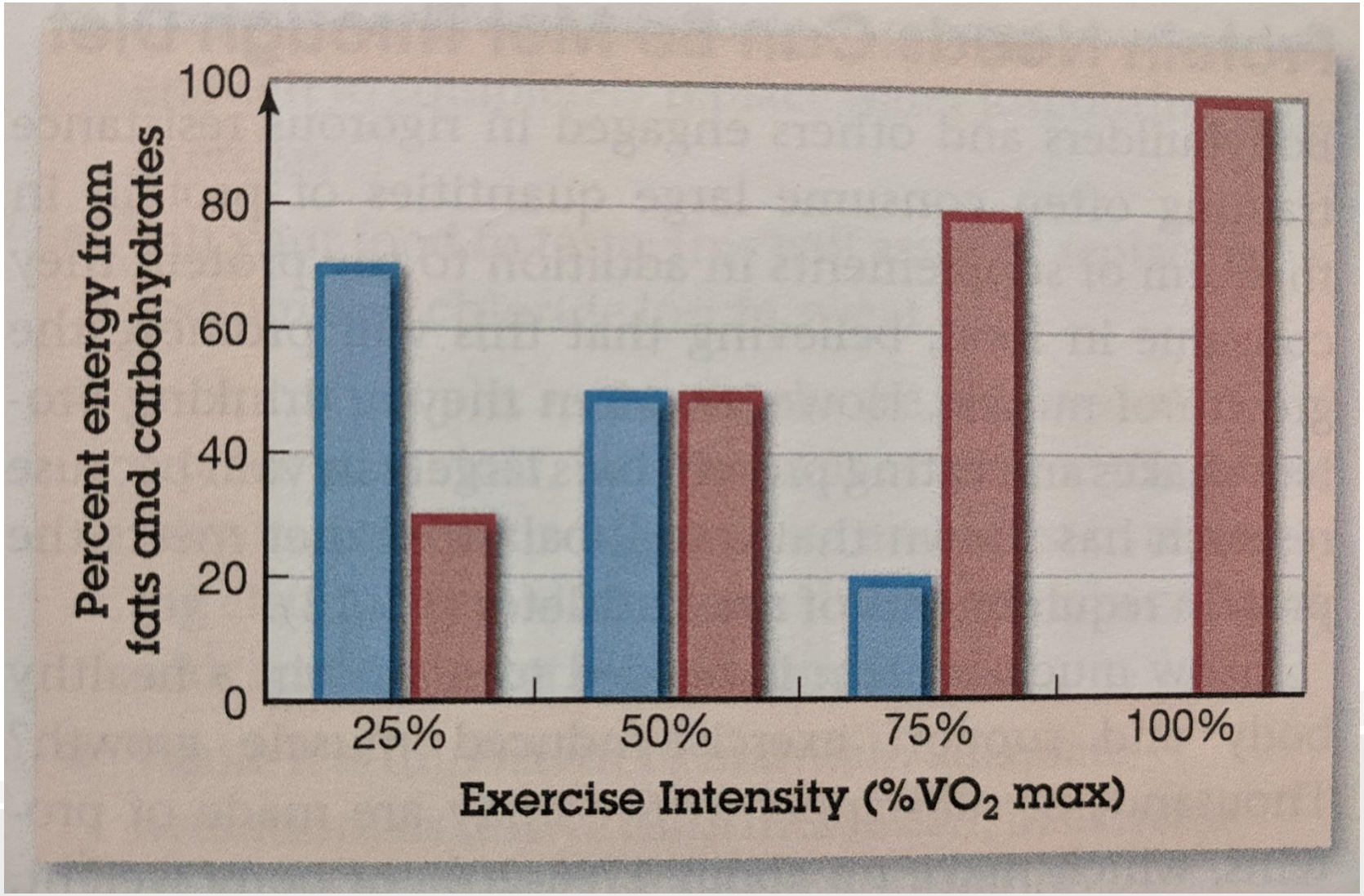
Does Exercise Increase Your Need for Carbohydrates and Fat? Continued….

- Carbs of active individuals depend on
  - Types of exercise
  - Daily training load (intensity and duration of exercise)
- Intensity and duration of the exercise determines whether carbohydrates or fat are the predominant source of energy production
  - Although moderate-intensity exercise does require fat as a fuel source, your body has adequate fat stores to provide the needed energy

The Impact of Exercise Intensity on Fat and Carbohydrate Use During Exercise

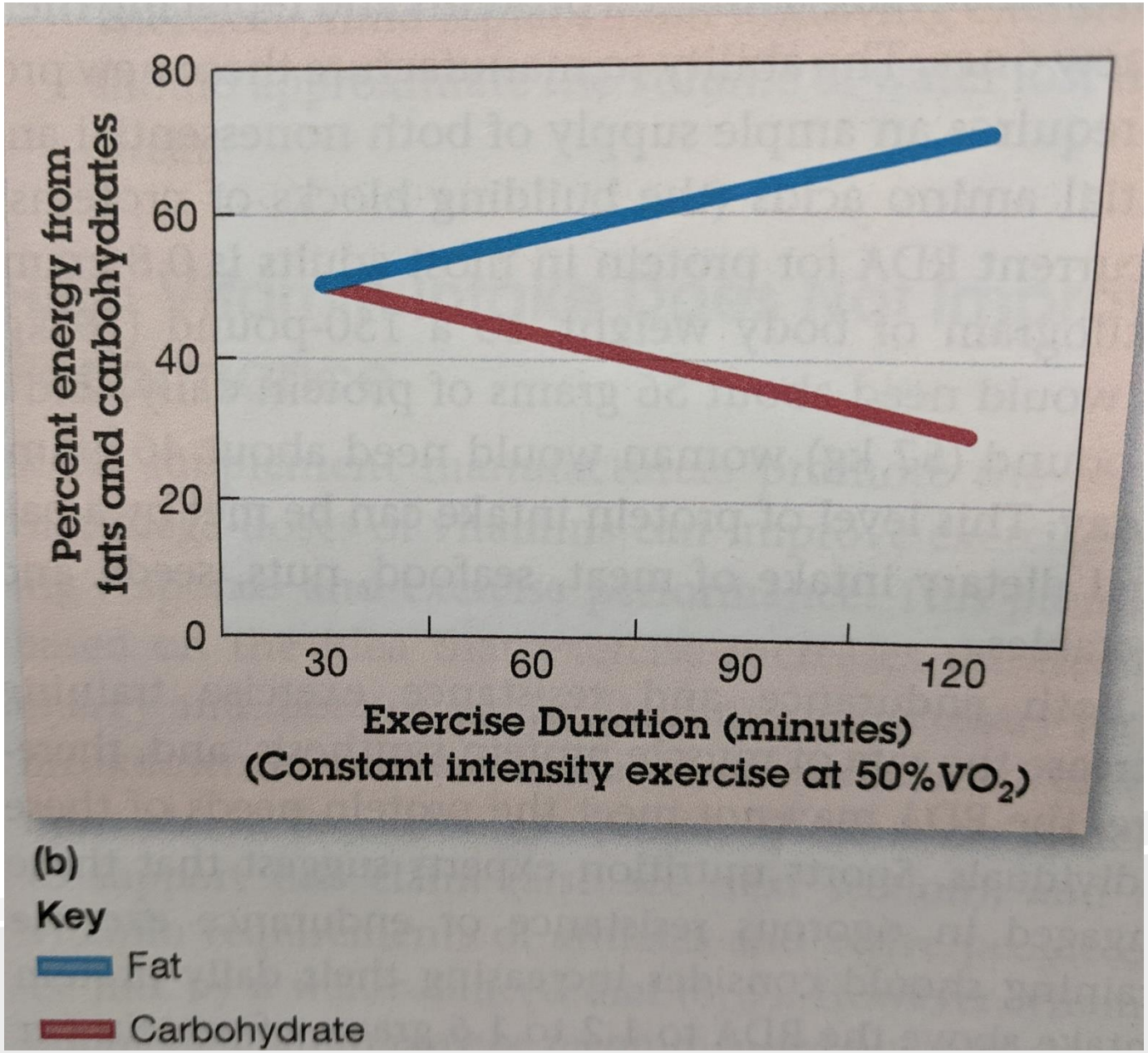
---- = Fat

---- = Carbohydrates



The Impact of Exercise Duration on Fuel Use During Exercise

- In most cases the energy you use during a workout comes from energy stored from meals eaten several hours before your exercise session
- Sport drinks/carb gels are not necessary to provide energy for exercise that lasts less than 90 mins



Amount of Carbs Needed to Sustain Daily Activity Levels

Ex: If your body weight is 70 kg (150 lbs), and your daily exercise is 30 mins per day (low-intensity exercise), your diet should contain 210 to 250 grams of complex carbohydrates per day.

TABLE 8.7 Amount of Carbohydrate Needed to Sustain Daily Activity Levels

TRAININGLOAD	TYPE OF TRAINING	CARBOHYDRATE INTAKE TARGET
Light	Low-intensity exercise (e.g., walking ~30 minutes/day)	3–5 grams per kilogram of body weight per day
Moderate	Moderate-intensity exercise (e.g., running, cycling, or resistance exercise 30–60 minutes/day)	5–7 grams per kilogram of body weight per day
High	High-intensity exercise (e.g., running, cycling, or swimming 1–3 hours/day)	6–10 grams per kilogram of body weight per day

Protein Needs Can be Met Through Diet

- Endurance and resistance exercise training increase the rate of muscle protein synthesis
  - Those engaged in rigorous resistance or endurance exercise training should consider increasing their daily protein from 0.7/0.8 to 1.2-1.6 grams/kg
  - Athletes restricting their energy intake in an effort to lose body fat may require even higher protein intake (1.6-2.4 grams/kg)

Timing of Protein Intake

- Consuming approx. 20 g of high quality protein before exercise or within 30-60 mins following exercise can increase protein synthesis in the exercised muscles
  - Milk protein (casein and whey)
  - Consuming MORE than 20 g does not promote additional gains – the "extra" amino acids are used as fuel or stored as fat

Water and Micronutrients

- Consuming water throughout the day allows you to regain the water lost via urine and feces
- Sweating = loss of water and electrolytes (sodium, chloride, and potassium)
- Institute of Medicine (IOM) recommends 16 cups (3.7 liters) of water for males, and 12 cups (2.7 liters) for females (including water from food and beverages)
  - These generally apply to the sedentary population, for those who exercise these values can vary greatly

Guidelines for replacing water and minerals for active people:

- Record weight before and after exercise, drink 3 cups of water for every pound lost
- Consume water before, during and after exercise.
- Ideal urine colour should be lemonade colour, if too dark, need more water
- Salt food to taste
- Sports drinks can accelerated rehydration & help with replenishing electrolytes
- Too much fluid can result in low sodium concentration – hyponatremia

High Vitamin Intake Does Not Improve Performance

- Mega-doses of vitamins can interfere with the balance of other micronutrients and can be toxic
- Ex high vitamin E can slow down blood clotting time

Antioxidants

- Exercise results in increased production of free radicals (oxygen molecules that can potentially damage cells) that can damage cells
- Cells contain endogenous antioxidants (molecules that neutralize free radicals, preventing them from causing damage to cells)
- Regular exercise = increased production of these cellular endogenous antioxidants
  - In diet: Vitamin C and E, polyphenols, copper, zinc, selenium
  - Antioxidant supplements are not scientifically proven to help

Do Dietary Supplements Provide Improved Health or Performance?

Concept 8: List the pros and cons of dietary supplement use.

Regulation of Supplement Products

- In Canada this is defined as: A food sold or represented as a supplement to a diet that may be inadequate in energy and essential nutrients
- Not heavily regulated

https://www.inspection.gc.ca/food/requirements-and-guidance/labelling/industry/foods-for-special-dietary/eng/1393627685223/1393637610720?chap=16#s30c16

- Scientific reports on the use of supplements conclude that most offer no health benefits

Supplements continued

- Supplements should never replace foods as major sources of dietary nutrients
- Supplements are not tested or approved by the FDA, but the agency does have certain mandates in regard to claims made on product labels
- Because dietary supplements are poorly regulated in the US, consumers should be cautious when choosing and using these products.

Check page 242 of textbook for a list of popular dietary supplements and evidence of effectiveness.

Food Safety & Food Technology

Concept 9: Describe the major issues of food safety and how changes in food technology affect the food we consume.

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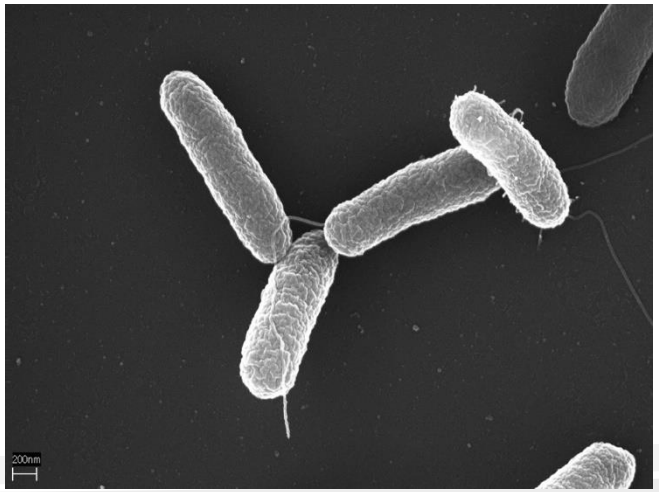
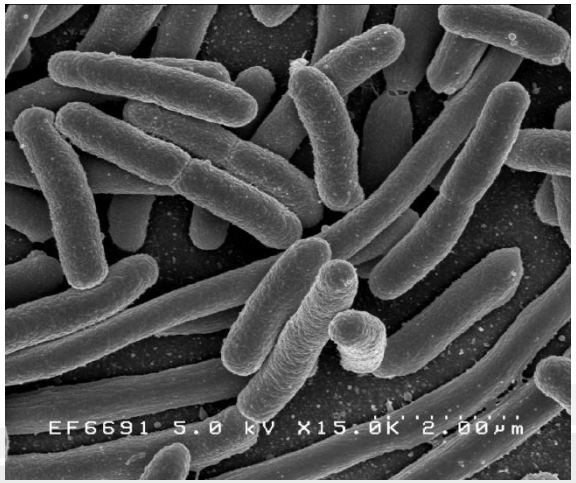
Foodborne Illness

- Bacteria such as *Salmonella* and *E. coli*
  - *Salmonella* found in raw or undercooked chicken and eggs, and processed meats
  - *E. coli* sometimes found in contaminated raw or undercooked ground beef and can lead to bloody diarrhea





To reduce risk of foodborne illnesses, follow these guidelines:

- Wash produce thoroughly with running water
- Drink only pasteurized milk and juices
- Don’t eat raw eggs
- Store perishable foods in fridge or freeze them
- Cook all meats thoroughly
- Cook all shellfish thoroughly
- Avoid raw fish
- See more guidelines on page 244

Food Additives

- Why?
  - Improve nutritional quality
  - Maintain freshness or increase shelf life
  - To improve colour
- What are they?
  - Monosodium glutamate (MSG)
  - Sulfites
  - Nitrites (found in bacon, sausages, deli meats → may also form cancer causing agents – nitrosamines)

Organically Grown Foods

- Plant or animal foods that are grown without the use of pesticides, chemical fertilizers, antibiotics, or hormones
- Hormones are NOT allowed in Canadian foods (in milk or animals)
- This is different than Genetically Modified Organisms

What foods to buy organic?

- Rule of thumb:
  - Thick skin = okay to buy regular
  - Thin layer of skin/berries = consider buying organic

Fin. ☺