Nutrition Education Staff Training

Basic Nutrition Module

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Introduction

Have you ever thought about how the nutrients in food keep us healthy? How does the body turn a bowl of cereal and a banana into energy for activity? How does a turkey sandwich help us make blood cells and repair skin? Exactly how does a glass of milk make our bones stronger? The answers are found in the study of nutrition. Nutrition is the science of diet and health — everything from how and why we choose certain foods to how the body digests, absorbs, and uses food. Indeed, all the pieces that make up the body come from the nutrients in the food we eat. The old saying is true — you are what you eat.

Each day, we make food choices that can either benefit or harm our bodies in some way. Over months and years, those choices can greatly impact overall health. So, while a lifetime of poor food choices can contribute to the development of disease, a lifetime of healthy choices has benefits throughout life. Good nutrition plays a key role in preventing and treating diseases, such as diabetes, heart disease, obesity, high blood pressure, and osteoporosis. While other key factors influence health, such as genetics, social and physical environment, and lifestyle, nutrition is one thing people usually have control over.

This module covers the basic concepts of good nutrition — from the nutrients in food to current topics such as weight management and vegetarian diets. By understanding these concepts, you become a more effective educator. As well, you will have a chance to impact your own health, and the health and wellbeing of others.

Section I: Nutrients in the Foods We Eat

Overview

Food that we buy at the grocery store is not in a form that our bodies can use. What we need are the tiny chemical compounds in food called nutrients, which are essential for the body to function properly**.** **Digestion** is the process of breaking food into these nutrients, so that they can be absorbed and changed into living tissue.

Our digestive tract is a long, hollow tube that changes the shape and size of the food we eat. Chewing breaks food into smaller pieces that can then travel through the esophagus, stomach, small intestines, and eventually the large intestine (colon). Inside these organs is a lining called the mucosa, made up of tiny glands that produce juices that further break our food into tiny pieces. As these pieces pass through the small intestine, they become so small that they are easily absorbed through the mucosa, and used to nourish all of the tissues in our bodies. Any food we cannot digest passes to the large intestine. Here, water and some of the remaining vitamins and minerals is absorbed from the undigested food (yep, it's poop also called stool or a bowl movement) before it's passed out of the body.

Nourishing our bodies is no small task. In fact, it takes over 40 nutrients to keep our bodies going. Many are essential, meaning the body can't make them so they must come from the food we eat in order for us to survive. In this section, we will cover the six major categories of nutrients:

1. **Carbohydrates** are the body's major source of energy, or calories. Scientific evidence suggests that 45%to 65% of our daily calories should come from carbohydrates.
2. **Fats** transport nutrients and are part of the structure in many body cells. Fats also contribute calories — lots of them. Experts say we should limit our intake of fat to between 20 and 35% of our calories, though many Americans go overboard.
3. **Proteins** are made up of amino acids that the body uses to build, repair, and maintain tissues. Proteins also contribute calories to the diet. It is recommended that 10% to 15% of our calories come from protein foods.
4. **Vitamins** don't provide calories, yet they're extremely important, helping with all kinds of chemical reactions in the body.
5. **Minerals** are similar to vitamins. They don't provide calories, but they play specific roles in the body's metabolism, the chemical reactions needed to sustain life.
6. **Water** is often called "the forgotten nutrient," because people don't think of it as a needed part of the diet. Consider this: our bodies can survive up to six weeks without food, but we can't make it past seven days or so without water.

Certain Nutrients Provide Energy

Before reviewing the six groups of nutrients in more detail, it is important to talk about energy. How would you feel about eating a food that was described as high in energy? How about a food high in calories? The two words mean the same thing. A calorie is what we use to measure energy for the body, just as we use pound or ounce to measure the body's weight. **Three types of nutrients in food provide calories: carbohydrates, proteins, and fats.**

On the other hand, vitamins, minerals, and water do not have any calories so we don't use them for energy. Carbohydrate and protein each have 4 calories per gram[1]; fat has 9 calories per gram. A gram is a unit of measurement for mass and is commonly used for food measurements. For example, a teaspoon of sugar (pure carbohydrate) has 4 grams, so it has 16 calories (4 grams x 4 calories/gram). A teaspoon of oil (pure fat) has 5 grams and thus provides 45 calories (5 grams x 9 calories/gram).

There is one other source of calories — alcohol, which provides 7 calories per gram. Alcohol is not a nutrient since our bodies don't need it to function; however, alcoholic beverages can contribute a significant number of calories to a person's diet.

Sources of Calories in the Diet

Carbohydrate	4 calories/gram
Protein	4 calories/gram
Fat	9 calories/gram
Alcohol	7 calories/gram

Later in this module, we'll cover energy, energy balance, and weight management in more detail. First, we'll take a closer look at the six categories of nutrients, including their functions, food sources, and how you can help WIC clients make healthier food choices.

[1] The gram (g) is the standard unit of mass for carbohydrate, protein, and fat.

Carbohydrates

Objectives

Why do so many health experts praise foods like whole grain breads, cereals and pasta? It's all about carbohydrates, the foundation of a healthy diet. Thanks to carbohydrates, you have the energy to walk, run, breathe, and even to read this module. Plus, carbohydrates help your body in other ways. But, be advised, not all carbohydrates are created equally. After reading this section, you will be able to:

- Identify many functions of carbohydrates in the body.
- Identify the two main types of carbohydrates.
- Identify sources of complex carbohydrates.
- Explain the health benefits of fiber.
- Define lactose intolerance.
- Define and list empty-calorie foods.

Functions of Carbohydrates

The world would be an awful place without carbohydrates. Just think — we would have no rice, bread, cereal, pasta, cookies, or many other popular foods. Even worse, our bodies wouldn't have the energy to function without carbohydrates. That's because the main role of carbohydrates is to *provide energy to every cell in the body.* Each gram of carbohydrate in a food provides 4 calories. Glucose, a carbohydrate, is the only energy source for red blood cells, and is the preferred energy source for the brain, central nervous system, placenta, and fetus.

There are two categories of carbohydrates: simple carbohydrates and complex carbohydrates. The body digests carbohydrates and eventually changes them into a sugar called glucose. Fiber is a complex carbohydrate that isn't digested and doesn't provide energy, but offers other unique benefits related to the intestinal tract. The following sections describe the two types of carbohydrates.

Simple Carbohydrates (Sugars)

Simple carbohydrates have a basic structure, which is why they are called simple carbohydrates, simple sugars, or refined sugars. Most people think of table sugar when they hear the word "sugar", but there are actually different kinds of sugars with different levels of sweetness. Simple carbohydrates can be either monosaccharides (single sugar units) or disaccharides (two sugar units joined together).

While simple carbohydrates occur naturally in food, like fructose in fruit or lactose in milk, many foods also contain added sugars. Either way, your body can't tell the difference — it treats all sugars as basically the same. First, enzymes in the intestine break the sugar down to single units. Then they're absorbed into the bloodstream, carried to the cells, and changed to energy to carry out the body's functions.

Here are some types of sugars:

- **Sucrose** is the same thing as table sugar. Sucrose comes from plants such as beets, sugar cane, and corn.
- **Lactose** is the sugar in milk. During digestion, the body breaks lactose into glucose and galactose. Some people have trouble digesting lactose; this is called lactose intolerance.
- **Fructose** is the sweetest of all sugars. It occurs naturally in fruits and fruit juices. It's also added to certain foods, especially in the form of high-fructose corn syrup (HFCS).
- **Glucose** is the main form of carbohydrate that our cells use for energy. It's found in many foods including fruits, vegetables, and honey. In the body, it is carried in the blood, so it may also be called blood sugar.
- Other types and names of sugars. When looking at ingredients on a food label, you will find many terms referring to added sugars. A food is likely to be high in sugar if one of these names appears in the first few ingredients, or if several names are listed:

  - Brown sugar
  - Corn syrup
  - Dextrose Dextrin
  - Fructose
  - Honey
  - Invert sugar
  - Maltose
  - Malt Syrup
  - Mannitol
  - Agave
  - Molasses
  - Raw sugar
  - Sorbitol
  - Sucrose syrup
  - Sugar

Table Sugar versus Other Sugars

It is a common misconception that honey and brown sugar are more nutritious than table sugar. Actually, they are nutritionally about the same; the body breaks honey down into glucose, just as if it were table sugar. However, since honey contains fructose, it is sweeter than table sugar so you might be able to use less of it. Brown sugar is table sugar with added molasses for flavor. Just like table sugar, it has 16 calories and 4 grams of carbohydrate per teaspoon and is nutritionally the same. Likewise, "raw sugar" is just like table sugar from a nutritional standpoint.

High-fructose corn syrup (HFCS) is one of the most common sugars that Americans consume. It is added to sodas, baked goods, salad dressings, candies, ketchup, syrups, cereals, juice drinks, etc. HFCS has received a lot of attention in the past few years due to its abundance in the American food supply. HFCS is a special corn syrup that has been treated to contain more fructose than similar products that contain sucrose, giving them a sweeter taste. Although equal amounts of HFCS and table sugar contain the same calories, some in the scientific community have linked high consumption of HFCS to adverse health effects, such as increased risk for obesity, liver disease, diabetes and related complications.

Lactose Intolerance

People with lactose intolerance have difficulty digesting lactose, the sugar that is naturally present in milk. The problem is that people with lactose intolerance don't make enough

lactase, the enzyme that breaks down lactose in the small intestine. Milk and foods that contain milk cause bloating, cramping, gas, discomfort, and diarrhea.

Babies are born with the enzyme necessary to digest lactose, but some people lose this ability, as they get older. It's an inherited condition, and certain groups have higher rates of lactose intolerance, including Native Americans, Asians, African-Americans, Middle Easterners, and people of Mediterranean descent. Babies may also temporarily lose the ability to digest lactose after a gastrointestinal illness. Many people mistakenly refer to lactose intolerance as a milk allergy. Milk allergies exist, but they are quite different. With milk allergy, a person's immune system reacts to the protein (casein) in milk.

The severity of the intolerance varies from person to person. Many people with lactose intolerance can drink a small glass of milk or eat products like yogurt, pudding, and cheese without any problems. Usually, aged or fermented products such as hard cheeses or yogurt are better tolerated, since the processing of these products reduces the lactose content. Also, products that have been treated with lactase are available (such as Lactaid ® milk). Calcium-fortified soy or almond milk, cheese, and yogurt are also options.

Complex Carbohydrates

Complex carbohydrates are components of foods called starches and fiber. The structure is more complex than that of sugars, so we call starch and fiber "complex carbohydrates". Both types of complex carbohydrates are important in a balanced diet.

Starches

Most of us refer to foods like potatoes and rice as "starchy" foods. What exactly is a starch? Simply put, a starch is a number of glucose units linked together (a polysaccharide) in long chains; they act as the energy storage units in plants. Grains, such as wheat, rice, corn, and oats are the richest source of starches. Other sources include legumes (dry beans and peas) and starchy vegetables, such as potatoes, yams, and corn. Starchy foods are very important because they contain a variety of nutrients, including vitamins, minerals, water, and fiber.

Fiber

The branched chains of sugar molecules that give plants their rigid structures are referred to as fiber, **dietary fiber**, or roughage. The key difference between starches and fiber is that we can't digest fiber; humans don't have the enzymes needed to break it down into smaller units for absorption. So what good is it? The fact that we can't digest fiber is what makes it so important. Generally, fiber is like a sponge, absorbing water as it moves through the digestive tract. The result is bulky, soft stools that are easier for the colon to push out of the body.

Dietary fiber consists of two types necessary for good health: soluble and insoluble fiber. **Soluble fiber** is found in oats, citrus fruits, apples, barley, psyllium, flax seeds, and beans. This type of fiber absorbs the most water, which helps to soften stools. It has been proven to

reduce cholesterol and lower blood sugar, important factors for preventing and treating heart disease and diabetes. **Insoluble fiber** is found in whole grains and whole grain flours, wheat bran, nuts, and vegetables. This type of fiber does not absorb as much water, but gives the stool bulk so that it is easier to pass. This type of fiber is proven to reduce constipation, hemorrhoids, and diverticular disease.

Table 1: Health Benefits of Fiber

Problem	Possible Health Benefits of Fiber
Hemorrhoids	Larger, softer stools reduce straining during bowel movements.
Heart disease	Eating soluble fiber reduces cholesterol, and thus the risk for heart disease.
Constipation	Fiber increases bulk of stool, produces softer stools, and reduces constipation.
Diverticulosis	Larger, softer stools reduce pressure in colon, so less outpouching to form diverticuli.
Obesity	Increased feeling of fullness from high-fiber food, resulting in less food eaten.
Colorectal cancer	Large, soft stools may dilute cancer-causing agents; also faster time through colon reduces contact of these agents with intestinal wall.

Increasing Fiber in the Diet

Typically, Americans consume about 12 to 15 grams of fiber daily, but nutrition experts recommend a general intake of 20 to 35 grams per day. Specific recommendations from the Dietary Reference Intakes (DRIs) are listed below.

Life Stage	Total Fiber (grams/day)
Children	
1 – 3 years	19g
4 – 8 years	25g
Females	
9 – 18 years	26g
19 – 50 years	25g
Pregnancy	28g
Lactation	29g
Males	
9 – 13 years	31g
14 – 50 years	38g

When grains are milled and refined (for example, white flour, refined flour), the fiber is removed, along with most of the protein, vitamins, and minerals. If a grain is "enriched," it means the manufacturer added iron, thiamin, riboflavin, and niacin back into the grain.

However, other nutrients lost in milling are not added, such as fiber, zinc, magnesium, vitamin B6, and vitamin E.

On the other hand, whole grain products have not been refined, so whole grain breads and cereals have more fiber, vitamins, and minerals than refined grain products. In an effort to increase fiber consumption in the United States, the recommendation is to eat half of your grains servings as whole grains. Choosing more fiber-rich fruits, vegetables, and whole grain products provides a variety of health benefits. Table 2 gives the fiber content of various foods.

Table 2: Approximate Fiber Content of Various Foods

	Serving	Calories	Fiber (g)
Bread, Grains, and Cereals			
All-brain Extra Fiber®	½ cup	50	15.3
Fiber One®	½ cup	60	14.3
Bran Buds®	⅓ cup	85	12.0
All-Bran®	½ cup	80	9.7
100% Bran™	⅓ cup	85	8.3
Whole-wheat spaghetti	1 cup	175	6.3
Bran flakes	¾ cup	95	5.0
Grape Nuts®	½ cup	210	5.0
Multi-Bran Chex®	½ cup	100	4.0
Air-popped popcorn	1 cup	40	3.0
Whole-wheat bread	1 slice	70	1.9
Brown rice	½ cup	110	1.7
Legumes, cooked			
Black beans	½ cup	115	7.5
Pinto beans	½ cup	115	7.4
Kidney beans	½ cup	110	7.3
Navy beans	½ cup	110	6.0
Vegetables, cooked			
Green peas	½ cup	55	3.6
Corn	½ cup	70	2.9
Potato, with skin	1 medium	95	2.5
Carrots	½ cup	25	2.3
Brussels sprouts	½ cup	30	2.3
Broccoli	½ cup	20	2.2
Beans, green	½ cup	15	1.6
Cabbage, red and white	½ cup	15	1.4
Kale	½ cup	20	1.4
Fruits			
Apple, with skin	1 medium	80	3.7
Raisins	¼ cup	110	3.1
Strawberries	1 cup	45	3.0
Dried prunes	3	60	3.0
Orange	1 medium	60	2.6
Apricot, fresh	3 medium	50	2.5
Banana	1 medium	105	2.4
Blueberries	½ cup	40	2.0
Dates, dried	3	70	1.9
Peach	1 medium	35	1.9
Grapefruit	½	40	1.6
Apricot, dried	5 halves	40	1.6
Cherries	10	50	1.2
Pineapple	½ cup	40	1.1
Cantaloupe	¼ melon	50	1.0

Sources: Product labels; USDA Nutrient Database for Standard Reference, Release 13; and California Daily Food Guide: Dietary Guidance for Californians.

Choosing Whole Grain Foods

Reading labels is the key to choosing whole grain products. For example, while some brown breads may look like whole grain breads, you can't be sure unless you read the ingredients; many are made with refined white flour and caramel coloring. This doesn't mean they're unhealthy choices; they do have nutritious qualities. To get the most fiber from your bread choices, look for "whole-wheat" or "whole grain" as the first ingredient on the label, or labels that say "100% whole" wheat or grain. Also, descriptions on the package may tell you something about fiber content. "High-fiber" cereals offer 5 or more grams of fiber per serving, while a cereal that is a "good source" of fiber has 2.5 to 5 grams of fiber in a serving.

Empty-Calorie Foods

Have you ever heard the term "empty-calorie foods"? These are foods that contribute calories without providing many other nutrients. Often, foods high in refined sugars fall into this category. Empty-calorie foods, like those in Table 3, replace other, more nutritious foods in the diet. To make matters worse, some of these foods, such as doughnuts and pastries, contain a lot of added fat, which means even more empty calories. The advice is to make better choices and limit intake of empty-calorie foods and beverages.

Table 3: Added Sugar in Empty-Calorie Foods

Food	Added Sugar (Approximate)
Sweetened fruit drinks (12 oz)	12 tsp
Soft drinks, cola (12 oz)	9 tsp
Cake, frosted (1/16 of 9" cake)	8 tsp
Sherbet (½ cup)	7 tsp
Fruit punch (8 oz)	6 tsp
Lemonade (8 oz)	6 tsp
Candy (assorted, i.e. chocolate bar, 1 oz)	5 tsp
Cookies, commercial (4 to 5)	5 tsp
Doughnut, yeast, glazed (1)	5 tsp
Gelatin desserts (1 cup)	5 tsp
Pastry, pan dulce (1)	5 tsp
Pie (1/6 of 9" fruit pie)	5 tsp
Popcorn, caramel (1 cup)	5 tsp
Granola bar (1)	4 tsp
Popsicle (1)	4 tsp
Fruit rolls (fruit leather) (1 roll)	3 tsp

Source: California Daily Food Guide: Dietary Guidance for Californians.

SELF-CHECK: PRACTICE YOUR KNOWLEDGE

The answers are located at the end of the Self-Check.

1. The main function of carbohydrate is to (*check one*):
   ____ Provide energy for the body.
   ____ Provide materials to build new tissue.
   ____ Make fat.
   ____ Insulate the body to prevent heat loss.

2. List the two types of carbohydrates:

3. Mark the following statements True or False:
   ____ Sucrose is the same thing as table sugar.
   ____ The body is able to digest fiber and convert it to a sugar called glucose.
   ____ The brain uses glucose as its main source of energy.
   ____ Starch is made up of sugar units linked together.

4. Define *lactose intolerance* and name at least two populations with higher rates of lactose intolerance.

5. An excellent source of complex carbohydrates is (*check one*):
   ____ orange juice
   ____ whole-wheat bread
   ____ skim milk
   ____ tuna fish
   ____ ice cream

6. List two benefits of eating enough fiber.

7. Which of the following are good sources of fiber? *(Check all that apply.)*
   ____ orange juice
   ____ apples
   ____ raisins
   ____ cheese
   ____ hamburger
   ____ milk
   ____ bran flakes

ANSWERS

1. Provide energy for the body.
2. Simple and Complex
3. T, F, T, T
4. The inability to digest lactose, the sugar that is naturally present in milk; Native Americans, Asians, African-Americans, Middle Easterners, and people of Mediterranean descent.
5. Whole-wheat bread
6. Easier bowel movements; feelings of fullness; reduction of constipation, hemorrhoids, heart disease, diverticular disease, colorectal cancer, obesity
7. Apples, raisins, bran flakes

Protein

Objectives

What foods do you think of when you hear the word *protein*? If you said milk, eggs, meat, beans, or nuts you're right — those are all great examples of protein foods. Exactly what is protein? How do our bodies use it, and how much protein do we need? After reading this section, you will be able to:

- List the functions of protein.
- Identify true statements about protein.
- Describe how amino acids are related to protein.
- Identify sources of complete and incomplete proteins.

Functions of Proteins

When we were kids, most of us learned that it was important to eat protein so that we would "grow big and strong." More specifically, proteins perform these functions in the body:

- **Protein helps build and maintain body tissue** — Almost every tissue and fluid in the body contains protein, and muscle tissue accounts for almost 50% of the body's protein. Our bodies constantly break down and rebuild tissue, so we need a steady supply of dietary protein, especially during periods of growth like childhood and pregnancy.
- **Protein regulates body processes** — All kinds of metabolic processes are taking place in your body right this second, and proteins are key to making those reactions happen. We need certain proteins to produce enzymes and hormones; we also rely on proteins for blood clotting, fluid balance, visual processes, antibodies to fight infection, and cell repair. Proteins also help transport nutrients and oxygen through the body. For example, hemoglobin is a protein that contains iron and transports oxygen through the blood.
- **Protein provides energy** — Although the previous two functions are the main functions of protein, when the body doesn't get enough carbohydrates and fats for energy, it uses protein for energy. Like carbohydrates, one gram of protein has 4 calories.

Amino Acids — Building Blocks of Proteins

Proteins are made up of amino acids, nitrogen containing compounds that combine in different ways to make thousands of different proteins in the body. When you eat a food that contains protein, your body breaks it down into amino acids, and then recombines these building blocks to make the new proteins that it needs. The human body requires 20 different amino acids to manufacture proteins. Our bodies can make 11 of these amino acids, but we must get the other nine from foods; we call these **the nine essential amino acids**.

Food Sources of Protein

Both plant and animal products contain protein, but they differ when it comes to amino acids. Animal foods, like meat, poultry, eggs, and dairy foods, contain all nine essential amino acids in sufficient amounts to meet our needs, so we call them **complete** or **high-quality proteins**.

Foods of plant origin, however, usually lack an adequate amount of a particular essential amino acid needed for the body to build new protein. So they are known as **incomplete proteins**. However, different plant foods have different amino acid profiles, so eating a combination of various plant proteins provide all the essential amino acids.

For example, rice is low in *lysine* (an essential amino acid) and beans are low in *methionine* (another essential amino acid), but rice and beans together make a complete protein. When grain foods and legumes (beans, peas,) or nuts are eaten together, they are called **complementary proteins** because they provide all the essential amino acids.

Also note that soybeans have an amino acid pattern similar to cow's milk, so health professionals commonly consider soy protein to be a complete, high-quality protein. These days, products such as soy milk, tofu, and vegetable burgers made with soy are popular alternative protein sources to milk and meat.

Protein Needs

A person's daily protein needs depend on age, life stage, and body weight. Generally, adults need 0.8 grams of protein for each kilogram of body weight. Protein needs increase during periods of rapid growth, so children, pregnant, and breastfeeding women need more protein.

It is important to get enough protein. Do we really need all the high-protein foods, drinks, and diets that are on the market these days? The fact is that, most Americans eat much more protein than they need. Protein intake adds up quickly, especially when a person includes meats and dairy foods in his or her diet. What happens to the extra protein we eat? The body turns extra protein into fat or glucose and either stores it or uses it for energy. Experts emphasize that eating too much protein over a long period of time strains the kidneys. Also, consider that many high-protein animal products can contain significant amounts of fat and saturated fat, which are linked to heart disease.

Table 4: Recommended Dietary Allowance for Protein

	Grams of protein needed each day
Children ages 1 – 3	13
Children ages 4 – 8	19
Children ages 9 – 13	34
Girls ages 14 – 18	46
Boys ages 14 – 18	52
Women ages 19 – 70+	46
Men ages 19 – 70+	56

Source for Acceptable Macronutrient Distribution Range (AMDR) reference and RDAs: Institute of Medicine (IOM) Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids.

Do I Need to Eat Meat to Get Enough Protein?

Since protein is found in every food group, most Americans have no problem meeting their protein needs. Inadequate protein consumption the United States is rare; it is much more common in underdeveloped countries. Symptoms of severe protein deficiency include stunted growth (height and weight), digestive problems, water retention, fatty liver, and lack of immune function leading to infection.

However, strict **vegans**, vegetarians who don't eat any meat, eggs, or dairy products, do have to be careful to be sure they eat the quantity and quality of protein that they need every day. Remember, plant foods usually don't contain complete protein, so vegetarians need to be sure they get a balanced variety of foods. Eating a variety of foods every day, eating grains and legumes, and having soy products will ensure a vegetarian meets his or her protein needs. Good sources of plant protein include tofu, soymilk, tempeh, veggie burgers, beans, peas, seeds, nuts, and nut butters. For more information on vegetarian diets, see the section on Vegetarian Diets later in this module.

SELF-CHECK: PRACTICE YOUR KNOWLEDGE

1. *Fill in the blanks:* The building blocks of protein are called _____. Our bodies can make 11 of these but we have to get the other nine from foods, so we call those nine the _____.

2. State one function of protein in the body:

3. *Mark the following statements True or False.*
   ____ The main function of protein is to provide energy to the body.
   ____ Pinto beans are a source of incomplete protein.
   ____ Protein needs decrease during periods of growth, such as pregnancy.
   ____ Most Americans need more protein in their diets.
   ____ Peanut butter and jelly on whole-wheat bread is a complete protein.

4. *Put an "A" next to animal proteins and a "V" next to vegetable proteins.*
   ____ baked chicken
   ____ fat free milk
   ____ cheese pizza with olives and green peppers
   ____ green peas
   ____ soy burger
   ____ black beans
   ____ almonds
5. Approximately how many grams of protein do children ages 1-3 years need each day?

ANSWERS

1. Amino acids, essential amino acids.
2. Protein helps build and maintain body tissue, regulates body processes, and provides energy.
3. F, T, F, F, T
4. A, A, A, V, V, V, V
5. 13 grams

Fats

Objectives

Dietary fat has become an obsession for many Americans. It is true that too much fat in the diet is related to chronic diseases such as obesity and heart disease, but fat in and of itself isn't such a bad thing. In fact, our bodies need fat to survive. After reading this section, you'll be familiar with the role of fat in the body, as well as the issues surrounding dietary fat and cholesterol. Specifically, you'll be able to:

- Identify functions of fat in the body
- Describe what fatty acids are in relation to fats
- Define cholesterol
- Identify foods that contain cholesterol

Functions of Fat

In foods, fat provides flavor, aroma, and texture. Aside from making our ice cream creamier and our cheese tastier, fat serves several important functions in the body:

- **Fat provides energy**. Each gram of fat provides 9 calories, so fat is a very concentrated source of energy. Also, the body stores extra calories as fat, creating an energy reserve for times of food shortage. The recommendation is 20% to 35% of calories from fat daily.
- **Fat is needed for the absorption, storage, and circulation of vitamins A, D, E, and K** in the body. Because of this, these four vitamins are called the fat-soluble vitamins.
- **Fat provides essential fatty acids**, part of the chemical structure of fats. There are three essential fatty acids that must come from the diet: linoleic, linolenic, and arachidonic acids. We need these fats for proper growth and brain function, especially as infants.
- **Fat tissue provides cushioning for internal body parts** like the liver. Fat just underneath the skin acts as insulation to help the body maintain a constant internal temperature.
- **Fat also provides the feeling of fullness** (satiety) when eating.

Types of Fat in Foods

Most of the fat found in foods is in the form of triglycerides. Each triglyceride molecule is made up of two basic parts: glycerol and fatty acids. Glycerol makes up the "backbone" of the molecule, and three fatty acids are attached to the glycerol backbone. The glycerol portion is always the same, while the fatty acids can vary. The three types of fatty acids are:

- Saturated
- Unsaturated (monounsaturated and polyunsaturated)
- *Trans* fatty acids

All foods that contain triglycerides contain a mixture of saturated and unsaturated fatty acids. The type of fatty acid that is most common determines whether a fat is referred to as saturated, monounsaturated, or polyunsaturated. For example, most of the fatty acids in butter are saturated, so butter is known as a saturated fat. Similarly, corn oil contains mostly polyunsaturated fatty acids, so we say that it's polyunsaturated.

Saturated Fat

Saturated fats are generally solid at room temperature and are usually from animal sources like meat, whole milk, cheese, butter, egg yolk, and cream. There are some plant sources of saturated fat, including coconut oil, palm oil, and chocolate. Eating large amounts of saturated fat can significantly raise blood cholesterol, a risk factor for heart disease. Indeed, saturated fat intake is the primary cause of high levels of cholesterol in the blood.

Table 5: Foods High in Saturated Fats

Animal Sources	Plant Sources
high fat cuts of beef and pork	coconut, coconut oil
chicken and turkey skin	palm oil, palm kernel oil
whole-milk dairy products	cocoa butter
butter	chocolate
lard or beef fat	some hydrogenated oils

Unsaturated Fats

Unsaturated fats are generally liquid at room temperature and are mostly from plant sources (oils, nuts, seeds, avocados, etc.), although unsaturated fats are also found in cold-water fish like salmon, trout, and herring. Unsaturated fat can be either monounsaturated or polyunsaturated; both types reduce blood cholesterol when they replace saturated or *trans* fats in the diet. Healthy vegetable oils are also a major source of vitamin E in the diet.

Table 6: Foods High in Unsaturated Fats

Polyunsaturated	Monounsaturated
soybean oil (vegetable oil)	canola oil
safflower oil	olive oil
corn oil	peanut butter
sunflower oil	avocado

The essential fatty acids mentioned earlier, linoleic acid, linolenic acid, and arachidonic acid — are polyunsaturated fatty acids, and must come from the diet because the body can't make them. They are used to build omega-6 and omega-3 fatty acids, important for the functioning of all tissues of the body.

Omega-3 Fatty Acids

Omega-3s have received plenty of attention from the media, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Omega-3 fatty acids are polyunsaturated fats that may be made in the body from linolenic acid, an essential fatty acid. However, this pathway in the body is slow, and research suggests that the addition of oily fish to the diet supplies more effective amounts of omega-3 fats. The scientific community suggests that omega-3 fats

have beneficial effects against coronary heart disease, mental conditions and diseases (e.g. Alzheimer's disease and Parkinson's disease), high blood sugar and diabetes, and possibly cancer.

MyPlate, the food guidance system from the U. S. Department of Agriculture (USDA), recommends choosing oily fish, nuts, and seeds as a protein source more often. Good sources of omega-3 fatty acids include salmon, trout, herring, mackerel, anchovies, sardines, and tuna, and plant sources such as walnuts, flaxseeds, and flaxseed oil. DHA and ARA are abundant in brain tissue and are particularly important during growth and brain development in babies and children. These two fatty acids are naturally found in breast milk and have been added to some infant formulas in the past few years.

Trans Fats

The third type of fat, *trans* fat, occurs naturally in food, but is more often created in an industrial process to turn liquid oils into solid fats (hydrogenated oil, shortening, or stick margarine). This process was first used to improve texture and shelf life of foods but is now recognized as a harmful food component. Eating *trans* fat raises LDL ("bad") cholesterol and lowers HDL ("good") cholesterol, increasing the risk for developing heart disease or stroke. *Trans* fat has also been associated with an increased risk for developing type 2 diabetes.

Trans fats are found mostly in fried foods or processed baked goods, including French fries, onion rings, doughnuts, pastries, pie crusts, biscuits, snack cakes, cookies, crackers, stick margarine, and shortenings. There is no recommended intake for *trans* fats, but rather, Americans should try to limit intake altogether. The U.S. Food and Drug Administration (FDA) now require *trans* fats to be included on the Nutrition Facts Label, under the Total Fat heading. Look for foods that contain no *trans* fats when making purchases.

Dietary Recommendations for Fat

Eating a diet high in fat, especially saturated or *trans* fat, may increase the risk for heart disease. But, remember, the body needs a certain amount of fat to survive, and many of our favorite foods would be extremely bland and boring without fat. **The key is moderation**. According to the *Dietary Guidelines*, Americans should get about 20% to 35% of their total calories from fats, and no more than 10% of calories from saturated fats. Likewise, Americans should try to limit *trans* fat intake as much as possible. That means most fat should come from foods higher in unsaturated fats. To keep fat intake at an acceptable level, consumers should:

- Use lean meats and fat-free (skim) or low fat (1%) dairy products.
- Use liquid vegetable oils for cooking, instead of lard or shortening.
- Read nutrition labels on food packages to check the kinds and amounts of fat.
- Bake, broil, steam, and grill more often, rather than frying.
- Eat plenty of fruits, vegetables, and whole grains — foods naturally low in total fat and high in complex carbohydrates.
- Eat oily fish, seeds, and nuts (which contain healthy fats) as a source of protein more often.

Cholesterol

Cholesterol is a waxy, fat-like substance found in every cell in the body. It is also found in all foods of animal origin or foods made from animal products, although you can't see it or taste it. Plant foods have no cholesterol in them, unless it has been added.

Cholesterol is not an essential nutrient because your liver can make all the cholesterol your body needs, even if you don't eat any. The body uses cholesterol to make hormones like estrogen and testosterone, and to make cell walls, bile for digestion, and vitamin D. But even though cholesterol performs some important and necessary functions in the body, it's also true that cholesterol deposited in arteries is a risk factor for heart disease.

When discussing cholesterol, it's important to clarify whether you're referring to dietary cholesterol or blood cholesterol. The cholesterol that circulates throughout the body is known as **blood cholesterol**. The cholesterol that comes from food is called **dietary cholesterol**. Dietary cholesterol is found only in foods of animal origin. Plant products do not contain cholesterol. So, contrary to what some consumers think, certain high-fat foods such as nuts, peanut butter, vegetable oil, and avocados do not contain cholesterol because they come from plants. Still, they are high in fat, so the advice is to enjoy them in moderation.

Cholesterol in the Blood

Just like oil and water, cholesterol and blood don't mix. So, for cholesterol to travel through your blood, it's coated with a layer of protein to make a "lipoprotein." Two lipoproteins you may have heard about are low-density lipoprotein (LDL) and high-density lipoprotein (HDL). LDL carries cholesterol in the blood to all tissues in the body. When too much LDL cholesterol is in the blood, it can lead to cholesterol buildup in the arteries (atherosclerosis or atherosclerotic plaque), thus increasing the risk for developing a blockage. If the blockage occurs in the arteries of the heart it can cause a heart attack. This is why **LDL cholesterol is called "bad" cholesterol**. However, HDL cholesterol travels through the blood and removes cholesterol from the tissues, which helps prevent plaque buildup. So, **HDL cholesterol is called the "good" cholesterol**, because it prevents plaque buildup and thus, heart disease.

Saturated fat is the primary dietary cause when it comes to high blood cholesterol. It does this in two ways. First, when saturated fat in the diet is absorbed into the body, it increases the amount of cholesterol the liver makes. Second, saturated fat also decreases the liver's ability to pick up LDL cholesterol from the blood. This causes more cholesterol to circulate and deposit cholesterol in the arteries.

Dietary Recommendations for Cholesterol

Cholesterol is present in different amounts in animal foods, like beef, poultry, fish, milk products, and egg yolks (examples are given in Table 7). But remember that it is saturated fat that is the main dietary cause of high blood cholesterol. Dietary recommendations suggest that we limit cholesterol intake to fewer than 300 milligrams (mg) per day. USDA's MyPyramid and food labels provide information that can help adults keep cholesterol in check. It's not

necessary to eliminate dietary cholesterol, but it is important for people to monitor total cholesterol, total fat, and most especially, saturated and *trans* fats.

Table 7: Cholesterol Content of Various Foods

Food	Cholesterol (mg)
Liver (3 oz, cooked)	331
Egg (1 large yolk)	213
Beef (3 ounces, cooked)	76
Chicken (3 ounces, cooked)	76
Whole milk (1 cup)	33
Cheddar Cheese (1 ounce)	30
Bacon (3 medium strips)	16
Lard (1 Tbsp)	12
Fat free milk (1 cup)	4

SELF-CHECK: PRACTICE YOUR KNOWLEDGE

1. *Check each statement that describes a function of fat*:
   ____ provides essential fatty acids
   ____ aids in bone formation
   ____ some types prevent heart disease
   ____ provides cushioning for internal body parts
   ____ provides vitamin C

2. What are the three types of fatty acids? (*Check one.*)
   ____ glycerol, triglyceride, and cholesterol
   ____ HDL, LDL, and VLDL
   ____ saturated, unsaturated, and *trans*
   ____ safflower, soybean, and sunflower

3. *Fill in the blanks to complete the following simple definition of cholesterol:* Cholesterol is a _____ *(protein-like, fat-like, water-like)* substance that is needed to form _____ *(hormones, enzymes, fatty acids)* such as estrogen and testosterone, to form bile, and to make vitamin _____*(A, C, D)*.

4. *Circle the foods that contain cholesterol*:

Fat free milk	Avocado	Cereal
Tomato	Tuna	Coconut
Beef	Peanut butter	Whole milk
Egg	Chicken	Fruit

ANSWERS

1. Provides essential fatty acids, some types prevent heart disease, provides cushioning for internal body parts
2. Saturated, unsaturated, *trans*
3. Fat-like, hormones, D
4. Fat free milk, beef, egg, tuna, chicken, whole milk

Vitamins

Objectives

Vitamins are essential nutrients that our bodies need in very small amounts. In fact, if you added up all the vitamins you need in a day, you'd only get about 1/50th of a teaspoon! But these tiny amounts perform some very amazing tasks in the body. After reading this section on vitamins, you'll be able to:

- State the purpose of the new Dietary Reference Intakes (DRIs).
- Identify general characteristics of vitamins.
- Identify major functions and sources of folic acid.
- Become familiar with symptoms of vitamin deficiency or excessive intake.

Vitamin Basics

Vitamins partner with other nutrients to build, maintain, and repair body tissues, and to regulate body processes. Vitamins don't provide energy themselves, but they help us produce energy from carbohydrates, fats, and proteins. It's the same idea as oil in a car: a car relies on gasoline for energy, but it still needs oil to run and stay in working condition. Similarly, your body relies on calories for energy, but it also needs vitamins to run and stay in good shape.

Vitamins are widely distributed in food. Some are found mostly in fruits and vegetables, others in enriched and whole grain breads and cereals, and others in meats and dairy products. So, the best way to get enough vitamins is to eat a wide variety of foods.

How Much Do We Need of Each Vitamin?

Vitamins are *micro*nutrients, meaning our bodies require only tiny amounts. But how much is enough? To answer that question, a group of researchers and nutrition experts at the Institute of Medicine/Food and Nutrition Board (IOM/FNB) routinely publish standard recommendations for daily nutrient intakes.

Until recently, these recommendations have been known as the Recommended Dietary Allowances (RDAs), daily levels of nutrients that were determined to be adequate for most healthy people. The original goal was to prevent nutrient deficiency diseases, such as scurvy (vitamin C) and rickets (vitamin D). But the IOM/FNB recently changed its approach; the emphasis now includes reducing the risk for chronic diseases such as heart disease, cancer, and osteoporosis. So, the IOM/FNB developed standards called the **Dietary Reference Intakes (DRIs)**, which are levels of nutrients determined to meet the needs of healthy people.

Fat-Soluble and Water-Soluble Vitamins

There are 13 known vitamins that humans need. These 13 vitamins fall into two groups depending on how they exist in food and how they're carried in the body: **fat-soluble vitamins** and **water-soluble vitamins**.

Vitamins A, D, E, and K are fat-soluble vitamins, meaning they dissolve in fat rather than water or body fluids. Instead of excreting excess amounts, the body stores them in body fat. If you take dietary supplements, it's possible to take extremely high levels of fat-soluble vitamins, which could have toxic effects.

If, however, you rely on foods to supply your vitamins, there is no danger of reaching toxic amounts. Since our bodies store fat-soluble vitamins, we don't have to take in 100% of the recommended amount for these vitamins every single day, though it's a good goal to have. In foods, fat-soluble vitamins are fairly stable, meaning they aren't really affected by food preparation, storage, or cooking.

Water-soluble vitamins dissolve in water, and the body easily gets rid of excess amounts in the urine. **Water-soluble vitamins include vitamin C and eight different B-complex vitamins**: thiamin, riboflavin, niacin, vitamin B_6, vitamin B_{12} (also called cobalamin), folic acid, pantothenic acid, and biotin. In foods, water-soluble vitamins are not as stable as fat-soluble vitamins, so heat, air and cooking can easily destroy them. The body doesn't store significant amounts of these vitamins, so it's important to get enough every day.

What about Supplements?

Megadoses, levels of nutrients in excess of 10 times the amount the body needs, are regularly sold over-the-counter. Even though our bodies don't accumulate toxic levels of water-soluble vitamins, scientists have learned that excessive intakes of certain water-soluble vitamins can be harmful. For example, large doses of vitamin C from supplements can lead to problems such as kidney stones and diarrhea, and megadoses of niacin can cause flushing of the skin, nausea, and liver damage. Also, important, **dietary supplements do not have to be tested for safety or approved by the Food and Drug Administration (FDA)**, including mega doses. A balanced and varied diet provides all the vitamins most people need. However, someone experiencing rapid growth, stress to the body, or other conditions may need extra vitamins in the form of supplements. People who potentially need supplements include pregnant and breastfeeding women, infants, teenagers, older adults, those recovering from illness, and those trying to lose weight.

But many consumers who aren't at risk of a deficiency feel the need to take vitamin supplements. Some people feel that supplements provide extra "insurance" for days when they don't eat well; others see supplements as cure-alls or a preventive measure for numerous discomforts and illnesses. Nutrition experts stress that supplements should not take the place of a healthy diet. Unfortunately, many people routinely take supplements that supply mega doses. **Taking excessive amounts of nutrients without medical supervision is dangerous**. Depending on the supplement and the dosage, the effects can include anything from hair loss, fatigue, or gastrointestinal distress to more serious results such as kidney stones, nerve damage, birth defects, and even death. Also, remember that dietary supplements don't have to be tested for safety or approved by the Food and Drug Administration (FDA). Preferably, people should try to improve their eating habits rather than to rely on supplements. Also, contrary to what many people believe, vitamins and minerals don't supply extra energy.

Remember, energy only comes from carbohydrates, protein, and fat. For those who do want to take a supplement, it is safe to take one that provides no more than 100% of the recommended levels (such as a daily multivitamin).

Vitamin of Special Interest in WIC: Folic Acid

Folic acid is also called folate. Folic acid is common in green, leafy vegetables. The body uses folic acid to make new cells, including red blood cells. Also, it's needed for protein synthesis and growth. Folic acid is especially important for women of childbearing age because it can help prevent a serious group of birth defects known as **neural-tube defects (NTDs)**. With this type of birth defect, the baby's brain, spinal cord, or both do not develop properly, and the results can be serious. In addition, children and infants need ample amounts of folic acid during periods of rapid growth.

Folic Acid and Neural-tube Defects

Women who don't get enough folic acid during the first few weeks of pregnancy run a higher risk of giving birth to an infant with an NTD, such as spina bifida. Normally, the neural tube of the fetus develops and closes within the first 30 days of pregnancy, a time frame when many women don't even know they're pregnant.

So public health experts recommend that all women in their childbearing years get adequate amounts of folic acid on a continuous basis from foods and/or daily multivitamin supplements. That way, if a woman does get pregnant, she'll be getting the folic acid she needs in the early weeks. What's more, some drugs such as aspirin and oral contraceptives interfere with folic acid in the body; making it even more important for women to be sure they get enough.

To reduce the risk of NTDs, experts recommend that women of childbearing age or planning to become pregnant consume **400 micrograms (μg)** of synthetic folic acid daily in addition to folate from a varied diet. Synthetic folic acid found in fortified foods and vitamin supplements is nearly 100 percent absorbed by the body, whereas naturally-occurring folate in food is only about 50 percent absorbed. In the WIC population, participants usually schedule an appointment after they are already pregnant. It is important to encourage these women to visit a medical doctor and to take their prenatal vitamins.

Other Problems Related to Folic-acid Deficiency

Besides increasing the risk of NTDs, when there is a shortage of folic-acid, folic-acid deficiency, it interferes with normal cell division, protein synthesis, and growth. Inadequate folic acid can lead to megaloblastic anemia. Anemia is a type of disorder in the blood or red blood cells, and is often related to nutrition, such as iron-deficiency anemia. In megaloblastic anemia, the blood cells are malformed and can't carry enough oxygen. Cases of megaloblastic anemia do occur in the United States, especially among pregnant women and people with alcoholism. Like vitamin C, folic acid is water-soluble, so the body doesn't store excess

amounts. But taking mega doses of folic acid can interfere with medications and can mask a vitamin B_{12} deficiency.

Where is Folic Acid Found?

Folic acid is naturally present in leafy, green vegetables, as well as other foods. Folic acid is sensitive to heat, so it's best to include raw vegetables in your diet, and for cooked vegetables, try to limit cooking time to 5 to 10 minutes.

Table 8: Naturally Occurring Sources of Folic Acid

Food Source	Serving Size	Folic Acid (µg)
Lentils	½ cup	180
Pinto beans	½ cup	150
Garbanzo beans	½ cup	140
Black beans	½ cup	130
Spinach	½ cup	130
Asparagus	½ cup	130
Orange Juice	1 cup, from frozen	110
Collard greens	½ cup	90
Romaine lettuce	1 cup, shredded	80
Sunflower seeds	¼ cup	75
Split peas	½ cup	65
Wheat germ	2 Tbsp	50
Brussels sprouts	½ cup	45
Broccoli	½ cup cooked	40
Orange	1 medium	40
Walnuts	¼ cup, halves	25

Source: USDA Nutrient Database for Standard Reference, Release 13.

In addition to plant sources, in 1998 the FDA began requiring that synthetic folic acid be added to certain grain foods to reduce the incidence of neural-tube defects. Enriched grain products such as breads, flours, cornmeal, rice, noodles, and macaroni supply about 40 µg of folic acid (10% of the recommended level) in a single serving. However, several fortified breakfast cereals provide 200–400 µg (50 – 100%) of folic acid in just one serving (such as Total® brand cereals). It's always best to check the label to be sure.

A Summary of the 13 Vitamins

Tables 9 and 10 provide a summary of the food sources, specific functions and problems related to deficiencies and excesses of the fat-soluble and water-soluble vitamins. These tables are for general reference, but please take a few moments to become familiar with some of the symptoms.

Table 9: Summary of the Fat-Soluble Vitamins

Vitamin	Best Sources	Functions	Deficiency Symptoms	Toxicity Symptoms
A	Carrots, yams, sweet potatoes, peppers, spinach, kale, mango, papaya, apricot, cantaloupe. Retinol: Butter, milk, cheese and eggs.	• Maintains eye health & needed for night vision. • Maintains skin and mucous membranes. • Helps resist infection. • Helps develop bones & teeth.	Night blindness; eye changes leading to blindness; decreased resistance to infection; dry, scaly skin.	Birth defects; miscarriage; severe headaches; nausea; loss of appetite; itchy skin (note: toxicity symptoms occur with excess retinol, not carotene).
D	Direct exposure of skin to sunlight. Foods: fortified milk, fish oils, egg yolk, and liver.	Associated with calcium metabolism: • Promotes calcium absorption • Improves bone formation. • Helps maintain blood calcium levels.	Rickets in children: soft, deformable bones	• Diarrhea; nausea; headache; calcium deposits in heart, kidneys blood vessels. Vitamin D is the most toxic vitamin. • Symptoms can appear at an intake of five times the Daily Value.
E	Vegetable oils and shortening, butter, green vegetables, legumes, whole grains, nuts, liver.	Protects vitamin A and polyunsaturated fats in the body from oxidation.	Destruction of red blood cells; deficiency is rare except in premature babies.	Nausea, diarrhea, vomiting. Cases are rare.
K	Produced by bacteria in the intestine; also found in green leafy vegetables.	Helps clot blood.	Slow blood clotting; bleeding disorder in newborns (newborns routinely get a Vitamin K shot soon after birth).	• In infants: jaundice, lung problems, anemia. • Only the form of vitamin K called menadione is toxic in large amounts.

Table 10: Summary of the Water-Soluble Vitamins

Vitamin	Best Sources	Functions	Deficiency Symptoms	Toxicity Symptoms
C	Citrus fruits & their juices; broccoli, strawberries, kiwi, cantaloupe, guava, mango, papaya, cabbage, snow peas, peppers.	• Necessary for collagen formation. • Helps to heal wounds, develop healthy gums and teeth. • Helps resist infection. • Increases iron absorption. • Converts folic acid to its active form. • Strengthens blood vessels.	Scurvy: easy bruising; loss of appetite, poor growth; depression; weakness; bleeding gums; painful joints; poor wound healing.	Vitamin C has little toxicity. However, people taking large doses can show signs of scurvy if they abruptly quit taking the vitamin.
Thiamin (B_1)	Meats, especially liver & pork; wheat germ; whole grain & enriched breads; legumes; peanuts; fresh green vegetables	Part of an enzyme system that breaks down carbohydrate for energy.	Beriberi: confusion, loss of appetite, muscle wasting, heart failure, swelling of limbs.	No evidence of symptoms to date.
Riboflavin (B_2)	Milk, organ meats, meat, fish, eggs, legumes, whole grain & enriched breads/cereals; cheese, green leafy vegetables (Note: sunlight destroys riboflavin)	Helps break down fat for energy.	Cracks in corner of mouth; red swollen tongue; teary eyes, scaly skin around the nose, anemia.	No evidence of symptoms to date.
Niacin (B_3)	Liver, meat, fish, poultry, peanuts, whole grain & enriched breads/cereals	• Helps break down carbohydrates, fats, protein. • Helps the body make some hormones and fat.	Pellagra: weakness; loss of appetite; diarrhea; skin rash in areas exposed to the sun; sore tongue; dementia.	Flushing; nausea; liver damage.
B_6 (Pyridoxine)	Meat, fish, poultry, milk, egg, green vegetables, avocado, prunes,	• Helps make body protein. • Helps break down proteins for energy.	Abnormal brain function; skin changes.	Neurological problems.

	beans, bananas, whole grain cereals, potatoes.			
Folic Acid (Folate)	Green leafy vegetables, red meats, organ meats, oranges & juice, whole grains, beans, nuts, asparagus, broccoli, spinach.	Helps make new cells, including blood cells.	Anemia; sore tongue; diarrhea.	Hides vitamin B_{12} deficiency.
B_{12} (Cobalamin)	Found only in animal products or yeast: meat, fish, poultry, eggs, milk, and cheese.	• Helps make new cells, including red blood cells. • Helps keep nervous system healthy.	Anemia; swollen tongue; poor appetite; poor coordination; mental disturbances.	No evidence of symptoms to date.
Pantothenic Acid	• Organ meats, salmon, eggs, broccoli, mushrooms, pork, whole grains, legumes. • Widespread in foods, but also produced by intestinal bacteria.	Assists in the breakdown & production of protein, hormones, cholesterol, and hemoglobin.	• Deficiency is unlikely, unless it's part of a deficiency of all B vitamins. • Nausea; diarrhea; cramps.	No evidence of symptoms to date.
Biotin	Widespread in foods, especially organ meats, eggs, milk, whole grain cereals, some vegetables.	Assists in the breakdown of carbohydrate, protein, and fat for energy.	Lack of appetite; depression; dry skin; numb feet and hands.	No evidence of symptoms to date.

SELF-CHECK: PRACTICE YOUR KNOWLEDGE

1. The original goal of the RDAs was to prevent vitamin-deficiency diseases. What is the combined focus of the new DRIs?

2. *Mark the following statements True or False*:
   ____ Vitamins are a good source of energy.
   ____ Vitamins A, D, E, and K are stored in body fat.
   ____ Taking megadoses of vitamins and minerals is advisable for healthy adults.
   ____ It is easy for the body to accumulate toxic levels of water-soluble vitamins.

3. Which of the following can increase the risk of birth defects in pregnant women? *(Check all that apply.)*
   ____ inadequate intake of folic acid, especially during the first trimester
   ____ getting 400µg of folic acid daily
   ____ eating plenty of green leafy vegetables
   ____ getting <200µg of folic acid daily

4. List six good sources of folic acid:

5. Using the vitamin tables above, list a few symptoms of deficiency or excessive intake for Vitamin A:

   Vitamin C:

   Vitamin E:

   Folic Acid:

ANSWERS

1. To prevent nutrient deficiency diseases, to reduce risk for chronic diseases
2. F, T, F, F
3. Inadequate intake of folic acid, getting < 200µg of folic acid daily
4. Green leafy vegetables, red meats, organ meats, oranges & juice, whole grains, beans, nuts, asparagus, broccoli, spinach, fortified cereal, enriched grain products, prenatal/multivitamins
5. See tables

Minerals

Objectives

If the word "minerals" has you thinking of rock formations, gold mines, or heavy metals, then think again. Minerals in the body are anything but heavy — in fact, minerals are also micronutrients, so we only need tiny amounts in our diets. After reading this section, you'll be familiar with the various roles of certain minerals, as well as problems that can occur with deficiencies and toxicities. Specifically, you'll be able to:

- Identify basic characteristics of minerals
- List five risk factors for osteoporosis
- Define anemia and the function of iron in healthy blood
- List three ways to increase iron absorption
- Identify true statements about sodium in the diet
- List four ways to reduce sodium intake

Mineral Basics

Minerals are similar to vitamins in a number of ways. First, they're ***micro*nutrients**, so we only need small amounts. Also, minerals are involved in numerous chemical reactions, and they don't contribute calories to the diet. But, unlike vitamins, minerals aren't destroyed by heat; thus, cooking doesn't affect the mineral content of a food.

While different minerals play specific roles in the body, most of their functions fall under two main headings:

1. **Minerals are part of many cells in the body's structure, including:**
   - Red blood cells
   - Bones, teeth, and nails
   - Muscle tissue

2. **Minerals regulate many chemical reactions in the body, such as:**
   - Helping maintain the right amount of water inside and outside of the body's cells
   - Keeping the heart beat regular and consistent
   - Helping nerves respond normally
   - Helping blood to clot in wounds
   - Regulating the release of energy from food

Types of Minerals

We divide minerals into two categories, based on how much the body needs: **major minerals** and **trace minerals**. Our bodies need major minerals in greater amounts as compared to trace minerals. The major minerals include calcium, phosphorus, potassium, sodium, chlorine, magnesium, and sulfur.

Trace minerals make up less than 1 percent of the total minerals in the body. Still, they're essential for good health. The trace minerals include iron, iodine, fluoride, zinc, manganese, chromium, cobalt, molybdenum, copper, and selenium. In addition to these, scientists have identified other trace minerals, but they're still learning about their functions and how much our bodies need.

Can You Get All the Minerals You Need from Foods?

As with other nutrients, most people who eat a balanced and varied diet can get all the minerals they need. However, some people need additional amounts of certain minerals; more than what they can get from their diets. For example, people who have had chronic blood loss or multiple pregnancies typically need extra iron. Also, physicians often prescribe extra calcium for women at risk for osteoporosis.

Can You Get Too Much of Any Mineral?

Yes, excessive intake of minerals can be dangerous. However, this is usually a result of too many supplements. An example is accidental iron poisoning in children consuming excessive quantities of iron supplements; an overdose of supplemental iron can kill a young child.

Minerals of Special Interest in WIC: Calcium, Iron, and Sodium

While all minerals are important, WIC is especially interested in teaching clients about calcium, iron and sodium. These minerals are needed for good health, especially during periods of growth. Sodium is a mineral of special interest since Americans tend to get more sodium than they need.

Calcium

Forming and maintaining bones is calcium's main job and the human skeleton contains 99% of the body's calcium. Once we reach our mid-30s, our bones start to lose more calcium than they gain. But calcium's role goes beyond the skeleton. The bones are in a continuous state of change — they constantly take up calcium and then release it back into the blood. This action helps maintain a steady calcium supply in the bloodstream for functions such as:

- Forming teeth
- Clotting blood
- Stimulating nerves
- Maintaining a normal blood pressure and heartbeat
- Helping muscles contract

As your body uses calcium, you need to replace it by eating more calcium-rich foods. If you get enough calcium, the bones will be able to maintain their strength. However, if you don't, your bones end up releasing more calcium than they absorb. This leaves space in the bones where calcium should be, making the bones porous and fragile. This is a condition called osteoporosis, in which the bones are weak and prone to fracture.

Table 11: Recommended Calcium Intake

Life Stage	mg/day
1 – 3 years	700
4 – 8 years	1000
9 – 18 years	1300
Adults to age 50	1000
Pregnant and lactating (up to 18 years)	1300
Pregnant and lactating (19 to 50 years)	1000

Source: USDA Nutrient Database for Standard Reference.

Calcium during Childhood and Adolescence

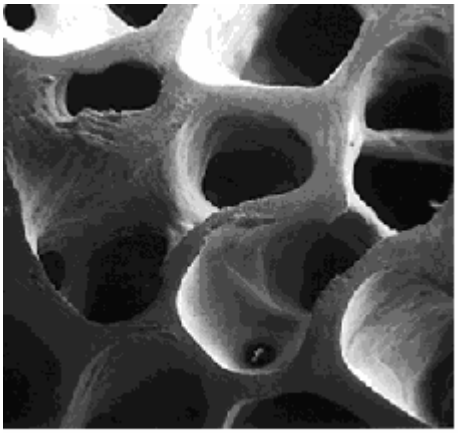
Have you noticed how children and young teenagers seem to suddenly grow, as if overnight? Rapid growth means the bones are getting longer and thicker, so those are times when the body needs even more calcium. Nearly *half* of the body's bone mass is formed from ages 11 to 15 in girls and ages 12 to 17 in boys. Calcium recommendations are higher for adolescents, and their bones are programmed to take up calcium more easily than adults. It's crucial that this age group gets enough calcium. Those who don't are at greater risk because they start their adult lives with a calcium deficit.

Calcium during Adulthood

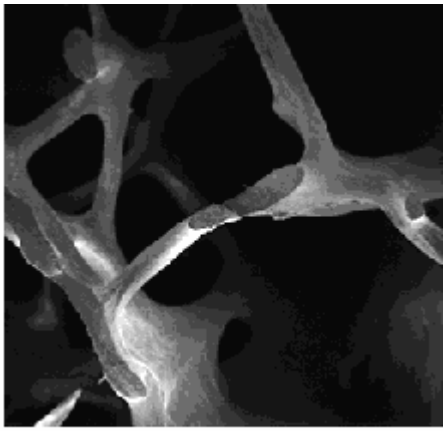
From ages 16 to 19 or so, our bones stop growing longer; however, we continue to build bone mass throughout our twenties. Then, after age 30 to 35, the bones start to lose more calcium than they gain - - a natural part of aging. This slow bone loss that occurs in adulthood gradually weakens the skeleton. For women in their childbearing years, the hormone estrogen helps protect bones; but after menopause, bone loss seems to increase due to hormonal changes.

Osteoporosis

In later adulthood, if there's a history of poor calcium intake, **osteoporosis** may develop. This condition is also called *porous bones* or *brittle-bone disease*.



Normal Bone



Osteoporotic Bone

The structure of bone, called the matrix, is primarily made of calcium, phosphorus, and protein. Without adequate calcium intake, the bones lose more calcium than they absorb. Over time, less calcium mass in the bones leads to tiny holes or pores in the bone matrix. This weakens the structure and may lead to a loss in height, a humped back, and a higher risk of breaking a bone even with a slight knock or fall. Osteoporosis is a painful disease with no cure. Risk increases as a result of:

- Being a woman
- Early menopause
- A family history of osteoporosis
- Being Caucasian or Asian
- Being underweight, or having a small, thin frame
- Smoking cigarettes
- Alcohol abuse
- A sedentary lifestyle
- A very low intake of dietary calcium or vitamin D

The best way to avoid osteoporosis is to make sure you reach adulthood with a strong skeleton, and to reduce calcium loss as you age. In young people, eating a diet rich in calcium and vitamin D helps build and maintain strong bones; for adults, a high-calcium diet helps reduce bone loss. Also, exercising, not smoking or abusing alcohol, and receiving hormone treatment during and after menopause can help prevent osteoporosis.

Many adults wonder if they can make up for their teen years when they didn't eat enough high-calcium foods. Unfortunately, after we reach about 30 to 35 years old, we don't add extra mass to the bone matrix, so our bones are as dense as they'll ever be. Still, it's never too late to start getting more calcium during your later adult years; consuming more calcium won't increase your bone density, but it can slow down the process of bone loss.

Vitamin D

Vitamin D plays many important roles in the body, including aiding calcium metabolism and bone health throughout the lifespan. Not enough vitamin D intake is linked to **rickets** in children, a disease characterized by delayed growth of the long bones; **osteomalacia**, a bone-thinning disease coupled with muscle weakness; and **osteoporosis**, lower bone density and bone brittleness. The role of vitamin D in bone health is complex, but generally works to properly adjust the calcium and phosphorus levels in the blood. It does this by controlling how much of these minerals is absorbed from food in the digestive tract, keeping these minerals from entering the urine to be discarded, and regulating how much mineral the bone takes up for growth and maintenance. Inadequate vitamin D may cause bone disease, even if calcium intake is adequate.

Vitamin D is available to the body in two ways: sunlight and food. First, the skin can make vitamin D after being exposed to ultraviolet light from the sun. This method is affected by a variety of factors, including season, climate, altitude, latitude, and sunscreen/SPF use. Second, vitamin D is fat-soluble and is naturally found in fatty fish, fish oil, and eggs. Very few foods *naturally* contain adequate amounts of vitamin D, so milk has been fortified with vitamin D since the 1930s. Fortified milk is the best dietary source of vitamin D, and other dairy and soy products are now fortified as well.

Daily Recommended Amount of Vitamin D

For babies, birth to 12 months, 10 micrograms (µg) or 400 International Units (IU) is the recommended daily allowance. The American Academy of Pediatrics recommends that exclusively and partially breastfed infants receive supplements of 400 IU/day of vitamin D shortly after birth and continue thereafter until weaned. For formula-fed babies, the requirements are the same. Unless the infant is drinking 32 ounces of infant formula per day, a vitamin D supplement may be needed.

In those younger than 70 years old, including children 1 year and older, men, women, and pregnant and lactation women, 15 micrograms (µg) or 600 International Units (IU) is the recommended daily allowance; the recommended 2 to 3 cups of fortified milk per day help meet at least some of this requirement.

Recommended Dietary Allowances (RDAs) for Vitamin D				
Age	**Male**	**Female**	**Pregnancy**	**Lactation**
0-12 months*	400 IU (10 mcg)	400 IU (10 mcg)		
1-13 years	600 IU (15 mcg)	600 IU (15 mcg)		
14-18 years	600 IU (15 mcg)	600 IU (15 mcg)	600 IU (15 mcg)	600 IU (15 mcg)
19-50 years	600 IU (15 mcg)	600 IU (15 mcg)	600 IU (15 mcg)	600 IU (15 mcg)

*Adequate Intake (AI)

Source: Institute of Medicine, Food and Nutrition Board. Dietary Reference Intakes for Calcium and Vitamin D. Washington, DC: National Avademy Press, 2010.

Food Sources of Calcium

Milk and milk products are the main sources of calcium for most Americans, providing about 73% of the calcium in our food supply. Dairy products also offer protein, vitamin D, and phosphorus, all of which help the body and bones use calcium. People who don't consume many dairy products can get their calcium from several non-dairy choices. Fortified soy milk, firm tofu made with calcium salts, and fish with edible bones offer considerable amounts, as well as fortified foods, like calcium-fortified juices or cereals. Some vegetables and leafy greens contribute calcium to the diet, although certain plant foods (spinach, Swiss chard, beet greens, rhubarb, and amaranth) have high amounts of oxalates that bind to some of the calcium, making it unavailable. Likewise, grains may contain phytates that reduce calcium availability, and caffeine is also a culprit that interferes with calcium absorption. Table 12 lists various foods that contribute calcium to the diet.

Table 12: Approximate Calcium Content of Various Foods

Food	Serving Size	Calcium (mg)
Total ® cereal	¾ cup	1000
Calcium-fortified orange juice	8 oz	350
Low fat yogurt	1 cup	300
Cheddar cheese	1.5 oz	300
Fat free milk	1 cup	300
Fortified soy milk	1 cup	299
Canned sardines with bones	3 oz	265
Firm tofu, set with calcium salts	1 cup	200
Calcium-fortified bread	1 slice	200
Blackstrap molasses	1 Tbsp	170
Pudding, made with milk	½ cup	150
Spinach, cooked	½ cup	120
Turnip greens, cooked	½ cup	100
Almonds	¼ cup	90
Sesame seeds	1 Tbsp	90
Ice cream	½ cup	85
Low fat cottage cheese (1% milk fat)	½ cup	80
Parmesan cheese	1 Tbsp	70
Pinto beans, cooked	½ cup	50
Okra, cooked	½ cup	50
Corn tortillas, made with lime-processed corn	2 tortillas	40
Broccoli, cooked	½ cup	35

*Actual calcium varies among brands, especially for tofu, yogurt, and other processed foods. Read the labels to determine calcium levels in various brands. Source: USDA Nutrient Database for Standard Reference.

Lactose Intolerance and Calcium Intake

Many people have difficulty digesting lactose, the sugar in milk. This includes most people of Asian, African, Native American, or Middle Eastern origin. If they drink a glass of milk, they might get cramps, gas, and diarrhea, a condition known as lactose intolerance. Those who avoid milk and foods made with milk can find it hard to get enough calcium. Here are some suggestions for people with lactose intolerance:

- Try small amounts of milk with meals.
- Try cheese, yogurt and pudding. These foods contain less lactose, may be easier to digest, and cause less stomach upset.
- Try lactose-reduced milk (such as Lactaid®).
- Try foods and recipes that include milk or cheese as ingredients, such as pancakes, waffles, milk-based soups, and casseroles with cheese.
- Try non-dairy sources of calcium (see table above).

What about Calcium Supplements?

Health care providers sometimes recommend calcium supplements for individuals who don't get enough calcium in their diets, especially postmenopausal women. However, people shouldn't rely on supplements as the major source of calcium, nor should they let supplements take the place of a healthy lifestyle. Also, calcium supplements can interfere with iron absorption, so it's best to avoid taking them along with iron-rich meals or iron supplements.

Those in danger of not getting enough calcium include:

- **Women and girls** — From about the age of 10 years on, most females don't consume enough calcium. Some are concerned about eating too many fat calories, so they avoid many foods including dairy products.
- **Vegans** — Strict vegetarians who don't consume any dairy products are able to consume adequate calcium through fortified soy products (for example, soy milk and yogurt, tofu) and other sources to help meet their calcium needs if they are aware of these sources and consume adequate amounts.
- **People with lactose intolerance** — As explained above, people in this group tend to avoid dairy products, so it's possible these individuals don't get enough calcium.

Iron

Our bodies only need small amounts of iron yet getting enough in the diet can be a challenge. Iron needs are highest during rapid periods of growth, so infants, children, and pregnant women are at higher risk for becoming deficient. One of the goals of the WIC Program is to prevent iron-deficiency anemia in low-income women, infants, and children.

Iron is a trace mineral that our bodies need for normal growth, to prevent infections, and to promote learning. But iron's main job is to help form hemoglobin, a protein in red blood cells. Specifically, iron carries oxygen within the hemoglobin molecule. When hemoglobin combines with oxygen, it turns red, giving blood its red color. Then hemoglobin travels to all of the body's cells, taking oxygen to all of the body's tissues to make energy.

Food Sources of Iron

Iron is found in many foods (Table 13). Iron is present in foods in two different forms: heme and non-heme iron.

- **Heme iron** — Most of the iron found in animal products is heme iron. The body absorbs about 15% to 35% of heme iron, which is pretty good compared to non-heme iron. Excellent sources of heme iron are meats such as chicken, beef, pork, and fish.
- **Non-heme iron** — The iron in plant sources is called non-heme iron. The body only absorbs about 2 – 20% of non-heme iron. Moderately good sources include dried beans, tofu, blackstrap molasses, dried fruit, and fortified cereals.

Table 13: Approximate Iron Content of Various Foods

Food	Serving Size	Iron (mg)
Total ® cereal	¾ cup	18.0
Soybeans, cooked	½ cup	4.4
Blackstrap molasses	1 tbsp	3.5
Potato, baked with skin	1 medium	2.7
Beef, ground, extra lean, cooked	3 oz	2.2
Pinto beans, cooked	½ cup	2.2
Figs, dried	5 medium	2.0
Tofu, firm	½ cup	1.8
Apricots, dried	10 halves	1.6
Almonds	¼ cup	1.5
Sesame seeds	1 Tbsp	1.3
Raisins	1/3 cup, packed	1.1
Prunes	5 medium	1.0
Chicken, without skin, cooked	3 oz	1.0
Bread	1 slice	0.9
Pork, cooked	3 oz	0.9
Turnip greens, cooked	½ cup	0.6
Peanut butter	2 Tbsp	0.6
Mustard greens, cooked	½ cup	0.5
Fish, cooked	3 oz	0.5

*The recommended intake for iron for women is 18 mg/day and 27 mg/day for pregnant women.
Source: USDA Nutrient Database for Standard Reference, plus product labels.

Iron Absorption

It's possible either to help or to hinder the amount of iron your body absorbs. For example, eating vitamin C–rich foods along with foods containing iron increases iron absorption. Also, heme iron helps the body to absorb non-heme iron. On the other hand, tea, coffee, spinach, chocolate, soy protein, wheat bran, calcium supplements, and fiber all interfere with iron absorption. So, to increase the amount of iron that you absorb, here are some tips:

- **Include meat in your diet**. The iron in meat is well absorbed, plus it helps the body absorb iron better from plant sources.
- **Include vitamin C–rich foods when you plan meals**. For example, serve green and red peppers along with chicken or beef, or orange juice along with iron-fortified cereal.
- **Avoid drinking tea and coffee with meals**, including decaffeinated coffee and tea (it's not the caffeine that decreases iron absorption, but substances called polyphenols).

Iron-deficiency Anemia

If you don't get enough iron in your diet, or if your body's iron stores get too low, your red blood cells can't carry as much oxygen. That means each cell has less oxygen, so they can't produce as much energy. The end results? You may feel tired, weak, and irritable — symptoms of low iron levels. If deficiency goes on for too long, a person may develop iron-deficiency anemia, showing results of poor nutrition in the red blood cells. A person who is anemic may have enough energy for most activities of daily living, but any physical effort becomes very difficult. Running, climbing stairs or even rapid walking is hard because the muscle cells do not have the oxygen, they need to produce energy.

Here are some of the symptoms of iron-deficiency anemia:

- Difficulty learning
- Slow growth
- Shorter attention span
- Poor appetite
- Problems breathing, especially during activity
- Less resistance to infection
- Pale skin and nails
- Reduced ability to exercise
- Less ability to regulate temperature
- Changes in behavior

Iron-deficiency anemia is a widespread health problem, especially among infants, growing children, and women in their childbearing years. The main causes are poor dietary intake, rapid growth, chronic blood loss, or a combination of these factors.

Poor Iron Intake

Many foods are relatively low in iron, so it takes a well-balanced diet with plenty of iron-rich foods to meet recommended levels.

- Children and teenagers often eat a lot of iron-poor foods, such as soft drinks, crackers, chips, cookies, and candies, and these replace iron-rich foods in the diet. Many adults and teenagers put themselves on calorie-restricted diets to lose weight, making it difficult for them to eat adequate amounts of iron-rich foods.
- There's a sudden drop in dietary iron at 1 year of age when babies switch to cow's milk from breast milk or iron-fortified formula. Cow's milk is a poor iron source. Some children drink more milk than they need, and, as a result, don't eat enough iron-rich foods. **This combination of a low intake of solid foods and excessive milk intake can contribute to iron-deficiency**.

Blood Loss

Sixty to 70% of the iron in the body is in the blood, so blood loss can lead to anemia. Here are some reasons for blood loss:

- **Menstruation**: Women lose iron during menstruation. Women with heavy menstrual periods may need iron supplements to prevent anemia.
- **Childbirth:** Blood lost during delivery may cause a reduction in iron reserves. Women who have pregnancies close together without iron supplementation may not build up their iron stores enough between pregnancies. Mild anemia has little effect on iron in breast milk, but the mother is at greater risk for developing infections.
- **Intestinal bleeding:** This can occur in infants fed cow's milk before 1 year of age. Also, untreated ulcers and excessive, long-term use of aspirin can cause intestinal bleeding.

Rapid Growth

Growth requires more iron to make extra blood and muscle. Rapid growth occurs during pregnancy, infancy, early childhood and adolescence.

- Pregnancy doubles a woman's iron needs because of increased blood volume. Pregnant women have at least three more pints of blood compared to their pre-pregnancy state. During the last three months of pregnancy the fetus stores iron, even if the mother is anemic. So mild anemia in a pregnant woman won't harm the fetus, but the mother may develop symptoms.
- In babies, children, and adolescents, rapid growth combined with poor intake often leads to anemia. Adolescent boys who are growing rapidly and building larger muscles need additional iron for their muscles and their larger blood volume. Young girls need extra iron at puberty for increased growth and because they start losing iron while menstruating.
- Premature babies and twins often don't have the opportunity to build up their iron stores the last few months before birth. Full-term babies, on the other hand, are usually born with enough iron to last through the first four to six months of age.

Sodium

Sodium is a major mineral in the fluid that surrounds our cells. The body needs sodium to:

- Transmit nerve impulses
- Help balance fluids in the cells
- Help muscles relax
- Regulate blood pressure

An adequate intake of sodium for adults is 1,500 milligrams (mg), although most of us eat much more. Sodium is naturally found in a large variety of foods from every food group, and the average American eats enough sodium simply from eating a varied diet. As well, sodium makes up 40% of table salt (sodium chloride) by weight. Many of us tend to add salt while cooking and at the dinner table, which adds up very quickly; 1 teaspoon of salt is equal to 2,300 mg of sodium!

While sodium is essential for the body to function, too much dietary salt is associated with several health concerns including high blood pressure. High blood pressure (hypertension) causes the heart to work harder, and it can eventually damage the arteries, heart, kidneys, and brain. While high blood pressure is itself an illness, it's also a major risk factor for kidney disease, heart attack, and stroke. Another health concern is that excess sodium increases the amount of calcium lost in the urine. So, **eating less sodium may cut down on calcium lost from bone**, which in turn could lower the risk for osteoporosis and fractures.

A number of factors can contribute to high blood pressure; a high-sodium diet is just *one* factor that contributes to the disease, and only in *some* individuals. There is no way to tell who might develop high blood pressure from eating too much sodium. And since cutting back on added salt isn't harmful, it's good advice for most Americans.

Reducing Sodium Intake

Obviously, there are some good reasons to limit dietary sodium, although, for many people, that's easier said than done. Americans dine on all kinds of processed foods loaded with sodium: canned and instant soups; canned meat and fish; crackers, chips and pretzels; lunch meats and cheeses; frozen meals; and condiments such as soy sauce, ketchup and pickles. Most Americans get six to twelve times the amount of sodium their bodies actually need! With a little effort, most people can lower their sodium intakes. Here are some tips:

- Rather than canned vegetables, choose fresh, frozen, or low-sodium canned vegetables.
- Choose fresh or frozen meat, poultry, and seafood instead of canned, cured, or smoked.
- Read the label to check the sodium content of processed foods, especially frozen dinners, packaged mixes, soups, salad dressings, and sauces.
- Look for labels that say "low-sodium." They contain 140 mg (about 5% of the Daily Value) or less sodium per serving.
- Go easy on sauces, gravies, dressings and condiments.
- Rather than salt, learn to use spices and herbs to enhance the flavor of food.
- Leave the salt shaker in the cupboard.

A Summary of Important Minerals

Table 14 provides a summary of the food sources, specific functions, and problems related to deficiencies and excesses of important minerals in the diet. This table is for general reference; please take a few moments to become familiar with some of the symptoms.

Table 14: Important Minerals in the Diet

Mineral	Best Sources	Functions	Deficiency Symptoms	Toxicity Symptoms
Calcium	Milk and milk products; salmon and small fish with bones; dark green vegetables, legumes.	• Helps blood clot. • Stimulates nerves. • Helps muscles contract.	Poor bone development and bone weakening leading to osteoporosis.	Constipation, kidney stones. An excess cannot be caused by food intake alone.
Iron	Heme: chicken, beef, pork, fish. Non-heme: Legumes, dried fruit, green vegetables, fortified cereals.	Forms hemoglobin in the red blood cells and myoglobin in the muscle cells, which transport and hold oxygen in the body.	Anemia: Weakness, tiredness, irritability, loss of appetite, increased susceptibility to infections, decreased attention span. If prolonged, growth retardation.	Iron overload: Infections, liver injury, acidosis, bloody stools, shock. Cannot be produced by food intake alone.
Fluoride	Fluoridated water, toothpaste and mouth rinses with fluoride, some processed foods. Naturally occurring fluoride in water.	• Prevents tooth decay by hardening tooth enamel. • Helps prevent osteoporosis.	Fluoride is not an essential nutrient. But without it, there is increased tooth decay in children and increased bone loss in older adults.	Discolored teeth when the excess occurs in childhood. Massive doses are toxic.
Phosphorus	Distributed widely in foods. Milk and milk products are rich sources; soft drinks, meat, eggs, poultry, nuts, legumes, whole grains, processed foods.	• Forms bones and teeth. • Needed to make proteins, enzymes and new cells. • Helps maintain acid-base balance.	Rare. Stunted growth, poor bone development, weakness, loss of appetite, pain in bones.	No symptoms reported. High intakes can increase calcium loss.
Sodium	Table salt, soy sauce, MSG, salty snack foods, foods prepared in brine, such as olives or pickles, salty smoked meat or fish, chesses, canned or instant soup. Milk, meat, poultry, and eggs.	• Helps maintain water balance. • Helps maintain acid-base balance. • Stimulates nerves. • Helps muscles contract.	Rare. Nausea, vomiting, tiredness, cramps.	If prolonged, may lead to high blood pressure in some people.
Potassium	Orange juice, bananas, dried fruits, potatoes. Also found in meats, fish, poultry, whole grains, fruits, vegetables.	• Maintains heartbeat •Helps muscles contract. • Stimulates nerves.	Tiredness, weakness in limbs, rapid heartbeat, heart failure, kidney damage.	Cannot be produced by food intake alone.

Magnesium	Green leafy vegetables, nuts, whole grains, meats, milk, seafood, chocolate.	• Forms bones. • Helps muscles function.	Tremors, convulsions.	Heart changes, coma. Cannot be produced by food intake alone.
Iodine	Iodized salt, seafood, and food grown near the ocean.	Part of thyroid hormones that control energy production in the body.	Goiter (enlarged thyroid). During pregnancy, deficiency causes cretinism, a form of mental retardation in the baby.	Thyroid disturbances.
Zinc	Meat, liver, oysters, herring, fish, milk, whole grains, nuts, legumes.	• Helps form enzymes and insulin. •Helps produce body proteins. • Helps the body use vitamin A. • Provides normal taste sensations.	Poor wound healing; decreased sense of taste; retarded growth and sexual development.	Nausea, vomiting, diarrhea. Difficult to produce from food alone.

SELF-CHECK: PRACTICE YOUR KNOWLEDGE

1. Mark the following statements True or False:
   ____ Minerals are easily destroyed by heat.
   ____ Minerals are an excellent source of energy.
   ____ Accidental iron poisoning can be fatal in young children who consume excessive iron from supplements.

2. List five risk factors for osteoporosis:

3. Mark the following statements True or False:
   ____ After you reach your early to mid-30s, your bones are as dense as they'll ever be.
   ____ People with lactose intolerance must avoid all forms of dairy foods.
   ____ Iron's main job is to form hemoglobin, a protein in red blood cells.

4. Which nutrient increases iron absorption? *(Check one.)*
   ____ Vitamin D
   ____ Vitamin C
   ____ Biotin
   ____ Calcium

5. Which food listed provides iron in the most absorbable form? *(Check one.)*
   ____ spinach
   ____ rice
   ____ hamburger
   ____ peas
   ____ pinto beans

6. Iron-deficiency anemia is (*check all that apply*):
   ____ Most commonly caused by a low dietary intake of iron, rapid growth, and/or major blood loss.
   ____ Avoidable by eating a low-sodium diet.
   ____ A condition of the blood in which iron stores are higher than normal.
   ____ Common among adult men.

7. List three tips for increasing the amount of iron absorbed from foods:

8. Mark the following statements True or False:
   ____ Most Americans consume 6 to 12 times the amount of sodium their bodies require.
   ____ Excess sodium can increase the amount of calcium excreted in the urine.
   ____ It's easy to tell if a person will develop high blood pressure from a high- salt diet.
   ____ A high-sodium diet is the only factor that contributes to high blood pressure.

9. List four tips for reducing sodium in the diet:

ANSWERS

1. F, F, T
2. Being a woman, early menopause, a family history of osteoporosis, being Caucasian or Asian, being underweight, or having a small, thin frame, smoking cigarettes, alcohol abuse, a sedentary lifestyle, a very low intake of dietary calcium or vitamin D.
3. T, F, T
4. Vitamin C
5. Hamburger
6. Most commonly caused by a low dietary intake of iron, rapid growth, and/or major blood loss.
7. Eat meat, include vitamin C foods with iron-rich foods, avoid tea or coffee with food
8. T, T, F, F
9. Choose fresh, frozen, or low-sodium vegetables; choose fresh or frozen meat, poultry, and seafood; read the label to check sodium content; look for labels that say "low-sodium;" go easy on sauces, gravies, dressings, and condiments; use spices and herbs to enhance food; leave the salt shaker in the cupboard.

Water

Objectives

Water does a lot more than simply satisfy thirst. It's a vital nutrient for health and survival. In fact, losing just 10% of your body's water can cause severe weakness and heat stroke. And, while the human body can live for weeks without food, biological processes stop within days without water. After reading this section, you'll be able to:

- Recognize various functions of water.
- Identify appropriate recommendations concerning daily fluid needs.
- List three factors that increase a person's need for water.
- State three practical ways to consume more fluid on a daily basis.

Water in the Body

Our bodies are about 55% to 75% water — that translates to about 10 to 12 gallons in most adults. Since we carry around that much water, it's no surprise that this essential nutrient performs some very important functions in the body, such as:

- **Composition of body fluids** — Water is the main component of fluids such as blood, saliva, urine, gastric juices in the stomach, and amniotic fluid in pregnant women.
- **Lubrication** – Water helps lubricate joints and moisten eyes and mucous membranes.
- **Regulation of body temperature** — Thanks to water, the human body can maintain a fairly constant temperature of about 98.6ºF. When your body needs to get rid of excess heat, you lose water in the form of sweat, like the water in your car's radiator. So, in hot, humid weather, or when you exercise vigorously, you perspire to cool down. To make sure you don't overheat, you need to drink plenty of water.
- **Removal of waste products** — Most waste products and unwanted substances in our bodies are water-soluble. Water carries these substances out of the body via the urine.

Meeting Water Needs in Adults

We lose water every day — about 10 cups on average. Some is excreted in urine and feces, some is lost through the skin as perspiration and some leaves the lungs when we breathe. Also, certain factors can increase fluid needs, including pregnancy, breastfeeding, being elderly, eating a high-fiber diet, being sick, being exposed to high altitudes or extreme temperatures, and performing strenuous work or exercise.

Since our bodies don't store extra water, we must make up for what we lose by consuming water on a daily basis. Most adults should consume about 8 to 12 cups of fluids every day from water, non-caffeinated beverages, and nonalcoholic beverages. While most of this should come from drinking water, foods and other beverages also contribute a significant amount to

our daily fluid intakes. In fact, solid foods provide about 4 cups of water each day for the average adult.

So how do you know if you're getting enough fluids? Usually, thirst is a signal that you need more fluids. But don't rely completely on thirst since the body signals thirst after it is already dehydrated. Keep an eye on urinary output. If you're excreting fairly clear urine, then you're getting enough water. However, a smaller amount of darker urine means you need more fluids. Also, it helps to make a conscientious effort to drink plenty of fluids throughout the day. Here are some practical tips:

- Fill a large pitcher with water, store it in the refrigerator, and use this water for all your drinking needs during the day. Aim to drink about 8 cups (64 ounces) - keeping in mind you'll also get fluids from foods and other beverages.
- If you're on the go, keep a water bottle with you throughout the day. Or, if you work at a desk, always have a glass of water handy to sip on.
- Avoid beverages that contain caffeine and alcohol. These drinks are diuretics, so you end up losing more water in the urine.
- Always include water, soup, or some other beverage with meals and snacks.
- Be sure to drink water before, during, and after physical activity. This is especially important if you exercise outside in hot weather or at high altitude.
- Since many fruits and vegetables have a high water content, enjoy them on a routine basis — especially foods like lettuce, broccoli, watermelon, oranges, and grapefruit.

Dehydration

If you don't replace the water you lose, the body becomes dehydrated. Essentially, the body overheats, resulting in weakness, dizziness, and headache. Severe dehydration is dangerous; the symptoms can progress rapidly from exhaustion to delirium and may end in death. In Colorado, we are at a higher altitude and have warmer, sunnier days; dehydration is a serious concern. People who work or play outdoors or those who don't have air conditioning during the summer need to be extremely careful and drink plenty of fluids.

Even mild dehydration is concerning. Losing as little as 2% of body weight in the form of fluids, can affect physiological responses and impair performance. Plus, new studies suggest that fluid and water intake may affect a person's risk for various disorders, including urinary stone disease and certain types of cancer.

Fluids for Children

Children need about 6 to 8 cups of fluids each day, depending on age and weight. Like adults, they get their fluids from water, as well as milk, juice, and solid foods. While adequate fluids are important, **too many fluids can interfere with the intake of calories and nutrients from other foods.** For example, if a toddler drinks an excessive amount of juice throughout the day, he probably won't consume the amount and variety of other foods he needs to meet his nutrient needs. So the American Academy of Pediatrics' recommendation is to limit juice to 4 ounces (½ cup) to 6 ounces of 100% juice and limit milk to 16 ounces (2 cups) daily. Healthy

babies are generally able to get the fluids they need from breast milk or infant formula that is properly prepared.

Dehydration in Infants and Children

Babies and young children have a greater portion of body weight as water, so fluid loss from diarrhea, vomiting, or sweating can easily lead to dehydration. Symptoms include a reduced amount of urine, dry membranes in the mouth, no tears when crying, sunken eyes, and restlessness, irritability, or lethargy. Health care providers should see dehydrated children immediately.

Water Intoxication in Babies

While dehydration can be a concern for babies, getting too much water can be just as dangerous. Over-diluted formula or too much water can lead to a number of problems.

First, babies who get too much water don't get enough calories to meet their needs for growth and development. In more serious cases, excess water leads to water intoxication. The symptoms of this life-threatening condition include respiratory failure, seizures, and convulsions. Healthy babies fed adequate amounts of breast milk or infant formula in the first 6 months of life generally do not require additional plain water added to their diet. A baby's health care provider may recommend feeding a small amount of sterile water (4 to 8 ounces per day) in a cup when complementary foods are introduced.

Water intoxication can occur when caregivers force-feed excessive amounts of water. Also, caregivers who can't afford adequate amounts of formula may try to stretch it out by over-diluting the formula or by substituting bottles of water for formula feedings. So it's important to teach clients to dilute formula properly and to instruct them on the dangers of giving excess water.

SELF-CHECK: PRACTICE YOUR KNOWLEDGE

1. How does water function in the body? *(Check all that apply.)*
   _____ lubricates the joints
   _____ maintains body temperature
   _____ provides energy
   _____ removes waste products from the body

2. List three factors that increase fluid needs:

3. *Mark the following statements True or False.*
   ____ Adults should consume about 8–12 cups of fluid on a daily basis from water and other beverages.
   ____ Solid foods contribute negligible amounts of fluid so they don't count as part of your daily fluid consumption.
   ____ Young children shouldn't get more than 4 – 6 ounces of juice per day.
   ____ Young babies (less than 5 months) need water in addition to breast milk or formula to prevent dehydration.

4. List three ways you can help ensure that you're meeting your fluid needs:

ANSWERS

1. Lubricates joints, maintains body temperature, and removes waste products from the body.
2. Pregnancy, breastfeeding, being elderly, eating a high-fiber diet, being sick, being exposed to high altitudes or extreme temperatures, and performing strenuous work or exercise.
3. T -- Adults should consume about 8–12 cups of fluid on a daily basis from water and other beverages.
   F -- Solid foods contribute negligible amounts of fluid so they don't count as part of your daily fluid consumption.
   T -- Young children shouldn't get more than 4 – 6 ounces of juice per day.
   F -- Babies need water in addition to breast milk or formula to prevent dehydration.

4. Fill a large pitcher with water, and use this water for all your drinking needs during the day; keep a water bottle with you throughout the day; avoid beverages that contain caffeine and alcohol; always include water, soup, or some other beverage with meals and snacks; be sure to drink water before, during, and after physical activity; enjoy fruits and vegetables on a routine basis.

Section II: What Should Americans Eat?

Overview

Now that you've learned about the nutrients the body needs, how do you go about transforming that information into dietary recommendations for WIC clients? Fortunately, the USDA and other government agencies have done some of the groundwork for you. Since the 1950s, the U.S. government has collaborated with scientists, universities, nutrition professionals, and the food industry to design guidelines and nutrition education information for Americans. The government at times updates this information to reflect current scientific and medical advice. Currently, there are three key tools that can support and enhance your nutrition education efforts:

- The Dietary Guidelines for Americans, 2015-2020.
- MyPlate, the USDA's primary food group icon, intended to help consumers to think about building a healthy plate at meal times and to seek more information to help them do that visiting the website:
    - www.ChooseMyPlate.gov
- The Nutrition Facts Label

In this section, we'll look at these guides to see how they can help you educate clients and help all of us make healthier food choices.

The Dietary Guidelines for Americans

Overview

The USDA's Dietary Guidelines for Americans (Dietary Guidelines), first published in 1980, were recently revised in 2015-2020 to reflect the changing face of the American diet. The Dietary Guidelines are the federal government's evidence-based nutritional guidance to promote health, reduce the risk of chronic diseases, and reduce the prevalence of overweight and obesity through improved nutrition and physical activity. They provide science-based advice to promote health and to reduce risk for chronic disease through diet and physical activity for Americans over 2 years of age. These guidelines recognize that in recent years nearly 15% of American households have been unable to acquire adequate food to meet their needs.

Five main guidelines of the 2015-2020 Dietary Guidelines for Americans include:

1. **Follow a healthy eating pattern across the lifespan.** All food and beverage choices matter. Choose a healthy eating pattern at an appropriate calorie level to help achieve and maintain a healthy body weight, support nutrient adequacy, and reduce the risk of chronic disease.

2. **Focus on variety, nutrient density, and amount.** To meet nutrient needs within calorie limits, choose a variety of nutrient dense food across and within all food groups in recommended amounts.
3. **Limit calories from added sugars and saturated fats and reduce sodium intake**. Consume an eating pattern low in added sugars, saturated fats, and sodium. Cut back on foods and beverages higher in these components to amounts that fit within healthy eating patterns.
4. **Shift to healthier food and beverage choices.** Choose nutrient-dense foods and beverages across and within all food groups in place of less healthy choices. Consider cultural and personal preferences to make these shifts easier to accomplish and maintain.
5. **Support healthy eating patterns for all.** Everyone has a role in helping to create and support healthy eating patterns in multiple settings nationwide, from home to school to work to communities.

The Key Recommendations of the 2015-2020 Dietary Guidelines

Consume a healthy eating pattern that accounts for all foods and beverages within an appropriate calorie level.

A healthy eating pattern includes:

- A variety of vegetables from all of the subgroups – dark green, red and orange, legumes (beans and peas), starchy, and other.
- Fruits, especially whole fruits.
- Grains, at least half of which are whole grains.
- Fat-free or low-fat dairy, including milk, yogurt, cheese, and/or fortified soy beverages.
- A variety of protein foods, including seafood, lean meats and poultry, eggs, legumes (beans and peas), and nuts and seeds, and soy products.
- Oils.

A healthy eating pattern limits:

- Saturated fats and trans fats, added sugars, and sodium.

Key recommendations are provided for several components of the diet that should be limited. These components are of particular health concern in the United States, and the limits can help individuals achieve healthy eating patterns within calorie limits:

- Consume less than 10 percent of calories per day from added sugars.
- Consume less than 10 percent of calories per day from saturated fat.
- Consume less than 2,300 milligrams (mg) per day of sodium.
- If alcohol is consumed, it should be in moderation – up to one drink per day for women and two drinks per day for men – and only by adults of legal drinking age.

https://health.gov/dietaryguidelines/2015/resources/2015-2020_Dietary_Guidelines.pdf

More information regarding the 2015-2020 Dietary Guidelines can be found at:

- http://www.cnpp.usda.gov/dietaryguidelines.htm
- https://health.gov/dietaryguidelines/2015/resources/2015-2020_Dietary_Guidelines.pdf

MyPlate

- MyPlate is based on the 2010 Dietary Guidelines for Americans to help consumers make better food choices.
- MyPlate is designed to remind Americans to eat healthfully; it is not designed to change consumer behavior alone.
- MyPlate shows the five food groups using a familiar mealtime visual; a place setting.

Objectives:

In the 1970s and 1980s, children in school studied the four basic food groups, and in the 1990s they studied the Food Guide Pyramid. In 2005, MyPyramid, the USDA's food guidance system, replaced the Food Guide Pyramid. MyPyramid was created in concert with and to follow the new Dietary Guidelines, as well as to reflect the new nutrient standards, the Dietary Reference Intakes (DRIs). But in general, it was developed to determine what and how much Americans should eat. MyPlate was introduced along with updating of USDA food patterns for the 2010 Dietary Guidelines for Americans. After reading this section, you'll be able to:

- Identify and explain the significance of certain characteristics of MyPlate.
- List the food groups and recommended number of servings from each group.
- Use MyPlate to evaluate your own diet.

Overview

In using MyPlate it is important to be aware that information about **what** and **how much** to eat has not changed. The illustrations are based on the food groups with recommendations about what and how much to eat. The message of MyPlate focuses on key behaviors including:

- Enjoy your food but eat less.
- Avoid oversized portions.
- Make half your plate fruits and vegetables.
- Switch to fat-free or low fat milk.
- Make at least half of your grains whole grains.

- Compare sodium in foods such as soup, bread and frozen meals – and choose foods with lower numbers.
- Drink water instead of sugary drinks.

The website www.choosemyplate.gov includes much of the consumer information formerly found at www.mypyramid.gov.

The Food Groups

Below you will find the general recommendations for adults. For each major food group, the standard measurement uses a cup or ounce equivalent. Remember that these amounts will differ between people, based on their ages, weights, genders, and physical activity levels.

Table 16: Typical adult servings from the five food groups.

Food Group	Amount per day	What counts as 1 cup or 1 ounce:	Examples
	2½ cups	What counts as 1 cup: 1 cup raw, cooked, or canned 1 cup vegetable juice 2 cups raw leafy vegetables	**Vary your veggies** Dark Green: Broccoli, Brussels sprouts, leaf lettuce, spinach Orange: Carrots, sweet potatoes, pumpkin, squash (acorn or butternut) Starchy: Potatoes, yams, and corn Other: Eggplant, tomatoes, peppers, mushrooms, onions, cauliflower, cabbage, greens beans, zucchini Nutrition Tip: Eat dark green and orange vegetables every day. Try fresh, frozen, or canned vegetables.
	2 cups	What counts as 1 cup: 1 small piece or ½ large piece 1 cup cut fruit 1 cup 100% fruit juice ½ cup dried fruit	**Focus on fruits** Oranges, grapefruit, citrus juices, melons, berries, apples, bananas, pears, plums, grapes, pineapple, peaches, apricots, applesauce, 100% juice, raisins, other dried fruit Nutrition Tip: Eat a variety of fruits by choosing different colors.
	3 cups	What counts as 1 cup: 1 cup milk or yogurt 1½ oz cheese or 2 oz processed cheese (such as American) 2 cups cottage cheese	**Get your calcium-rich foods** Milk, yogurt, cheese, cottage cheese Milk-based soups, pudding, ice milk, frozen yogurt Nutrition Tip: Go fat-free (skim) or low fat (1%) when you choose milk, yogurt, and cheese.
	6 ounces	What counts as 1 ounce: 1 slice bread or 6" tortilla 1 cup ready-to-eat cereal ½ cup cooked pasta, rice, or cereal	**Make half your grains whole** 100% whole grain breads, cereals, crackers, and pasta Rice, noodles, tortillas, oatmeal, bagels, English muffins, popcorn Nutrition Tip: Just because bread is brown does not mean it is whole grain. Look for the words "whole-wheat" or "whole grain" before the first

		5 to 7 crackers	ingredient or "100% whole" wheat or grain on the label.
	5½ ounces	What counts as 1 ounce: 1 oz meat, poultry, or fish ¼ cup cooked beans or peas 1 egg 1 tablespoon peanut butter or ½ oz nuts	**Go lean with protein** Lean beef, pork, chicken, or turkey Fish including canned salmon and tuna (limit canned tuna to 6oz/week) Split peas, pinto beans, black beans, kidney beans, lentils, other beans Eggs, peanut butter, nuts, seeds Nutrition Tip: Choose low fat or lean protein, such as chicken, turkey, fish, and cooked beans.

Let's look at each food group in more detail.

Vegetables

Any vegetable or vegetable juice counts as a member of the vegetable group. Vegetables may be raw or cooked, fresh, frozen, canned, dried, or dehydrated. As well, they may be whole, cut, or mashed. Vegetables provide vitamins A, C, and E, folate, iron, potassium, fiber, and many other vital nutrients. Also, vegetables are naturally low in fat and calories, and have no cholesterol. But be careful; butter, sauces, gravies, and dressings may add fat, calories, and cholesterol to otherwise healthy vegetables.

Different types of vegetables offer different nutrients, so it is important to **vary your veggies.** There are plenty of vegetables to choose, and they fall into 5 subcategories: dark green, orange, starchy, other vegetables, and legumes. Dry beans and peas, called legumes, are also sometimes considered part of the vegetable group since they are plant foods, and high in fiber and other nutrients like folate. They are also considered vegetarian meat alternatives, because they have levels of protein, iron, and zinc similar to meat, poultry, and fish. Because of their high nutrient levels, consuming beans and peas is important for everyone, but here they are included in the Meat and Bean food group.

MyPlate recommends 2½ cups of vegetables every day. One cup is equal to 1 cup raw or cooked vegetables, 1 cup of vegetable juice, or 2 cups of leafy green vegetables (such as lettuce or spinach). Americans should try to eat a variety of vegetables every day, and because different colors of vegetables are rich in different nutrients, we should choose dark green and orange vegetables more often. Dark green vegetables are deep green in color and are beneficial because they provide many healthful nutrients, including fiber, vitamins A and C, folate, and potassium. Orange vegetables may be orange, red, or yellow, and are also good sources of fiber and are particularly high in vitamin A. Starchy vegetables include potatoes and corn, and are a good source of potassium and fiber. Likewise, the other vegetables are excellent sources of fiber, vitamins and minerals.

Dark Green	Orange	Starchy	Other
Broccoli	Carrots	Corn	Artichoke
Brussels sprouts	Sweet potatoes	Potatoes, any variety	Asparagus
Leaf lettuce	Pumpkin	Sweet potatoes	Beets
Romaine lettuce	Acorn squash	Yam	Cabbage
Spinach	Butternut squash		Cauliflower
Kale	Hubbard squash		Celery
Mesclun	Yam		Cucumber
Bok choy			Eggplant
Collard greens			Iceberg lettuce
Mustard greens			Okra
Turnip greens			Tomatoes or juice

Fruits

Among other nutrients, fruit and 100% fruit juice provide vitamins A, C, and potassium, as well as being naturally low in fat and sodium. Choose fresh, frozen, dried, or canned fruit, but pass on fruit canned in syrup. Also, look for fresh fruits that are in season when they may cost less and be at their peak flavors. As for juice, only 100% fruit juice counts as a fruit serving, since punches, fruit sodas, and most fruit drinks contain only small amounts of juice but large amounts of added sugars. Compared to fruit juices, whole fruits are better choices because they provide fiber, and more vitamins and minerals.

MyPlate recommends 2 cups of fruit every day, so what counts as 1 cup? 1 small piece of fruit (such as a 2" apple), ½ of a large piece of fruit (such as a large banana), 1 cup cut fruit, 1 cup 100% fruit juice, or ½ cup dried fruit count as 1 cup of fruit. Americans should try to **focus on fruits**, by choosing a variety of colors for more vitamins and minerals, and to choose whole fruit over juice for added nutrients. Also, select fruits high in potassium more often, such as bananas, prunes, dried peaches and apricots, cantaloupe, honeydew melon, and 100% prune or orange juices. It's easy to get 2 cups of fruit every day: keep a bowl of fresh fruit on the table, cut up fruit and store it in the refrigerator for snacking, and always have fruit on hand for snacks, side dishes, and desserts.

Milk

Fluid milk and products made from milk that retain their calcium content, such as yogurt and cheese, are part of this food group. Foods that are made from milk but do not retain their original calcium contents, such as cream cheese, cream, and butter, are not considered part of this food group and should be limited. Milk foods provide protein and vitamins, and are excellent sources of calcium and vitamin D. But since milk is an animal product, it also naturally contains saturated fat and cholesterol. Therefore, choose fat-free (skim) or low-fat (1%) milk, yogurt, and cheeses. Likewise, flavored milk, yogurt, and dessert products such as ice cream and frozen yogurt contain added sugar, and should only be eaten in moderation.

MyPlate recommends that you **get your calcium-rich foods** by consuming 3 cups of fat-free or low fat (1%) milk products every day, children aged 2 to 3 should have 2 cups, and children aged 4 to 8 should have 2 ½ cups every day. 1 cup of milk or yogurt, 1½ ounces of hard or soft

cheese, ⅓ cup shredded hard cheese, or 2 ounces of processed cheese supply the same amount of calcium as 1 cup of milk. Cottage cheese, however, is lower in calcium than other cheeses; 2 cups of cottage cheese equal 1 cup of milk.

Milk foods include all fluid milk, lactose-reduce milk (such as Lactaid®), flavored milk, yogurt, pudding made with milk, ice milk, frozen yogurt, ice cream, hard cheese, soft cheese, and processed cheeses (such as American). For those who are lactose intolerant, lactose-free and reduced-lactose products are available, including cheeses and yogurt. Also, enzyme pills (like Lactaid® brand) are available. Calcium fortified foods and beverages such as soy milk, rice milk, and orange juice may provide calcium, but may not provide the other nutrients found in milk and milk products.

Remember that babies should *not* drink cow's milk during the first year of life. A baby's sensitive digestive tract cannot properly digest the proteins found in cow's milk. As well, there are high levels of sodium, potassium, and chloride in milk, which may strain an infant's kidneys. However, after babies turn 1 year old, they should drink whole milk until their 2nd birthdays. This provides the essential fats for growth and brain development needed at this age. After 2, children should switch to fat-free or 1% milk.

Grains

The grains group includes breads, cereals, rice, pasta, tortillas, crackers, oatmeal, bagels, English muffins, and popcorn among other food items. Why are foods made from grains so important? They provide complex carbohydrates, energy, vitamins, and minerals. This group also provides fiber, especially when eating whole grain products. But what are whole grains?

Grains are divided into two subgroups, whole grains and refined grains. **Whole grains** contain the entire grain kernel, which includes the bran, the germ, and endosperm. The importance of this is that whole grains contain more fiber, found in the bran, and vitamins and minerals, found in the germ. Some examples of whole grains include whole-wheat flour, oats or oatmeal, whole cornmeal, bulgur, and brown rice. The best way to identify a whole grain product is to look at the packaging. If the product says "100% whole grain" or "100% whole-wheat," then it is a whole grain product. Also, if the first ingredient on the ingredient list is "whole" wheat, rye, oat, etc., then the product is at least 51% whole grain.

Refined or enriched grains have been milled, a process that removes the bran and germ. This gives grains a finer texture and improves the amount of time a product lasts on the shelf, but it also removes important nutrients like fiber, iron, and B vitamins. However, most refined grains are *enriched*. This means that some of the removed B vitamins and minerals, particularly iron, folic acid, thiamin, riboflavin, and niacin, are added back after processing. Fiber is not added back. Some examples of refined grains include white flour (also called "enriched flour," "bleached flour," or "unbleached flour"), degermed cornmeal, white bread, and white rice.

The general recommendation for daily grains is 6 ounces, and an ounce is about 1 slice of bread, 1 cup of ready-to-eat cereal, ½ cup of cooked cereal, 5 to 7 crackers, or ½ cup of cooked rice or pasta. The *Dietary Guidelines* recommend that you **make half your grains whole**. This

means that the average American should consume at least 3 ounces of whole grain products every day. This might sound like a lot of whole grains, but it is fairly easy to make half your grains whole. See how to eat 3 ounces of whole grains throughout the day in the table below (and remember, the other 3 ounces may come from whole grain or refined products).

Table 17: Typical ways to get 3 ounces whole grains daily.

	Day 1	Day 2	Day 3	Day 4	Day 5
Breakfast	1 cup whole-wheat cereal (1oz)	1 slice whole grain toast (1oz)		½ cup cooked oatmeal (1oz)	
Lunch	1 sandwich with 2 slices whole grain bread (2oz)		½ cup cooked whole grain pasta (1oz)		1 sandwich with 2 slices whole grain bread (2oz)
Dinner		½ cup cooked whole grain pasta (1oz)	1 cup brown rice (2oz)	1 12" whole-wheat tortilla (2oz)	
Snack		3 cups popcorn (1oz)			5 whole-wheat crackers (1oz)

Meat and Beans

All foods made from meat, poultry, fish, dry beans, peas, eggs, nuts, and seeds are considered part of this group. The foods in this group supply protein, B vitamins, iron, and zinc. Animal products are naturally high in saturated fat and cholesterol; so **go lean with protein** by choosing low fat or lean meats and poultry. Also, plant foods found in this group, beans, peas, nuts, and seeds, are excellent sources of protein, fiber, vitamins including vitamin E, and minerals. Nuts, seeds, and fish (salmon, trout, herring) contain healthy unsaturated oils, so choose these foods more often. To reduce the amount of saturated fat from this group:

- Choose lean meat, poultry without skin, fish, beans, and peas.
- Trim away all visible fat, then bake, broil, roast, or grill instead of frying or cooking in fat.
- Egg yolks contain the fat and cholesterol found in eggs, so use egg yolks and whole eggs in moderation. Use egg whites or egg substitutes freely when cooking.

Processed meats such as ham, sausage, hotdogs, luncheon meats, deli meats, and potted or canned meats are usually high in saturated fat and added sodium. Check the ingredient and Nutrition Facts label to help limit fat and sodium intake.

Why is it important to include fish, nuts, and seeds? Varying choices and including fish, nuts, and seeds in meals can boost intake of healthy unsaturated fatty acids; most fat in the diet should come from these fats. Some of the polyunsaturated fats in these foods are essential—the body can't make them.
Some fish (such as salmon, trout, and herring) are high in omega-3 fatty acids, especially EPA and DHA. There is some evidence that suggests eating fish rich in EPA and DHA may reduce

the risk for mortality from cardiovascular disease. Some nuts and seeds (flax, walnuts) are excellent sources of essential fatty acids, and some (sunflower seeds, almonds, hazelnuts) are good sources of vitamin E.

A word about Oils…

Oils are fats that are liquid at room temperature, like vegetable oils used in cooking. This food group is the thin yellow sliver in the middle of the pyramid, which means that oils should be used sparingly. The specific amount of fat a person should have depends on that individual's calorie needs. But that doesn't mean that oils are bad for you… in fact, it's just the opposite! Most oils are high in monounsaturated or polyunsaturated fats, and low in saturated fats. Oils from plant sources (vegetable and nut oils) do not contain any cholesterol.

Oils come from fish and many different plants. Some common oils are canola, corn, cottonseed, olive, safflower, soybean, and sunflower oils. A number of other foods are also naturally high in oils, like nuts, olives, some fish, and avocados. Food products that are mainly oil include mayonnaise, certain salad dressings, and soft (tub or squeeze) margarine with no *trans* fats. Check the Nutrition Facts label to find margarines with 0 grams of *trans* fat.

A few plant oils, however, including coconut oil and palm kernel oil, are high in saturated fats and for nutritional purposes should be thought of as **solid fats**. Solid fats are fats that are solid at room temperature, like butter and shortening. Solid fats come from many animal foods and can be made from vegetable oils through a process called *hydrogenation*. Usually, these fats are high in saturated fat, *trans* fat, or both, and it's best to limit these fats in the diet. Some common solid fats to avoid are:

Butter	Stick margarine
Beef fat (tallow, suet)	Shortening
Chicken fat	Coconut oil, palm kernel oil
Pork fat (lard)	

A word about discretionary calories…

Everyone has a certain amount of calories that he or she needs to function and have energy left for physical activities. This calorie amount includes the minimum calories needed to meet nutrient needs, as well as some built in *extras* called **discretionary calories**. These extras are often in the form of added sugars and fats, and are sometimes necessary because they help us enjoy our food. But too much of these extras can add up quickly and cause health problems. Everyone has an allowance for some extras, usually between 100 to 300 calories. Extras are found in many foods, including candies, desserts, soft drinks, sweetened cereals, fried foods, whole fat cheese and milk, sweetened yogurt, and processed meats like sausages. By choosing the lowest fat and no-added-sugar forms of foods, extras will be limited. Therefore:

- Choose low fat foods from each of the food groups.
- Limit fats and sugars added to food while cooking or preparing, such as butter, margarine, gravy, salad dressing, sugar, and jelly.
- Limit foods that are high in sugar – candy, sweet desserts, and soft drinks.

SELF-CHECK: PRACTICE YOUR KNOWLEDGE

Now that have reviewed the food groups and MyPlate, why don't you try making a plan for yourself? Just direct your web browser to http://www.ChooseMyPlate.gov.

- Select *Online Tools* and choose *MyPlate Plan* from the top navigation bar and get started!

The Daily Food Plan allows you to enter personal information and receive a customized food plan. The *Online Tools* can help you plan, analyze and track your diet and physical activity.

Food Labels

Objectives

Are you curious about the fat in your mayonnaise or the sodium in your soup? Well, you don't have to look any further than the food label on the package. Food labels offer a wealth of information about the nutrient content of foods, plus the food label is a great tool for teaching clients about eating healthfully. After reading this section, you'll be able to:

- Identify certain characteristics of food labels
- Define the term "Daily Value"
- Evaluate the nutrient content of a food based on its label

Food Labels

Today's food labels provide helpful information about the food inside a package. Food labels have a number of parts, including: the front panel, the ingredient list, and the Nutrition Facts panel.

Front Panel

Along with the product's name, the front panel often carries certain nutritional descriptions about the food, such as "low-sodium," fat-free," etc. These phrases offer quick information about a product's nutritional makeup. Here are some common terms and their meanings.

Table 18: Common Nutrition Claims

Label	Meaning
Low fat	3 grams or less per serving (refers to total fat)
Fat-free	Less than 0.5 grams per serving (refers to total fat)
Low-sodium	140 milligrams or less per serving
Low-cholesterol	20 milligrams or less, and 2 grams or less of saturated fat per serving
Cholesterol-free	2 milligrams or less, and 2 grams or less of saturated fat per serving
Low-calorie	40 calories or less per serving
Calorie-free	5 calories or less per serving
Sugar-free	Less than 0.5 gram per serving

High	This term can be used if the food contains 20% or more of the Daily Value (%DV) from a particular nutrient in a serving (such as "High Fiber")
Good source	This term can be used if the food contains 10 – 19% of the Daily Value for a particular nutrient in a serving (such as "Good Source of Iron")
Reduced	This means the product has been altered and contains 25% less of a nutrient or of calories than the regular product (such as "Reduced Sodium")
Healthy	This means the product has *no more than* 3 grams total fat, 1 gram saturated fat, 60 milligrams cholesterol, and 300 milligrams sodium per serving; the product must also contain 10% of the Daily Value for calcium, iron, vitamin A, vitamin C, protein, or fiber.

Although these terms are helpful, some other terms are not regulated and can be misleading. The following table lists words that have no defined meaning, and therefore the nutrition facts or ingredients label should also be consulted before purchase.

Natural	Made with real fruit	No artificial ingredients
All-natural	Made with vegetables	Organic, *unless it says "Certified Organic" or has this symbol*
Pure	Made with whole grains	

Some products will also include a health claim about a specific disease or health-related condition. A health claim is an approved statement about a nutrient or substance in the food and its relationship to a particular health concern. For example, the Food and Drug Administration (FDA) allows manufacturers of whole grain breads and cereals to make a health claim about the role of fiber, especially soluble fiber, in reducing the risk for coronary heart disease. You may have seen a claim like this on a package of oats or oatmeal. Other examples of FDA-approved claims are the role of folic acid in reducing the risk of birth defects, and the role of calcium in decreasing the risk of osteoporosis. The FDA has very strict rules regarding these claims; there must be agreement among experts that the claim is true before it may be used. Even then, the FDA is strict about the types of claims, the food products used for the claims, and the wording of the health claims.

Ingredient List

This list tells you what is in the product. The key is that the ingredients are listed in **descending order by weight**. So if corn syrup is the first or second ingredient listed, then the food is high in sugar. Likewise, the ingredient list can help consumers determine if a food is made from whole grains or if certain nutrients have been added. It's also an essential tool for people who have to avoid specific ingredients due to food allergy.

Nutrition Facts Label

The Nutrition Facts label is designed to provide information that can help consumers make informed choices about the food they purchase and eat. The label gives you very specific information about nutrients in a food product. It lists the serving size, and how a serving of the food contributes to your daily intake of nutrients (% Daily Value). The information is based on the nutrients found in **one serving** of the food, so start reading the label at the top where the **servings per container and serving size** are listed. Serving sizes are listed in

common household units (e.g. cup, tablespoon, teaspoon, slice, or piece), and usually reflect the amount someone would eat. Also, serving sizes are usually standardized so that consumers can easily compare different brands. For example, if you're comparing different brands of canned beans, you'll usually find that the Nutrition Facts labels are all based on ½-cup servings.

Next on the label is how many **calories** are in one serving. After calories is the **percent Daily Value (%DV) that** tells you if a food is high or low in a certain nutrient. So if a food provides 25%DV for calcium, it is providing about ¼ of daily calcium needs; whereas, if the food has 2%DV, it really won't help you reach your calcium goal for that day.

As a general guide, any food with 5% or less of the Daily Value for a nutrient contributes small amounts of that nutrient to your daily intake., but if a food provides more than 20% it contributes large amounts of that nutrient to your daily intake. So, if you want to get more of a nutrient, such as calcium, choose foods with a higher %DV for calcium. But if you want to limit certain nutrients, such as sodium, look for foods with lower %DVs for those nutrients. The %DV is based on a 2000-calorie diet, and therefore reflects the nutrient needs of an average person who eats 2000 calories per day. Someone who eats more or less than 2000 calories every day will have different requirements. However, anyone can use the %DV as a quick and easy way to evaluate nutrient content and to compare brands.

Servings per Container and **Serving Size** - Start here, because all the values are based on one serving. If you eat both servings in this container, multiply all other values by 2.

Calories – This is how many calories are in one serving of this food.

Total Fat, Saturated Fat, Trans Fat, Cholesterol, and Sodium – The goal is to limit daily intake of these nutrients to 100% DV or less. Trans Fat must now be labeled on all foods, and it best to avoid this type of fat.

Fiber, Vitamins, and Minerals – You should aim for 100% of these nutrients every day.

Nutrition Facts

8 servings per container

Serving size **2/3 cup (55g)**

Amount per serving

Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

If the food contains 5% or less, the food is low in that nutrient. 20% or more means this food is high in this nutrient (in this example, this food is high in sugar, iron and calcium).

% Daily Value (%DV) – These values tell you how much of each nutrient recommendation or allowance you get in one serving of this food.

Added sugar – The goal is to consume less than 10% of your total daily calories needs from added sugar.

Section III: Special Nutrition Issues

Overview

Nutrition covers more than nutrient needs, food labels, and dietary guidelines. In fact, there are all kinds of specific issues related to the foods we eat. In this section, we'll move beyond the basics and discuss two important topics that are relevant to WIC participants.

- Weight management
- Vegetarian diets

Each of these issues can impact a person's nutritional needs and food choices, and you'll learn practical tips and important information that can help WIC participants make healthier choices.

Weight Management

Objectives
In theory, losing weight sounds easy – you simply need to use more calories than you eat. But, as many of us know, losing weight is anything but easy. After reading this section, you'll be more familiar with various concepts related to weight management, including weight assessment, energy balance, food composition, and practical strategies for managing weight. Specifically you'll be able to:

- Identify appropriate weight management approaches
- Determine body mass index (BMI)
- Define the term "energy balance"
- Identify average caloric intakes and factors that affect calorie needs
- Name strategies for weight management for someone who is overweight or underweight

A Weighty Issue

There are plenty of Americans striving to reach and maintain a healthy weight. According to the Centers for Disease Control and Prevention (CDC) as of 2010, more than 35% of men and women, and 16.9% of children and adolescents were obese.[2] While many people simply want to lose weight so they can look better, others have learned that the real benefit of a healthy weight is *feeling* better. Staying at a healthy weight can help someone feel more energetic, and it reduces the risk for many chronic diseases like high blood pressure, high blood cholesterol, heart disease, stroke, diabetes, some cancers, arthritis, and breathing problems.

These days, nutrition professionals are encouraging people to shift their focus from the ideas of weight loss and weight gain, and instead focus on **weight management.** Weight

[2] Centers for Disease Control and Prevention. "Prevalence of Obesity in the United States." Centers for Disease Control and Prevention website, http://www.cdc.gov/nchs/data/databriefs/db82.pdf

management means adopting healthful, long-term eating and exercise patterns in order to reduce risk for disease, and to improve feelings of energy and wellbeing.

Assessing an Adult's Weight

Evaluating an adult's weight involves more than just reading the number on a scale. Consider two people who weigh exactly the same, but one person is taller with more muscle mass while the other is shorter with a high percentage of body fat. Without even seeing them, we can assume that the leaner individual is at a healthier weight. So, besides weight, it's also important to consider height and amount of body fat. Determining a person's Body Mass Index (BMI) can help you do just that.

Body Mass Index (BMI)

BMI measures weight in relation to height, using a mathematical equation:

$$\text{BMI} = \text{weight (in kilograms)} / \text{height (in meters)}^2$$

1 kilogram = 2.2 pounds; 39.4 inches = 1 meter

If you'd rather skip the math, you can use a BMI table (**Table 19**), which does all of the calculations for you. Simply find the person's height (in inches) and then find the number that's closest to the person's weight (in pounds). The number at the top of the table is the BMI for that individual. As an example, take a few minutes to determine your own BMI.

Table 19: Body Mass Index (BMI)

Body Mass Index Table

	Normal						Overweight					Obese										Extreme Obesity														
BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Height (inches)	Body Weight (pounds)																																			
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191	196	201	205	210	215	220	224	229	234	239	244	248	253	258
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	212	217	222	227	232	237	242	247	252	257	262	267
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184	189	194	199	204	209	215	220	225	230	235	240	245	250	255	261	266	271	276
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190	195	201	206	211	217	222	227	232	238	243	248	254	259	264	269	275	280	285
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196	202	207	213	218	224	229	235	240	246	251	256	262	267	273	278	284	289	295
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203	208	214	220	225	231	237	242	248	254	259	265	270	278	282	287	293	299	304
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209	215	221	227	232	238	244	250	256	262	267	273	279	285	291	296	302	308	314
65	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270	276	282	288	294	300	306	312	318	324
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	247	253	260	266	272	278	284	291	297	303	309	315	322	328	334
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	236	242	249	255	261	268	274	280	287	293	299	306	312	319	325	331	338	344
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	262	269	276	282	289	295	302	308	315	322	328	335	341	348	354
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243	250	257	263	270	277	284	291	297	304	311	318	324	331	338	345	351	358	365
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	278	285	292	299	306	313	320	327	334	341	348	355	362	369	376
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257	265	272	279	286	293	301	308	315	322	329	338	343	351	358	365	372	379	386
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265	272	279	287	294	302	309	316	324	331	338	346	353	361	368	375	383	390	397
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272	280	288	295	302	310	318	325	333	340	348	355	363	371	378	386	393	401	408
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280	287	295	303	311	319	326	334	342	350	358	365	373	381	389	396	404	412	420
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	319	327	335	343	351	359	367	375	383	391	399	407	415	423	431
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	328	336	344	353	361	369	377	385	394	402	410	418	426	435	443

Source: Evidence Report of Clinical guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults, 1998. NIH/National Heart, Lung, and Blood Institute (NHLBI)

Then, once you know your BMI, you can determine which weight range you're in:

BMI	Weight Range
Less than 18.5	Underweight
18.5 – 24.9	Healthy weight
25.0 – 29.9	Overweight
30.0 and above	Obese

BMI is an index, meaning it is simply a ratio of weight and height. In general, people with more body fat have a higher BMI, but there are exceptions. For example, a lean and muscular body builder who weighs a lot will likely have a higher BMI. So while his BMI may be in the "overweight" range, he wouldn't be overly fat. Or consider this — your BMI may be in the "healthy" range, but, if you have lots of fat and little muscle, you may actually be at an unhealthy weight. Keep in mind that the BMI is simply a guideline.

In addition to BMI, other tools are available to assess weight. Health professionals often use measurements such as triceps skinfold and waist circumference to determine a person's percentage of body fat. Also, they check for risk factors such as high blood pressure, high LDL cholesterol, high blood glucose, a family history of heart disease, physical inactivity, and cigarette smoking. If a patient is overweight and also has several of these risk factors, then losing weight is especially important. Even losing just 10% of current weight will help lower a person's risk for developing obesity-related diseases.

Energy Balance

One key to managing weight understands the concept of energy balance. As discussed earlier in this module, energy and calories mean the same thing — we refer to calories when we talk about how much energy a food provides and how much energy the body uses to perform certain tasks. **The body is in energy balance when the number of calories eaten equals the number of calories burned**. So, if you're in energy balance, your weight stays the same. If you consistently take in more calories than you use for energy, you'll have a positive energy balance and gradually gain weight. And, if you routinely consume fewer calories than your body needs, you'll have a negative energy balance and eventually lose weight.

The average woman needs about 2000 calories per day and the average man needs about 2700 calories; but energy needs vary greatly from person to person. For example, shorter people usually need less energy than taller people, pregnant and breastfeeding women need more calories than before they were pregnant, and athletes require more energy than inactive people. Furthermore, after we reach age 30 our calorie needs decrease about 5% each decade we live.

To lose weight, a person must reduce calorie intake and/or increase physical activity. The most successful weight loss programs combine both — eating less while doing more. **A pound**

of body fat is equivalent to 3500 calories. So, for every 3500 calories you burn off above your normal needs, you lose approximately one pound of body fat. Likewise, for every 3500 calories of food you cut back on, you'll also lose approximately one pound of body fat.

Increasing Physical Activity

Studies show that routine physical activity is one of the most effective tools for losing weight and maintaining weight loss. Experts suggest that everyone, regardless of weight goals, get a total of 30 to 60 minutes of moderate physical activity on most days. If you are actively trying to lose weight, you will benefit from 60 to 90 minutes of activity most days. It doesn't have to be all at once; you can accumulate your activity over the course of a day.

If you plan to use extra calories for physical activity, you'll need to consider the type of activity and how long you want to be active. You can start out by walking 30 minutes for three days a week, and build to 45 minutes of more intense walking five days a week. With this regimen, you can burn 100 to 200 calories more per day. Less intensive activities burn fewer calories, so you need to do those for a longer period in order to get the same results.
To avoid soreness and injury, people who plan to increase their activity levels should start slowly and gradually build up to the target level. People with health problems or anyone starting a new exercise program should talk with a doctor before starting a program.

Reducing Caloric Intake

In addition to increasing activity, cutting calories can help a person lose weight. The key to reducing calories is to cut back *moderately* by reducing current intake by about 500 calories a day. That doesn't mean skipping meals, but rather eating moderate portions of a well-balanced diet that offers carbohydrate, protein, and fat. Cutting out 500 calories a day reduces a person's intake by about 3500 calories per week, leading to a weight loss of about one pound each week.

Unfortunately, many people go to extremes, drastically cutting their caloric intakes to less than 1000 calories a day, and essentially starving themselves. These diets don't have enough nutrients to maintain health, and can lead to loss of energy, hunger, poor appearance, and poor concentration. Also, people on very low-calorie diets often give up quickly, frustrated by hunger and deprivation. Some people tend to "go off" a diet with a vengeance, bingeing on high-calorie foods and often gaining back more weight than what was initially lost. Research suggests this cycle of dieting and bingeing may increase the risk for heart disease and may perhaps slow down the body's rate of metabolism, making it even harder to lose weight.

In addition to very low-calorie diets, there are plenty of other diet fads and trends to avoid. Ignore plans that include quick weight-loss claims; anything that says you'll lose more than two pounds a week is unhealthy and unlikely. And there are all kinds of diet pills, potions, candies, and other diet aids designed to get your money. Remember, the healthiest, safest, and most palatable weight-loss plan includes a balanced choice of foods from all food groups, combined with increased activity. Once the weight comes off, it is best to follow the same diet principles as when losing weight: balance, variety, and moderation.

Practical Weight-Management Suggestions

It's one thing to talk about weight loss, another to do it. Most people who want to lose or maintain their body weights need plenty of practical tips to help them modify their behaviors. Here are a few:

- **Quit "dieting"** – A diet is something people associate with unpleasant eating rules, limited choices, and failure. What works best is to discover a healthy eating plan and enjoy it for years to come. The best way to develop this plan is to use MyPlate.
- **Diet cycling –** Also known as "yo-yo" dieting, diet cycling is the pattern of repeatedly losing and regaining weight. It's often the result of quick-fix diets and other gimmicks. Not only is it unhealthy, but it can lead to feelings of failure and frustration.
- **Get moving –** Find an activity you like to do on a routine basis, such as walking, swimming, dancing, jogging, or biking. And, for extra motivation, find a friend or family member to join you. Always check with a doctor before beginning an exercise program.
- **Recognize your hunger cues** – Many people turn to food for reasons other than hunger — they may be upset, bored, lonely, or feeling another emotion that food temporarily satisfies. Before you reach for something to eat, ask yourself if you are truly hungry or just trying to fulfill some other need. Some people learn a lot about their eating habits by keeping a food diary.
- **Slow down and taste your food** – If you take more time to eat snacks and meals, you'll not only enjoy it more, but you'll give your brain some time to tell you that you're full. You may find you feel full before you finish what's on your plate!
- **Choose foods that are lower in fat *and* calories –** Drink fat-free milk instead of whole milk; try low-fat salad dressings and mayonnaise; opt for baking and grilling instead of frying; and take that fatty skin off the chicken. But do shop wisely — when it comes to packaged foods, remember that low-fat doesn't necessarily mean low-calorie. Manufacturers often add extra sugar when they cut down on fat, so their products end up having the same calories as their high-fat counterparts.
- **Quit counting every calorie –** While it helps to know the caloric content of foods, don't go overboard obsessing over every calorie and gram of fat. You'll end up restricting yourself too much and losing sight of what your goal should be — to enjoy a balanced variety of healthful foods.
- **Reach for fruit and vegetables every chance you get –** Whenever you plan a meal or snack, include fruit and/or vegetables. As long as you don't add sugar, butter, salad dressing, etc., fruits and vegetables are very low in calories, and the more fruits and vegetables you enjoy, the fewer high-calorie foods you'll eat.
- **Everything in moderation –** There is no such thing as a *bad* food. So, it's okay to eat a cookie when you want something sweet, just don't eat the whole bag! Enjoy your favorite foods in moderation.
- **Don't buy it if you don't want to eat it –** While it's important not to deprive yourself, there are a number of empty-calorie foods that you don't need to have sitting in your pantry. So shop wisely, passing up the chips, sodas, doughnuts, etc.,

that you don't need. Again, this doesn't mean you can never eat these foods, but don't stock up on items that may undermine your healthful eating plan!

- **Drink plenty of water –** If you're not getting your 8 to 10 glasses a day, try carrying a bottle of water around with you and keep it filled. And drink water with your meals — it'll help you slow down, eat less, and appreciate the flavors of your food.
- **Not so fast on those fast foods –** Fast food is notorious for fat and calories. But, if you take a minute to look at the menu, you'll find that you can make some smart choices. Try a salad with low-fat dressing, a baked potato topped with veggies, or a plain hamburger with tomato and lettuce, ketchup, and mustard.
- **Get rid of the bathroom scale –** Some people weigh themselves on a daily basis, and if the scale tips in the wrong direction they get discouraged and give up trying to lose weight. Real weight loss happens over time, so instead, check your progress by how your clothes fit. That way you can focus on your healthier lifestyle rather than the number on the scale.
- **Get real, set goals you can achieve –** Be realistic and take it slow. It's best to drop just one to two pounds a week, at the most. As well, if you're not meant to be a size 6 or 8, don't go nuts trying to get there! Aim for a weight that's healthy for you.

When Someone Is Too Thin

Some people have a completely different kind of challenge when it comes to weight management, and that's being too thin. Many of these people will tell you that trying to put on additional pounds can be just as frustrating and difficult as trying to lose weight.

There are health risks associated with extreme thinness, including menstrual irregularity, infertility, and increased risk for osteoporosis. If thinness is a result of under-eating, a person may suffer from fatigue, lose the ability to concentrate, experience irritability, and be prone to infection. If she is suffering from an eating disorder, her health may be at risk from unhealthy practices like excessive exercise, self-induced vomiting, and laxative abuse. There are other serious underlying causes of being underweight, such as hyperthyroidism, drug abuse, and depression. These situations require medical intervention. However, there are other healthy people who simply need and want to gain weight. In those cases, there are some practical suggestions for weight management:

- **Follow MyPlate** – Rather than simply adding extra fat and sugar, it's best to follow a varied and balanced diet. Follow MyPlate, aiming for adequate servings from all of the food groups.
- **Keep Fat to a Moderate Level** – It's best to keep fat intake to less than 30% of calories, unless a physician recommends more. Keeping saturated and *trans*-fat under control is important for heart health.
- **Concentrate the Calories –** It's easy to add calories to food so that you can take in additional calories without a lot of added volume. For example, add dried fruit or nuts to cereal, enjoy sherbet with fresh fruit, and add dry milk powder to soups and casseroles. Also, it's fine to add some extra calories with toppings, dressings, cheeses, and condiments, just don't go overboard.

- **Eat More Often –** If you have a small appetite, it may help to eat five or six smaller meals throughout the day rather than two or three large meals.
- **Fill up on Food at Meals –** Don't drink fluids immediately before or during a meal so you have more room for food.
- **Reach for Nutrient-Rich –** For example, rather than drinking a diet soda that has no calories or other nutrients, enjoy a refreshing glass of orange juice.
- **Stimulate Your Appetite –** Do all you can to make meals appetizing — select and prepare foods with lots of color, flavor, and texture. Keep your favorite foods handy for snacking or cooking. Make your meals enjoyable — sit down, take your time and share meals with friends and family.
- **Stay active –** Remember, experts recommend that everyone get a total of 30 to 60 minutes of physical activity on a daily basis. Activity also helps stimulate a healthy appetite, and certain types of exercise can increase strength and muscle mass.

SELF-CHECK: PRACTICE YOUR KNOWLEDGE

1. Which examples illustrate the concept of weight management? *(Check all that apply.)*

____ Taking a daily walk.
____ Skipping breakfast every day as a way of reducing intake by 500 calories a day.
____ Adopting a long-term, low fat eating style that includes regular exercise.
____ Drinking a dietary supplement beverage every day in place of lunch.
____ Including taking the stairs as part of your daily physical activity.

2. *Mark the following statements True or False.*

____ BMI measures weight in relation to height, using a mathematical equation.
____ In general, people with more body fat have a higher BMI.
____ BMI involves weighing a person underwater.
____ BMI is only a guideline; you should talk to a doctor about a weight that's healthy for you.
____ BMI can only be used to assess the weight of adult women.

3. Rebecca is the 28 year-old mother of a 4year-old. She weighs 146 pounds and is 5 feet 3 inches tall. Rebecca's secretarial job involves answering phones and sitting at a computer all day. She claims that she doesn't like to exercise and says that, whenever she has spare time, she enjoys watching TV.
   a. What is Rebecca's BMI (use Table 19 on page 66)?
   b. Which weight range is she in?
   c. What's one strategy you would suggest to Rebecca for managing her weight?

4. *Fill in the blanks:* When the number of calories eaten equals the number of calories burned, the body is in _____ _____ . If you eat more calories than you use for energy, you'll gradually _____ weight. If you consume fewer calories than your body needs, you'll eventually _____ weight.

5. *For each statement, circle the correct answer:*
   a. The average woman needs about (1000 / 2000 / 2700) calories per day.
   b. Shorter people usually need (more / fewer) calories than taller people.
   c. Breastfeeding women need (more / fewer) calories compared to pre-pregnancy needs.
   d. Athletes require (more / less) energy than inactive people.
   e. After a person turns 30, his/her calorie needs (increase / decrease /remain the same).

6. List three practical weight-management suggestions for someone who is overweight.

7. State three strategies for weight management for someone who is underweight.

ANSWERS

1. Taking a daily walk, adopting a long-term, low fat eating style that includes regular exercise, and including taking the stairs as part of your daily physical activity.
2. T, T, F, T, F
3. a. 26, b. Overweight, c. See Practical Management Weight Suggestions
4. Energy balance, gain, lose
5. a. 2000, b. Fewer, c. More, d. More, e. Decrease
6. See Practical Weight Management Suggestions
7. See When Someone is Too Thin

Vegetarian Diets

Objectives

While some people will never give up their burgers and steaks, many Americans are making a switch to a vegetarian lifestyle. What exactly is a vegetarian diet and how do you make sure it's nutritionally adequate? After reading this section you'll be more familiar with the types of vegetarian diets and the nutritional issues surrounding them. Specifically you'll be able to:

- Distinguish between different types of vegetarian diets
- Identify various nutrients that vegetarians need to include
- List sources of various nutrients for vegetarians
- Identify appropriate dietary recommendations for vegetarians

The Vegetarian Diet

If you're a vegetarian, your meals feature a number of foods from plant sources. However, depending on the specific type of vegetarian diet you follow, you might also eat eggs and/or dairy products. Here are the main types of vegetarians:

- **Vegans** eat plant-based *foods* and no animal products such as dairy, egg, fish, and meat.
- **Lacto vegetarians** eat plant-based foods and dairy products.
- **Lacto-ovo vegetarians** eat plant-based foods, dairy products, and eggs ("lacto" refers to milk and "ovo" refers to egg).
- **Pesco-vegetarians/pescatarians** eat a vegetarian diet and include fish and seafood.
- **Flexitarian** is a person who eats mainly vegetarian and occasionally eats meat products.

Potential Benefits of Vegetarian Diets

From a nutritional standpoint, plant-based diets have some wonderful advantages. Vegetarians generally eat plenty of fruits, vegetables, grains, and legumes, so they get lots of fiber, magnesium, and vitamins A, C, and E. Also, plant-based diets generally have less saturated fat, *trans* fat, and cholesterol than diets based on meat. In fact, vegetarian diets fall right in line with most of the current recommendations outlined in the *Dietary Guidelines* and MyPlate; this is why it's no surprise that vegetarian diets are linked to a lower risk for many chronic diseases including colorectal cancer, heart disease, diabetes, diverticular disease, hypertension, renal disease, and obesity.

Potential Risks of Vegetarian Diets

On the other hand, certain nutritional risks are associated with some types of vegetarian diets. The more restrictive the diet, the riskier it is; so vegans run the greatest risk of not getting all the necessary nutrients. Still, well-planned vegetarian diets provide adequate nutrition during

all stages of the life cycle, including infancy, childhood, pregnancy, and lactation. The bottom line is that vegetarians, especially vegans, need to make careful food choices, paying special attention to the following nutrients: protein, calcium, vitamin D, vitamin B_{12}, iron, and zinc.

Protein

The requirement for protein is really a requirement for the 9 essential amino acids. As discussed earlier, animal proteins are *complete proteins* because they provide all nine essential amino acids in sufficient amounts to meet our needs. Foods of plant origin, however, usually lack adequate amounts of certain essential amino acids, so they're known as *incomplete proteins.* Remember that when two or more incomplete proteins are combined, they create a complete protein, and are called **complementary proteins**. For example, peanut butter alone won't supply all the amino acids your body needs, but the wheat in bread provides essential amino acids that are lacking in peanut butter. So, by combining grains and legumes together throughout the day ensures all the essential amino acids are present.

Although vegans don't consume animal foods, they can still meet their protein needs with plant foods. Since some plant foods provide the essential amino acids that other plant foods lack, vegans simply need a variety of plant foods throughout the day for sufficient amounts of the essential amino acids. Also, contrary to what we used to think, **complementary proteins don't have to be eaten together at the same meal**. Research shows that eating various sources of plant protein throughout the day gives adults enough essential amino acids to meet their needs.

A vegetarian's daily intake should include a variety of legumes and whole grains along with seeds or nuts. Soy protein has become a popular meat alternative since it is a complete protein, without the cholesterol and saturated fat found in animal products.

Soy may also have other potential health benefits, including cholesterol-lowering abilities, a role in bone health, and possible anti-cancer properties. Vegetarians can choose numerous soy products, including tofu, soy milk, and soy burgers.

Calcium

Since milk provides a large share of the required calcium for most people, vegetarians who don't consume milk or dairy products may not get enough calcium. The most reliable and practical source of calcium for pure vegetarians is calcium-fortified soy milk. Firm tofu set with calcium salts is also a significant source, as are some of the calcium-fortified products that can fit into a vegetarian diet, like calcium-fortified orange juice, grapefruit juice, bread, and cereal. Other sources that offer moderate to small amounts of calcium include soy cheese, blackstrap molasses, sesame seeds, tahini (sesame butter), almonds and almond butter, tempeh, and certain vegetables (collards, kale, mustard greens, turnip greens, broccoli, okra, and rutabaga). Calcium supplements may be necessary if dietary intake is insufficient; keep in mind that calcium citrate is absorbed better than calcium carbonate. *For more information about calcium and the calcium content of various foods, refer to the section on calcium on page 29.*

Vitamin D

In addition to calcium, we need vitamin D for healthy bones. Vitamin D may be a concern for vegans since eggs and fortified cow's milk are two important sources of vitamin D in the American diet. Although it's true that our bodies make vitamin D through exposure of the skin to sunlight, vegetarians should not rely on this as a source, especially if they live in areas where full sun is not available year round. So vegans, especially children and adolescents, need to take extra steps to be sure they get adequate vitamin D. Some brands of soy milk, cereals, and margarine are fortified with vitamin D, but it's important to check the labels to be sure. WIC approved soy milks are fortified with vitamin D in amounts similar to cow's milk.

Vitamin B_{12}

Vitamin B_{12}, also known as *cobalamin*, is essential for growth, formation of red blood cells, and function of the central nervous system. Vitamin B_{12} is primarily found in animal products, including eggs and dairy products.

While some foods of plant origin contain B_{12}, plant foods aren't a reliable source. For example, seaweed, miso, tempeh, tamari, sauerkraut, spirulina, and algae are often cited as good sources of vitamin B_{12}, but they generally contain an inactive form of the vitamin that the body can't use. So vegans need other sources, and their best bet is to look for foods fortified with B_{12} such as cereals, soy products, or vegetarian burger products. Also, nutritional yeast can contribute vitamin B_{12} to the diet, which is different than brewer's yeast and baking yeast, neither of which contain B_{12}. Another alternative is vitamin B_{12} supplements.

Iron

Getting enough iron is hard enough for those eating a mixed diet, so it can be especially challenging for vegetarians. As discussed earlier, plant products contain *non-heme* iron, which the body doesn't absorb as well as the *heme* iron found in meat, fish, and poultry. Eggs contain heme iron, but only in small amounts, and milk has negligible amounts. Therefore, all types of vegetarians need to optimize iron intake and absorption. That means consuming high-iron foods daily. Fortified cereals, blackstrap molasses, legumes, tofu, dried fruits, and enriched pasta and bread all contribute some iron. To increase iron absorption, vegetarians should **eat vitamin C–rich foods with foods high in iron**. It's also important to avoid iron inhibitors such as coffee, tea, and wheat bran, or at least try not to consume them with iron-rich foods. *For more information about iron and the iron content of foods, refer to page 33.*

Zinc

Zinc is essential for growth and development. This mineral is widely available in animal products, including milk and eggs, and, to a lesser extent, in foods of plant origin. Although most vegetarians eat adequate levels of zinc, it's still a nutrient of concern because substances in plants such as fiber and phytates can reduce zinc absorption. Plant sources of zinc include legumes, tofu, miso, tempeh, nuts, seeds, wheat germ, and whole grains (zinc is lost in the refining of flour). To increase absorption and ensure adequate zinc intake, vegetarians should

avoid raw wheat bran and limit the consumption of unleavened bread. Also, it helps to soak legumes one to two hours and then discard the water before cooking. Calcium interferes with zinc absorption, so people should avoid taking calcium supplements with sources of zinc.

Meal Planning for Vegetarians

As with any type of meal plan, it's important to assess a vegetarian's diet before making recommendations. Not only are there different types of vegetarians, but an individual's intake can vary quite a bit. Here are some general guidelines for discussing vegetarian diets:

- **Choose a variety of foods**, including whole grains, vegetables, fruits, legumes, nuts, seeds, and, if desired, dairy products and eggs. Variety is a key to healthy eating.
- **Limit heavily refined foods that are high in fat and sugar**. Instead, opt for whole, unrefined foods that offer plenty of vitamins, minerals, and complex carbohydrates.
- For vegetarians who choose to include dairy or eggs, **go easy on the eggs, cheese, and other whole-fat dairy foods which are high in saturated and trans fats**. Instead, choose fat-free or low fat dairy products.
- **Also, don't rely solely on eggs and dairy for protein**. For variety and nutrition, it's important to consume protein from plant foods as well.
- **Vegans need a routine source of vitamin B_{12} and vitamin D** from fortified foods and/or supplements. Don't rely on sun exposure for adequate vitamin D.
- **Don't restrict dietary fat in children younger than 2 years.** For older children, offer nutrient dense foods to help them meet their calorie needs. Include foods higher in unsaturated fats such as nuts, seeds, nut and seed butters, avocados, and vegetable oils.

SELF-CHECK: PRACTICE YOUR KNOWLEDGE

1. Write the letter of each term next to its definition.
   a. Lacto-vegetarians c. Semi-vegetarians
   b. Vegans d. Lacto-ovo vegetarians

____ eat only foods of plant origin; no animal products whatsoever.
____ eat foods of plant origin, plus milk and milk products.
____ eat foods of plant origin, as well as milk, milk products, and eggs.
____ eat plant foods, eggs, milk, and milk products, plus fish or poultry on occasion.

2. Mark the following statements *True or False.*

____ One advantage of a vegan diet is that it supplies large amounts of iron.
____ Soy protein is a plant product that is considered to be a complete protein.
____ Seaweed, miso, tempeh, tamari, sauerkraut, spirulina, and algae are excellent sources of vitamin B_{12}.
____ If a vegetarian becomes pregnant, it is impossible for her to meet all of her nutrient needs while following a vegetarian diet.

3. List three sources of iron for someone following a vegetarian diet:

4. Vegans are at special risk of not getting enough of the following nutrients to meet their needs (*check all that apply*):
   ____ iron ____ vitamin K ____ calcium ____ sodium
   ____ cholesterol ____ energy ____ fiber ____ vitamin B_{12}

5. List five food sources of calcium for someone who follows a *vegan* diet:

6. Appropriate dietary suggestions for vegans include (*check all that apply*):

____ Rely on sunshine for vitamin D.
____ Add nutritional yeast to foods as one source of vitamin B_{12}.
____ Adults should always eat complementary proteins at the same meal.
____ Eat a variety of foods from plant sources.
____ To increase calories, eat more whole grain breads and cereals, legumes, nuts, and seeds.
____ Limit heavily refined foods that are high in fat and sugar.

ANSWERS

1. b, a, d, c
2. F, T, T, F
3. Fortified cereals, blackstrap molasses, legumes, tofu, dried fruits, and enriched pasta and bread
4. Iron, calcium, vitamin B_{12}
5. Calcium-fortified soy milk, firm tofu set with calcium salts, calcium-fortified orange juice, grapefruit juice, bread, and cereal, soy cheese, blackstrap molasses, sesame seeds, tahini (sesame butter), almonds and almond butter, tempeh, and certain vegetables (collards, kale, mustard greens, turnip greens, broccoli, okra, and rutabaga)
6. Add nutritional yeast to foods as one source of vitamin B_{12}, eat a variety of foods from plant sources, and limit heavily refined foods that are high in fat and sugar.

Training Activity

Once you have completed this module, please take the Basic Nutrition Module post- test.