

## GRADE 4: LESSON PLAN 2

### NUTRITION: WHAT NUTRIENTS DOES MY BODY NEED?

#### Goals

- Students will understand the roles carbohydrates, protein, fat, and water play in maintaining a healthy body.
- Students will understand how food provides fuel (energy) to the body, how much fuel the body needs, how the fuel is used, and what happens to unused fuel.

#### Instructional objectives

Students will be able to

1. Differentiate between carbohydrates, protein, and fat.
2. Determine a healthy balance of carbohydrates, protein, and fat in the diet.
3. Explain what foods provide fuel for the body.
4. Explain why water is necessary to the body.

#### Background information

The body needs 6 nutrients: carbohydrates, protein, fat, water, vitamins, and minerals. We concentrate on the carbohydrates, protein, fat, and water in this lesson. Vitamins and minerals are covered in depth in grade 5 nutrition. If your students are ready, you may add vitamins and minerals to this lesson.

#### Carbohydrates

Carbohydrates are the main source of fuel because the body converts them to glucose, a type of sugar. Your body uses some of this glucose right away for energy and converts any extra into a sugar called glycogen. Your body stores glycogen in the liver and muscles for future use; glycogen can be quickly changed back to glucose as needed. Once your body has made enough glycogen, the leftover glucose is stored as fat.

Sugars, starches, and fiber are carbohydrates. Sugars are called simple carbohydrates or simple sugars. (The most common form of simple sugar is glucose.) They give the body a quick source of energy. Some examples are granulated sugar, brown sugar, syrup, molasses, and honey. Fresh fruits also contain sugar and so do candies and soft drinks.

When glucose molecules link together, they form larger molecules called complex carbohydrates. Starches are complex carbohydrates because your body must break them down to use their sugars. So, your body can use them as a source for energy over a longer period of time—just what your heart needs for the long haul. Breads, cereals, corn, peas, potatoes, pasta, tortillas, and rice are some examples of complex carbohydrates.

Fiber, also known as roughage, is another complex carbohydrate your body must break down for energy. Fiber comes in two forms: insoluble (does not dissolve in water) and soluble (does dissolve in water). Insoluble fiber can be found in cereals, whole-grain breads, rice, and many vegetables. Soluble fiber is found in oatmeal, dried beans, peas, and many fruits, including apples, strawberries, and citrus fruits. Many foods contain both forms.

#### Proteins

Proteins are the building materials for the growth, maintenance, and repair of tissues and muscles. (Remember that the heart is one of the most important muscles in your body.) Extra protein is converted and stored in your body as fat, which can be used as emergency fuel.

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Two main types of protein are animal protein and vegetable protein. Foods rich in animal protein include beef, pork, fish, chicken, eggs, and dairy products. Some foods that contain vegetable protein are broccoli, lentils, potatoes, pasta, oatmeal, rice, nuts, chickpeas (garbanzo beans), soybeans, and kidney, lima, and navy beans.

### Fat

Lipid is the general term for fats and oils. Lipids do not dissolve in water. At room temperature, fats are solid (butter or shortening) and oils are liquid (olive or vegetable). A little fat is necessary to help the body store energy; protect cells, tissues and organs; and transport other nutrients.

Fats are generally referred to as saturated or unsaturated. Saturated fat can put you at risk of heart disease because it is hard for the body to break down. Major sources of saturated fat include the butterfat in milk products, fat from red meat, and fat from tropical oils such as coconut or palm oil. Unsaturated fat is healthier and comes from sources such as vegetable oils. Some lipids contain both saturated and unsaturated fat.

### Water

Water is essential for life. Water is used both inside and outside each cell as it helps regulate the nervous system, helps muscles to contract, helps transport nutrients, and helps remove waste. Since our bodies cannot produce or store water, we must continuously replenish the supply by drinking beverages such as water, milk, or juice, or eating foods containing plentiful water such as tomatoes, apples, or watermelon.

### Materials

1. Optional: Classroom and/or individual computer with Internet access:
  - Understanding food labels: [www.texasheart.org/HIC/Topics/HSmart/foodlabl.cfm](http://www.texasheart.org/HIC/Topics/HSmart/foodlabl.cfm)
  - Nutrition for Athletes: [www.houstontexans.com/fitness/nutrition.php](http://www.houstontexans.com/fitness/nutrition.php)
  - Blast Off Game: [www.choosemyplate.gov/kids/](http://www.choosemyplate.gov/kids/)
2. Illustration: Fueling the Rocket (Activity 4–E)
3. Worksheets: “Calories In/Calories Out–The Energy Balance” (Activity 4–F)
4. Clear, clean plastic soft drink bottle with a nutrition label

5. Granulated sugar
6. Teaspoon measuring spoon
7. Calculator
8. Food labels
9. Worksheet: “How My Favorite Foods Stack Up”(Activity 4–G)
10. Worksheet: “My Venn Diagrams”(Activity 4–H)

### Introduction

Begin the classroom discussion of fuel for the body by using a rocket analogy. Referring to the illustration of the rocket, explain how rockets have solid rocket boosters for short-term fuel and fuel tanks for long-term fuel. The solid rocket boosters are quick energy to blast the ship into orbit and the long-term fuel is in reserve for the whole journey and the return trip. Without both kinds of fuel, the rocket will not have the appropriate amount and type of energy for the round trip. What different kinds of fuel does your body need for energy?

### Lesson procedures/activities

1. Your body is a lot like a rocket; it needs fuels to perform many different functions. The foods we eat provide the energy for take-offs and landings (exercise) and steady orbits (resting, thinking, studying, playing games, etc.). A balanced diet helps the body function efficiently. The nutrients you need include carbohydrates, proteins, fats, water, vitamins, and minerals. This lesson concentrates on carbohydrates, proteins, fats, and water. Refer to the illustration “Fueling the Rocket,” and lead a brief discussion about foods for quick energy versus foods for the long haul, and about the right mix of fuel for the rocket to achieve its mission.
2. Explain the 3 different kinds of carbohydrates (CHO): simple (sugar), complex (starches), and fiber (roughage). Carbohydrates are the main source of fuel in a balanced diet. The body converts carbohydrates into glucose, a type of sugar for immediate energy. Extra glucose is stored as glycogen in the liver to be converted back into glucose when needed. Starch is a complex carbohydrate that must be broken down to be used by the body. Fiber, also called roughage, is the most complex form of carbohydrate.  
*Interesting Fact:* Herbivores, such as cows and horses, get their carbohydrates by eating and slowly digesting lots of plants (fiber). The plants also contain small amounts of simple carbohydrates (glucose) in leaves and stems.

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- Ask the class for examples of simple carbohydrates (sugar), complex CHO (starches), and fiber (plants). Explain that simple is the easiest carbohydrate for the body to break down and use, complex is a little more complicated, and fiber is the most difficult. They are all important and beneficial in a well-balanced diet.
3. To help students visualize how much sugar (simple carbohydrates) we consume and the amount of “quick energy” we get from that sugar, conduct this demonstration: Use a clear, empty soft drink bottle that has sugar listed on its ingredient label. Calculate the amount of sugar in the soft drink using the following formula: 4.24 grams of sugar = 1 teaspoon of sugar or 16.25 calories. Using the teaspoon measure and granulated sugar, counting the teaspoons as you put them in the container, fill the container with sugar equivalent to the total grams listed on the label. Students will be amazed at how much sugar is in a soft drink. Other sugary foods you can discuss are:
- 1 tablespoon of ketchup contains 1 teaspoon sugar
  - 1 carton (8 oz.) of yogurt contains 7 teaspoons sugar
  - 2 ounces of chocolate (like a plain chocolate candy bar) contains 8 teaspoons sugar
4. Research approximately how many calories/minute are burned when a person runs, and then calculate how long a student could run with the energy from the sugar in the soft drink. What happens when that quick energy is used up? Why do we need complex carbohydrates? Remember what happens when we take in more energy than we need? Use the worksheets, Calories In/Calories Out, for reference, calculations, and notes. Remind students that an average 9-year-old boy who is sedentary\* needs about 500 fewer calories per day than if he was physically active for even an hour a day. Note that athletes eat complex carbohydrates prior to their activity to give them energy. Discuss the athlete's need for quick energy versus sustained energy.
- \* *sedentary means inactive, spending lots of time sitting*
5. Proteins are the building materials for growth, maintenance, and repair of tissues and muscles. Extra protein is stored as fat for emergency fuel when carbohydrates and fats are not available. The 2 main types of protein are animal and vegetable. Proteins are made from 20 differ-

ent amino acids, 8 of which are considered essential (also referred to as building blocks). For a protein to be considered a “complete protein” it must have all 8 of the essential amino acids. Ask students to list foods that provide protein. There are 4 calories per gram of protein (the same as carbohydrates), but protein is denser, so portions are smaller for the same total calories.

6. Visit the website of a sports team such as the Houston Texans and review their in-season meals. ([www.houstontexans.com/fitness/nutrition.php](http://www.houstontexans.com/fitness/nutrition.php)) Compare the carbohydrates, protein, and fat in the players' diet to the students' diet. Ask students to look for healthy and unhealthy food choices in the diet. Do they see potato chips and cookies in the team's diet? Discuss the concept of beginning a healthy diet as a child to build good habits to carry into adult life. Athletes can be good examples of healthy eaters.

*Thought-provoking question for the students:* We talked about athletes pre-loading with complex carbohydrates before a big game to provide energy. Would an athlete need protein right before a game? Why? Would he or she need protein after the game? Why? (To repair/ rebuild the muscle tissues?)

7. Dietary fat plays an important role in daily nutrition; however, we only need a small amount of fat to keep the body healthy. Fat performs the following functions:
- Stores energy for life processes
  - Cushions the vital organs
  - Insulates the body
  - Transports some of the vitamins and minerals
  - Adds flavor to foods helping to stimulate the appetite
  - Forms part of the cell membrane
- Some lipids (fats and oils) are better for you than others. The more solid a fat is the less healthy it is. In general liquid fats such as olive oil are healthier for your body because they are unsaturated (break down more easily). Vegetable oils are the best-known sources of unsaturated fat. Problems arise with fat intake because fat contains a lot of calories (fuel for energy). Since fat has 9 calories/gram, it provides more than 2 times the energy of carbohydrates or protein. The body is very efficient at storing unused fuel in fat cells. Many people consume more fat than their bodies need. Discuss how much energy is available from

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fats (calories in) and how much exercise (calories out) it takes to burn that fuel.

Remember that if the body doesn't need the energy in fat right away, it stores it in fat cells. Fat cells can store large amounts of fats. The more they store, the more they grow, until an obese person's fat cells may be a hundred times larger than a thin person's fat cells.

Look for the hidden fats in foods such as french fries, donuts, cookies, and crackers and beverages such as whole milk or shakes. The fats used in these foods, or used to cook these foods, may be saturated. Saturated fat is the type of fat that raises your cholesterol levels and puts you at risk of heart disease. Major sources of saturated fat are the butter fat in milk products, fat from red meat, and fat from tropical oils such as palm kernel or coconut oil often used to fry foods. Students who train themselves to recognize and eat healthy, low-fat meals and snacks will have a better chance of being a healthy adult.

*Interesting fact:* Hikers and mountain climbers often carry snacks high in simple carbohydrates and fat because they provide short and long-term fuel and are lightweight and easy to carry. (Remember that fat contains twice the calories per gram as carbohydrates or protein.)

Have students refer back to the Calories In/Calories Out worksheet and add calories/gram notations for carbohydrates, protein, and fats. Then they can calculate how much exercise it takes to burn off the calories in their daily diet.

8. Water is essential to your health and makes up 60% of the body's weight. Have students calculate how much of their body weight is made up of water.

A person can survive without other nutrients for long periods of time, but you can only survive a few days without water. Every cell in the body depends on water.

- Nutrients and waste products all move through the body in water.
- Water dissolves the amino acids, glucose, vitamins, and minerals so the cells can use them.
- Water lubricates joints, protects the spinal cord, and fills the eye chambers.
- The body's temperature is regulated by sweating.

When it gets hot, sweat (water) evaporates, carrying off body heat and cooling the body.

Ask students to discuss other organs or areas of the body in which water is evident.

Nearly all foods contain some water; some have more than 90% (for example, watermelon). Without water, the essential nutrient, carbohydrates, protein, fat, vitamins, and minerals in our foods would never reach the cells. When your body needs water, or detects a fluid imbalance, a center in the brain sends a "thirsty" message to the body to drink. Drink about 8 glasses of water a day to stay healthy. Ask the students if they noticed the team's diet often uses water as the beverage for a meal. Discuss other healthy beverages to consume and beverages to limit or avoid.

### Guided practice

Have each student or a small group choose a fast-food restaurant and plan a meal by making choices from the menu. Using the worksheet, Calories In, log the calories for the foods and beverages chosen, then complete the Calories Out worksheet. Repeat the exercise with alternate choices. Which choices are more heart-healthy? Which menu provides the right amount of calories for your activity level?

Divide the students into groups. Print off the school lunch menu and assign each group a different weekly menu. Ask the groups to explain the best and worst meal for providing energy (carbohydrate based), or for building muscle (protein based) from the menu and present their findings to the class. (Be sure they are prepared to justify their choices.)

### Independent practice

Ask students to list 20 of their favorite foods making sure to include different kinds of foods. (Review MyPlate to help them choose foods from each category.) Ask them to bring food labels to school for some of the foods on their list. (Hint: Fast food restaurants have pamphlets that show nutritional content of various items and also provide nutritional information on their websites.) Using the labels, determine the carbohydrate, protein, and fat content. Ask students to determine if the food is a healthy choice (providing energy for exercise, proteins for building muscles, and small amounts of fat). Or, does the food appear to be an unhealthy choice that students should limit in their diet, such as foods

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high in fat or sugar? Would you suggest that athletes eat this food? Why? Using the worksheet, answer the question, "How do my favorite foods stack up?"

**Extension**

Students can bring in a favorite recipe (for example, soup, casserole, cookies, or salad). Ask them to analyze the recipe and label each ingredient as carbohydrate (simple, complex, or fiber), protein (animal or vegetable), fat (saturated or unsaturated), or water. Ask students' opinions as to whether the recipe is healthy or unhealthy and to explain why. They could also suggest options to make the recipe more healthy. Students can share their results with the class.

Use the information from independent practice and develop Venn diagrams\* demonstrating the overlap in food composition. Some foods contain primarily one kind of nutrient (protein, carbohydrate, or fat); however, many foods

have combinations of protein, carbohydrates, or fats. To break it down even further, Venn diagrams could show foods that contain primarily saturated fat or primarily unsaturated fat and those that contain a balance of both. Explain the concept of hidden fats in some foods and why students should be aware of them. This exercise should provide a better understanding of the complexity of foods.

*\* Wikipedia defines Venn diagrams: [http://en.wikipedia.org/wiki/Venn\\_diagrams](http://en.wikipedia.org/wiki/Venn_diagrams)*

**Adaptations**

Students who have difficulty with writing or drawing may have their assignments adapted by allowing them to verbalize their responses or work with other students during guided and independent practice.

**Assessment**

Students' understanding of the lesson objectives can be measured by observing them in group activities and by assessing their independent practice work.

Objective	Demonstrated lesson objective	Partially demonstrated lesson objective	Did not demonstrate understanding of the objective
Differentiate between carbohydrates, protein, and fat			
Determine a healthy balance of carbohydrates, protein, and fat in the diet			
Explain what foods provide fuel for the body			
Explain why water is necessary to the body			