Carbohydrates

At a Glance

Recommended Dietary Intake:
130g for adults = 520 calories;
% of Daily Calories: 50-70%

Calories per Gram: 4
For example, a 12 oz soda has 39 grams which equals 156 calories or 9 teaspoons sugar

Types of Carbohydrates:

- Sugars – Simple and Complex
- Starches
- Fiber – Soluble and Insoluble
- Glucose (form in body for energy)
- Glycogen (for storage in body)

Function: Body converts carbohydrates into glucose to supply energy for muscles during aerobic and anaerobic activity and for use by the central nervous system and brain. Converted into glycogen for stored energy.

Food Sources: fruit, vegetables, grains, wheat, potatoes, milk, nuts, beans/legumes, candy, sweets, soda, jelly, honey.

Typical Serving Size: ¾ cup breakfast cereal, 38 g=152 calories.

Health Concerns:
Overconsumption of simple carbohydrates can contribute to chronic diseases, such as diabetes and obesity.

Carbohydrates in the Body and Food

Carbohydrates are the main source of energy and are found in plant foods, in both simple and complex forms. Healthy sources of carbohydrates in the diet come from whole grain products like whole wheat bread, brown rice, quinoa, millet, and oats. Vegetables, beans and legumes also contain nutrient rich, complex carbohydrates. These molecules take longer for the body to metabolize because of their high fiber content, which produces a steady release of energy as the food is being digested.

Simple sugars are abundant in fruit and milk. However, fruit also contains fiber, which helps regulate the release of energy from these sugars. Fruit juice and soda in particular, contain all of the simple sugar of fruit, with none of the fiber, leading to a spike in blood sugar, followed by a crash. Additionally, soda contains none of the health promoting vitamins and minerals that fruit contains.

Carbohydrates in the Right Balance

While carbohydrates often get a bad rap in popular diets, complex carbohydrates, such as whole grains, are essential and healthful foods. Yet blaming carbs for the poor health of the American diet isn't entirely a myth. In fact, eating too many foods with simple carbohydrates can lead to a dramatic increase in calorie intake while providing little nutrition to the individual.

Simple carbohydrates that should be limited are often found in the form of sugars such as corn syrup, maple syrup and cane sugar. There is unexpected sugar in processed foods such as tomato sauce, yogurt, crackers and bread. Soft drink consumption can contribute a lot of added sugar to the diet as well.

Many processed foods are made with refined grain products, like white flour. When a grain is changed from its whole form to a refined form (i.e. whole wheat flour to white flour, or brown rice to white rice) the fiber and many of the vitamins and minerals are removed leaving the calories, but few of the nutrients. Avoiding these forms of carbohydrates is important to a healthy diet. Use the Nutrition Facts Label to identify good sources of carbohydrate low in simple sugars and high in fiber.

Carbohydrates

Selecting Healthy Food Using Food Labels

Goal: Learn how to use the Nutrition Facts Label to select foods that are good sources of carbohydrates.

Exercise: The Food and Drug Administration requires a nutrition facts panel on all packaged food products. This exercise demonstrates how to read and interpret the label in order to compare different foods. Have the students compare the two nutrition fact labels below to determine the healthiest source of carbohydrates. Notice that the caloric content of the food is similar, as is the amount of Total Carbohydrates. However, notice that the carbohydrates in the soda come almost entirely from sugar, while in the brown rice they are mostly complex starches. The brown rice also has fiber and protein, and the soda has none. Next, look at the ingredients list which lists food in order of ingredient by weight. When sugar (corn syrup, honey, cane sugar) is within the top five ingredients the food is considered high in sugar.

Brown Rice

Nutrition Facts

Serving Size 1 cup 195g (195 g)

Amount Per Serving	
Calories 216	Calories from Fat 15
	% Daily Value*
Total Fat 2g	3%
Saturated Fat 0g	2%
Trans Fat	
Cholesterol 0mg	0%
Sodium 10mg	0%
Total Carbohydrate 45g	15%
Dietary Fiber 4g	14%
Sugars 1g	
Protein 5g	

Vitamin A	0%	• Vitamin C	0%
Calcium	2%	• Iron	5%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Ingredients: Brown Rice

Soda

Nutrition Facts

Serving Size 1 bottle 16 lf oz 491g (491 g)

Amount Per Serving	
Calories 182	Calories from Fat 1
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 20mg	1%
Total Carbohydrate 47g	16%
Dietary Fiber 0g	0%
Sugars 44g	
Protein 0g	

Vitamin A	0%	• Vitamin C	0%
Calcium	1%	• Iron	3%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Ingredients: Carbonated Water, High Fructose Corn Syrup, Caramel Color, Phosphoric Acid, Natural Flavors, Caffeine

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History and Carbohydrates

- Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts. (CCSS.ELA-Literacy.RH.6-8.7)
- Distinguish among fact, opinion, and reasoned judgment in a text. (CCSS.ELA-Literacy.RH.6-8.8)
- Analyze the relationship between a primary and secondary source on the same topic. (CCSS.ELA-Literacy.RH.6-8.9)
- Students acquire a framework for thinking geographically, including the location and unique characteristics of places.
- Describe the influence of industrialization and technological developments on the region, including human modification of the landscape and how physical geography shaped human actions

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
Growing food... The primary grain crop grown in Asia was rice, Africa was barley, North America was wheat, South America was corn, and Europe was wheat. Global grain production is expected to reach a record high of 2.37 billion tons* World Watch Institute.	What are cereal crops? How have they been important throughout human history? What crops are primarily grown now? How has legislation influenced food production and food consumption?	***Crops, United States Department of Agriculture, Economic Research Service*** www.ers.usda.gov/topics/crops.aspx ***Africa's Indigenous Crops*** www.worldwatch.org/system/files/NtP-Africa%27s-Indigenous-Crops.pdf ***CHILD NUTRITION ACT OF 1966; Healthy, Hunger-Free Kids Act of 2010*** www.fns.usda.gov/cnd/Governance/legislation.htm
Eating food... American's ate 110 pounds of sweeteners like sugar and corn syrup per person in 1950 and 152 pounds per person in 2000.	Compare the way children ate in other countries to the way children eat now. What are the differences and what caused them? Describe why fruits and vegetables are part of a healthy meal pattern in most cultures.	***Profiling Food Consumption in America, USDA*** www.usda.gov/factbook/chapter2.pdf ***A Century of Data on Food Availability (Consumption), Economic Research Service, USDA*** http://webarchives.cdlib.org/sw1s17tt5t/ http://ers.usda.gov/Features/Centennial/

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Science and Carbohydrate

- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (CCSS.ELA-Literacy.RST.6-8.7)
- Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (CCSS.ELA-Literacy.RST.6-8.8)
- Compare and contrast the information gained from experiments, simulations, video or multimedia sources with that gained from reading a text on the same topic. (CCSS.ELA-Literacy.RST.6-8.9)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
Growing food... Plants use photosynthesis to make carbohydrates, which they store for a variety of uses throughout the plant. Carbohydrates make up the structure of the plants.	Compare the role of carbohydrates to plants versus humans. Why are these molecules important to both living organisms?	***Empowering Youth with Nutrition and Physical Activity, Team Nutrition, USDA*** http://teamnutrition.usda.gov/Resources/empoweringyouth.html ***Power of Choice, Team Nutrition, USDA*** http://teamnutrition.usda.gov/Resources/POC_intro.pdf
Eating food... Carbohydrates can be complex or simple. Glucose is the most simple, and eating sugary foods provides a quick boost of energy, but not lasting energy.	Understanding the complex text on a Nutrition Facts label will increase practical knowledge to make healthy food choices. Using the sample food labels, have students compare two foods.	***Read It Before You Eat It, Team Nutrition, USDA*** http://teamnutrition.usda.gov/Resources/readit_poster.pdf ***Nutrition Voyager: TREK 2 Grade 7 Field Correspondents: Conducting a School Survey, Team Nutrition, USDA*** http://teamnutrition.usda.gov/Resources/nutvoyage7_trek1.pdf ***Center for Science in the Public Interest*** www.cspinet.org/liquidcandy/ **Supporting Urban Science & math Educators** http://susmek12.wordpress.com/2011/02/10/carbohydrates/

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Math and Carbohydrates

- Represent and analyze quantitative relationships between dependent and independent variables. (CCSSM.6.EE)
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations. (CCSSM.7.RP)
- Investigate patterns of association in bivariate data. (CCSSM.8.SP)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
Growing food... Global grain production is at record highs despite extreme climatic events.	Chart and analyze global grain production and weather over time. Compare the cost of producing cereal crops based on inputs and outputs. What is the impact on the environment?	***World Watch*** http://vitalsigns.worldwatch.org/vs-trend/global-grain-production-record-high-despite-extreme-climatic-events
Eating food... 100 grams of wheat supply 449 calories whereas 100 grams of potatoes supply only 83 calories.	Compare the nutritive values of different cereal crops to each other and other plant foods like potato. How much sugar is consumed in the USA? What percent of the American diet is due to sugar intake?	***Adaptations of Cereals*** www.cix.co.uk/~argus/Dreambio/fertilisers%20and%20crops/cereal%20crops.htm ***Team Nutrition Vegetable and Fruit Challenge*** Identify, count and record daily consumption of produce. http:// teamnutrition.usda.gov
On average, males consumed 2,475 calories daily and females consumed 1,833 calories in the USA (NHANES 1999–2000).	Graph and compare the consumption of carbohydrate foods of males and females over time. Adolescent boys (12–19 years) consumed an average of 442 kcals from added sugars daily, whereas girls consumed 314 kcals daily. What percentage of adolescent males and females diets were from added sugar?	***Profiling Food Consumption in America, USDA*** www.usda.gov/factbook/chapter2.pdf ***Intake of Calories and Selected Nutrients for the United States Population, 1999-2000*** www.cdc.gov/nchs/data/nhanes/databriefs/calories.pdf ***Consumption of Added Sugar Among U.S. Children and Adolescents, 2005–2008.*** www.cdc.gov/nchs/data/databriefs/db87.pdf

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Language Arts and Carbohydrates

- Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (CCSS.ELA.W)
- Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (CCSS.ELA.SL)
- Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation. (CCSS.ELA.7.W)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
Growing food... Hundreds of famous novels explore America's interesting agricultural history and the relationships of people to the farmland and food production.	Read **Oh! Pioneers** by Willa Cather, **Of Mice and Men** by John Steinbeck or **The Adventures of Tom Sawyer** by Mark Twain and write a paper on the impact of farming and food on the main characters. Compare farm life in several novels in the same or different time period.	***History of Agriculture, National Agricultural Library, USDA*** www.nal.usda.gov/history-art-and-biography/history-agriculture ***Library Thing, Farming, Historical fiction*** www.librarything.com/tag/farming,+historical+fiction
Eating food... The average grocery store carries 38,718 items. 53% of grocery sales are of perishable food items. Consumers spent $788.9 billion for food that originated on U.S. farms in 2004.	Create a consumer information brochure on topics such as food origin, cost of food in a healthy diet or selecting healthy diets (serving sizes, portion distortion, label reading).	***Power of Choice, Team Nutrition, USDA*** http://teamnutrition.usda.gov/Resources/POC_intro.pdf ***Nutrition Voyager: TREK 3 Grade 7 Leading the Way as Change Agents , Team Nutrition, USDA*** http://teamnutrition.usda.gov/Resources/nutvoyage7_trek3.pdf ***MebMD, Weight Loss & Diet Plans, Portion Size Plate*** www.webmd.com/diet/healthtool-portion-size-plate ***Food Marketing Institute*** www.fmi.org/