

Vitamins

At a Glance

Recommended Dietary Intake:

The Recommended Dietary Allowance indicates daily needs while the % Daily Value on food labels shows how much a given food contains

Calories per Gram of food: 0

Vitamins do not provide energy, but are essential compounds in the process of converting macronutrients into energy

Types of Vitamins:

Fat soluble - A, D, E, K

Water soluble - B (thiamin, riboflavin, niacin, folate, B6, B12, biotin, pantothenic acid), C

Function: Fat soluble: stored in fatty tissue until needed for essential roles like making proteins, chemical reactions and blood clotting. Water soluble: carried in watery substances and not stored; must be eaten daily; essential in energy metabolism, protecting cells and converting compounds

Food Sources: fruits, vegetables, whole grains, nuts, seeds, beans, meat, dairy

Typical Serving size: 1 orange has 103% of your daily vitamin C, 4% vitamin A, and B vitamins

Health Concerns: Severe deficiencies occur in developing countries, and in people with severe illnesses. Moderate deficiencies can occur from unhealthy diets in the U.S.

Vitamins in the Body and Food

We eat food to deliver essential nutrients like vitamins to our bodies. Vitamins are tiny, non-caloric, organic compounds with very diverse functions related to growth, maintenance and repair of all cells. Each of the 13 vitamins is classified by a letter and has multiple functions. A vitamin can be either water-soluble or fat-soluble. This influences how they are absorbed by the body and carried where they are needed.

B vitamins are essential in the production of energy. They are found in abundance in whole grains, oranges, mushrooms, yogurt, seafood, nuts and beans. B12 is unusual because it is produced by bacteria, and found only in animal products. Vitamin K, essential to clot blood, is abundant in green leafy vegetables. Vitamin C has many functions, including fighting infection and assisting protein with chemical reactions. Our bodies can make vitamin D, required for healthy bones, from sunshine. Vitamins A, C and E act as antioxidants to help protect the body from compounds that can cause cancer or heart disease.



Eating a Diet High in Vitamins

The best plan for maximizing intake of quality vitamins is to eat unprocessed or lightly processed foods. A diet high in fresh, canned or frozen fruits and vegetables will greatly increase your vitamin intake. Unfortunately, some of the most commonly consumed foods in the US are the least concentrated sources of vitamins due to heavy processing. For example, most of the wheat products we consume are made with white flour – a product of milling whole grain to remove the “germ” where most of the nutrients are.

While a potato is high in vitamin C and several B vitamins, potato chips and fries are not. Frying a potato not only adds a lot of fat but also destroys some of the heat sensitive vitamins.

While fruit juice can be healthier than soda, it is far less healthy than eating the whole fruit, containing fewer nutrients and more sugar. Choosing whole foods is always healthier than the products food processors make with them.

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Selecting Healthy Food Using Food Labels

Goal: Learn how to use the Nutrition Facts label to select nutrient dense snacks.

Exercise: The Food and Drug Administration requires a Nutrition Facts panel on all packaged food products but not fresh produce which can be found on the internet. Compare the two labels below to assess the difference between a whole food snack and a candy snack. First compare the serving size of the strawberries, 1 cup, and the Twizzlers, 1 ounce. How many Twizzlers is that? (There are 4). Notice they both have sugar, so look at the ingredients list to determine whether it is “added” sugar or natural. Then look at the Daily Values and note the strawberries are an excellent source of vitamin C, while the Twizzlers have no vitamin C. Also important to note is that Twizzlers are not made with any real fruit, even though strawberries appear on the package. Instead they are made from mostly artificial flavors, chemicals and sugar. The comparison shows that the strawberries are nutrient dense and low calorie, whereas the candy is nutrient poor and high in calories (empty calories).

Strawberries

Nutrition Facts			
Serving Size 1 cup, halves 152g (152 g)			
Amount Per Serving			
Calories 49		Calories from Fat 4	
% Daily Value*			
Total Fat 0g			1%
Saturated Fat 0g			0%
Trans Fat			
Cholesterol 0mg			0%
Sodium 2mg			0%
Total Carbohydrate 12g			4%
Dietary Fiber 3g			12%
Sugars 7g			
Protein 1g			
Vitamin A 0%	Vitamin C 149%		
Calcium 2%	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

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Ingredients: Strawberries



Strawberry Twizzlers

Nutrition Facts			
Serving Size 1 ounce 28g (1 ounce (28g))			
Amount Per Serving			
Calories 98		Calories from Fat 6	
% Daily Value*			
Total Fat 1g			1%
Saturated Fat 0g			0%
Trans Fat			
Cholesterol 0mg			0%
Sodium 80mg			3%
Total Carbohydrate 22g			7%
Dietary Fiber 0g			0%
Sugars 11g			
Protein 1g			
Vitamin A 0%	Vitamin C 0%		
Calcium 0%	Iron 1%		

*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

Ingredients: Corn syrup; enriched wheat flour (flour, niacin, ferrous sulfate, thiamin mononitrate, riboflavin, and folic acid); sugar; cornstarch; contains 2% or less of: palm oil; salt; artificial flavor ; mono and diglycerides; citric acid; potassium sorbate (preservative); artificial color (red 40) ; mineral oil; soy lecithin; glycerin

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History and Vitamins

- Identify key steps in a text’s description of a process related to history/social studies. (CCSS.ELA-Literacy.RH.6-8.4)
- Describe how a text presents information (e.g., sequentially, comparatively, causally). (CCSS.ELA-Literacy.RH.6-8.5)
- Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies. (CCSS.ELA-Literacy.RH.6-8.4)

DID YOU KNOW?

Growing food...

Brown rice is a good source of vitamin B1, but white rice is not, as the vitamin is removed when the grain is polished. As a result, a deficiency disease called beri beri was common in Japan in the 1800s.

The carrots you eat have an agricultural history that dates back 5,000 years to Iran and Afghanistan and was purple.

Eating food...

The value of eating a certain food to maintain health was recognized long before vitamins were identified. The ancient Egyptians knew that feeding liver to a person would help cure night blindness, an illness now known to be caused by a vitamin A deficiency.

LESSONS IDEAS

What is the history of processing whole foods, i.e. making brown rice white and whole wheat flour white? What vitamins are removed in this process and what diseases have they contributed to in history? Have students watch the video on A Brief History of Processed Foods.

Trace the cultivation of the carrot across the globe and consider the historical evidence, agricultural practices and political influences.

One of the most important vitamins throughout history has been vitamin C. Deficiency was common among sailors, as access to fresh fruit was lacking. Research the history of this vitamin and its deficiency disease - scurvy.

Browse through some of the food history lesson plans

SUPPORTING INFORMATION AND CURRICULUM

A Brief History of Processed Foods, Vimeo
<http://vimeo.com/40919343>

Top 10 Vitamin Deficiencies, Listverse
<http://listverse.com/2012/03/16/top-10-vitamin-deficiencies/>

World Carrot Museum
www.carrotmuseum.co.uk/history.html

The History of Scurvy, LoveToKnow Vitamins
vitamins.lovetoknow.com/History_of_Scurvy_Vitamin_C

Food History Lesson Plans, Food Timeline
www.foodtimeline.org/food2a.html

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Science and Vitamins

- Cite specific textual evidence to support analysis of science and technical texts. (CCSS.ELA-Literacy.RST.6-8.1)
- Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. (CCSS.ELA-Literacy.RST.6-8.5)
- Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. (CCSS.ELA-Literacy.RST.6-8.6)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><i>Growing food...</i> Humans have developed the capability to add vitamins to our food products. However, in nature, animals, including humans, receive vitamins from their food. Concentrated sources include most fruits and vegetables and some animal products.</p>	<p>Discuss the role of vitamins in a natural ecosystem. Where do they originate? Plants produce many vitamins, and animals produce several as well. One vitamin, however, is only produced by bacteria – vitamin b12. Microbes in the soil produce this vitamin, as well as microbes in the guts of animals.</p>	<p><i>What’s In My Soil, USGS</i> education.usgs.gov/lessons/soil.pdf</p> <p><i>How is Vitamin C Added to Food, eHow</i> www.ehow.com/how-does_5006279_how-vitamin-c-added-food.html</p>
<p><i>Eating food...</i> If we do not get enough vitamin B12 in our diets we can succumb to a condition known as B12 anemia.</p> <p>Scientists discovered the first vitamin (A) in 1913 and the last of the 13 known vitamins (B9, or Folate) in 1941. Of the 13, 9 are water soluble, and 4 are fat soluble.</p>	<p>What are some of the functions of vitamins in our bodies? What does vitamin B12 do in our bodies? What about vitamin C?</p> <p>Research various conditions of vitamin deficiency including good food sources of each vitamin.</p> <p>What does water soluble vs. fat soluble mean? Discuss water and oil mixing principles.</p>	<p><i>Vitamin Functions in the Body, WebMD</i> www.webmd.com/vitamins-and-supplements/vitamins-and-their-functions-and-sources</p> <p><i>Water vs. Fat Soluble Vitamins, WebMD</i> www.webmd.com/vitamins-and-supplements/nutrition-vitamins-11/fat-water-nutrient</p> <p><i>The Nobel Prize and the Discovery of Vitamins</i> www.nobelprize.org/nobel_prizes/medicine/articles/carpenter/</p>

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Math and Vitamins

- Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). (CCSSM.6.EE.4)
- Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. (CCSSM.7.RP.1)
- Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. (CCSSM.8.SP.1)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><i>Growing food...</i> Global production of citrus fruits is about 105 million tons annually! 35 million tons of carrots are grown globally each year, 153 million tons of tomatoes, 145 million tons of bananas, and 102 million tons of sweet potatoes!</p>	<p>Use the data on global fruit and vegetable production to calculate how many of a particular fruit or vegetable are produced. For example, if 105 million tons of oranges are produced, how many oranges is that? How many mg of vitamin C is that?</p>	<p><i>Global Crop Production Data, GeoHive</i> www.geohive.com/charts/ag_crops.aspx</p> <p><i>Great Algebra Sample Lesson, Algebra.com</i> www.algebra.com/algebra/homework/word/unit_conversion/Unit_Conversion_Word_Problems.faq.question.157300.html</p>
<p><i>Eating food...</i> Studies show that our prehistoric ancestors consumed 600mg of vitamin C, 11000 IU of vitamin A, and 33mg of vitamin E daily. The modern human diet provides only about 100mg of vitamin C, 4000 IU of vitamin A, and just 6mg of vitamin E. Human ancestors ate amazing quantities of whole plant foods, contributing to these differences.</p>	<p>Using the nutrition facts for various fruits and vegetables, have students calculate how many oranges they would need to eat to get 600mg of vitamin C; how many carrots to get 5500 micrograms of vitamin A; how many almonds to get 33mg of vitamin E.</p>	<p><i>Nutrition Facts, Self.com, USDA</i> <u>Orange</u>: nutritiondata.self.com/facts/fruits-and-fruit-juices/1969/2 <u>Carrots</u>: nutritiondata.self.com/facts/vegetables-and-vegetable-products/2383/2 <u>Almonds</u>: nutritiondata.self.com/facts/nut-and-seed-products/3170/2</p>

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Language Arts and Vitamins

- Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. (CCSS.6.RL)
- Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. (CCSS.6.W)
- Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation. (CCSS.6.SL)

DID YOU KNOW?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p><i>Growing food...</i> Food supply nutrient data influences what food is grown and how it is manufactured.</p>	<p>Consumers, researchers and public health professionals have influenced the food supply from focusing on food that is nutritionally adequate to food that maintains health and decreases risk of disease. What do farmers grow now that they didn't grow 30 years ago? How have food products changed?</p>	<p><i>Nutrient Content of the US Food supply</i> www.cnpp.usda.gov/publications/foodsupply/foodsupply1909-2000.pdf</p>
<p><i>Eating food...</i> B vitamin folic acid (folate) naturally occurs in vegetables and grains. In 1998 the US required fortification of grain products with folate and their contribution to dietary folate rose from 30% to 60% in 2 years. (2000)</p>	<p>What is the difference between fortified and enriched on a food label? Explore why the US requires food companies to add nutrients to food products. What are the pros and cons?</p> <p>Provide the MyPlate poster to students in groups. Have them research restaurant meal photos and determine whether or not the meals meet the "half fruit and vegetable" requirement. Discuss the quality of food in restaurants/fast food chains.</p>	<p><i>Are foods that contain added nutrients considered "enriched"?</i> http://www.fda.gov/AboutFDA/Transparency/Basics/ucm194348.htm</p> <p><i>MyPlate Half Fruits and Veggies Poster, USDA</i> teamnutrition.usda.gov/Resources/myplate_halfplateposter.pdf</p> <p><i>MyPyramid Amounts of Foods—FOR YOU, USDA</i> teamnutrition.usda.gov/Resources/ne_amounts4u.pdf</p> <p><i>Great Vocabulary List, Team Nutrition, USDA</i> teamnutrition.usda.gov/Resources/ne_vocab.pdf</p>