

Minerals

At a Glance

Recommended Dietary Intake:

Each mineral has a Recommended Dietary Allowance for a daily intake as indicated by the % Daily Value on food labels

Calories per Gram of Food: 0

Minerals are elements that cannot be broken down or destroyed; therefore, they do not provide calories to the body

Types of Minerals:

Major Dietary Minerals: Calcium, Phosphorous, Potassium, Sodium, Chloride, Magnesium, Sulfate

Trace Dietary Minerals: Iron, Iodine, Zinc, Chromium, Selenium, Fluoride, Molybdenum, Copper, Manganese

Function: Minerals are essential to the normal functioning of the human body. They help our bodies build strong bones, make new blood cells, and serve many other important roles.

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

Typical Serving Size: 1 cup of collard greens has 268 g or 27% of your daily calcium

Health Concerns: A deficiency in a mineral can cause a mild to serious health concern. Iron, calcium and magnesium deficiencies are common in the US.

Minerals in the Body and Food

The food we eat contains important minerals essential to life. Minerals are very important in many different functions throughout the body. Without adequate mineral intake, your body would not be able to grow and make new cells. Some of the most important minerals are calcium, iron, and potassium.

Calcium is vital to growing healthy bones for young people, and maintaining healthy bones in adults. Good sources of calcium are dark leafy green vegetables, soybeans, and dairy products. Iron is another very important mineral. Getting enough iron in our diet is important in making new blood cells, as each cell needs iron. Good sources include beans, soybeans, nuts and seeds, dark leafy vegetables, and some animal products. While these minerals are especially important, each of the major and trace minerals are essential to a healthy diet.



Selecting a Diet High in Minerals

As with the other nutrients, a diet high in unprocessed, well prepared food will provide the body with the most bioavailable minerals with the fewest extra calories. Processed foods have become so abundant in the American diet that the balance of fat to micronutrients is contributing to a diet with too many calories and too few nutrients. Processing food can decrease minerals, vitamins and fiber by using techniques such as milling, baking or boiling. Many of the wheat products we consume are made with white flour. In order to make white flour, the grain is milled to eliminate the germ and in the process the fiber and most of the vitamins, minerals, and phytonutrients are destroyed.

Cooking a food can increase the quantity you can eat in one serving, and thus the amount of minerals consumed. For example, 1 cup of raw spinach has 3% of the daily value for calcium, while 1 cup boiled spinach has 24% because you are eating more spinach.

Eating whole fruits is better than drinking juice since juice often has added sugar, no fiber and fewer micronutrients. Choosing raw or lightly cooked foods is healthier than consuming their processed counterpart. Check the price too to compare the quality of the nutrients to the cost of the product.

Selecting Healthy Food Using Food Labels

Goal: Learn how to use the Nutrition Facts label to compare food mineral content.

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 foods. Notice that the per serving caloric content of the food is similar; however, the whole potato contains a lot more iron, vitamin C and fiber, less sodium and no fat. Note that while the serving size for the potato is realistic, a person might easily eat 3 or 4 times the serving size of chips. In this case, multiply all nutrients by the number of servings and you will see that the number of calories, fat and salt increase dramatically. Finally, look at the ingredients list. In this case, the chips have fat and salt added in processing. By looking at all the information on the label, you can see that the potato is nutrient dense with fewer of the nutrients that should be limited in a healthy diet like salt and fat.

Potato

Nutrition Facts	
Serving Size 1 potato medium 173g (173 g)	
Amount Per Serving	
Calories 161	Calories from Fat 2
% Daily Value*	
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat	
Cholesterol 0mg	0%
Sodium 17mg	1%
Total Carbohydrate 37g	12%
Dietary Fiber 4g	15%
Sugars 2g	
Protein 4g	
Vitamin A 0%	Vitamin C 28%
Calcium 3%	Iron 10%
*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: Potato	



Potato Chips

Nutrition Facts	
Serving Size 1 ounce 28g (1 ounce (28g))	
Amount Per Serving	
Calories 153	Calories from Fat 92
% Daily Value*	
Total Fat 10g	16%
Saturated Fat 3g	15%
Trans Fat	
Cholesterol 0mg	0%
Sodium 147mg	6%
Total Carbohydrate 14g	5%
Dietary Fiber 1g	5%
Sugars 0g	
Protein 2g	
Vitamin A 0%	Vitamin C 9%
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
Ingredients: Potatoes, Canola Oil Salt	



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History and Minerals

- 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?	LESSONS IDEAS	INFORMATION AND CURRICULUM
<p>Growing food... During colonial times, one farmer fed four people. Today, one farmer produces food for 130 people. Agricultural advances have enabled farmers to grow more food from less land, but the health of the environment such as the soil and water has suffered.</p>	<p>How did early Americans, Colonists, traders and farmers influence food production? What types of growing practices impact the environment? How is soil quality measured and managed? What is the impact on mineral content of food?</p> <p>Discuss various countries around the world and compare and contrast their soil preservation techniques. What crops do we grow in the US compared to a developing nation? What techniques are utilized?</p>	<p>Sciences of Life Explorations: Through Agriculture, Let’s Explore Agriculture www.agclassroom.org/ny/resources/pdf/activities/explore.pdf</p> <p>Soil: Educational Resources, www.Soils.org www.soils.org/about-soils/lessons/resources</p>
<p>Eating food... The salt industry started in 1614 by Jamestown colonist and now the US produces 46 million tons a year.</p> <p>Minerals in the diet come from plant and animal sources. Calcium is most associated with dairy products, but is also abundant in leafy green vegetables. Iron, most associated with meat, is found in abundance in beans.</p>	<p>Salt is one of the most important compounds in history. A crystal of 2 minerals, sodium and chloride, salt has had a tremendous economic and military significance throughout the history of the world. What role has it played in trade, food preservation, religion and industry? What impact does it have on human health?</p>	<p>The History of Salt, Salt Institute www.saltinstitute.org/Uses-benefits/Salt-in-history</p> <p>History of Salt, Salt Works www.saltworks.us/salt_info/si_HistoryOfSalt.asp</p> <p>Food History Lesson Plans, Food Timeline www.foodtimeline.org/food2a.html</p>

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Science and Minerals

- 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?

Growing food...

We eat rocks with the help of plants and animals! Minerals are part of the soil in which we grow crops. These dissolved minerals are taken up by plants. When an animal, like a human or cow, eats the plant, some of the minerals are absorbed.

Humans have the capability to add minerals to food products. In nature, sometimes mammals will lick mineral deposits like “salt licks,” to meet their mineral needs.

Eating food...

Deficiencies in minerals can cause mild to severe symptoms. For example, a deficiency of iron in our diets can lead to anemia which causes us to feel tired. Insufficient calcium can contribute to the bone disease osteoporosis.

LESSONS IDEAS

Discuss the role of minerals in a natural ecosystem. Where do they originate? Trace the absorption of minerals in the digestive track. Lead the “What’s In My Soil” lesson from the USGS and the many lessons in “Soil and Life on Earth”

What are some of the functions of the major minerals in our bodies like calcium, iron and salt? What causes deficiencies?
Research foods that provide adequate mineral intake and make a diet plan.

Play the “Nutrition Sleuth” game with students.

INFORMATION AND CURRICULUM

What’s In My Soil, USGS

www.education.usgs.gov/lessons/soil.pdf

Soil and Life on Earth, Bush Middle School

www.wscss.org/web_docs/Lake_Chelan_Retreat/Lessons/LowdownOnDirtCURRICULUM.pdf

Mineral Deficiency, Right Diagnosis

www.rightdiagnosis.com/m/mineral/

MedLine Plus, Minerals

www.nlm.nih.gov/medlineplus/minerals.html#cat47

Good Food, Good Health, ScienceNetLinks

<http://sciencenetlinks.com/lessons/nutrition-2-good-food-good-health/>

Nutrition Sleuth, Pacific Science Center

[www.pacificsciencecenter.org/nutrition/nutrition_affe.html](http://www.pacificsciencecenter.org/nutrition/nutrition_caffe.html)

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Math and Minerals

- 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?

Growing food...

The word “salary” was derived from the word “salt,” reflecting its importance in global trade. Global production of salt is about 250 million tons annually.

LESSONS IDEAS

Use the data on global salt production to compare the top producing countries, as well as the most popular methods for producing salt.

Petroleum comes from plants and animals over millions of years. Compare times to produce petroleum, availability and current rate of consumption. Analyze and chart the fuel required to produce food.

INFORMATION AND CURRICULUM

Global Salt Production Data, Salt Institute
www.saltinstitute.org/content/download/14739/91891

Cost Components of Domestically produced Food, DOE
www.afdc.energy.gov/data/tab/all/data_set/10341

Eating food...

The suggested upper intake of salt is at 2,300 mg and the recommended intake is just 1,500 mg per day. Americans over the age of two consume on average about 3,400 mg of sodium daily.

What is the result of American’s high intake of salt? Have students compare the sodium content of foods they eat by either bringing in wrappers or looking up nutrient information in a database. Plot sodium content on graphs with labels to illustrate high salt food products.

Americans Consume Too Much Sodium, CDC
www.cdc.gov/features/dssodium/

SuperTracker, Analyze and Track your Diet and Exercise, Choose My Plate, USDA
www.choosemyplate.gov/supertracker-tools/supertracker.html

Get What you Need, Compare What you Eat and Serving Sizes, Team Nutrition, USDA
http://teamnutrition.usda.gov/Resources/ne_get.pdf

Track nutrient intake for 2 days and plot mineral intake. How much sodium do your students eat compared to the recommendation?

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Language Arts and Minerals

- 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> The word “soil” or “dirt” in English is used in a positive way to describe the substance where we grow food; however, it has a negative connotation when we say “soiled” or “dirty.” Why does the Spanish language have different words for each?</p>	<p>Etymology is the study of words. Research information on the food system and pay attention to the use of different terms used to describe food and agriculture.</p>	<p><i>Teaching the Food System, Johns Hopkins University</i> www.jhsph.edu/research/centers-and-institutes/teaching-the-food-system/curriculum/</p> <p><i>Historical Timeline, Farm Machinery, Growing a Nation</i> www.agclassroom.org/gan/timeline/farm_tech.htm</p>
<p><i>Eating food...</i> Some pregnant women crave and eat dirt! Geophagy is the act of eating earth or soil-like compounds such as dirt or clay and may be due to a craving for the high mineral content.</p> <p>Pregnant women’s bodies make more blood to support the growth of the fetus. Iron is an essential component in this process and iron deficiency anemia is common.</p>	<p>Research the pros and cons of using nutritional supplements for different reasons like during pregnancy, increase sports performance or prevent illness.</p> <p>Look at the 10 tips for reducing salt/sodium in the diet produced by MyPlate. Read the text and test for understanding. Have students create their own guide for the school.</p>	<p><i>MyPlate, Salt Guide, USDA</i> www.fns.usda.gov/cnd/healthierschoolday/pdf/19_TT_NE-SAS.pdf</p> <p><i>Questions To Ask Before Taking Vitamin and Mineral Supplements</i> www.nutrition.gov/dietary-supplements/questions-ask-taking-vitamin-and-mineral-supplements</p> <p><i>Build a Healthy Plate with Less Salt and Sodium, USDA</i> www.fns.usda.gov/tn/Resources/nutritionandwellness/sodium.pdf</p> <p><i>Just the Facts: Calcium, USDA</i> www.fns.usda.gov/tn/resources/jtf_milk.pdf</p>