National Institutes of Health
Office of Dietary Supplements

Selenium

Fact Sheet for Consumers

What is selenium and what does it do?

Selenium is a nutrient that the body needs to stay healthy. Selenium is important for reproduction, thyroid gland function, DNA production, and protecting the body from damage caused by free radicals and from infection.

How much selenium do I need?

The amount of selenium that you need each day depends on your age. Average daily recommended amounts are listed below in micrograms (mcg).

Life Stage	Recommended Amount
Birth to 6 months	15 mcg
Infants 7–12 months	20 mcg
Children 1–3 years	20 mcg
Children 4–8 years	30 mcg
Children 9–13 years	40 mcg
Teens 14–18 years	55 mcg
Adults 19–50 years	55 mcg
Adults 51–70 years	55 mcg
Adults 71 years and older	55 mcg
Pregnant teens and women	60 mcg
Breastfeeding teens and women	70 mcg

What foods provide selenium?

Selenium is found naturally in many foods. The amount of selenium in plant foods depends on the amount of selenium in the soil where they were grown. The amount of selenium in animal products depends on the selenium content of the foods that the animals ate. You can get recommended amounts of selenium by eating a variety of foods, including the following:

- Seafood
- Meat, poultry, eggs, and dairy products
- Breads, cereals, and other grain products

What kinds of selenium dietary supplements are available?

Selenium is available in many multivitamin/mineral supplements and other dietary supplements. It can be present in several different forms, including selenomethionine and sodium selenate.

Am I getting enough selenium?

Most Americans get enough selenium from their diet because they eat food grown or raised in many different areas, including areas with soil that is rich in selenium.

Certain groups of people are more likely than others to have trouble getting enough selenium:

- People undergoing kidney dialysis
- People living with HIV
- People who eat only local foods grown in soils that are low in selenium

What happens if I don't get enough selenium?

Selenium deficiency is very rare in the United States and Canada. Selenium deficiency can cause Keshan disease (a type of heart disease) and male infertility. It might also cause Kashin-Beck disease, a type of arthritis that produces pain, swelling, and loss of motion in your joints.

What are some effects of selenium on health?

Scientists are studying selenium to understand how it affects health. Here are some examples of what this research has shown.

Cancer

Studies suggest that people who consume lower amounts of selenium could have an increased risk of developing cancers of the colon and rectum, prostate, lung, bladder, skin, esophagus, and stomach. However, whether selenium supplements reduce cancer risk is not clear. More research is needed to understand the effects of selenium from food and dietary supplements on cancer risk.

Cardiovascular disease

Scientists are studying whether selenium helps reduce the risk of cardiovascular disease. Some studies show that people with lower blood levels of selenium have a higher risk of heart disease, but other studies do not. More studies are needed to better understand how selenium in food and dietary supplements affects heart health.

Cognitive decline

Blood selenium levels decrease as people age, and scientists are studying whether low selenium levels contribute to a decline in brain function in older adults. Some studies suggest that people with lower blood selenium levels are more likely to have poorer mental function, but a study of older adults in the United States found no link between selenium levels and memory. More research is needed to find out

whether selenium dietary supplements might help reduce the risk of or treat cognitive decline in older adults.

Thyroid disease

The thyroid gland has high amounts of selenium that play an important role in thyroid function. Studies suggest that people—especially women—who have low blood levels of selenium (and iodine) might develop problems with their thyroid. However, whether selenium dietary supplements can help treat or reduce the risk of thyroid disease is not clear. More research is needed to understand the effects of selenium on thyroid disease.

Can selenium be harmful?

Yes, if you get too much. Brazil nuts, for example, contain very high amounts of selenium (68–91 mcg per nut) and can cause you to go over the upper limit if you eat too many. Getting too much selenium over time can cause the following:

- Garlic breath
- Diarrhea
- Irritability
- Brittle hair or nails
- Discolored teeth
- Nausea
- Skin rashes
- Metallic taste in the mouth
- Loss of hair or nails
- Nervous system problems

Extremely high intakes of selenium can cause severe problems, including difficulty breathing, tremors, kidney failure, heart attacks, and heart failure.

The daily upper limits for selenium include intakes from all sources—food, beverages, and supplements—and are listed below.

Ages	Upper Limit
Birth to 6 months	45 mcg
Infants 7–12 months	60 mcg
Children 1–3 years	90 mcg
Children 4–8 years	150 mcg
Children 9–13 years	280 mcg
Teens 14–18 years	400 mcg
Adults	400 mcg

Does selenium interact with medications or other dietary supplements?

Yes, some of the medications you take may interact with selenium. For example, cisplatin, a chemotherapy drug used to treat cancer, can lower selenium levels, but the effect this has on the body

is not clear.

Tell your doctor, pharmacist, and other health care providers about any dietary supplements and prescription or over-the-counter medicines you take. They can tell you if the dietary supplements might interact with your medicines or if the medicines might interfere with how your body absorbs, uses, or breaks down nutrients.

Selenium and healthful eating

People should get most of their nutrients from food and beverages, according to the federal government's *Dietary Guidelines for Americans*. Foods contain vitamins, minerals, dietary fiber, and other components that benefit health. In some cases, fortified foods and dietary supplements are useful when it is not possible to meet needs for one or more nutrients (for example, during specific life stages such as pregnancy). For more information about building a healthy dietary pattern, see the *Dietary Guidelines for Americans* (https://www.dietaryguidelines.gov) and the U.S. Department of Agriculture's (USDA's) MyPlate. (https://www.myplate.gov)

Where can I find out more about selenium?

- For general information on selenium
  - Office of Dietary Supplements (ODS) Health Professional Fact Sheet on Selenium
  - Selenium in Diet (https://medlineplus.gov/ency/article/002414.htm), MedlinePlus
- For more information on food sources of selenium
  - USDA's FoodData Central (https://fdc.nal.usda.gov/)
  - Nutrient List for selenium (listed by food or by selenium content), USDA
- For more advice on choosing dietary supplements
  - ODS Frequently Asked Questions: Which brand(s) of dietary supplements should I purchase?
- For information about building a healthy dietary pattern
  - MyPlate (https://www.myplate.gov/)
  - *Dietary Guidelines for Americans* (https://www.dietaryguidelines.gov)

Disclaimer

Glossary

absorption
: In nutrition, the process of moving protein, carbohydrates, fats, and other nutrients from the digestive system into the bloodstream. Most absorption occurs in the small intestine.

arthritis
: A group of diseases in which one or more joints (places in the body where two bones connect) become swollen and painful. The most common type of arthritis is osteoarthritis. It is caused by the breakdown of cartilage, a type of tissue that cushions and supports the joint. Without cartilage, the bones in the joint rub together, causing inflammation (swelling, redness, pain, and

warmth) and stiffness. Arthritis may affect the fingers, hips, knees, lower back, feet, or any joint in the body.

cancer
: A group of diseases in which cells divide abnormally and without control, and spread to nearby tissues and other parts of the body. Without treatment, cancer can stop organs from working normally, damage body systems, and cause the patient to die. Cancer may be caused by multiple factors, such as radiation, sunlight, tobacco, certain viruses, and poisonous chemicals; however, the cause of many cancers is unknown.

cardiovascular disease
: CVD. A general term referring to disorders of the heart and blood vessels. CVD includes coronary artery disease, heart failure, atherosclerosis, high blood pressure, peripheral artery disease, and stroke.

chemotherapy
: A chemical that kills bacteria, viruses, fungi, or tumor cells. It usually refers to drugs used in cancer treatment.

colon
: A tube-like organ about 5 feet long in adults that is connected to the small intestine at one end and the anus at the other. The colon absorbs water, some nutrients, and electrolytes (such as sodium and chloride) from partially digested food. The remaining material (solid waste called stool) moves through the colon to the rectum and leaves the body through the anus as a bowel movement. The colon is part of the digestive system (a series of organs from the mouth to the anus). Also called the large intestine.

consume
: To eat or drink.

dairy food
: Milk and products made with milk, such as buttermilk, yogurt, cheese, cottage cheese, and ice cream.

deficiency
: An amount that is not enough; a shortage.

deoxyribonucleic acid
: DNA. The molecules inside cells that carry genetic information and pass it from one generation to the next.

dialysis
: The process of filtering the blood when the kidneys are not able to cleanse it.

diarrhea
: Loose, watery stools.

dietary fiber
: A substance in plants that you cannot digest. It adds bulk to your diet to make you feel full, helps prevent constipation, and may help lower the risk of heart disease and diabetes. Good sources of dietary fiber include whole grains (such as brown rice, oats, quinoa, bulgur, and popcorn), legumes (such as black beans, garbanzo beans, split peas, and lentils), nuts, seeds, fruit, and vegetables.

Dietary Guidelines for Americans
: Advice from the federal government to promote health and reduce the chance (risk) of long-lasting (chronic) diseases through nutrition and physical activity. The Guidelines are updated and published every 5 years by the US Department of Health and Human Services and the US Department of Agriculture.

dietary supplement

A product that is intended to supplement the diet. A dietary supplement contains one or more dietary ingredients (including vitamins, minerals, herbs or other botanicals, amino acids, and other substances) or their components; is intended to be taken by mouth as a pill, capsule, tablet, or liquid; and is identified on the front label of the product as being a dietary supplement.

drug

Any substance (other than food) that is used to prevent, diagnose, treat, or relieve symptoms of a disease or abnormal condition. Also, a substance that alters mood or body function or that can be habit-forming or addictive, especially a narcotic.

esophagus

The muscular tube through which food passes from the throat to the stomach.

fortified

When nutrients (such as vitamins and minerals) are added to a food product. For example, when calcium is added to orange juice, the orange juice is said to be “fortified with calcium”. Similarly, many breakfast cereals are “fortified” with several vitamins and minerals.

free radical

An atom or molecule made in the body that can damage cells. A free radical has at least one unpaired electron, which makes it unstable. To become stable, the free radical takes an electron away from another atom, which makes *that* atom unstable, and starts a chain reaction that can injure cells. Free radicals are made during chemical changes that take place in a cell or an organism to produce energy and basic materials needed for important life processes (metabolism). They also come from tobacco smoke, pollution, radiation from the sun and x-rays, and other sources outside the body. Free radicals damage cells, cause genetic alterations (mutations), and may play a role in cancer, heart disease, and age-related diseases (such as Alzheimer’s, Parkinson’s, and Lou Gehrig’s diseases). Free radicals are also beneficial; they are involved in killing germs (microorganisms) and they help hormones and chemical messengers communicate with cells. Proteins (enzymes) made by the body, and vitamin C, vitamin E, and beta carotene in the diet help prevent free radical damage.

gland

A small organ that makes and releases a substance such as sweat, tears, saliva, milk, a hormone, or substances that aid in digestion.

heart attack

The blockage of an artery supplying blood and oxygen to the heart, resulting in the damage or death of a section of heart muscle.

heart failure

A condition in which the heart is unable to pump the amount of blood needed by the body. It is caused by high blood pressure, heart attack, and other disorders of the heart or blood vessels. Also called congestive heart failure.

infant

A child younger than 12 months old.

infection

The invasion and spread of germs in the body. The germs may be bacteria, viruses, yeast, or fungi.

infertility

The inability to produce children.

interaction

A change in the way a dietary supplement acts in the body when taken with certain other supplements, medicines, or foods, or when taken with certain medical conditions. Interactions may cause the dietary supplement to be more or less effective, or cause effects on the body that are not expected.

iodine
: A mineral the body needs to make thyroid hormones, which control metabolism (the process of turning the food you eat into energy your body can use) and many other essential functions, including bone and brain development during pregnancy and infancy. Iodine is found in seaweed, seafood, dairy products, grain products, eggs, and iodized salt.

kidney
: One of two organs that remove waste from the blood (as urine). The kidneys also make erythropoietin (a substance that stimulates red blood cell production) and help regulate blood pressure. The kidneys are located near the back under the lower ribs.

kidney failure
: Loss of kidney function. When kidney failure is caused by an acute (sudden and short-term) condition, such as a traumatic injury or poisoning, the kidneys may be able to recover. Usually, however, kidney failure is caused by chronic (long-term) conditions such as high blood pressure and diabetes. Chronic diseases permanently damage kidney tissue; treatments include dialysis and kidney transplantation.

lung
: An organ in the chest that supplies oxygen to the body and removes carbon dioxide. There are two lungs in the body.

microgram
: µg or mcg. A unit of weight in the metric system equal to one millionth of a gram. (A gram is approximately one-thirtieth of an ounce.)

mineral
: In nutrition, an inorganic substance found in the earth that is required to maintain health.

nausea
: The uneasy feeling of having an urge to throw up (vomit).

nervous system
: The brain and spinal cord, including the network of nerves that carry messages back and forth between the brain and all parts of the body. The nervous system controls what the body does.

nutrient
: A chemical compound in food that is used by the body to function and maintain health. Examples of nutrients include proteins, fats, carbohydrates, vitamins, and minerals.

Office of Dietary Supplements
: ODS, Office of Disease Prevention, Office of Director, National Institutes of Health, Department of Health and Human Services. ODS strengthens knowledge and understanding of dietary supplements by evaluating scientific information, stimulating and supporting research, disseminating research results, and educating the public to foster an enhanced quality of life and health for the US population.

pharmacist
: A person licensed to make and dispense (give out) prescription drugs and who has been taught how they work, how to use them, and their side effects.

poultry
: Birds that are raised for eggs or meat, including chickens, turkeys, ducks, and geese.

prescription
: A written order from a health care provider for medicine, therapy, or tests.

risk
: The chance or probability that a harmful event will occur. In health, for example, the chance that someone will develop a disease or condition.

selenium

A mineral required in very small amounts to make important enzymes that are essential for good health. Selenium is found in some foods, including plant foods grown in selenium-rich soil, and some meats and seafood.

supplement

A nutrient that may be added to the diet to increase the intake of that nutrient. Sometimes used to mean dietary supplement.

thyroid

A gland located in the front of the neck, below the larynx (Adam's apple). The thyroid makes hormones that circulate in the bloodstream and affect brain development, metabolism, weight, breathing, heart rate, blood pressure, nervous system functions, body temperature, muscle strength, skin dryness, menstrual cycles, and cholesterol levels.

treat

To care for a patient with a disease by using medicine, surgery, or other approaches.

tremor

A trembling or shaking in one or more parts of the body, usually the hands. An individual can also have tremors in the arms, head, face, vocal cords, torso, and legs.

upper limit

UL. The largest daily intake of a nutrient considered safe for most people. Taking more than the UL is not recommended and may be harmful. The UL for each nutrient is set by the Food and Nutrition Board at the National Academies of Sciences, Engineering, and Medicine. For example, the UL for vitamin A is 3,000 micrograms/day. Women who consume more than this amount every day shortly before or during pregnancy have an increased chance (risk) of having a baby with a birth defect. Also called the tolerable upper intake level.

US Department of Agriculture

USDA promotes America's health through food and nutrition, and advances the science of nutrition by monitoring food and nutrient consumption and updating nutrient requirements and food composition data. USDA is responsible for food safety, improving nutrition and health by providing food assistance and nutrition education, expanding markets for agricultural products, managing and protecting US public and private lands, and providing financial programs to improve the economy and quality of rural American life.

vitamin

A nutrient that the body needs in small amounts to function and maintain health. Examples are vitamins A, C, and E.

Updated: March 22, 2021 History of changes to this fact sheet