

A Detailed Guide to Antioxidants: Why They're Beneficial and the Best Sources

From Every Day Health

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To reap the benefits of antioxidants, reach for a handful of fresh, juicy berries. Florian Kunde/500px

You've probably heard the word antioxidant before — maybe in a health magazine, a story headline online, or even in your doctor's office. But how much do you know about these important nutrients? Here, we explain what antioxidants are, how they function in the body, how to increase your intake, and more.

What Is an Antioxidant and Why Is It Important?

In order to understand what an antioxidant is, we must remember some basics from science class. Atoms are made up of protons, electrons, and neutrons. Molecules are made of two or more atoms. In order for a molecule to remain stable, it must contain the

right number of electrons; otherwise it will turn into a “free radical.” Free radicals are dangerous molecules that attack good molecules that promote essential body functions. These “pro-oxidants” are produced by internal and external exposures. Antioxidants combat free radicals that cause various diseases such as cancer, diabetes, and heart disease. Free radicals are a natural part of human metabolism, but problems happen when the balance of free radicals and antioxidants is thrown off. This imbalance is called oxidative stress.

Antioxidants are considered free radical scavengers. Exposure to air pollution, heavy metals, and cigarette smoke can cause free radical damage, increasing the risk of autoimmune diseases, diabetes, heart disease, Parkinson’s disease, Alzheimer’s disease, and cancer. (1)

Types of Antioxidants and the Top Food Sources

According to the U.S. Department of Agriculture's MyPlate guidelines, there are various types of antioxidants – each of which may play an important role in your health.

Phytonutrients

These are chemical compounds found in plants, and they have a variety of possible health benefits for the body, including antioxidant activity. Scientists estimate there are more than 4,000 phytonutrients, though only a small fraction have been closely studied. Some of the more studied phytonutrients include:

Anthocyanins

These are found in blue and purple fruits and veggies, such as berries, eggplant, purple potatoes, carrots, and asparagus. These antioxidants help promote blood vessel health.

Resveratrol

This type of antioxidant is found dark chocolate, red wine, peanuts, and grapes. They have been shown to help promote heart and lung health, help prevent certain types of cancer, and reduce inflammation overall.

Isoflavones

They’re found in soybeans. They may help promote bone health, decrease joint inflammation, ease menopause symptoms, and help protect against breast cancer.

Lycopene

This is found in tomatoes and tomato products, pink grapefruit, watermelon, and red peppers. These help promote prostate and heart health.

Lutein

This antioxidant is found in spinach, Brussels sprouts, broccoli, lettuce, kale, artichokes, and collard greens. This antioxidant can help promote eye and heart health and may play a role in preventing some cancers.

This one is the precursor to vitamin A and this antioxidant is high in orange produce items such as carrots, apricots, sweet potatoes, and pumpkin. It is also found in dark leafy greens such as spinach, collard greens and kale. Beta-carotene plays a role in healthy vision, immunity, and bone health.

Vitamin and Mineral Sources of Antioxidants

Vitamins and minerals can also perform antioxidant activity. Here are some examples.

Vitamin E

This vitamin is found in eight various chemical forms in food, but alpha-tocopherol is the only form that meets human vitamin E needs.

In addition to helping the body carry out its normal functions, vitamin E limits the production of free radicals.

Foods high in vitamin E, along with their daily values (DVs), include:

- Wheat germ oil (1 tablespoon [tbsp]), 100 percent DV
- Sunflower seeds, dry roasted (1 ounce [oz]), 37 percent DV
- Almonds, dry roasted (1 oz), 34 percent DV
- Sunflower or safflower oil (1 tbsp), 25–28 percent DV
- Hazelnuts, dry roasted (1 oz), 22 percent DV

Vitamin C

If you see ascorbic acid listed on your food labels, your eats contain vitamin C. This nutrient is naturally occurring in many plant-based foods, and it not only acts as an antioxidant, but it revives other antioxidants attacked by free radicals such as vitamin E.

Research suggests vitamin C may help protect against various diseases, including certain types of cancers, and heart disease.

Foods high in vitamin C include:

- Red bell pepper, raw (½ cup), 158 percent DV
- Orange juice (¾ cup), 155 percent DV
- Orange (1 medium), 117 percent DV
- Grapefruit juice (¾ cup), 117 percent DV
- Kiwi (1 medium), 107 percent DV

Selenium

This vitamin exists in two forms: inorganic (selenate and selenite) and organic (selenomethionine and selenocysteine).

The body can use both forms of this vitamin, which you can get from various plants and animals.

Selenium is a powerful antioxidant that may help protect the heart and body from developing certain types of cancer.

Foods high in selenium include:

- Brazil nuts (1 oz), 777 percent DV
- Yellowfin tuna (3 oz), 131 percent DV
- Halibut (3 oz), 67 percent DV
- Sardines, in oil with bones (3 oz), 64 percent DV
- Ham, roasted (3 oz), 60 percent DV

Copper

This vitamin is both a pro-oxidant (meaning it causes free radical damage) and an antioxidant. Copper is composed of a powerful antioxidant enzyme and ceruloplasmin, a

protein responsible for transporting iron to your tissues. Balance of copper is the key — too much makes it destructive to the body and not enough doesn't provide ample protection.

Not getting enough copper affects the levels of selenium, iron, catalase, and glutathione — all powerful antioxidants. Foods high in copper include:

- Oysters (3 oz), 539 percent DV
- Black beans (1 cup), 181 percent DV
- Soy protein powder (1 scoop), 131 percent DV
- Granola (1 cup), 88 percent DV
- Tomato puree (1 cup), 80 percent DV

Manganese

Like copper, manganese is a powerful antioxidant. Manganese superoxide dismutase (MnSOD) is the main antioxidant enzyme in the mitochondria of every cell in the body.

As you may remember from high school chemistry, the mitochondria are considered the “powerhouses” of the cell because they are responsible for the production of energy.

Foods highest in manganese include:

- Pecans (1 oz), 57 percent DV
- Brown rice (½ cup cooked), 48 percent DV
- Pineapple (½ cup), 33 percent DV
- Almonds (1 oz), 28 percent DV
- Pineapple juice (½ cup), 27 percent DV

Zinc

This vitamin is instrumental in the activity of about 100 enzymes in the body. Among its known anti-inflammatory powers is protection of the arteries.

Zinc also helps maximize the immune system.

Foods high in zinc include:

- Oysters (3 oz), 607 percent DV
- Beef roast (3 oz), 47 percent DV

- Alaskan King crab (3 oz), 43 percent DV
- Beef patty (3 oz), 35 percent DV
- Breakfast cereal, fortified with 25 percent DV ($\frac{3}{4}$ cup), 25 percent DV total

Iron

This nutrient helps protect the cell membrane from damage (oxidation). It's found in two forms: iron connected to a special protein that helps with absorption (heme) and one without the attached protein (nonheme). Nonheme iron is found in plant foods and fortified foods, while meat, seafood, and poultry contain both nonheme and heme iron.

Foods high in iron include:

- Breakfast cereal, fortified with 100 percent DV ($\frac{3}{4}$ cup), 100 percent DV total
- Oysters (3 oz), 44 percent DV
- White beans, canned (1 cup), 44 percent DV
- Dark chocolate, 44–69 percent cacao solids (3 oz), 39 percent DV
- Beef liver (3 oz), 28 percent DV

Enzymes Are Another Type of Antioxidant That Fight Against Free Radicals

Enzymes convert free radicals to hydrogen peroxide and then water using a process that includes copper, zinc, manganese, and iron. Examples of enzymatic antioxidants include:

Superoxide dismutases (SODs) These are the major antioxidant defense system against free radicals. Formed in the body, they do require copper and manganese to make them work.

There are three forms: two varieties of copper-zinc superoxide dismutase (CuZnSOD) with one being in the cell and one located outside the cell, as well as manganese superoxide dismutase (MnSOD). Oysters and black beans are good sources of copper. Oysters also contain zinc, but zinc is also abundant in various seafood and beef cuts.

Glutathione peroxidase (GSHPx) This is a cell antioxidant enzyme that reduces hydrogen peroxide to water. Selenium is part of the regulation and translation which means it is a required mineral for this enzyme to activate. Selenium is highest in Brazil nuts and yellowfin tuna.

Catalase (CAT) This is also responsible for changing hydrogen peroxide to water using iron as its assistant (called a cofactor). Breakfast cereals, oysters, and white beans are high in iron.

Don't let these scientific names confuse you. The upshot is how important it is to eat foods rich in these minerals. All antioxidants are directly or indirectly influenced by the body's supply of vitamins and minerals. Any deficiencies could mean a reduction in antioxidant activity that can increase the oxidative stress you may be under.

Other Food Sources of Antioxidants to Know About

Herbs and spices contain compounds that have antioxidant effects on the body. In particular, research has zeroed in on the contents of phytonutrients (flavonoids). Although there are no specific intake recommendations, consider incorporating them as a part of healthy eating as functional food ingredients.

Spices with the highest flavonoids, from highest to lowest, are:

- Parsley
- Mexican oregano
- Celery seeds
- Capers
- Saffron
- Dill
- Thyme
- Fennel
- Coriander, leaves
- Wormwood
- Rosemary
- Ginger
- Mustard
- Sage
- Red onion
- Chile pepper
- Yellow pepper
- Tasmanian pepper

- Garlic

Essential Oils May Also Offer Antioxidant Benefits

These natural oils contain antioxidant and anti-inflammatory properties. Several factors can influence their effects — including harvesting time, mode of intake (skin, ingestion, or inhalation), temperature and weather, and growth and oil extraction methods. Be sure to check the U.S. Food and Drug Administration (FDA) for a list that is generally recognized as safe (GRAS).

You Can Increase Your Intake of Antioxidants With Supplements

Supplementing your diet is another way you can up your antioxidant intake. Supplements often come with a variety of the necessary forms of vitamins E and C and selenium.

But with antioxidant supplements, balance is key. Some studies suggest that certain antioxidants, such as beta-carotene and vitamin E, may increase mortality, with a possible similar outcome with vitamin C and selenium (but more studies are needed).

For people with cancer, antioxidant supplements may be counterproductive, causing cancer cells to grow rather than die in some cases. Additionally, supplements may interact with cancer treatment or medications and should be avoided.

Be sure to talk to your doctor before taking any supplements, regardless of whether you're on medication or have a preexisting health condition such as cancer. It's always best to get your nutrients from nutritious, whole foods rather than supplements.

And remember, supplements fall under the Dietary Supplement Health Education Act (DSHEA), but are not regulated for safety or efficacy by the FDA.

The Bottom Line on Antioxidants and Their Health Benefits

Antioxidants are powerful components that may help protect your body from disease. When possible, enjoy foods rich in a variety of antioxidants to reap all their possible health benefits.

If you choose to supplement or use essential oils to get your fix, consult your healthcare team to see if this is the right fit for you.