

Vitamin E

Vitamin E is found naturally in some foods, added to others, and available as a dietary supplement. The name “vitamin E” is actually the collective name for a group of fat-soluble compounds with very distinctive antioxidant activities.^[18] Naturally occurring vitamin E exists in eight chemical forms (alpha-, beta-, gamma- and delta-tocopherol and alpha-, beta-, gamma- and delta-tocotrienol) that all have varying levels of biological activity.^[18] Overall, the alpha-tocopherol form is the most potent in the group of eight molecules and is the only form that is recognized to meet human requirements.

Vitamin E is an antioxidant that is important in the prevention of cancer and cardiovascular disease. As an antioxidant, vitamin E prevents cell damage by inhibiting the oxidation of lipids (fats) and the formation of free radicals. It protects other fat-soluble vitamins from destruction by oxygen and aids in the utilization of vitamin A. It retards aging and may prevent age spots.^[19]

Antioxidants protect cells from the damaging effects of free radicals, which are molecules that contain an unshared electron. Free radicals damage cells and might contribute to the development of cardiovascular disease and cancer.^[23] Unshared electrons are highly energetic and react rapidly with oxygen to form reactive oxygen species (ROS). The body forms ROS endogenously when it converts food to energy, and antioxidants might protect cells from the damaging effects of ROS. The body is also exposed to free radicals from environmental exposures, such as cigarette smoke, air pollution, and ultraviolet radiation from the sun.

Functions of vitamin E in your body:

[1,2,3,4,5,6,7,19]

- Antioxidant
- Can stop cholesterol-like substances from damaging your blood vessels and causing heart disease and stroke
- Can increase your immune system
- Aids ovaries in functioning properly
- Inhibits platelet adhesion
- Helps protect neurons in your brain from beta amyloid protein-induced oxidant toxicity (helps prevent Alzheimer’s disease)
- Protects vitamin A and increases its storage
- May enhance sperm production in some men
- Maintains healthy nerves and muscles while strengthening capillary walls
- Helps to prevent anemia
- Helps to prevent retrolental fibroplasias (an eye disorder that can affect premature infants)
- Improves athletic performance and relaxes leg cramps
- Can act as an estrogen substitute and relieve hot flashes
- Helps relieve atrophic vaginitis
- Improves the action of insulin
- Necessary for tissue repair
- Improves circulation
- Promotes normal blood clotting and healing
- Reduces scarring from some wounds
- Reduces blood pressure
- Aids in preventing cataracts
- Promotes healthy skin and hair



The following are sources of vitamin E from most to least: ^[9]

- | | | |
|-----------------------|-----------------------|--------------------------|
| 1. Wheat germ | 12. Peanuts (roasted) | 23. Pecans |
| 2. Sunflower seeds | 13. Peanut butter | 24. Rye & wheat crackers |
| 3. Sunflower seed oil | 14. Butter | 25. Whole wheat bread |
| 4. Safflower oil | 15. Spinach | 26. Carrots |
| 5. Almonds | 16. Oatmeal | 27. Peas |
| 6. Sesame oil | 17. Bran | 28. Walnuts |
| 7. Peanut oil | 18. Asparagus | 29. Bananas |
| 8. Corn oil | 19. Salmon | 30. Eggs |
| 9. Peanuts | 20. Brown rice | 31. Tomatoes |
| 10. Olive oil | 21. Rye (whole) | 32. Lamb |
| 11. Soybean oil | 22. Dark rye bread | |

Vitamin E may be used to treat: ^[10,11,12]

- Prevent and treat heart disease
- Claudication (pain in legs with exercise)
- Fibrocystic breast disease
- PMS
- Hot flashes
- Painful menstrual cramps
- Hepatitis
- Restless leg syndrome
- Scleroderma/autoimmune diseases
- Osteoporosis

Vitamin E and Your Health

Many claims have been made about vitamin E's potential to promote health and prevent and treat disease. The mechanisms by which vitamin E might provide this protection include its function as an antioxidant and its roles in anti-inflammatory processes, inhibition of platelet aggregation and immune enhancement. ^[22]

Atherosclerosis ^[15]

Of all the antioxidants, vitamin E may offer the greatest protection against the oxidation of LDL cholesterol because of its ability to be easily incorporated into the LDL molecule. According to several studies, there is a clear cut correlation between the dosage and effect of vitamin E. Meaning, the higher the dosage of vitamin E, the greater the degree of protection against oxidative damage to LDL cholesterol. It has been shown that dosages as low as 25mg are effective in offering some protection, although typically doses greater than 400IU are required to produce clinically significant effects. Vitamin E may provide additional benefits in protecting against heart disease and strokes by its ability to:

- Reduce LDL cholesterol peroxidation and increase plasma LDL breakdown
- Inhibit excessive platelet aggregation
- Increase HDL cholesterol levels
- Increase fibrinolytic activity

Atrophic vaginitis ^[16]

According to several studies, vitamin E supplementation was shown to improve not only the symptoms, but also the blood supply to the vaginal wall when taken for at least 4 weeks. ^[13] A follow-up study demonstrated that vitamin E (400IU/day) was effective in about 50% of postmenopausal women with atrophic vaginitis. ^[14] Vitamin E oil, creams, ointments, or suppositories can be used topically to provide symptomatic relief of atrophic vaginitis. Vitamin E is usually quite effective in relieving the dryness and irritation of atrophic vaginitis as well as other forms of vaginitis.

Cancer

Antioxidant nutrients like vitamin E protect cell constituents from the damaging effects of free radicals that, if unchecked, might contribute to cancer development.^[21] Vitamin E might also block the formation of carcinogenic nitrosamines formed in the stomach from nitrites in foods and protect against cancer by enhancing immune function.^[23] Some research has linked higher intakes of vitamin E with a decreased incidence of breast and prostate cancers.^[24]

Diabetes^[17]

Diabetics appear to have an increased requirement for vitamin E. High dose of vitamin E (900IU) not only improves insulin action, but also exerts a number of beneficial effects that may aid in preventing the long-term complications of diabetes.

Eye Disorders

Age-related macular degeneration (AMD) and cataracts are among the most common causes of significant vision loss in older people. Their etiologies are usually unknown, but the cumulative effects of oxidative stress have been suggested to play a role. If so, nutrients with antioxidant functions, such as vitamin E, could be used to prevent or treat these conditions.

The Age-Related Eye Disease Study (AREDS), a large randomized clinical trial, revealed that participants with early stage AMD could slow the progression of their disease by taking a daily supplement of vitamin E (400IU), vitamin C (500mg), beta-carotene (15mg), zinc (80mg), and copper (2mg) for an average of 6.3 years compared to participants taking a placebo.^[25] Several observational studies have revealed a potential relationship between vitamin E supplements and the risk of cataract formation. One prospective study found that lens clarity was superior in participants who took vitamin E supplements and those with higher blood levels of the vitamin.^[26] In another study, long-term use of vitamin E supplements was associated with slower progression of age-related lens opacification.^[27]

Overall, the evidence available is inconsistent with respect to whether vitamin E supplements, taken alone or in combination with other antioxidants, can reduce the risk of developing AMD or cataracts. However, the formulation of vitamin E, other antioxidants, zinc, and copper used in AREDS holds promise for slowing the progression of AMD in people with early-stage disease.

Vitamin E Deficiency:

Vitamin E deficiency may result in damage to red blood cells and destruction of nerves. According to several studies, low levels of vitamin E in the body have been linked to bowel and breast cancer. People with fat-malabsorption disorders are more likely to become deficient than people without such disorders because the digestive tract requires fat to absorb vitamin E. In addition, people with Crohn's disease, cystic fibrosis, or an inability to secrete bile from the liver into the digestive tract, for example, often pass greasy stools or have chronic diarrhea; as a result they sometimes require water-soluble forms of vitamin E.^[22]

Signs of deficiency can include:^[19,20,22]

- Infertility (in both men and women)
- Menstrual problems
- Neuromuscular impairment
- Shortened red blood cell lifespan
- Spontaneous abortion (miscarriage)
- Uterine degeneration
- Peripheral neuropathy
- Ataxia
- Skeletal myopathy
- Retinopathy
- Impairment of the immune response

Things that can decrease vitamin E levels: ^[8]

- High levels of vitamin A
- High intake of wheat bran
- High intake of pectin
- High intake of alcohol
- Smoking

Dosage ^[32]

The following are tolerable upper intake levels for vitamin E. These levels are the highest average daily intake level that is likely to pose no risk of adverse health effects to individuals in the general population. Please be advised that with any over the counter supplement it is best to discuss the options with your physician before beginning the regimen.

Age	Male	Female	Pregnancy	Lactation
1-3 years	200mg (300IU)	200mg (300IU)		
4-8 years	300mg (450IU)	300mg (450IU)		
9-13 years	600mg (900IU)	600mg (900IU)		
14-18 years	800mg (1,200IU)	800mg (1,200IU)	800mg (1,200IU)	800mg (1,200IU)
19+ years	1,000mg (1,500IU)	1,000mg (1,500IU)	1,000mg (1,500IU)	1,000mg (1,500IU)

Interactions with medications

Vitamin E supplements have the potential to interact with several types of medications. Please be advised if you are taking any of the following:

Anticoagulant and antiplatelet medications

Vitamin E can inhibit platelet aggregation and antagonize vitamin K-dependent clotting factors. As a result, taking large doses with anticoagulant or antiplatelet medications, such as warfarin (Coumadin®), can increase the risk of bleeding, especially in conjunction with low vitamin K intake. The amounts of supplemental vitamin E needed to produce clinically significant effects are unknown but probably exceed 400IU/day.^[28]

Chemotherapy and radiotherapy

Oncologists generally advise against the use of antioxidant supplements during cancer chemotherapy or radiotherapy because they might reduce the effectiveness of these therapies by inhibiting cellular oxidative damage in cancerous cells.^[29,30] Although a systematic review of randomized controlled trials has called this concern into question^[31], further research is needed to evaluate the potential risks and benefits of concurrent antioxidant supplementation with conventional therapies for cancer.

References:

1. Bland, J., *Clinical Nutrition: A Functional Approach*. Gig Harbor, Washington: Institute for Functional Medicine, 1999, p. 130.
2. Meydani, S., et al., "Vitamin E supplementation and in vivo immune response in healthy elderly subjects," *JAMA* 1997; 277:1380-86.
3. Chan, A, et al., "Vitamin E and atherosclerosis," *J. Nutr* 1998; 128(10):1593-96.
4. Freedman, F., et al., "Alpha-tocopherol inhibits aggregation of human platelets by a protein kinase C-dependent mechanism," *Circulation* 1996; 94(10):2434-40.
5. Behl, C., et al., "Vitamin E protects nerve cell from amyloid and protein toxicity," *Biochem Biophys J. Res Commun* 1992; 186(2):944-50.
6. Packer, L., *The Antioxidant Miracle*. New York: John Wiley & Sons, Inc., 1999, p. 66.
7. Paolisso, G., et al., "Vitamin E improves the action of insulin," *Diabetes Care* 1989; 12:265-69.
8. Fillion, M., *Natural Prostate Healers*. Paramus, NJ: Prentice Hall Press, 1999, p. 93.
9. Bland, J., *Clinical Nutrition: A Functional Approach*. Gig Harbor, Washington: Institute for Functional Medicine, 1999, p.130.
10. Sano, M., et al., "A controlled trial of selegiline, alpha-tocopherol, or both as treatment for Alzheimer's disease. The Alzheimer's disease cooperative study," *NEJM* 1997; 336:1216-22.
11. Gaby, A., *Nutritional Therapy in Medical Practice*. Carlisle, PA: Nutrition Seminars, 2003, p. 26--7.
12. Lethem, R., et al., "Antioxidants and dementia," *Lancet* 1997; 348: 1189.
13. Christy CJ. Vitamin E in menopause. *Am J Ob Gyn* 1945; 50: 84-87
14. McLaren HC. Vitamin E in the menopause. *Br Med J* 1949; ii: 1378-1381.
15. Pizzorno Jr., Joseph E., and Michael T. Murray. *Textbook of Natural Medicine*. 2nd. 2. Churchill Livingstone, 2000. 1118-9. Print.
16. Pizzorno Jr., Joseph E., and Michael T. Murray. *Textbook of Natural Medicine*. 2nd. 2. Churchill Livingstone, 2000. 1393. Print.
17. Pizzorno Jr., Joseph E., and Michael T. Murray. *Textbook of Natural Medicine*. 2nd. 2. Churchill Livingstone, 2000. 1209. Print.
18. Traber MG. Vitamin E. In: Shils ME, Shike M, Ross AC, Caballero B, Cousins R, eds. *Modern Nutrition in Health and Disease*. 10th ed. Baltimore, MD: Lippincott Williams & Wilkins, 2006;396-411.
19. Verhagen H, Buijsse B, Jansen E, Bueno-de-Mesquita B. The state of antioxidant affairs. *Nutr Today* 2006;41:244-50.
20. Institute of Medicine. Food and Nutrition Board. Dietary Reference Intakes: Vitamin C, Vitamin E, Selenium, and Carotenoids. Washington, DC: National Academy Press, 2000.
21. U.S. Department of Agriculture, Agricultural Research Service. 2010. USDA National Nutrient Database for Standard Reference, Release 23.
22. Kowdley KV, Mason JB, Meydani SN, Cornwall S, Grand RJ. Vitamin E deficiency and impaired cellular immunity related to intestinal fat malabsorption. *Gastroenterology* 1992;102:2139-42. [PubMed abstract]
23. Weitberg AB, Corvese D, Effect of vitamin E and beta-carotene on DNA strand breakage induced by tobacco-specific nitrosamines and stimulated human phagocytes. *J Exp Clin Cancer Res* 1997; 16:11-4. [PubMed abstract]
24. Chan JM, Stampfer MJ, Giovannucci EL. What causes prostate cancer? A brief summary of the epidemiology. *Semin Cancer Biol* 1998;8:263-73. [PubMed abstract]
25. Age-Related Eye Disease Study Research Group. A randomized, placebo-controlled, clinical trial of high-dose supplementation with vitamins C and E, beta carotene, and zinc for age-related macular degeneration and vision loss: AREDS report no. 8. *Arch Ophthalmol* 2001;119:1417-36. [PubMed abstract]
26. Leske MC, Chylack LT Jr, He Q, Wu SY, Schoenfeld E, Friend J, et al. Antioxidant vitamins and nuclear opacities: the longitudinal study of cataract. *Ophthalmology* 1998;105:831-6. [PubMed abstract]
27. Jacques PF, Taylor A, Moeller S, Hankinson SE, Rogers G, Tung W, et al. Long-term nutrient intake and 5-year change in nuclear lens opacities. *Arch Ophthalmol* 2005;123:517-26. [PubMed abstract]
28. Natural Medicines Comprehensive Database. Vitamin E.
29. Doyle C, Kushi LH, Byers T, Courneya KS, Denmark-Wahnefried W, Grant B, et al., for the 2006 Nutrition, Physical Activity and Cancer Survivorship Advisory Committee. Nutrition and physical activity during and after cancer treatment: an American Cancer Society guide for informed choice. *CA Cancer J Clin* 2006;56:323-53. [PubMed abstract]
30. Lawenda BD, Kelly KM, Ladas EJ, Sagar SM, Vickers A, Blumberg JB. Should supplemental antioxidant administration be avoided during chemotherapy and radiation therapy? *J Natl Cancer Inst* 2008;100:773-83. [PubMed abstract]
31. Block KI, Koch AC, Mead MN, Tothy PK, Newman RA, Gyllenhaal C. Impact of antioxidant supplementation on chemotherapeutic efficacy: a systematic review of the evidence from randomized controlled trials. *Cancer Treat Rev* 2007;33:407-18. [PubMed abstract]
"Dietary Supplement Fact Sheet: Vitamin E." Office of Dietary Supplements. National Institutes of Health, 24 Jun 2011. Web. 3 Oct 2011. <http://ods.od.nih.gov/factsheets/vitamine>.