

Vitamin E

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While some complementary and alternative techniques have been studied scientifically, high-quality data regarding safety, effectiveness, and mechanism of action are limited or controversial for most therapies. Whenever possible, it is recommended that practitioners be licensed by a recognized professional organization that adheres to clearly published standards. In addition, before starting a new technique or engaging a practitioner, it is recommended that patients speak with their primary healthcare provider(s). Potential benefits, risks (including financial costs), and alternatives should be carefully considered. The below monograph is designed to provide historical background and an overview of clinically-oriented research, and neither advocates for or against the use of a particular therapy.

Related Terms:

- All rac-alpha-tocopherol, alpha-tocopherol, alpha tocopherol acetate, alpha tocopheryl acetate, alpha tocotrienol, antisterility vitamin, beta-tocopherol, beta-tocotrienol, d-alpha-tocopherol, d-alpha-tocopheryl, d-alpha-tocopheryl acetate, d-alpha-tocopheryl succinate, d-beta-tocopherol, d-delta-tocopherol, delta-tocopherol, delta-tocotrienol, d-gamma-tocopherol, dl-alpha-tocopherol, dl-alpha-tocopheryl acetate, dl-tocopherol, d-tocopherol, d-tocopheryl acetate, dl-tocopherol, gamma-tocopherol, gamma-tocotrienol, mixed tocopherols, RRR-alpha-tocopherol, Spondyvit®, tocopherol, tocotrienol, tocotrienol concentrate, tocopheryl succinate.

BACKGROUND

- Vitamin E is a fat-soluble vitamin with antioxidant properties. Vitamin E exists in eight different forms (isomers): alpha, beta, gamma, and delta tocopherol; and alpha, beta, gamma, and delta tocotrienol. Alpha-tocopherol is the most active form in humans. Dosing and daily allowance recommendations for vitamin E are often provided in Alpha-Tocopherol Equivalents (ATE) to account for the different biological activities of the various forms of vitamin E, or in International Units (IU), which food and supplement labels may use. Vitamin E supplements are available in natural or synthetic forms. The natural forms are usually labeled with the letter "d" (for example, d-gamma-tocopherol), whereas synthetic forms are labeled "dl" (for example, dl-alpha-tocopherol).
- Vitamin E has been proposed for the prevention or treatment of numerous health conditions, often based on its antioxidant properties. However, aside from the treatment of vitamin E deficiency (which is rare), there are no clearly proven medicinal uses of vitamin E supplementation beyond the recommended daily allowance. There is ongoing research in numerous diseases, particularly in cancer and heart disease.
- Recent concerns have been raised about the safety of vitamin E supplementation, particularly in high doses. An increased risk of bleeding has been proposed, particularly in patients taking blood-thinning agents such as warfarin, heparin, or aspirin, and in patients with vitamin K deficiency. Recent evidence suggests that regular use of high-dose vitamin E supplements may increase the risk of death (from "all causes") by a small amount, although a different study found no effects on mortality in women who took vitamin E daily. Caution is warranted.

SCIENTIFIC EVIDENCE

Uses <i>These uses have been tested in humans or animals. Safety and effectiveness have not always been proven. Some of these conditions are potentially serious, and should be evaluated by a qualified healthcare provider.</i>	<u>Grade</u> [*]
<p><u>Vitamin E deficiency</u></p> <p>Vitamin E deficiency is rare, and may occur in people with diminished fat absorption through the gut (due to surgery, Crohn's disease, or cystic fibrosis), malnutrition, very low-fat diets, several specific genetic conditions (abetalipoproteinemia, "Ataxia and Vitamin E deficiency" [AVED]), very low birth weight premature infants, or infants taking unfortified formulas. Vitamin E supplementation is accepted as an effective therapy for vitamin E deficiency to halt progression of complications. Diagnosis of this condition and management should be under the care of a physician and nutritionist.</p>	<p><u>A</u></p>
<p><u>Allergic rhinitis</u></p> <p>Although thought to aid in reducing the nasal symptoms of allergies, vitamin E intake may not be effective. Current evidence is limited, however, and more studies are needed before a firm conclusion can be drawn.</p>	<p><u>C</u></p>
<p><u>Altitude sickness</u></p> <p>Vitamin E may offer some benefits in exposure to high altitude. Antioxidant supplementation (vitamin E with beta carotene, vitamin C, selenium, and zinc) may improve ventilatory threshold at high altitudes; however, antioxidants may not reduce inflammation after exercise at high altitudes. More research is needed before conclusions can be drawn.</p>	<p><u>C</u></p>
<p><u>Amyotrophic lateral sclerosis (ALS)</u></p> <p>There is unclear evidence of Vitamin E for treatment of ALS. More studies are needed before a strong recommendation can be made.</p>	<p><u>C</u></p>
<p><u>Anemia</u></p> <p>Studies of vitamin E supplementation for anemia have yielded mixed results. Further research is needed before a firm recommendation can be made.</p>	<p><u>C</u></p>
<p><u>Angina (chest pain)</u></p> <p>Vitamin E has been suggested and evaluated in patients with angina, although possible benefits remain unclear. Further evidence is necessary before a clear conclusion can be drawn. Patients with known or suspected angina should be evaluated by a physician.</p>	<p><u>C</u></p>

<p><u>Antioxidant</u></p> <p>Vitamin E possesses antioxidant activity, but it is not clear if there is any benefit of this property in humans. The American Heart Association has recommended obtaining antioxidants such as vitamin E by eating a well-balanced diet high in fruits, vegetables, and whole grains, rather than from supplements, until further scientific evidence is available.</p>	<p><u>C</u></p>
<p><u>Atherosclerosis (clogging and hardening of arteries)</u></p> <p>Vitamin E has been proposed to have a role in preventing or reversing atherosclerosis by inhibiting oxidation of low-density lipoprotein ("bad cholesterol"). Several population studies have suggested that a high dietary intake of vitamin E and high blood concentrations of alpha-tocopherol are associated with lower rates of heart disease. However, while the Cambridge Heart Antioxidant Study supported this hypothesis, the more recent prospective Heart Outcomes Prevention Evaluation (HOPE) study did not. This area remains controversial.</p>	<p><u>C</u></p>
<p><u>Bladder cancer</u></p> <p>There is preliminary evidence of possible benefits of long-term vitamin E supplementation to reduce the risk of mortality in bladder cancer patients, although additional research is necessary before a clear conclusion can be reached.</p>	<p><u>C</u></p>
<p><u>Breast cancer</u></p> <p>Vitamin E has been suggested as a possible therapy for the prevention or treatment of breast cancer. Published studies have included measurement of vitamin E levels, laboratory experiments, and population studies. Evidence remains inconclusive, and no clear conclusion can be drawn at this time.</p>	<p><u>C</u></p>
<p><u>Breast cancer-related hot flashes</u></p> <p>A study of oral vitamin E reports a very small reduction in hot flash frequency (approximately one less hot flash per day), but no preference among patients for vitamin E over placebo.</p>	<p><u>C</u></p>
<p><u>Cancer treatment</u></p> <p>There is a lack of reliable scientific evidence that vitamin E is effective as a treatment for any specific type of cancer. Caution is merited in people undergoing treatment with chemotherapy or radiation because it has been proposed that the use of high-dose antioxidants may actually reduce the anti-cancer effects of these therapies. This remains an area of controversy and studies have produced variable results. High doses of vitamin E supplements cause harm in some patients. Patients</p>	<p><u>C</u></p>

<p>results. High doses of vitamin E may also cause harm in cancer patients. Patients interested in using high-dose antioxidants such as vitamin E during chemotherapy or radiation should discuss this decision with their medical oncologist or radiation oncologist.</p>	
<p><u>Cardiovascular disease in dialysis patients</u></p> <p>It has been suggested that hemodialysis patients may be under increased oxidative stress, and therefore may benefit from the chronic use of antioxidants (particularly for the reduction of risk of heart disease). There is some research on the use of high-dose chronic vitamin E in dialysis patients for heart disease prevention, although benefits or risks remain unclear in this population. Recent concern has been raised that regular use of high-dose vitamin E supplements may actually increase the risk of death (from "all causes") by a small amount, although this remains an area of controversy and active investigation. Additional research is necessary in this area before a firm conclusion can be reached.</p>	<p><u>C</u></p>
<p><u>Cataract prevention</u></p> <p>There is conflicting evidence regarding the use of vitamin E to prevent cataracts. Although some studies across populations have suggested some protective effects (which may take up to 10 years to yield benefits), other studies in humans report a lack of benefits when used either alone or in combination with other antioxidants. Additional research is necessary before a clear conclusion can be reached.</p>	<p><u>C</u></p>
<p><u>Chemotherapy nerve damage (neurotoxicity)</u></p> <p>Like other antioxidants, vitamin E has been suggested as a therapy to prevent complications due to chemotherapy, such as nerve damage (neuropathy). There is some evidence of benefits, for example, when it is used with cisplatin. However, caution is merited because it is not known if the use of high-dose antioxidants during chemotherapy may actually reduce the anti-cancer effects of some chemotherapy agents or radiation therapy. This remains an area of controversy and patients interested in using antioxidants during chemotherapy should discuss this decision with their oncologist.</p>	<p><u>C</u></p>
<p><u>Colon cancer prevention</u></p> <p>There is not sufficient scientific evidence to determine if vitamin E prevents colon cancer. In patients with previous colon cancer, a combination of vitamins A, C, and E has been reported to reduce the risk of developing a new colon cancer. Preventive benefits have also been suggested in those with no prior colon cancer when vitamin E is used in a multivitamin, but not when used alone. Recent results of the Women's Health Study report no overall reduction in cancer risk with daily use of vitamin E, although this study was not large enough to look at colon cancer specifically. Additional research is necessary in this area before a firm conclusion can be reached.</p>	<p><u>C</u></p>

<p><u>Dementia / Alzheimer's disease</u></p> <p>Vitamin E has been proposed and evaluated for the prevention or slowing of dementia (including Alzheimer's type), based on antioxidant properties and findings of low vitamin E levels in some individuals with dementia. There is some evidence that all-rac-alpha-tocopherol (synthetic vitamin E) is similar in efficacy to selegiline (Eldepryl®) and superior to placebo for slowing cognitive function decline in patients with moderately severe Alzheimer's disease, but no additive effect was observed when used in combination with selegiline. Retrospective data suggests that long-term combination therapy with donepezil (Aricept®) may help slow cognitive decline in patients with Alzheimer's disease. Overall, the evidence remains inconclusive in his area.</p> <p>Other research suggests that vitamin E from dietary sources or supplements does not affect the risk of developing Alzheimer's disease or vascular dementia.</p>	<p><u>C</u></p>
<p><u>Diabetes mellitus</u></p> <p>Vitamin E has been proposed for the prevention of types I or II diabetes; for the improvement of abnormal sugar control in diabetes; for prevention of platelet dysfunction and atherosclerosis in diabetes; for the correction of vitamin E deficiency in diabetic patients; and for the prevention of diabetic complications of the eye, kidneys, and nervous system (neuropathy, retinopathy, nephropathy). It is not clear that vitamin E is beneficial in any of these areas, and further evidence is necessary before a clear conclusion can be drawn.</p>	<p><u>C</u></p>
<p><u>Dysmenorrhea (painful menstruation)</u></p> <p>There is preliminary evidence of possible benefits of vitamin E supplementation to reduce chronic menstrual pain, although additional research is necessary in this area before a firm conclusion can be reached.</p>	<p><u>C</u></p>
<p><u>G6PD deficiency</u></p> <p>Vitamin E supplementation has been studied for the inherited disorder G6PD deficiency with conflicting evidence. Additional research is necessary before a clear conclusion can be drawn.</p>	<p><u>C</u></p>
<p><u>Glomerulosclerosis (kidney disease)</u></p> <p>It has been suggested that proteinuria (protein in the urine) may be reduced with the use of vitamin E in patients with focal segmental glomerulosclerosis, which is refractory to standard medical management. However, further research is necessary before a clear conclusion can be drawn.</p>	<p><u>C</u></p>

<p><u>Healing after photorefractive keratectomy (laser eye surgery)</u></p> <p>High-dose vitamin E plus vitamin A (taken by mouth) may improve healing of the cornea and improve visual acuity (sharpness) following laser surgery for vision correction. Animal research suggests that topical vitamin E on the eye may be helpful. Additional research is necessary before this use of vitamin E can be concluded as being safe or effective.</p>	<p><u>C</u></p>
<p><u>Hepatitis (hepatitis C)</u></p> <p>In patients with hepatitis C on antiviral therapy, vitamin E has been proposed to prevent inflammation. More studies are needed to examine the effects of vitamin E in chronic hepatitis.</p>	<p><u>C</u></p>
<p><u>High cholesterol</u></p> <p>The effects of vitamin E on cholesterol levels and atherosclerosis have been studied in numerous laboratory, population, and clinical trials. It remains unclear if there are clinically meaningful benefits, and it is not known what the effects of vitamin E are compared to (or in combination with) other agents that have been clearly demonstrated as beneficial for lowering lipids. Further research is warranted before a clear conclusion can be drawn.</p>	<p><u>C</u></p>
<p><u>Immune system function</u></p> <p>Studies of the effects of vitamin E supplementation on immune system function have yielded mixed results. Further research is needed before a clear conclusion can be drawn.</p>	<p><u>C</u></p>
<p><u>Intermittent claudication</u></p> <p>Multiple studies have evaluated the use of vitamin E in patients with peripheral vascular disease, to improve exercise tolerance and intermittent claudication (pain in the legs with walking due to cholesterol buildup in blood vessels). Although some results have been promising, most studies have been small and poorly designed. It remains unclear if vitamin E is beneficial in this condition.</p>	<p><u>C</u></p>
<p><u>Macular degeneration (eye disease)</u></p> <p>Like other antioxidants, vitamin E has been suggested to prevent, slow progression, or improve macular degeneration. The scientific evidence in this area is not conclusive, although there is some suggestion that alone vitamin E may not be beneficial. In combination with beta-carotene and vitamin C, it may similarly not be significantly beneficial. Additional research is necessary before a clear conclusion can be drawn.</p>	<p><u>C</u></p>

<p><u>Parkinson's disease</u></p> <p>The scientific evidence is inconclusive in this area.</p>	<p><u>C</u></p>
<p><u>Premenstrual syndrome (PMS)</u></p> <p>The scientific evidence is inconclusive in this area.</p>	<p><u>C</u></p>
<p><u>Prostate cancer prevention</u></p> <p>The role of vitamin E supplementation for the prevention of prostate cancer is controversial. There are numerous laboratory studies that support possible anti-cancer properties. However, the results of population research and human research have been mixed, with some studies reporting benefits and others finding no effects.</p>	<p><u>C</u></p>
<p><u>Respiratory infection prevention</u></p> <p>Daily supplementation with oral vitamin E does not appear to affect the incidence, duration, or severity of pneumonia (lower respiratory tract infections) in elderly nursing home residents or alter patterns of antibiotic use, although there may be a protective effect against colds (upper respiratory tract infections). Additional research is warranted before a recommendation can be made.</p>	<p><u>C</u></p>
<p><u>Seizure disorder</u></p> <p>Vitamin E has been evaluated as an addition to other drugs used to prevent seizures, particularly in refractory epilepsy. This evidence is not conclusive enough to make a clear recommendation. The management of seizure disorder should be under medical supervision.</p>	<p><u>C</u></p>
<p><u>Steatohepatitis (inflamed liver)</u></p> <p>There is some evidence suggesting possible benefits in the management of steatohepatitis in children, although further evidence is necessary before a clear conclusion can be drawn.</p>	<p><u>C</u></p>
<p><u>Stomach cancer (prevention)</u></p> <p>Vitamin supplementation has been proposed to reduce the rate of stomach (gastric) cancer. However, there is some evidence suggesting that vitamin E does not reduce the rates of gastric cancer or pre-cancerous gastric lesions. More research is needed to examine whether vitamin E has any effects on gastric cancer.</p>	<p><u>C</u></p>
<p><u>Supplementation in preterm and very low birthweight infants</u></p>	

<p>Premature infants are at risk of vitamin E deficiency, particularly when they are born with very low birth weight. There are numerous studies of vitamin E given to premature infants to try to prevent potentially serious complications such as intraventricular hemorrhage (bleeding into the brain), retinopathy (eye damage), or death. The quality of published research is variable, and is not clearly conclusive. Premature infants should be under strict medical supervision, and decisions regarding vitamin supplementation should be made with the infant's physician.</p>	<p><u>C</u></p>
<p><u>Tardive dyskinesia (involuntary movements)</u></p> <p>Vitamin E has been studied in the management of tardive dyskinesia, and has been reported to significantly improve abnormal involuntary movements, although the results of existing studies are not conclusive enough to form a clear recommendation. Vitamin E may be more effective in higher doses and in people who have had tardive dyskinesia for less than five years.</p>	<p><u>C</u></p>
<p><u>Uveitis (inflammation of the eye)</u></p> <p>Four-month oral supplementation with vitamin E had no apparent effect on uveitis-associated macular edema or visual acuity in one small study. Additional research is necessary before a clear conclusion can be drawn.</p>	<p><u>C</u></p>
<p><u>Venous thromboembolism (VTE)</u></p> <p>Data suggests that supplementation with vitamin E may reduce the risk of VTE in women, and those with a prior history or genetic predisposition may particularly benefit.</p>	<p><u>C</u></p>
<p><u>Asthma</u></p> <p>There is preliminary evidence that vitamin E does not provide benefits in individuals with asthma.</p>	<p><u>D</u></p>
<p><u>Cancer prevention (general)</u></p> <p>Recent evidence from a well-conducted randomized controlled trial (the Women's Health Study) reports no reduction in the development of cancer with the use of natural-source vitamin E taken daily. Previously, there have been laboratory, population, and other human trials examining whether vitamin E is beneficial in preventing various types of cancer, including prostate, colon, or stomach cancer. Results of these prior studies have been variable. At this time, based on the best available scientific evidence, and recent concerns about the safety of vitamin E supplementation, vitamin E cannot be recommended for this use.</p>	<p><u>D</u></p>

<p><u>Heart disease prevention</u></p> <p>Numerous studies of vitamin E oral supplementation have suggested no benefits in the prevention of cardiovascular disease, and there is recent evidence to suggest that regular use of high-dose vitamin E increases the risk of death (from "all causes") by a small amount. These conclusions have been criticized by some experts.</p> <p>Recently, the Women's Health Study reported a reduction in cardiovascular deaths in women taking vitamin E daily (with 10 year follow-up), but no change in total death rate or number of heart attacks or strokes. Based on the balance of available scientific evidence, and in light of recent safety concerns, chronic use of vitamin E cannot be recommended for this purpose, and high-dose vitamin E should be avoided.</p>	<p><u>D</u></p>
<p><u>Osteoarthritis</u></p> <p>Vitamin E does not appear to reduce symptoms or prevent cartilage loss in knee osteoarthritis. There is a lack of evidence supporting the use of vitamin E in the management of osteoarthritis.</p>	<p><u>D</u></p>
<p><u>Peyronie's disease</u></p> <p>One study did not show significant improvement in pain, curvature, or plaque size in patients with Peyronie's disease (PD) treated with vitamin E, propionyl-L-carnitine, or vitamin E plus propionyl-L-carnitine compared with those treated with placebo.</p>	<p><u>D</u></p>
<p><u>Retinitis pigmentosa</u></p> <p>Oral vitamin E does not appear to slow visual decline in people with retinitis pigmentosa and may be associated with more rapid loss of visual acuity, although the validity of this finding has been questioned. Until further evidence is available, vitamin E may not be advisable in this condition. Therapy decisions should be under medical supervision.</p>	<p><u>D</u></p>
<p><u>Rheumatoid arthritis</u></p> <p>Vitamin E, taken by mouth, does not appear to reduce the risk of developing rheumatoid arthritis in women.</p>	<p><u>D</u></p>
<p><u>Scar prevention</u></p> <p>Application of topical vitamin E does not appear to reduce surgical wound scarring. Because of a risk of contact dermatitis, some authors have recommended against the use of this therapy.</p>	<p><u>D</u></p>

Stroke

Recent evidence from the Women's Health Study suggests that regular vitamin E supplementation daily does not reduce the risk of stroke. Prior evidence was indeterminate for stroke prevention or stroke recovery. At this time, based on the best available scientific evidence and recent safety concerns, vitamin E cannot be recommended for this use.

D

**Key to grades: A: Strong scientific evidence for this use; B: Good scientific evidence for this use; C: Unclear scientific evidence for this use; D: Fair scientific evidence against this use (it may not work); F: Strong scientific evidence against this use (it likely does not work).*

TRADITION/THEORY

The below uses are based on tradition, scientific theories, or limited research. They often have not been thoroughly tested in humans, and safety and effectiveness have not always been proven. Some of these conditions are potentially serious, and should be evaluated by a qualified healthcare provider. There may be other proposed uses that are not listed below.

- Abortifacient, acne, aging (prevention), aging skin, air pollution protection, allergies, amiodarone pulmonary toxicity prevention, bee stings, benign prostatic hypertrophy, beta-thalassemia, blood disorders (porphyria), breast pain/inflammation (mastitis), bronchopulmonary dysplasia in premature infants, bursitis, cardiomyopathy, celiac disease, chemotherapy extravasation, chorea (chronic progressive hereditary), congestive heart failure, Crohn's disease, cystic fibrosis, dermatitis, diaper rash, digestive enzyme/pancreatic insufficiency, doxorubicin hair loss prevention, Duchenne muscular dystrophy, dyspraxia, energy enhancement, exercise recovery, frostbite, gastric ulcer, granuloma annulare (topical vitamin E), hair loss, heart attack, transplant rejection prevention (heart), hereditary spherocytosis, Huntington's disease, hypertension, impaired glucose tolerance, impotence, leg cramps, liver disease (non-alcoholic liver disease), liver spots, lung cancer prevention, male fertility, menopausal symptoms, menstrual disorders, miscarriage, mucositis, muscle strength, myotonic dystrophy, neuromuscular disorders, nitrate tolerance, oral leukoplakia, labor pain, pancreatitis (chronic), peptic ulcers, physical endurance, poor posture, post-operative recovery (post-angioplasty restenosis prevention), pre-eclampsia prevention (high blood pressure in pregnancy), radiation-induced fibrosis, reperfusion injury protection during heart surgery, restless leg syndrome, sickle cell disease, skeletal muscle damage, skin damage caused by the sun, skin disorders, sperm motility, sunburn, thrombophlebitis (vein inflammation), ulcerative colitis.

DOSING

The below doses are based on scientific research, publications, traditional use, or expert opinion. Many herbs and supplements have not been thoroughly tested, and safety and effectiveness may not be proven. Brands may be made differently, with variable ingredients, even within the same brand. The below doses may not apply to all products. You should read product labels, and discuss doses with a qualified healthcare provider before starting therapy.

Dietary Sources of Vitamin E

- Foods that contain vitamin E include: eggs, fortified cereals, fruit, green leafy vegetables (such as spinach), meat, nuts/nut oils, poultry, vegetable oils (corn, cottonseed, safflower, soybean,

sunflower), argan oil, olive oil, wheat germ oil, and whole grains. Cooking and storage may destroy some of the vitamin E in foods.

Adults (over 18 years old)

- Most individuals in the United States are believed to obtain sufficient vitamin E from dietary sources, although individuals with very low-fat diets or intestinal malabsorption disorders may require supplementation. Recommended Dietary Allowances (RDAs) for vitamin E are provided in Alpha-Tocopherol Equivalents (ATE) to account for the different biological activities of the various forms of vitamin E, as well as in International Units (IU), which food and supplement labels often use. For conversion, 1 milligram ATE = 1.5 IU. The RDA for men or women older than 14 years old is 15 milligrams (or 22.5 IU); for pregnant women of any age is 15 milligrams (or 22.5 IU); and for breastfeeding women of any age is 19 milligrams (or 28.5 IU).
- For adults older than 18 years, the tolerable upper limit of dosing for supplementary alpha-tocopherol recommended by the U.S. Institute of Medicine is 1,000 milligrams per day (equivalent to 1,500 IU). This limit recommendation is not altered during pregnancy or breastfeeding.
- Treatment of vitamin E deficiency should be under medical supervision, tailored to the underlying cause of the deficiency, and may include either oral or injected vitamin E. If the cause is due to chronic malnutrition and there is no evidence of malabsorption, an oral dose that is between 2-5 times greater than the RDA may be considered. If the cause is malabsorption that cannot be corrected, then injections of vitamin E may be necessary. Dosing recommendations vary by the underlying cause.
- No specific dosing of vitamin E has been established for other conditions, and there is recent evidence suggesting possible adverse health effects of long-term use of daily supplementation with 400 IU or greater daily. Although controversial, the use of long-term vitamin E supplementation should be approached cautiously until further evidence from prospective clinical trials is available. Various doses and durations have been evaluated in clinical trials, although many have not been proven as effective or safe. Patients are recommended to discuss the choice of dosing and duration with a licensed healthcare professional.

Children (under 18 years old)

- Recommended Dietary Allowances (RDAs) for vitamin E are provided in Alpha-Tocopherol Equivalents (ATE) to account for the different biological activities of the various forms of vitamin E, as well as in International Units (IU), because food and supplement labels often use this system. For conversion, 1 milligram ATE = 1.5 IU. There is no RDA for infants, but there is a recommended Adequate Intake (AI) for healthy breastfeeding infants ages 0-6 months old of 4 milligrams per day (6 IU), and for infants ages 7-12 months old of 5 milligrams per day (7.5 IU). The RDA for children ages 1-3 years old is 6 milligrams per day (9 IU); for ages 4-8 years old is 7 milligrams per day (10.5 IU); for ages 9-13 years old is 11 milligrams per day (16.5 IU); for ages greater than 14 years old is 15 milligrams per day (22.5 IU); for pregnant women of any age is 15 milligrams (22.5 IU); and for breastfeeding women of any age is 19 milligrams (28.5 IU).
- An upper limit for infants up to 12 months of age has not been established. The tolerable daily upper limit of dosing for ages 1-3 years old is 200 milligrams (300 IU); for ages 4-8 years old is 300mg (450 IU); for ages 9-13 years old is 600 milligrams (900 IU); and for ages 14-18 is 800 milligrams (1,200 IU).

- Treatment of vitamin E deficiency should be under medical supervision, tailored to the underlying cause of the deficiency, and may include either oral or injected vitamin E. Selected doses in specific conditions are noted above under adult dosing. Vitamin E absorption may improve if given with meals, and in small doses.
- No specific dosing of vitamin E has been well established for other conditions.

SAFETY

The U.S. Food and Drug Administration does not strictly regulate herbs and supplements. There is no guarantee of strength, purity or safety of products, and effects may vary. You should always read product labels. If you have a medical condition, or are taking other drugs, herbs, or supplements, you should speak with a qualified healthcare provider before starting a new therapy. Consult a healthcare provider immediately if you experience side effects.

Allergies

- Skin reactions such as contact dermatitis and eczema have been reported with topical vitamin E preparations, such as ointments or vitamin E containing-deodorants. Individuals with known or suspected hypersensitivity to vitamin E should avoid these products.

Side Effects and Warnings

- Recent evidence suggests that regular use of high-dose vitamin E may increase the risk of death (from "all causes") by a small amount. These conclusions have been criticized by some experts because they are based on re-calculations (meta-analyses) of the results of prior smaller studies, which were of mixed quality, with variable results, and often in patients with chronic illnesses. Nonetheless, this is the best available scientific evidence currently, and therefore chronic use of vitamin E should be used cautiously and high-dose vitamin E should be avoided. Acute overdose of vitamin E is very uncommon.
- For short periods of time, vitamin E supplementation is generally considered safe at doses up to the recommended tolerable upper intake level (UL). However, vitamin E is possibly unsafe when used orally at doses exceeding the tolerable upper intake level. The Recommended Dietary Allowance (RDA) obtained through food consumption is considered to be safe and beneficial.
- Skin reactions, such as contact dermatitis and eczema, have been reported with topical vitamin E preparations, such as ointments or vitamin E containing-deodorants.
- In rare cases, vitamin E supplementation has been associated with abdominal pain, diarrhea, nausea, diarrhea, or flu-like symptoms (particularly when taken at high doses). The risk of necrotizing enterocolitis may be increased with large doses of vitamin E.
- In rare cases, vitamin E supplementation has been associated with gonadal dysfunction and diminished kidney function.
- High doses of vitamin E might increase the risk of bleeding, due to inhibition of platelet aggregation and antagonism of vitamin K-dependent clotting factors (particularly in patients with vitamin K deficiency). In studies of vitamin E, a small increase in rate of hemorrhagic (bleeding) stroke and gum bleeding has been observed, particularly which used in humans with aspirin. Increased risk of bleeding when used with warfarin (Coumadin®) has been noted in animal studies. However, other studies have not observed a greater incidence of bleeding. Bleeding has been observed in patients given high repeated doses of intravenous all-rac-alpha-tocopherol (synthetic vitamin E). Caution is advised in patients with bleeding disorders or taking drugs that may increase the risk of bleeding. Dosing adjustments may be necessary.
- In rare cases, vitamin E supplementation has been associated with dizziness, fatigue,

headache, weakness, or blurred vision (particularly when used in high doses).

- Oral vitamin E should be avoided in patients with retinitis pigmentosa, as it does not appear to slow visual decline, and may be associated with more rapid loss of visual acuity, although the validity of this finding has been questioned.

Pregnancy and Breastfeeding

- Many prenatal vitamins contain small amounts of vitamin E. Natural forms of vitamin E may be preferable to synthetic forms.
- Use beyond the Recommended Dietary Allowance (RDA) level in otherwise healthy pregnant women is generally not recommended. There is otherwise insufficient evidence regarding the safety of higher doses of oral, topical, or injected vitamin E during pregnancy and breastfeeding, and therefore it is not recommended.

INTERACTIONS

Most herbs and supplements have not been thoroughly tested for interactions with other herbs, supplements, drugs, or foods. The interactions listed below are based on reports in scientific publications, laboratory experiments, or traditional use. You should always read product labels. If you have a medical condition, or are taking other drugs, herbs, or supplements, you should speak with a qualified healthcare provider before starting a new therapy.

Interactions with Drugs

- The amount of bleeding risk associated with vitamin E remains an area of controversy, and caution is warranted in patients with a history of bleeding disorders or taking blood-thinning drugs such as aspirin, anticoagulants such as warfarin (Coumadin®) or heparin, anti-platelet drugs such as clopidogrel (Plavix®), and non-steroidal anti-inflammatory drugs such as ibuprofen (Motrin®, Advil®) or naproxen (Naprosyn®, Aleve®).
- Concern has been raised that antioxidants may interfere with some chemotherapy agents (such as alkylating agents, anthracyclines, or platinum), which themselves can depend on oxidative damage to tumor cells for their anti-cancer effects. Studies on the effects of antioxidants on cancer therapies have yielded mixed results, with some reporting interference, others noting benefits, and most suggesting no significant interaction. However, until additional scientific evidence is available, high-dose antioxidants should be avoided during chemotherapy administration, unless otherwise decided in discussion with the treating oncologist.
- Cholestyramine (Questran®), colestipol (Colestid®), orlistat (Xenical®), isoniazid (INH, Lanizid®, Nydrizid®), olestra (Olean® fat substitute), and sucralfate (Carafate®) can reduce dietary vitamin E absorption and blood levels of vitamin E. Gemfibrozil (Lopid®) may decrease serum levels of both alpha- and gamma-tocopherol, although clinical significance is not clear. Anticonvulsant drugs such as phenobarbital, phenytoin, or carbamazepine may decrease blood levels of vitamin E.
- Vitamin E use with cyclosporine appears to increase the area under the blood concentration-time curve of cyclosporine. A water-soluble form of vitamin E, tocopheryl succinate polyethylene glycol, may improve the absorption of cyclosporine (observed after liver transplantation).
- Vitamin E may have additive effects with cholesterol-lowering medications.

Interactions with Herbs and Dietary Supplements

- High doses of oral or injected vitamin E may increase the risk of bleeding including hemorrhagic stroke (bleeding into the brain), and caution is warranted in patients with a history of bleeding disorders or taking herbs or supplements that may also increase the risk of bleeding. For example, multiple cases of bleeding have been reported with the use of *Ginkgo biloba*, and fewer cases with garlic or saw palmetto.
- Vitamin E may have additive effects with cholesterol-lowering herbs and supplements.
- Mineral oil may reduce dietary vitamin E absorption. Blood levels of vitamin E may be decreased with zinc deficiency. Increased intake of omega-6 fatty acids may increase vitamin E requirements, particularly at high doses.
- Vitamin E is involved in the absorption, storage, and utilization of vitamin A in the body and contributes to avoiding toxicity with vitamin A intake. Large doses of vitamin E may deplete vitamin A stores.
- Aloe is reported to slow the rate of vitamin E absorption, allowing sustained release of vitamin E into the bloodstream.
- Vitamin E has been proposed to improve the bioavailability of iron.

AUTHOR INFORMATION

- This information is based on a systematic review of scientific literature edited and peer-reviewed by contributors to the Natural Standard Research Collaboration (www.naturalstandard.com).

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Natural Standard developed the above evidence-based information based on a thorough systematic review of the available scientific articles. For comprehensive information about alternative and complementary therapies on the professional level, go to www.naturalstandard.com. Selected references are listed below.

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