

Vitamins

In Depth Report

Extensive review of health topics and links to related information

Vitamins

Carotenoids; Flavonoids; Phytochemicals

An in-depth report on the dietary importance of vitamins and other nutrients.

Highlights

Overview

- Fresh fruits and vegetables and whole grains are the primary sources of vitamins, carotenoids, and phytochemicals, as well as dietary fiber and beneficial minerals. A balanced, healthful diet is the best way to obtain vitamins and other important nutrients.
- Unlike drugs, the Food and Drug Administration (FDA) does not require manufacturers to provide any scientific evidence that their dietary supplements are safe and effective. However, once on the market, side effects or false claims may prompt restrictions or withdrawal of a supplement.
- With the possible exception of vitamin D, supplements are helpful only for certain people (for example, during pregnancy or for people with deficiencies or certain illnesses), and they may actually be harmful for other people. More than half of American adults use supplements, most often multivitamins and minerals.

Vitamins and Health

- Many fresh fruits and vegetables contain chemicals that may fight cancer, including lung, breast, colon, and prostate cancers.
- Although Vitamin D has been the focus of hundreds of studies, the question of whether supplementation with vitamin D is beneficial has not been answered.
- In a 12-year trial of nearly 6,000 male physicians over age 65, a daily multivitamin was not shown to provide any cognitive benefits compared to not taking a daily multivitamin.
- For healthy adults, the U.S. Preventive Services Task Force (USPSTF) does not recommend the use of daily multivitamins, or single or paired nutrient supplements, for the prevention of heart disease or cancer. There is not enough evidence to assess the balance of benefits and harms.



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- A combination of zinc and antioxidants, including vitamins C, E, and beta-carotene, slows the progression of age-related macular degeneration (AMD). The combination can be helpful in people with intermediate or advanced AMD in one eye. However, these supplements will not prevent macular degeneration from developing in the first place.
- A review of several trials showed that vitamin C supplementation does not prevent the average person from getting a cold, but it may have a protective effect for some athletes who perform strenuous physical exercise.

New Recommendation

- Healthy postmenopausal women with good diets do not benefit from low-dose vitamin D and calcium supplements, according to a 2013 report by the USPSTF. According to the USPSTF, daily low-dose amounts of vitamin D and calcium supplements do not prevent fractures and can increase the risk of kidney stones. Talk with your doctor about whether you need these supplements and how to obtain calcium and vitamin D from your diet.
- However, the National Osteoporosis Foundation stresses the importance of calcium and vitamin D for strong bones, and the use of medications along with these nutrients to prevent fractures.

New Standard

- The Recommended Dietary Allowance (RDA) for vitamins is gradually being replaced by a new standard called the Dietary Reference Intake (DRI). The DRI is a general term used to describe the types and amounts of nutrients healthy people need.

Introduction

Vitamins are organic nutrients that the human body needs in small amounts for normal function and good health. A well-balanced diet should provide most of the vitamins people need to stay healthy and prevent disease. Vitamin D is the only exception since it is mostly obtained through sun exposure. Supplements can be helpful in some situations, such as pregnancy and certain illnesses. Strict vegetarians may benefit from taking vitamin B12 supplements.

Unlike carbohydrates, fats, and proteins, vitamins are not sources of energy. Instead, vitamins are involved in the body's metabolism, cell production, tissue repair, and other vital processes.



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Vitamins are either fat soluble or water soluble.

- Fat-soluble vitamins, which include A, D, E, and K, are stored in the liver and used up very slowly. Because the body stores fat-soluble vitamins, they can be dangerous when taken in large amounts.
- Water-soluble vitamins include vitamin C and the B vitamins. The body uses these vitamins very quickly. Excess amounts are removed in the urine.

Guidelines for Adequate Intake of Vitamins

The Recommended Dietary Allowance (RDA) for vitamins, set by the Food and Nutrition Board of the National Academy of Sciences-National Research Council, has been used for years as a guide for determining the amount of vitamins needed to prevent deficiency diseases.

The RDA is gradually being replaced by a new standard called the Dietary Reference Intake (DRI). The DRI is a general term used to describe the types and amounts of nutrients healthy people need.

The DRI values are based on four categories:

- Recommended dietary allowance (RDA). This is the current rating on most vitamins.
- Estimated average requirement (EAR). This is the amount of the vitamin needed to meet the nutritional requirements for 50% of the population.
- Adequate intake (AI). This amount is used if there are not enough data to calculate the RDA.
- Tolerable upper intake level (UL). This is the maximum dose that is likely to be safe in 98% of the population.
- Food and supplement labels now typically list the Daily Value (DV) for consumers. The DV is based on the recommended daily amount of a nutrient for a person taking in 2,000 calories a day.

Regulating Quality

Regulation of dietary supplements by the U.S. Food and Drug Administration (FDA) is a complex issue.

Vitamin and other dietary supplement labels now include nutrient information and list all of the ingredients in the supplement, including the parts of plants from which the ingredients are taken. Unlike drug labels, vitamin and supplement labels cannot claim to treat any specific disease.



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Vitamin and supplement labels include one of the following:

Health claim:

description of how the substance may reduce the risk of a health-related condition

Nutrient claim:

description of the amount of nutrients in the product

Structure or function claim:

description of how the product may affect organs or systems of the body, without claiming to treat specific diseases

Dietary supplements are not standardized or regulated by the FDA, meaning that the amounts or quality of nutrients may vary depending on the batch or manufacturer. So, more expensive supplements are not necessarily better than less expensive ones. Government regulations are in the process of catching up to the boom in the supplement industry. In the meantime, some companies voluntarily stick to rigorous quality controls, while others do not.

The U.S. Pharmacopeia (USP), an independent organization that sets quality standards for drugs, has also implemented standards for vitamins. Consumers may look for the USP label on products made by companies that follow these standards.

USP verification means the following:

- What is in the bottle matches what is listed on the label.
- There are no harmful levels of contaminants.
- The supplement will be properly absorbed into the body.
- The supplement has been produced according to good manufacturing standards.

The FDA does not require manufacturers to provide any scientific evidence that dietary supplements are safe and effective before a product is sold (unlike drugs, which must be proven both safe and effective through clinical trials). If a supplement causes side effects in people once it is sold, the government may place restrictions on the supplement or withdraw it from the market. The FDA may also withdraw products from the market if their labels are false or misleading.



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People Who Should Take Vitamin Supplements

Dietary supplement use is on the rise. More than half of American adults use supplements, most often multivitamins and minerals. In particular, more Americans are taking vitamin D and calcium supplements than in the past. Although most experts recommend against routine use of supplements, some believe that shipping, storing, and cooking techniques deplete the nutritional value of food and that it is difficult to meet nutritional needs in a busy American lifestyle. For some, a multivitamin is a simple way to ensure appropriate amounts of substances like folic acid and vitamin D.

However, many studies have found no difference in mortality rates between people who take vitamin supplements and those who do not. While nutrients from food have protective effects against many diseases, several studies show the same nutrients taken in supplement form are not beneficial. Most people who eat a healthy diet rich in a variety of fruits and vegetables do not need vitamins, but there are some exceptions.

Pregnant and Breastfeeding Women:

Women who are pregnant or breastfeeding generally need additional vitamins. Folic acid and vitamins B6 and B12 are particularly important during pregnancy. Since the best sources of vitamin B12 are found in meat and animal products, pregnant women who are vegetarian should take extra care that they are not deficient in this vitamin, which can harm their baby. Folic acid reduces the risk for neural tube defects and possibly deformities of the face, such as cleft palate. Studies also link low folate levels during pregnancy with low birth weight, which may increase the risk of heart disease in adulthood. A woman's best approach is to start taking extra folic acid plus multivitamin supplements before she becomes pregnant.

The human body stores several years' worth of vitamin B12, so deficiency of this vitamin is extremely rare.

However, people who follow a strict vegetarian diet and do not eat eggs or dairy products may need to take vitamin B12 supplements.

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Pregnant women who eat a healthy diet may still have low folate levels and need to take folic acid supplements. Requirements are as follows:

- The RDA for folic acid before getting pregnant is 400 mcg.
- During pregnancy the RDA is 600 mcg.
- Women who are breastfeeding should get 500 mcg of folic acid.

Some women have low vitamin A reserves in their liver. However, getting too much vitamin A from food or supplements significantly increases the risk for birth defects. Experts recommend that pregnant women get no more than 3,000 mcg of vitamin A each day.

Infants and Children:

Infants who are breastfed by healthy mothers should receive enough vitamins. However, in some cases, infants may not get enough of vitamins K and D.

- Human milk contains low levels of vitamin K, and newborn babies do not yet have the gut bacteria that produces vitamin K within the body. Most babies are given an injection of this vitamin at birth.
- Infants who are breastfed or who do not get enough sunlight exposure are at risk for low levels of vitamin D. Therefore, daily supplements of 400 IU are recommended until the child switches to vitamin D-fortified formula or milk.

Formulas are required to contain enough vitamins and minerals. After infancy, most American children receive all the vitamins they need from their diet, unless they are severely deprived. However, research suggests that many healthy children ages 1 to 11, especially African-American and Hispanic children, are not getting enough vitamin D. It is recommended that children and adolescents take a vitamin D supplement of 400 IU daily if they are not getting this amount through fortified foods and milk. In light of the new vitamin D RDA of 600 IU per day for children and adolescents, this recommended dosage may increase in the coming years.

Smokers

Smoking interferes with the absorption of several vitamins, especially vitamins C and D. Smoking can also interfere with the metabolism of vitamin D, resulting in poor muscle function.



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Taking supplements of antioxidant vitamins, especially beta-carotene, is harmful to smokers. Instead of taking supplements, smokers should eat a diet rich in fresh fruits, vegetables, and whole grains. Smoking cessation is the most important intervention.

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Alcoholics:

Alcoholics often have several vitamin deficiencies. The most dangerous deficiencies are:

- Vitamin B1 (thiamin)
- Vitamin B2 (riboflavin)
- Vitamin B6 (pyridoxine)
- Folic acid
- Vitamin C

Low levels of vitamin B6 may increase the risk for colorectal cancer in men who drink large amounts of alcohol.

People Who Have Had Gastric Bypass Surgery:

Vitamin deficiency is a complication of gastric bypass surgery. Women, African Americans, and adults who have had laparoscopic Roux-en-Y bypass surgery are at highest risk. The deficiency is treated with water-soluble vitamin supplements.

Strict Vegetarians:

Strict vegetarians need to take vitamin B12 supplements, unless they get enough of this vitamin from fortified cereals and other grain products. They may also need to take vitamin D and riboflavin supplements, or a



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multivitamin, and watch their iron levels. Vegans, who do not eat dairy, eggs, fish, or meat may be at risk for vitamin A deficiencies if they do not eat plenty of dark-colored fruits and vegetables.

Vitamin deficiencies may be particularly harmful in vegetarian children. Pregnant and breastfeeding women who are vegetarians must get enough vitamins. Mothers who do not get enough vitamin B12 may cause growth and nervous system problems in their newborns.

Dieters:

People who are on weight-reduction diets of fewer than 1,000 calories a day should probably take a multivitamin. They should also check in regularly with a physician to make sure they are getting enough nutrients.

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Older Adults:

Almost a third of elderly people do not get enough of certain vitamins and important minerals. Often their dietary habits slip and they fail to regularly eat balanced meals. In addition, older adults are more likely to take medications that prevent the absorption of certain vitamins.

Common vitamin deficiencies in the elderly include the following:

Elderly people, particularly if they are not exposed to sunlight, may be deficient in vitamin D. Older adults should get at least 800 IU of vitamin D a day. People who are obese, or who have osteoporosis, limited sun exposure, or poor nutrient absorption may need to increase their intake to as much as 2,000 IU per day.

Seniors also may have low levels of important B vitamins. Older adults with symptoms of dementia should be tested for a B12 deficiency.



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Seniors need to use caution when taking vitamin supplements. Because metabolism slows with age, it takes the liver longer to remove vitamins from the body. Therefore, the effect of some vitamin supplements may be intensified in older adults. For example, a dose of vitamin A that might be harmless in a younger adult could be toxic in an elderly patient.

People Who Avoid Sunlight:

People who avoid sunlight or who are housebound, and those whose diet is low in foods that contain vitamin D should take supplements. People with darker skin are at higher risk for vitamin D deficiencies than those with whiter skin. It should be noted that vitamin D is toxic in high doses, and no one should exceed the RDA of vitamin D except under a physician's direction.

Vitamin A and Provitamin A Carotenoids (Beta-Carotene)	
Benefits	<p>Essential for:</p> <ul style="list-style-type: none"> • Growth • Tooth and bone development • Vision (especially in low light) • Reproduction • Healthy skin <p>Beta-carotene is an antioxidant that helps protect the body against the damaging effects on cells that can lead to disease.</p>
Recommended dietary allowance (RDA) (mcg = micrograms)	<p>Children:</p> <ul style="list-style-type: none"> • 0 to 6 months: 400 micrograms (mcg) (upper limit is 600 mcg) • 7 to 12 months: 500 mcg (upper limit is 600 mcg) • 1 to 3 years: 300 mcg (upper limit is 600 mcg) • 4 to 8 years: 400 mcg (upper limit is 900 mcg) • 9 to 13 years: 600 mcg (upper limit is 1,700 mcg) <p>Nonpregnant adolescent girls and women:</p> <ul style="list-style-type: none"> • 14 to 18: 700 mcg (upper limit is 2,800 mcg) • 19 and older: 700 mcg (upper limit is 3,000 mcg) <p>Pregnant women:</p> <ul style="list-style-type: none"> • Under age 18: 750 mcg (upper limit is 2,800 mcg) • 19 and up: 770 mcg (upper limit is 3,000 mcg) <p>Warning: The use of preformed vitamin A, including the skin acne medication tretinoin (a vitamin A derivative), during pregnancy can cause birth defects.</p>



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Vitamin A and Provitamin A Carotenoids (Beta-Carotene) - continued

<p>Recommended dietary allowance (RDA) (mcg = micrograms)</p>	<p>Breastfeeding women:</p> <ul style="list-style-type: none"> • Under age 18: 1,200 mcg (upper limit is 2,800 mcg) • 19 and up: 1,300 mcg (upper limit is 3,000 mcg) <p>Adolescent boys and men:</p> <ul style="list-style-type: none"> • 14 to 18: 900 mcg (upper limit is 2,800 mcg) • 19 and up: 900 mcg (upper limit is 3,000 mcg) <p>Note: Some experts recommend also getting 3 to 6 mg of beta-carotene, which converts to vitamin A.</p>
	<p>Vitamin A is now measured with a unit called the Retinol Activity Equivalent (RAE). One RAE is equal to:</p> <ul style="list-style-type: none"> • 1 mcg retinol • 12 mcg beta-carotene • 24 mcg alpha-carotene • 24 mcg beta-cryptoxanthin <p>Retinol is the most active form of vitamin A.</p>
<p>Foods containing the vitamin</p>	<ul style="list-style-type: none"> • Animal products, such as liver, beef, milk and other dairy products, egg yolks, and fish liver oil. • Dark red, green, and yellow vegetables and fruits. The deeper the color of the vegetable, the more beta-carotene it contains.
<p>Effects of deficiencies</p>	<ul style="list-style-type: none"> • Skin disorders • Severe diarrhea • Increased risk of infectious diseases • Vision problems • Cancer (may increase the risk) • Lung function problems in children
<p>People at risk for deficiencies</p>	<ul style="list-style-type: none"> • Preschool children and children who do not get enough protein, calories, and zinc • People with iron deficiency, which may affect the metabolism of vitamin A • People with asthma • People with serious disorders of the intestine, liver, or pancreas, such as cystic fibrosis, steatorrhea, biliary obstruction, inflammatory bowel disease, and cirrhosis • People who have had Roux-en-Y gastric bypass surgery • Vegans (vegetarians who do not eat eggs and dairy) • People who abuse alcohol <p>The liver in healthy adults can store a year's worth of vitamin A. A temporary lack of nutrients is unlikely to cause a serious vitamin A deficiency.</p>



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Vitamin A and Provitamin A Carotenoids (Beta-Carotene) - continued

Toxicities	<p>Vitamin A is very toxic when taken in high doses (more than 25,000 IU a day) for long periods of time. Even mild excesses increase the risk for fractures. Large amounts of beta-carotene will not make people sick, but they can turn the skin yellow or orange.</p> <p>Excess vitamin A can affect almost every part of the body, including the eyes, bones, blood, skin, central nervous system, liver, and genital and urinary tracts.</p> <p>Symptoms of vitamin A overdose include:</p> <ul style="list-style-type: none"> • Dizziness • Nausea and vomiting • Headache • Skin damage • Mental problems • Less frequent periods in women <p>Severe toxicity can cause blindness and may even be life threatening. High doses of vitamin A may also increase the risk for gastric cancer, osteoporosis, and hip fractures.</p> <p>In children, long-term vitamin A overdose can cause fluid on the brain, liver damage, as well as the same complications seen in adults.</p> <p>Pregnant women who take amounts of vitamin A that are not much higher than the RDA increase the risk for birth defects in their children.</p>
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B Vitamins, part 1		
	B Vitamins: General Information	Vitamin B1 (thiamin)
Benefits	The B vitamins have a wide and varied range of functions in the human body. Most B vitamins are involved in the process of converting blood sugar into energy.	Vitamin B1 is essential for converting carbohydrates from food into energy. It is also involved in heart, muscle, and nerve function.
Recommended dietary allowance (RDA) (mcg = micrograms, mg = milligrams)		<p>Infants:</p> <ul style="list-style-type: none"> • 0 to 6 months: 0.2 mg/day • 7 to 12 months: 0.3 mg/day <p>Children:</p> <ul style="list-style-type: none"> • 1 to 3 years: 0.5 mg/day • 4 to 8 years: 0.6 mg/day • 9 to 13 years: 0.9 mg/day



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B Vitamins, part 1 - continued

<p>Recommended dietary allowance (RDA)</p> <p>(mcg = micrograms, mg = milligrams)</p>		<p>Adolescents and adults:</p> <ul style="list-style-type: none"> • Males age 14 and over: 1.2 mg/day • Females ages 14 to 18: 1.0 mg/day • Females age 19 and older: 1.1 mg/day <p>Pregnant and breastfeeding women (all ages): 1.4 mg/day.</p>
<p>Foods containing the vitamin</p>		<p>Good sources are fortified cereals and breads, dried milk, nuts, legumes (dried beans), cauliflower, lean meats, and sunflower seeds.</p> <p>People who eat a normal diet and are in good health do not need to take supplements.</p>
<p>Effects of deficiencies</p>	<p>Deficiencies are uncommon in the U.S., but when they occur, they usually involve several B vitamins, since many of them come from the same food groups.</p>	<p>Vitamin B1 deficiency may cause:</p> <ul style="list-style-type: none"> • Vision problems • Weakness and fatigue • Paralysis • Loss of feeling in the legs and feet • Mental problems • Heart failure <p>Severe vitamin B1 deficiency is known as beriberi.</p>
<p>People at risk for deficiencies</p>	<ul style="list-style-type: none"> • People who abuse alcohol • Elderly people (because of poor diet and medicines that interfere with vitamin B absorption) • People who are severely malnourished • People who receive long-term dialysis • People who are fed intravenously • Vegetarians (may be at risk) 	<p>See general vitamin B description.</p>
<p>Toxicities</p>	<p>Because the B vitamins are water-soluble and removed in the urine, toxic reactions from taking most of them by mouth are extremely rare. (Exceptions are niacin and vitamin B6.)</p> <p>Note: Substances known as B15 (pangamic acid) and B17 (laetrile) are not vitamins or nutrients. Both chemicals are highly dangerous and have no proven nutritional or health value.</p>	<p>No toxic effects have been reported from thiamin.</p>



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B Vitamins, part 2

B Vitamins, part 2			
	Vitamin B2 (riboflavin)	Vitamin B3 (niacin) also known as nicotinic acid	Vitamin B5 (pantothenic acid)
Benefits	Important for growth, red blood cell production, and the conversion of carbohydrates into energy.	Helps break down food for energy. Helps the digestive system, skin, and nerves function. Widens blood vessels and increases blood flow. May be prescribed in very high doses for improving cholesterol levels, but medical supervision is recommended.	Important for helping the body break down fats, carbohydrates, and proteins. Essential for growth, and the production of steroid hormones and cholesterol.
Recommended dietary allowance (RDA) (mcg = micrograms, mg = milligrams)	<p>Infants:</p> <ul style="list-style-type: none"> 0 to 6 months: 0.3 mg/day 7 to 12 months: 0.4 mg/day <p>Children:</p> <ul style="list-style-type: none"> 1 to 3 years: 0.5 mg/day 4 to 8 years: 0.6 mg/day 9 to 13 years: 0.9 mg/day <p>Adolescents and adults:</p> <ul style="list-style-type: none"> Males age 14 and older: 1.3 mg/day Females ages 14 to 18: 1.0 mg/day Females age 19 and older: 1.1 mg/day <p>Pregnant women (all ages): 1.4 mg/day</p> <p>Breastfeeding women (all ages): 1.6 mg/day</p>	<p>Infants:</p> <ul style="list-style-type: none"> 0 to 6 months: 2 mg/day 7 to 12 months: 4 mg/day <p>Children:</p> <ul style="list-style-type: none"> 1 to 3 years: 6 mg/day 4 to 8 years: 8 mg/day 9 to 13 years: 12 mg/day <p>Adolescents and adults:</p> <ul style="list-style-type: none"> Males age 14 and older: 16 mg/day Females age 14 and older: 14 mg/day <p>Pregnant women (all ages): 18 mg/day</p> <p>Breastfeeding women (all ages): 17 mg/day</p> <p>Some people take 1 to 3 grams of niacin per day to treat low HDL (good) cholesterol and high LDL (bad) cholesterol and triglycerides.</p>	<p>Infants:</p> <ul style="list-style-type: none"> 0 to 6 months: 1.7 mg/day 7 to 12 months: 1.8 mg/day <p>Children:</p> <ul style="list-style-type: none"> 1 to 3 years: 2 mg/day 4 to 8 years: 3 mg/day 9 to 13 years: 4 mg/day <p>Adolescents and adults:</p> <ul style="list-style-type: none"> 14 and older: 5 mg/day <p>Pregnant women (all ages): 6 mg/day</p> <p>Breastfeeding women (all ages): 7 mg/day</p>



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B Vitamins, part 2 - continued

<p>Foods containing the vitamin</p>	<p>Liver, fortified breads and cereals, milk and other dairy products, eggs, nuts, fish, and some dark green leafy vegetables.</p> <p>People who eat a normal diet and are in good health do not need to take supplements.</p>	<p>Fish, chicken, veal, beans, nuts, fortified breads and cereals, dairy products, eggs, pork, salmon, and beef liver.</p> <p>People who eat a normal diet and are in good health do not need to take supplements.</p>	<p>Whole-grain cereals, beans, milk, avocado, broccoli and other vegetables in the cabbage family, milk and liver.</p> <p>People who eat a normal diet and are in good health do not need to take supplements.</p>
<p>Effects of deficiencies</p>	<p>Effects may include:</p> <ul style="list-style-type: none"> • Cracks on the lips or corners of the mouth • Eczema of the face and genitals • A burning sensation on the tongue • Eye irritation • Anemia (low iron levels) • High levels of homocysteine, a risk for heart disease 	<p>Symptoms may include:</p> <ul style="list-style-type: none"> • Swelling of the skin • Digestive problems • Depression • Headache • Thinning of the hair • Excess saliva production <p>Niacin deficiency is called pellagra.</p>	<p>Deficiency is unlikely to occur, except together with other B vitamin deficiencies.</p> <p>Symptoms of a deficiency include:</p> <ul style="list-style-type: none"> • Stomach upset • Burning sensation in the heels • Sleep problems
<p>People at risk for deficiencies</p>	<p>See general vitamin B description.</p>	<p>Alcoholics and people who are malnourished.</p>	<p>Alcoholics and people who are malnourished.</p>
<p>Toxicities</p>	<p>No toxic effects have been reported, even from large doses of riboflavin.</p>	<p>Even mildly high doses of niacin can cause hot flushes of the face and shoulders, headaches, itchiness, and stomach problems.</p> <p>Large doses may trigger erectile dysfunction, ulcers, gout, diabetes, and liver damage. These symptoms are usually reversed when high doses are stopped.</p>	<p>Although no toxic effects have been reported in humans, high doses have caused liver damage in rats.</p>



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B Vitamins, part 3

B Vitamins, part 3		
	Vitamin B6 (pyridoxine)	Vitamin B12 (cobalamin)
Benefits	Vitamin B6 affects over 60 proteins in the body, including proteins that play a role in the nervous system, red and white blood cell production, the immune system, and heart disease.	Vitamin B12 is essential for the production of red blood cells, manufacture of genetic material, and function of the nervous system.
Recommended dietary allowance (RDA) (mcg = micrograms, mg = milligrams)	<p>Infants:</p> <ul style="list-style-type: none"> 0 to 6 months: 0.1 mg/day 7 to 12 months: 0.3 mg/day <p>Children:</p> <ul style="list-style-type: none"> 1 to 3 years: 0.5 mg/day 4 to 8 years: 0.6 mg/day 9 to 13 years: 1.0 mg/day <p>Adolescents and adults:</p> <ul style="list-style-type: none"> Males ages 14 to 50: 1.3 mg/day Males over age 50: 1.7 mg/day Females ages 14 to 18: 1.2 mg/day Females ages 19 to 50: 1.3 mg/day Females over age 50: 1.5 mg/day <p>Pregnant women (all ages): 1.9 mg/day</p> <p>Breastfeeding women (all ages): 2.0 mg/day</p>	<p>Infants:</p> <ul style="list-style-type: none"> 0 to 6 months: 0.4 mcg/day 7 to 12 months: 0.5 mcg/day <p>Children:</p> <ul style="list-style-type: none"> 1 to 3 years: 0.9 mcg/day 4 to 8 years: 1.2 mcg/day 9 to 13 years: 1.8 mcg/day <p>Adolescents and adults:</p> <ul style="list-style-type: none"> Males and females age 14 and older: 2.4 mcg/day <p>Pregnant women (all ages): 2.6 mcg/day</p> <p>Breastfeeding women (all ages): 2.8 mcg/day</p>
Foods containing the vitamin	Meats, oily fish, poultry, whole grains, fortified cereals, soybeans, avocados, baked potatoes with skins, watermelon, plantains, bananas, peanuts, and brewer's yeast.	The only natural dietary sources are animal products, including meats, milk and other dairy products, eggs, and fish (clams and oily fish are very high in vitamin B12). Like other B vitamins, B12 is added to fortified cereals and grain products.



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B Vitamins, part 3 - continued

<p>Effects of deficiencies</p>	<ul style="list-style-type: none"> • Increased levels of homocysteine, which is linked to heart disease and possibly Alzheimer disease • Skin problems • Nervous system disorders, including impaired memory and concentration • Increased risk for kidney stones <p>In unborn children, a lack of vitamin B6, vitamin B12, and folic acid may cause defects such as cleft lip and palate and spina bifida. Women should take B vitamin supplements before and during their pregnancy.</p> <p>Note: People who have been regularly taking more than 50 mg of vitamin B6 and stop suddenly are at risk for a rebound deficiency. That is why people should taper off vitamin B6 slowly.</p>	<ul style="list-style-type: none"> • Increased risk of bone fractures • Abnormal walk in the elderly • Balance problems, weakness, and decreased reflexes • Severe depression, memory loss, and disorientation • Hearing loss <p>Children who lack this vitamin may not grow properly. Deficiencies in pregnant and breastfeeding women may cause nervous system problems in their babies.</p> <p>The gene defect that causes vitamin B12 deficiencies is responsible for pernicious anemia, a serious disorder that causes rapid heart rate, shortness of breath, dizziness, weakness, and fatigue. It must be treated with injections of vitamin B12 or very high oral doses to prevent nervous system damage.</p>
<p>People at risk for deficiencies</p>	<ul style="list-style-type: none"> • Alcoholics • Malnourished people • In rare cases, newborns are unable to break down pyridoxine, and will need to be given vitamin B6. 	<ul style="list-style-type: none"> • Alcoholics • Malnourished people • People who are infected with <i>Helicobacter pylori</i> (<i>H. pylori</i>) bacteria (a cause of ulcers) • People who take the antibiotic isoniazid, the high blood pressure medication hydralazine, the diabetes drug metformin, or the drug penicillamine • People with inflammatory bowel disease • Vegetarians and vegans <p>People over age 50, and those who have Crohn disease, celiac disease, or who have undergone certain gastrointestinal surgeries may have trouble absorbing vitamin B12 and need to take supplements.</p>
<p>Toxicities</p>	<p>Very high doses can cause nerve damage, which may be permanent in some cases. The babies of pregnant women who take large doses, such as for morning sickness, may have adverse health effects.</p>	<p>There is no evidence of toxic effects from this vitamin.</p>



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B Vitamins, part 4

B Vitamins, part 4			
	Biotin (a B vitamin)	Choline (a B vitamin)	Folate, or Folic Acid, its synthetic form (a B vitamin)
Benefits	Biotin is involved in the production of amino acids, proteins, hormones, and fatty acids.	Choline is essential for a baby's brain development and for learning and memory.	<p>Folate is important for many processes in the body. It is used to produce chemical messengers in the brain, break down and produce proteins, and make DNA, the genetic information that controls cell functions.</p> <p>Dietary sources of folate may reduce the risk of some forms of cancer, including cancers of the colon, breast, esophagus, cervix, and stomach.</p> <p>A recent large study found that taking folic acid supplements did not increase or decrease the risk of site-specific cancer, such as large intestine, lung, breast, or any other site, in the first five years of supplementation.</p> <p>It is very important for pregnant women to get enough folic acid to prevent birth defects in their babies.</p>
Recommended dietary allowance (RDA) (mcg = micrograms, mg = milligrams)	<p>Infants:</p> <ul style="list-style-type: none"> 0 to 6 months: 5 mcg/day 7 to 12 months: 6 mcg/day <p>Children:</p> <ul style="list-style-type: none"> 1 to 3 years: 8 mcg/day 4 to 8 years: 12 mcg/day 9 to 13 years: 20 mcg/day <p>Adolescents and adults:</p> <ul style="list-style-type: none"> 14 to 18: 25 mcg/day 19 and older: 30 mcg/day <p>Breastfeeding women (all ages): 35 mcg/day</p>	<p>Infants:</p> <ul style="list-style-type: none"> 0 to 6 months: 125 mg/day 7 to 12 months: 150 mg/day <p>Children:</p> <ul style="list-style-type: none"> 1 to 3 years: 200 mg/day 4 to 8 years: 250 mg/day 9 to 13 years: 375 mg/day 	<p>Supplements may be in the form of folate (natural) or folic acid (synthetic). Folic acid is nearly twice as potent as folate.</p> <p>Infants:</p> <ul style="list-style-type: none"> 0 to 6 months: 65 mcg/day 7 to 12 months: 80 mcg/day <p>Children:</p> <ul style="list-style-type: none"> 1 to 3 years: 150 mcg/day 4 to 8 years: 200 mcg/day 9 to 13 years: 300 mcg/day <p>Adolescents and adults age 14 and older:</p> <ul style="list-style-type: none"> 400 mcg/day <p>Women who are planning to become pregnant should take at least 400 mcg/day of folic acid before conception, 600 mcg/day during pregnancy, and 500 mcg/day while nursing.</p>



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B Vitamins, part 4 - continued

Foods containing the vitamin	Dietary sources are cereal, egg yolks, chocolate, milk, legumes, liver, mushrooms, bananas, tomatoes, whole grains, nuts, and brewer's yeast. Also produced by bacteria in the intestines.	Peanuts, eggs, cauliflower, and meats, especially liver.	Avocado, bananas, beets, oranges and orange juice, cereal, asparagus, broccoli, green leafy vegetables, dried beans and peas, and yeast. Breads and cereals are now supplemented with folic acid.
Effects of deficiencies	Deficiencies are almost unheard of.	Low levels during pregnancy increase the risk of birth defects in newborns.	<p>As with vitamins B6 and B12, deficiencies of folate raise levels of homocysteine, an amino acid in the body that may increase the risk for heart disease, and possibly Alzheimer disease . Folic acid supplements lower homocysteine levels, but they have little or no impact on the risk of heart disease. This suggests that homocysteine may be a marker of heart disease, rather than a cause. However, some evidence suggests that folic acid supplementation in patients with low folic acid levels substantially reduces the risk of a first stroke.</p> <p>Low folic acid levels during pregnancy increase the risk of birth defects in newborns. Folic acid supplementation plays a key role in preventing birth defects.</p> <p>Folic acid deficiencies can also cause depression , anemia , and problems with concentration, memory, and hearing.</p>
People at risk for deficiencies			<ul style="list-style-type: none"> • Alcoholics • People who are malnourished • People with conditions that affect the function of the small intestine • People who take certain drugs, such as methotrexate, high-dose aspirin, seizure medicine, or birth control pills • People who smoke
Toxicities	There are no known toxic effects of biotin.	Excessive doses can cause intestinal problems. There is also some concern that high doses can cause cancer.	<p>There is a possible link between high-dose folic acid supplements and an increased risk for colorectal, prostate, and breast cancers. More research is needed.</p> <p>Researchers have also found a link between high doses of folic acid and central nervous system disorders, zinc deficiency, and seizures in epileptics. This risk appears to be low, but results indicate that people should avoid taking megadoses of folic acid.</p> <p>Large amounts of folic acid may mask symptoms of vitamin B12 deficiency.</p>



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Vitamin C (Ascorbic Acid)

Vitamin C (Ascorbic Acid)	
Benefits	<p>Vitamin C acts as an antioxidant (it reduces harm from damaging chemical processes in the body) and helps the body absorb iron. Vitamin C is essential for the production of collagen, the basic protein in bones, cartilage, tendons, and ligaments. It also helps with wound healing.</p> <p>Another possible, but still unproven benefit of vitamin C is protection against narrowing of the airways during exercise in people with asthma. Studies have shown that supplementation does not prevent colds in the average person, but it may have a protective effect for some athletes who perform strenuous physical exercise.</p>
Recommended dietary allowance (RDA) (mg = milligrams)	<p>Infants:</p> <ul style="list-style-type: none"> • 0 to 6 months: 40 mg/day • 7 to 12 months: 50 mg/day <p>Children:</p> <ul style="list-style-type: none"> • 1 to 3 years: 15 mg/day • 4 to 8 years: 25 mg/day • 9 to 13 years: 45 mg/day <p>Adolescents:</p> <ul style="list-style-type: none"> • Girls 14 to 18 years: 65 mg/day • Boys 14 to 18 years: 75 mg/day <p>Adults:</p> <ul style="list-style-type: none"> • Men age 19 and older: 90 mg/day • Women age 19 and older: 75 mg/day <p>Pregnant and breastfeeding women:</p> <ul style="list-style-type: none"> • Pregnant women (under age 18): 80 mg/day • Pregnant women (over age 18): 85 mg/day • Breastfeeding women (under age 18): 115 mg/day • Breastfeeding women (over age 18): 120 mg/day <p>Smokers need 35 mg/day more vitamin C than nonsmokers.</p>
Foods containing the vitamin	<p>Orange juice is the most important source of vitamin C in the U.S. Other sources include citrus fruits and juices, papayas, hot chili peppers, bell peppers, broccoli, potatoes, dark leafy greens, kale, red cabbage, cauliflower, cantaloupe, sweet potatoes, tomatoes, and Brussels sprouts.</p> <p>The best way to get vitamin C from these foods is by eating them raw. Cooking foods that are rich in vitamin C or storing them for long periods of time can reduce the vitamin C content.</p>



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Vitamin C (Ascorbic Acid) - continued

<p>Effects of deficiencies</p>	<p>Symptoms of vitamin C deficiency may include:</p> <ul style="list-style-type: none"> • Fatigue • Weakness • Irritability • Weight loss • Dry hair • Easy bruising • Nosebleeds <p>Scurvy is the main disease of vitamin C deficiency. It affects most body tissues, especially the bones, teeth, and blood vessels. Symptoms include tiredness, weakness, irritability, weight loss, and muscle wasting.</p> <p>Vitamin C deficiencies may also contribute to gum disease and gallstones .</p> <p>In children, a lack of vitamin C in the diet has been associated with poor lung function. Low vitamin C intake may also increase lead levels in the blood.</p>
<p>People at risk for deficiencies</p>	<p>True vitamin C deficiency is rare in the U.S. It only occasionally occurs in the elderly, alcoholics, cancer patients, and some people who are on severely limited diets that are low in fresh fruits and vegetables. However, studies now suggest that as many as 16% of middle-aged Americans are low in vitamin C, with the highest risk in smokers and middle-aged men.</p> <p>Taking high doses of aspirin over a long period of time can interfere with vitamin C absorption.</p>
<p>Toxicities</p>	<p>The upper limit of vitamin C is 2,000 mg/day in adults (the limit is lower in children). High doses may cause headaches and diarrhea. Long-term high doses may increase the risk for kidney stones.</p> <p>Vitamin C increases iron absorption, so people with blood disorders such as hemochromatosis, thalassemia, or sideroblastic anemia should avoid taking high doses. Large doses may also thin the blood and interfere with blood thinning medications, blood tests used in diabetes, and stool tests.</p> <p>Rebound scurvy can occur after a person stops taking large doses of vitamin C. This rebound effect may be more significant in infants or pregnant women.</p>



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Vitamin D

Vitamin D	
Benefits	Vitamin D is a single term for several hormones. These hormones are stored mainly in the liver and also in fat and muscle tissue. Vitamin D is essential for the absorption of calcium into bone and for normal bone growth. Vitamin D status, health risk, and the benefits of supplementation continue to be studied.
Recommended dietary allowance (RDA) (mcg = micrograms, IU = international units)	<p>Infants:</p> <ul style="list-style-type: none"> • 0 to 6 months: 400 IU (10 mcg/day) • 7 to 12 months: 400 IU (5 mcg/day) <p>Safe upper limit for infants is 1,000 to 1,500 IU/day.</p> <p>Children:</p> <ul style="list-style-type: none"> • 1 to 3 years: 600 IU (15 mcg/day) • 4 to 8 years: 600 IU (15 mcg/day) <p>Safe upper limit for children is 2,500 to 3,000 IU/day.</p> <p>Older children and adults:</p> <ul style="list-style-type: none"> • 9 to 70 years: 600 IU (15 mcg/day) • Over 70 years: 800 IU (20 mcg/day) <p>Pregnant and breastfeeding women:</p> <ul style="list-style-type: none"> • 600 IU (15 mcg/day) <p>Safe upper limit for older children, adults, and pregnant and breastfeeding women is 4,000 IU/day.</p> <p>Breastfed infants, as well as people who are obese, have osteoporosis, limited sun exposure, poor nutrient absorption, or dark skin should take vitamin D supplements.</p>
How the body gets the vitamin	<p>There are two forms of vitamin D. Vitamin D₃ is made in the body from a chemical reaction triggered by the ultraviolet radiation in sunlight. People can get enough vitamin D by exposing their skin to 10 to 15 minutes of sunshine three times a week (without sunscreen).</p> <p>Vitamin D₂ is found in a few food sources, including vitamin D-fortified milk, cheese, butter, fatty fish, oysters, egg yolks, and liver.</p>



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Vitamin D - continued

<p>How the body gets the vitamin</p>	<p>There are two forms of vitamin D. Vitamin D3 is made in the body from a chemical reaction triggered by the ultraviolet radiation in sunlight. People can get enough vitamin D by exposing their skin to 10 to 15 minutes of sunshine three times a week (without sunscreen).</p> <p>Vitamin D2 is found in a few food sources, including vitamin D-fortified milk, cheese, butter, fatty fish, oysters, egg yolks, and liver.</p>
<p>Effects of deficiencies</p>	<ul style="list-style-type: none"> • Softening of the bones (called rickets in children and osteomalacia in adults) • Knee problems • Hip fractures in postmenopausal women • Poor muscle strength after bone fracture • Higher risk for prostate cancer and breast cancer • High blood pressure and diabetes • Age-related macular degeneration (AMD) • Cognitive problems in the elderly
<p>People at risk for deficiencies</p>	<ul style="list-style-type: none"> • Older people, especially if they live in the North and do not get enough sunlight • Obese people • People who regularly use sunscreen, avoid the midday sun, wear protective clothing, or have dark skin • Children ages 1 to 11, especially black and Hispanic children
<p>Toxicities</p>	<p>Vitamin D is very toxic in high doses. Too much vitamin D can cause the intestines to absorb excess calcium, leading to high blood calcium levels.</p> <ul style="list-style-type: none"> • In infants, daily amounts higher than 1,000 IU can cause mental and growth retardation, kidney failure, and death. • In children and adults, daily amounts over 50,000 IU can cause weakness, appetite loss, vomiting, diarrhea, and mental changes. • Long-term megadoses can affect soft tissues and cause life-threatening kidney failure. <p>Eating a low-calcium diet and stopping the vitamin can usually reverse these side effects, except for kidney failure.</p>

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Other Vitamins

Other Vitamins		
	Vitamin E (Tocopherol or Tocotrienol)	Vitamin K
Benefits	<p>This vitamin helps protect cells from damage that can lead to disease and premature aging. Vitamin E also helps with the production of red blood cells and prevents clots from forming inside blood vessels.</p> <p>Researchers once thought that vitamin E might protect against heart disease, but this theory has been disproved. It is also clear that vitamin E does not prevent prostate cancer, as previously thought, and one study found that it actually increases the risk. Supplements of vitamin E have also been linked to an increase in respiratory infections and the overall death rate.</p>	<p>The most important function of vitamin K is its role in blood clotting and bleeding prevention. It also helps maintain healthy bones and heal fractures. Vitamin K is widely used in Japan to treat osteoporosis, and studies suggest it may be effective in treating rheumatoid arthritis .</p>
Recommended dietary allowance (RDA) (mcg = micrograms, mg = milligrams)	<p>Infants:</p> <ul style="list-style-type: none"> 0 to 6 months: 4 mg/day 7 to 12 months: 5 mg/day <p>Children:</p> <ul style="list-style-type: none"> 1 to 3 years: 6 mg/day 4 to 8 years: 7 mg/day 9 to 13 years: 11 mg/day <p>Upper limits:</p> <ul style="list-style-type: none"> 1 to 3 years: 200 mg/day 4 to 8 years: 300 mg/day 9 to 13 years: 600 mg/day <p>Adolescents and adults:</p> <ul style="list-style-type: none"> 14 and older: 15 mg/day <p>Breastfeeding women (all ages): 19 mg/day</p> <p>Upper limits:</p> <ul style="list-style-type: none"> Ages 14 to 18: 800 mg/day Ages 19 and up: 1,000 mg/day <p>Vitamin E is composed of eight compounds (four tocopherols and four tocotrienols). It is most often available as dl-alpha-tocopherol (a synthetic form) supplements.</p>	<p>Infants:</p> <ul style="list-style-type: none"> 0 to 6 months: 2.0 mcg/day 7 to 12 months: 2.5 mcg/day <p>Children:</p> <ul style="list-style-type: none"> 1 to 3 years: 30 mcg/day 4 to 8 years: 55 mcg/day 9 to 13 years: 60 mcg/day <p>Adolescents and adults:</p> <ul style="list-style-type: none"> Males and females ages 14 to 18: 75 mcg/day Males and females ages 19 and older: 90 mcg/day



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Other Vitamins - continued

	People should take vitamin E supplements with some oil or fat to help their body absorb this vitamin most efficiently.	
Foods containing the vitamin	Vegetable oils (particularly wheat germ oil), sweet potatoes, turnip greens, mangos, avocados, spinach, broccoli, nuts (almonds, peanuts, hazelnuts), sunflower seeds, fortified breakfast cereals, and soybeans. Tocotrienol (a possibly beneficial form) is found in natural tropical oils. Palm oil sold in the U.S. is refined and does not contain tocotrienol.	The best dietary sources are canola oil, green leafy vegetables such as spinach and kale, Brussels sprouts, broccoli, and soybean oil. Other good sources are beef liver, fish, bran, and olive oil. Vitamin K is also produced by bacteria in the intestines.
Effects of deficiencies	Deficiencies have not been established.	<ul style="list-style-type: none"> • Easy bruising and bleeding • May increase the risk of hip fractures in women • Appetite loss • Lethargy • Slowed growth • Bone loss • Soft tissue hardening
People at risk for deficiencies	<ul style="list-style-type: none"> • Low-birth-weight infants • People who eat a low-fat diet • People with medical problems such as Crohn disease, cystic fibrosis, steatorrhea, and liver diseases (such as cirrhosis), which impair fat absorption • People with abetalipoproteinemia, a rare genetic disorder that impairs fat metabolism 	<ul style="list-style-type: none"> • People who have problems absorbing fats, such as those with cirrhosis • People who are on long-term antibiotic therapy, or who are taking medications such as cholestyramine, Dilantin, and phenobarbital <p>Some evidence suggests that more young people may be deficient than was previously believed.</p>
Toxicities	Although vitamin E is one of the best-studied vitamins, research has yielded conflicting results. Definitive conclusions about the benefits and risks of vitamin E have not yet been determined. Although vitamin E from foods is not dangerous, large doses in supplement form may cause bleeding problems, particularly in people taking anti-clotting medications. Some research now indicates that vitamin E, like other antioxidants, may have damaging effects. Studies of people who took large amounts of vitamin E supplements indicated a higher risk of heart failure and death.	Allergic responses, including rash and itching, to high doses have been reported. People who are taking Coumadin, an anticoagulant, should not take vitamin K without consulting a physician.



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A Special Note on Vitamin D

While vitamin D has been the focus of hundreds of studies, the question of whether supplementation with vitamin D is beneficial has not been answered.

A large analysis of hundreds of systematic reviews and meta-analyses on the benefits of vitamin D supplementation did not yield conclusive evidence for its benefits, including no clear evidence for the prevention of osteoporosis or falls. There appeared to be associations of higher vitamin D status and protection from several neonatal, child, and maternal outcomes (as well as parathyroid hormone in people with chronic kidney disease), but further study is needed.

Supplementation with Vitamin D 3 (but not D2) was shown to reduce the risk of death from heart disease, cancer, or other causes, among older adults. More research is necessary to define the optimal dosing.

Researchers suggest that other key areas related to Vitamin D such as autoimmune diseases, cancer, infectious, and cognitive outcomes, could benefit from more meta-analysis to help draw conclusions.

Carotenoids

Carotenoids are a group of more than 700 fat-soluble nutrients that produce the colors in foods such as carrots, pumpkins, sweet potatoes, tomatoes, and other deep green, yellow, orange, and red fruits and vegetables. Many carotenoids are proving to be very important for health. Beta-carotene is the most widely studied carotenoid, but others are also of great interest. Some carotenoids, including beta-carotene, are known as provitamin A because they convert to vitamin A in the body.

Carotenoids are categorized as either xanthophylls or carotenes according to their chemical composition. Xanthophylls will be covered under the phytochemicals section of this report.

Carotenes

Most carotenes are found in yellow, orange, and red vegetables. They include beta- and alpha-carotene and lycopene.

Beta-carotene and other Provitamin A Carotenoids

Beta-carotene, alpha-carotene, and beta-cryptoxanthin are carotenes that are converted into vitamin A or retinol (the active form of vitamin A) in the body. They are found in many yellow fruits and vegetables.



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Beta-carotene is the most widely studied carotenoid. Evidence now strongly suggests that when taken as a separate supplement, it can have harmful effects in smokers.

Lycopene

Lycopene is responsible for the red color in fruits and vegetables, including tomatoes, red grapes, watermelon, and pink grapefruit. It is also found in papayas and apricots. It does not convert to vitamin A, but it may have important cancer fighting properties and other health benefits.

The beneficial actions of most carotenes, such as those in tomatoes, corn, and carrots, appear to be enhanced by cooking them, especially in oil (preferably olive, canola, or another monounsaturated oil). (Note: Cooking can also destroy certain nutrients, such as vitamin C, in these vegetables.)

Phytochemicals

The word phytochemical means plant chemical. Phytochemicals are plant-based nutrients, rather than vitamins. Researchers are studying hundreds of phytochemicals. Many are believed to have a major positive impact on human health. Some contribute to the bright and vivid colors found in fruits and vegetables.

The results of studies on certain phytochemicals may not necessarily apply to the vegetables or fruits that contain only small amounts of these chemicals. The health benefits of vegetables and fruits are probably due to some balance of phytochemicals, carotenoids, vitamins, fibers, and minerals rather than to any single substance.

The benefits of individual phytochemical supplements are unproven. Furthermore, these supplements are not regulated. High concentrations of some phytochemicals may act like drugs and be toxic, possibly even contributing to cancer cell growth.

Xanthophylls

Xanthophylls include lutein and zeaxanthin, which are both stored in the retina of the eye. Neither of these converts to vitamin A. Both lutein and zeaxanthin are powerful antioxidants that may be very important for healthy eyes.

Most xanthophylls are found in green vegetables, such as broccoli, cabbage, and kale. They are also in yellow fruits and vegetables. Cooking may reduce the antioxidant activity of some xanthophylls in foods, although probably not to any significant degree.



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Polyphenols and Flavonoids

Polyphenols are important phytochemicals. Flavonoids (or catechins) are members of the polyphenol family that may have significant health benefits. Laboratory (but not human) studies have shown that specific flavonoids suppress tumor growth, interfere with sex hormones, prevent blood clots, and have anti-inflammatory properties. Flavonoids are found in celery, cranberries, onions, kale, dark chocolate, broccoli, apples, cherries, berries, tea, red wine or purple grape juice, parsley, soybeans, tomatoes, eggplant, and thyme. Most common berries contain flavonoids and are rich in potent antioxidants.

Resveratrol, quercetin, and catechin are three important flavonoids. Evidence suggests that resveratrol (found in red wine, grapes, and olive oil) may be extremely potent. In laboratory studies, resveratrol increased cell survival and lengthened the lifespan of worms and fruit flies. Catechins are the primary flavonoids in tea, and may be responsible for its healthful effects. Flavonoids in dark chocolate may also have health benefits.

Isoflavones (Phytoestrogens)

Isoflavones, commonly known as phytoestrogens, have actions that are similar to the female hormone estrogen. However, no evidence to date indicates that soy-rich foods or phytoestrogen supplements help with hot flashes or other menopause symptoms.

Lignan is another phytoestrogen. It is found in whole grains, berries, some seeds, some vegetables, and a few fruits. In laboratory studies, it seems to have anti-cancer properties.

Isothiocyanates

Isothiocyanates are responsible for the sharp taste in cruciferous vegetables, such as broccoli, cabbage, Brussels sprouts, cauliflower, collards, kale, kohlrabi, mustard greens, rutabaga, turnips, and bok choy. Isothiocyanates stimulate enzymes that convert estrogen to a more harmless form and may block the steroid hormones that promote breast and prostate cancers. (Cruciferous vegetables are also high in fiber, vitamin C, and selenium.)

Monoterpenes

Monoterpenes contain two important phytochemicals, perillyl alcohol and limonene. They block proteins that stimulate cell growth and reproduction, and are being tested for their ability to fight cancer. Limonene is found in the peels of citrus fruits.

Organosulfur Compounds

Organosulfurs are found in garlic, leeks, onions, chives, scallions, and shallots. They are part of the allium family of phytochemicals. Organosulfur compounds such as allicin may benefit the immune system, help the liver make cancer-causing substances harmless, and reduce the production of cholesterol in the liver.



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Capsaicin

Capsaicin is found in hot red peppers. It seems to reduce levels of substance P, a compound that contributes to inflammation and the delivery of pain impulses from the central nervous system. Research suggests that it may inhibit cancer-causing substances.

Sterols

Sterols, which include sitosterol, stigmasterol, campesterol, and squalene, are found in vegetable oils. Sitosterol is the best-studied sterol, and it appears to have cholesterol-lowering effects.

Beta-sitosterols may help improve urine flow and urinary symptoms in men with an enlarged prostate gland (benign prostatic hyperplasia, or BPH). Beta-sitosterols come from South African star grass (*Hypoxis rooperi*) or the *Pinus* and *Picea* tree species.

Healthy Foods

Evidence increasingly suggests that it is not individual food chemicals, but a varied diet that is essential for good health and longevity. These types of diets are rich in fresh fruits and vegetables and whole grains, and low in saturated fats.

Dietary Health Benefits

The best way to get healthy levels of important nutrients is by eating healthy foods.

However, the benefit of any individual food or nutrient is very difficult to prove.

To date, there is little evidence that most dietary supplements protect against major diseases in otherwise healthy people with normal eating habits. A diet that is naturally high in vitamins and minerals can be the best defense against many diseases. Fresh fruits and vegetables and whole grains are the primary sources of vitamins, carotenoids, and vitamins, as well as of fiber and important minerals.



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Some Examples of Healthy Foods			
Foods	Phytochemicals and Carotenoids	Vitamins and other valuable food components	Claimed Benefits
Apples	Flavonoids		Thought to work against certain cancers (lung), but this is not proven. Also may help maintain healthy cholesterol levels.
Beans	Flavonoids	Folate, iron, potassium, and zinc	Some experts believe beans are the perfect food, because they are high in protein and fiber, and they have beneficial effects on the digestive tract and heart.
Berries, dark-colored	Ellagic Acid	Vitamin C, minerals	The anthocyanins in berries such as blueberries, cranberries, and elderberries have many health properties, including antioxidant effects. Blueberries may help protect the aging brain.
Broccoli (also kale, Brussels sprouts, and cauliflower)	Flavonoids, isothiocyanates, lutein, beta- and alpha-carotene. Note: Young sprouts of broccoli and cauliflower contain much higher levels of isothiocyanates than their mature forms.	Vitamin C, folate, fiber, and selenium	The nutrients in these vegetables may have anti-cancer properties.
Carrots and other bright yellow vegetables	Lutein, beta-carotene, and other provitamin A carotenoids	Vitamin A (converted from carotenoids), vitamin C	Protects eyes, lungs. (Cooking carrots may increase the potency of their nutrients.)
Chocolate, dark. Note: Milk chocolate does not have health benefits.	Flavonoids		Heart protective (may help prevent blood clotting). Claimed to have protective properties against lung cancer (not other cancers), but this is not proven.
Eggs	Lutein	Many B vitamins, vitamin A,	Although egg yolks are high in cholesterol, a modest consumption of eggs does not appear harmful for people with normal cholesterol levels. (People with diabetes or those with high cholesterol should limit eggs, however.)



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Examples of Healthy foods - continued

Fish, oily (mackerel, salmon, sardines)		Vitamins B3, B12. Essential fatty acids, selenium	Protects the heart and brain.
Garlic	Allium (organosulfurs)		Claimed to protect against certain cancers, heart disease, and infection, but this is not proven. Heating garlic can reduce its benefits. Allowing crushed fresh garlic to stand for 10 minutes before heating, however, may preserve beneficial chemicals while cooking.
Ginger	Zingiberaceae		Claimed to have cancer-fighting properties.
Grains (whole)	Lignans (phytoestrogens)	Vitamin B, selenium (important antioxidant mineral), fiber, folate	Whole grains appear to reduce the risk of diabetes, heart disease and various digestive disorders. Claimed to reduce the ability of cancer cells to invade healthy tissue, but this is not proven.
Grapes, including purple grape juice and red wine	Flavonoids, (resveratrol, quercetin, and catechin)		Claimed to fight heart disease and cancer, and to lower the risk for asthma, but these effects have not been proven.
Nuts		Vitamin E, vitamin B1, essential fatty acids, folate	Heart-healthy benefits include lowering LDL cholesterol and reducing the risk of developing blood clots that can lead to a heart attack.
Onions	Flavonoids, allium (organosulfurs)		Claimed to have activity against certain cancers (lung).
Oranges	Monoterpenes	Vitamin C, folate, potassium.	Many health benefits, including increasing HDL (good) cholesterol levels.
Potatoes (sweet)		Vitamin C, vitamin E, vitamin A	Many health benefits, including antioxidant and anti-inflammatory properties.



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Antioxidants: Pros and Cons

Free Radicals (Oxidants):

Currently, the most important benefit claimed for vitamins A, C, E, and many of the carotenoids and phytochemicals is their role as antioxidants, which are scavengers of particles known as free radicals (also sometimes called oxidants). These chemically active particles are byproducts of many of the body's normal chemical processes.

Warnings on High-Dose Antioxidants and Other Supplements:

Antioxidant vitamins (A, C, and E), carotenoids, and many phytochemicals can neutralize harmful free radicals. Although it is clear that the modest amounts of these vitamins in foods prevent deficiency diseases, high-dose vitamin C, vitamin E, and beta-carotene supplements may also have pro-oxidant effects, which can be harmful in people with cancer. In these people, high doses of antioxidant vitamins may actually protect cancer cells just as they do healthy cells. Because there is no evidence that antioxidants decrease the risk of cancer or heart disease, people should talk with their physician before taking these vitamins or supplements.

Protection against Heart Disease

A low dietary intake of vitamins A, C, E, and beta-carotene has been linked to heart disease. Deficiencies in the B vitamins folate (also known as folic acid) and B12 have been associated with high blood levels of the amino acid homocysteine. Higher homocysteine levels may increase the risk for heart disease, stroke, and heart failure. However, supplements of these vitamins, alone or in combination, have not been shown to protect against heart disease.

Calcium, which is often taken along with vitamin D to protect bones, may actually increase the risk for heart disease. Research suggests that calcium supplements, when taken alone or with vitamin D, increase the likelihood of heart problems, especially heart attack. This risk may prompt older adults to reevaluate their use of calcium supplements for bone protection. More research on the subject is needed.

Atherosclerosis

Atherosclerosis is a disease of the arteries in which fatty material is deposited in the vessel wall, resulting in narrowing and eventual blockage of blood flow. Severely restricted blood flow in the arteries to the heart muscle leads to symptoms such as chest pain.



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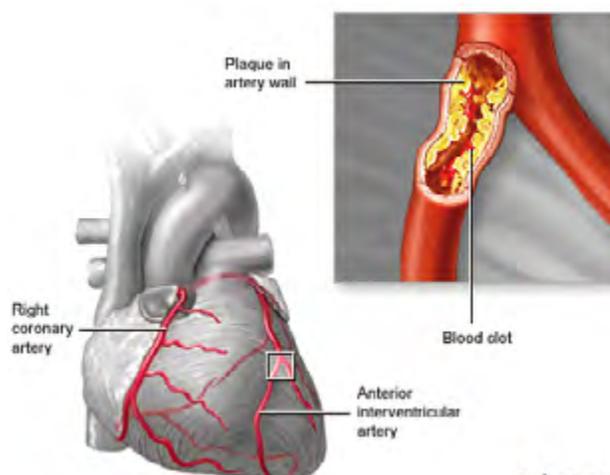
Phytochemicals and Heart Protection:

Foods containing phytochemicals have been shown to protect the heart. However, the reduced risk of heart disease is more likely due to a generally healthy diet that is low in harmful fats and other unhealthy foods than to any one fruit or vegetable.

Phytochemicals that may benefit the heart:

- **Flavonoids.** Certain flavonoids, which are found in both black and green teas, dark chocolate, onions, red wine or red grape juice, and apples may protect the heart. Flavonoids may help prevent cholesterol damage and blood clots, but further studies are needed.

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- **Organosulfurs.** Organosulfurs, found in onions and garlic, have been under investigation for their possible cholesterol-lowering effects.
- **Isoflavones.** Soy protein, found in foods like tofu and soy milk, is the best-studied source of isoflavones (known as phytoestrogens, or plant estrogens), which may help lower LDL (bad) cholesterol and triglycerides.
- **Sterols.** Plant sterols, including sitosterol, are also proving to be potent cholesterol fighters. They work by blocking the absorption of cholesterol in the intestine.

Protection against Stroke

A healthy diet that is rich in fruits and vegetables and low in salt and saturated fat may significantly lower the risk for a first stroke, perhaps by protecting against high blood pressure, which is a major stroke risk factor.



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Vitamins and Stroke Protection:

The effects of antioxidant vitamins and carotenoids (vitamins C or E, or beta-carotene) on stroke have been studied extensively. Most studies have found that these vitamins do not protect against stroke. Although B vitamin supplements help lower homocysteine levels, they have no effect on heart disease outcomes. More research is under way to evaluate the effect of vitamins on reducing stroke risk.

Protection against Cancer

Studies have found that diets rich in fresh fruits and vegetables may decrease the risk for many cancers, including cancers of the lung, breast, colon, and prostate. Examples of possible cancer-fighting foods include cruciferous vegetables (such as cabbage, Brussels sprouts, and broccoli), tomatoes (which contain lycopene), and carrots (which contain alpha-carotene).

Because many cancers are thought to be caused by the effects of oxygen-free radicals on DNA, the antioxidants A, C, and E and beta-carotene have been intensively studied for cancer prevention.

For the most part, vitamin or phytochemical supplements have not shown any benefit against cancer. Any protective effects of vitamins or phytochemicals against cancer may depend on the combined effect of these nutrients in foods. A National Institutes of Health study reviewed randomized trials that evaluated the effectiveness and safety of multivitamin and mineral supplements for preventing cancer and chronic disease. The reviewers concluded that current evidence is not sufficient to determine whether multivitamin and mineral supplements prevent cancer or chronic disease.

Certain supplements may actually encourage tumor growth. Research finds that beta-carotene supplements increase lung cancer risk in smokers and people who have been exposed to asbestos.

Vitamins and breast cancer prevention:

- Eating foods that are rich in calcium and vitamin D (such as low-fat or nonfat yogurt and milk) may modestly reduce the risk of breast cancer in premenopausal women. It is not clear whether fruits and vegetables can prevent breast cancer from developing or returning.
- The American Cancer Society recommends that women with breast cancer eat only moderate amounts of soy foods and avoid taking dietary supplements that contain high amounts of isoflavones. Isoflavones are a type of phytoestrogen (estrogen-like plant chemical). There have been concerns that high intakes of soy may increase the risk of estrogen-responsive cancers such as breast cancer.



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Dietary supplements and other cancers:

- Taking folic acid supplements did not increase or decrease the risk of site-specific cancer, such as large intestine, lung, breast, or any other site, in the first few years of supplementation in a recent study.
- Taking folic acid supplements does not lower the risk of developing colorectal cancer. In fact, supplements appear to increase the risk for repeated colorectal polyps. Eating a diet rich in fruits and vegetables may provide some protection against colorectal cancers, however.
- There is no evidence to support the idea that antioxidant supplements (including vitamins C, E, A, folate, and beta-carotene) decrease the risk for lung cancer. Evidence shows that vitamin C, vitamin E, and beta-carotene supplements increase lung cancer risk in smokers.
- There is no evidence that once someone is diagnosed with cancer, taking large doses of vitamin C will help the treatment. In fact, there is concern that large doses of antioxidants from supplements could interfere with radiation therapy and chemotherapy and, therefore, should be avoided during cancer treatment.
- Evidence has clearly shown that vitamin E does not prevent prostate cancer, and it may actually increase the risk of prostate cancer (and heart failure). While eating soy foods may decrease the risk for prostate cancer, soy or isoflavone supplements have not yet been proven to reduce that risk.
- Selenium supplements do not reduce the risk of bladder or prostate cancer.
- Selenium may help protect against colon and lung cancers, but studies have not confirmed that supplements help. Selenium supplements appear to increase the risk of diabetes.
- A combination of selenium, beta-carotene, and alpha-tocopherol may decrease the risk of death from gastric cancer in certain population groups.
- There is some evidence that, in women who are already at high risk for skin cancer, vitamin D plus calcium may offer some protection against melanoma.

Studies on the health benefits of vitamins and minerals have some important limitations. Some are held to rigorous standards, while others are not. In most cases, the results of existing research are complex, because they can be complicated by factors such as diet, exercise, healthy or unhealthy lifestyle behaviors, as well as environmental and genetic factors.



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Evidence of Protection against Other Diseases from Vitamins, Carotenoids, and Phytochemicals		
Disease or Condition	Vitamins	Carotenoids, Phytochemicals, and Healthy Foods
Alzheimer Disease	<p>Vitamin E.</p> <p>There is some evidence that foods high in vitamin E might reduce the risks of dementia and Alzheimer disease.</p> <p>B Vitamins.</p> <p>Some studies suggest that deficiencies of vitamins B6, B12, and folate (folic acid) may be a risk factor for Alzheimer disease. However, there is no evidence from randomized, controlled trials that these supplements prevent Alzheimer disease.</p> <p>Vitamin D.</p> <p>There is some evidence that older adults with low vitamin D levels are more likely to experience cognitive decline, including problems with thinking, learning, and memory. Whether supplementing with vitamin D can help reverse these cognitive changes is unclear.</p>	
Infectious Disease	<p>Studies are mixed as to whether vitamin supplements protect against upper respiratory infections. The evidence suggests there is little or no benefit. It is possible that vitamin C or multivitamin supplements may be helpful in specific people, such as those who are vitamin deficient or who have medical problems that impair their immune system.</p>	
Eye Disorders	<p>Cataracts and Macular Degeneration.</p> <p>Oxygen-free radicals play a role in cataract formation and age-related macular degeneration (AMD), the most common cause of irreversible blindness in the elderly.</p> <p>A low level of vitamin C in the lens of the eye has been a particularly strong predictor of cataracts. People with cataracts are often deficient in vitamin A, the carotenes, lutein, and zeaxanthin. Studies have not demonstrated that antioxidant vitamin supplements (such as vitamins C and E) prevent cataracts, however.</p> <p>A combination of zinc and antioxidants, including vitamins C, E, and beta-carotene, slows the progression of AMD. This combination can be helpful in people with intermediate or advanced AMD in one eye. However, these supplements will not prevent macular degeneration from developing in the first place.</p>	<p>Several studies have associated antioxidant-rich foods with a decreased risk for cataracts. Carotenoids, especially lutein, lycopene, and zeaxanthin, are especially eye-protective. However, there is not enough evidence to suggest that taking supplements containing carotenoids lowers the risk for cataracts.</p>



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Evidence of Protection against Other Diseases from Vitamins, Carotenoids, and Phytochemicals

<p>Osteoporosis</p>	<p>Vitamin D.</p> <p>Adequate amounts of daily calcium and vitamin D can reduce the risk of osteoporosis, but the impact on fracture risk is under debate. To keep bones strong, the National Osteoporosis Foundation (NOF) recommends:</p> <ul style="list-style-type: none"> • Adults under age 50 should get 1,000 mg of calcium and 400 to 800 IU of vitamin D daily. • Women age 50 and older should get 1,200 mg of calcium and 800 to 1,000 IU of vitamin D daily. • Men ages 50 to 70 should get 1,000 mg of calcium and 800 to 1,000 IU of vitamin D. • Men over age 70 should get 1,200 mg of calcium and 800 to 1,000 IU of vitamin D. <p>Ideally, adequate calcium and vitamin D will come from food and sun exposure. Doctors are currently reconsidering the use of calcium and vitamin D supplements based on studies suggesting that supplements do not make much difference for bone mineral density protection. The U.S. Preventive Services Task Force (USPSTF) advised that healthy postmenopausal women don't need to take these supplements. According to the USPSTF, taking daily low-dose amounts of vitamin D supplements (400 IU or less), with or without calcium supplements (1,000 mg or less), does not prevent fractures. For higher doses, the USPSTF says there is not enough evidence to make a recommendation. In addition to a possible lack of benefit, these supplements are associated (even at lower doses) with certain risks, like kidney stones.</p> <p>Vitamin D and calcium supplements may be appropriate for certain people, including those who do not get enough vitamin D through sunlight exposure and those who do not consume enough calcium in their diet. They are also helpful, along with other medications, for people who have been diagnosed with osteoporosis.</p>	
<p>Menstrual Disorders</p>	<p>Vitamin B6.</p> <p>Limited evidence suggests that vitamin B6 may help reduce premenstrual symptoms, including depression. Typically, women take 100 mg of vitamin B6 per day, although one study suggested that a lower dose (50 mg) may have the same effect.</p>	

Resources

<http://fnic.nal.usda.gov> -- The Food and Nutrition Information Center

<http://dietary-supplements.info.nih.gov> -- Office of Dietary Supplements, National Institutes of Health

www.ars.usda.gov/ba/bhnrc/ndl -- Nutrient Data Laboratory

www.fda.gov -- Food and Drug Administration

www.eatright.org -- Academy of Nutrition and Dietetics



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More Resources

www.acsh.org -- American Council on Science and Health

www.aicr.org -- American Institute for Cancer Research

www.nutritiondata.com -- Information on vitamins and nutrients in foods

www.consumerlab.com -- Independent testing of nutritional supplements' contents and quality

www.usp.org -- US Pharmacopeia

www.herbs.org -- Herb Research Foundation

References

Ambrosini GL, de Klerk NH, Fritschi L, Mackerras D, Musk B. Fruit, vegetable, vitamin A intakes, and prostate cancer risk. *Prostate Cancer Prostatic Dis.* 2007 May 22.

Bolland MJ, Grey A, Avenell A, Gamble GD, Reid IR. Calcium supplements with or without vitamin D and risk of cardiovascular events: reanalysis of the Women's Health Initiative limited access dataset and meta-analysis. *BMJ.* 2011 Apr 19;342:d2040.

Chen L, Hu JY, Wang SQ. The role of antioxidants in photoprotection: a critical review. *J Am Acad Dermatol.* 2012;67(5):1013-1024.

Chew EY, Clemons TE, Agrón E, Sperduto RD, Sangiovanni JP, Kurinij N, Davis MD; Age-Related Eye Disease Study Research Group. Long-term effects of vitamins C and E, β -carotene, and zinc on age-related macular degeneration: AREDS report no. 35. *Ophthalmology.* 2013;120(8):1604-11.e4.

Chowdhury R, Kunutsor S, Vitezova A, Oliver-Williams C, Showdhury S, Kieffe-de-Jong JC, et al. Vitamin D and risk of cause specific death: systematic review and meta-analysis of observational cohort and randomised intervention studies. *BMJ.* 2014;348:g1903.

Christen WG, Glynn RJ, Chew EY, Buring JE. Vitamin E and age-related macular degeneration in a randomized trial of women. *Ophthalmology.* 2010;117(6):1163-8.

Dawson-Hughes B, Mithal A, Bonjour JP, Boonen S, Burckhardt P, Fuleihan GE, et al. IOF position statement: vitamin D recommendations for older adults. *Osteoporosis Int.* 2010;21(7):1151-1154.

Devore EE, Grodstein F, van Rooij FJ, Hofman A, Stampfer MJ, Witteman JC, Breteler MM. Dietary antioxidants and long-term risk of dementia. *Arch Neurol.* 2010;67(7):819-825.

Devore EE, Kang JH, Stampfer MJ, Grodstein F. The association of antioxidants and cognition in the nurses' health study. *Am J Epidemiol.* 2013;177(1):33-41.

Evans JR, Lawrenson JG. Antioxidant vitamin and mineral supplements for slowing the progression of age-related macular degeneration. *Cochrane Database Syst Rev.* 2012;11:CD000254.

Fernandez MM, Afshari NA. Nutrition and the prevention of cataracts. *Curr Opin Ophthalmol.* 2008;19(1):66-70.

Gahche J, Bailey R, Burt V, Hughes J, Yetley E, Dwyer J, et al. Dietary supplement use among U.S. adults has increased since NHANES III (1988-1994). *NCHS Data Brief, No. 61.* April 2011.



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Gaziano JM, Sesso HD, Christen WG, et al. Multivitamins in the prevention of cancer in men: the Physicians' Health Study II randomized controlled trial. *JAMA*. 2012;308(18):1871-1880.

Gaziano JM, Glynn RJ, Christen WG, et al. Vitamins E and C in the prevention of prostate and total cancer in men: the Physicians' Health Study II randomized controlled trial. *JAMA*. 2009;301(1):52-62.

Grodstein F, O'Brien J, Kang JH, Dushkes R, Cook NR, Okereke O, et al. Long-term multivitamin supplementation and cognitive function in men: a randomized trial. *Ann Intern Med*. 2013;159(12):806-814.

Hamrick I, Counts SH. Vitamin and mineral supplements. *Wellness and Prevention*. December 2008;35(4):729-747.

Heimurger DC. Nutrition's Interface with Health and Disease. In: Goldman L, Ausiello D, eds. *Goldman's Cecil Medicine*. 24th ed. Philadelphia, PA: Elsevier Saunders; 2011:chap 220.

Hemilä H, Chalker E. Vitamin C for preventing and treating the common cold. *Cochrane Database Syst Rev*. 2013;1:CD000980.

Institute of Medicine. Food and Nutrition Board. Dietary Reference Intakes for Calcium, Phosphorous, Magnesium, Vitamin D, and Fluoride. National Academy Press, Washington, DC, 2010.

Isaac MG, Quinn R, Tabet N. Vitamin E for Alzheimer's disease and mild cognitive impairment. *Cochrane Database Syst Rev*. 2008 Jul 16;(3):CD002854.

Larsson SC, Orsini N, Wolk A. Vitamin B6 and risk of colorectal cancer: a meta-analysis of prospective studies. *JAMA*. 2010;303(11):1077-83.

Lin J, Cook NR, Albert C, et al. Vitamins C and E and beta carotene supplementation and cancer risk: a randomized controlled trial. *J Natl Cancer Inst*. 2009;101(1):14-23.

Llewellyn DJ, Lang IA, Langa KM, Muniz-Terrera G, Phillips CL, Cherubini A, et al. Vitamin D and risk of cognitive decline in elderly persons. *Arch Intern Med*. 2010;170(13):11351-1141.

Logan RF, Grainge MJ, Shepherd VC, Armitage NC, Muir KR; ukCAP Trial Group. Aspirin and folic acid for the prevention of recurrent colorectal adenomas. *Gastroenterology*. 2008;134(1):29-38.

Marra MV, Boyar AP. Position of the American Dietetic Association: nutrient supplementation. *J Am Diet Assoc*. 2009;109(12):2073-2085.

McAlindon T, LaValley M, Schneider E, et al. Effect of vitamin D supplementation on progression of knee pain and cartilage volume loss in patients with symptomatic osteoarthritis: a randomized controlled trial. *JAMA*. 2013;309(2):155-62.

Moeller SM, Voland R, Tinker L, Blodi BA, Klein ML, Gehrs KM, et al. Associations between age-related nuclear cataract and lutein and zeaxanthin in the diet and serum in the Carotenoids in the Age-Related Eye Disease Study, an Ancillary Study of the Women's Health Initiative. *Arch Ophthalmol*. 2008;126(3):354-64.

Morris MS. The role of B vitamins in preventing and treating cognitive impairment and decline. *Adv Nutr*. 2012;3(6):801-12.

Moyer VA; U.S. Preventive Services Task Force. Vitamin D and calcium supplementation to prevent fractures in adults: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2013;158(9):691-6.

Moyer VA; U.S. Preventive Services Task Force. Vitamin, mineral, and multivitamin supplements for the primary prevention of cardiovascular disease and cancer: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med*.



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