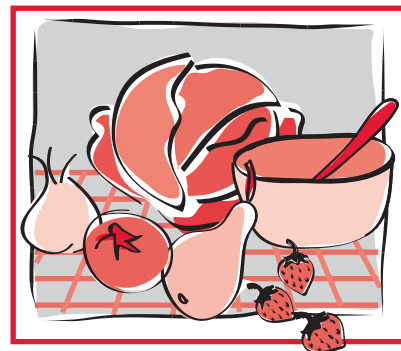


Dietary Supplements: Vitamins and Minerals

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The current food environment can be complicated, given the multitude of choices and purchasing options available for consumers. Many individuals are left questioning the best way to obtain vitamins and minerals, as a variety of options are available- including whole foods, multivitamins and multiminerals, as well as individual dietary supplements. The incredible variety of dietary supplements available in today's market comprises a wide range of brand names, supplement forms (pill, powder), and amounts (10 to 100 times the daily recommended intake value), which can make purchasing supplements very confusing. The following information defines dietary supplements and helps to explain the value of food in comparison to vitamin and mineral supplements. General guidelines are also provided to help individuals choose an appropriate supplement to fit their needs, as well as recommendations for obtaining important nutrients from diet alone. For more information on herbal supplements, see fact sheet [Dietary Supplements: Herbs and Botanicals](#).

What are Dietary Supplements?

Dietary supplements include vitamins, minerals, herbs, amino acids, enzymes, and other substances that may be "supplemented," or added to a diet, in order to complete dietary needs or to make up for a nutrition deficiency—they are not intended to replace a healthy diet. Dietary supplements may be found in many forms, including pills, capsules, powders, drinks, or energy bars. Supplement use can also be considered a type of complementary or alternative medicine

(CAM). It is important to remember that supplements are not required to go through the same stringent testing as over the counter (OTC) and prescribed medicine, and are not regulated as closely by the Food and Drug Administration (FDA).

Choose Food First, Supplements Second

Vitamin and mineral supplements are the most common dietary supplement used by approximately 40% of adults and 30% of children in the United States. Despite the popularity of supplements, many individuals are capable of obtaining all of the required vitamins and minerals through a healthy diet alone. In fact, those who consume a multivitamin or multimineral on a daily basis may be at risk for excessive intake, or toxicity of certain nutrients. Additionally, supplements can be very expensive—as evidenced by the \$30 billion that Americans spend annually on all forms, a number that continues to grow every year. In some circumstances a daily supplement may not be necessary, and for many, consuming a multivitamin or multimineral once every 2 to 3 days may be a cost-effective choice. Since the body has limited storage for many of these nutrients, most of the time they are simply excreted. Essentially, the most cost-effective way to promote good health is eat a wide selection of foods and exercise regularly. For a better understanding of how to choose foods that provide the daily requirements for nutrients see the USDA websites: [Choose MyPlate](#) or [The Dietary Guidelines for Americans](#). See Table 1 for common myths associated with vitamin and mineral supplements.

Quick Facts

- Most individuals can obtain all the vitamins and minerals needed to meet the recommended dietary allowances and adequate intakes by eating a variety of foods.
- Dietary supplements, including multivitamins and multiminerals, do not guarantee protection against disease.
- Large doses of either single nutrient supplements or high potency vitamin and mineral combinations may be harmful.
- Although vitamin deficiency is rare, it may occur when nutrients are limited in one's diet, or as a result of a secondary deficiency caused by tobacco, alcohol use, or disease.
- Consult a medical professional before taking any self-prescribed single nutrient supplements.

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Who Should Consider a Multivitamin, Multimineral, or Individual Nutrient Supplements?

National food consumption data and dietary surveys show that the majority of Americans consume all of the nutrients needed, through a balanced and varied diet that includes healthy food choices. Some nutrients, like calcium and iron, may require careful food selection, but can be obtained from adequate consumption of a variety of foods. Certain individuals may have dietary restrictions (such as those with celiac disease or lactose intolerance), or belong to a particular life stage (pregnant, breastfeeding, or older adult) and may benefit from taking specific supplements. Consult a medical professional before deciding to take a dietary supplement. See Table 2 for recommendations for the type and amount of supplement that may be best, and Table 3 for a description of how to obtain important nutrients through food.

Pregnant women or women who may become pregnant: This population is strongly advised to consume supplements for folic acid (folate), iron, or a prenatal vitamin that contains these nutrients.

- Folic Acid helps to prevent birth defects of the brain and spine, and may be obtained through fortified foods (such as enriched breads and cereals), vitamin supplements, or a combination of both.
- Iron helps to increase the amount of blood in the body and helps keep blood healthy. Too iron little may lead to anemia.
- A prenatal vitamin may contain both folic acid and iron, as well as other important vitamins and minerals both mother and baby need for proper nutrition (for example, vitamin B12 is important if the mother is a vegetarian). Some nutrients, however, may be harmful to babies (such as vitamin A, where too much can cause birth defects), and a prenatal supplement ensures that both mother and child are receiving healthy doses of all nutrients.

Vegetarians and vegans: This population should ensure adequate intake of vitamin B12, vitamin D, calcium, iron, and zinc.

- Vitamin B12 (cobalamin) is only found naturally in foods of animal origin such as eggs and dairy products.

How Are Dietary Supplements Regulated?

In 1994 Congress passed the Dietary Supplement Health and Education Act (DSHEA), which clearly defines supplements as food, not drugs. Unlike drugs, supplements do not need FDA approval before being marketed and sold to the public. The supplement manufacturer is responsible for the safe consumption of supplements and providing evidence to support health claims. However, evidence does not have to be provided before the supplement is marketed, and the FDA will take action against any unsafe dietary supplements after they reach the market. In 2007 the FDA implemented the Current Good Manufacturing Practices (CGMPs), which act to insure the consistency, identity, purity, strength, and composition, of dietary supplements.

Before consuming any type of supplement, consult a medical professional and research the supplement thoroughly.

The following website resources are provided to help one make an educated decision and identify inaccurate information when choosing a dietary supplement:

[National Library of Medicine \(NLM\)–Dietary Supplements Labels Database](#)

CSU Extension fact sheet, [Nutrition Misinformation: How to Identify Fraud and Misleading Claims](#)

Vegans and strict vegetarians that do not consume eggs or dairy products should consider taking a vitamin B12 supplement.

- Vitamin D is found in very few food items, although dairy products, milk alternatives (soy or almond milk), orange juice, breakfast cereals, and eggs, may be fortified with this

nutrient. Those who do not consume these food items and do not receive exposure to regular sunlight should consider a vitamin D supplement.

- Calcium is mostly found in dairy products, therefore vegans and vegetarians who do not consume dairy may not receive enough calcium in their diet.
- Iron is found in two different forms—heme iron (from animal products) is more available for absorption, and nonheme iron (from plant foods) is less available for absorption. Vegetarians and vegans may receive enough iron from their diet, although if it is strictly from plant foods (nonheme sources), twice as much dietary iron each day may be needed.
- Zinc is primarily found in animal proteins, therefore vegetarians and vegans may require 50% more zinc in the diet than is generally recommended. Additionally, beans and grains have compounds that may keep zinc from being absorbed as readily. For more information regarding dietary recommendations for vegetarians and vegans, see fact sheet [Vegetarian Diets](#).

Women with heavy menstrual bleeding:

This population should consume extra iron, which acts to replace that which is lost due to blood loss.

Those with a restrictive diet (1,600 calories per day or less):

For most adults, a diet that includes less than 1,600 calories per day will not supply all of the necessary vitamins and nutrients to meet the body's needs—and these individuals should consume a multivitamin and/or multimineral supplement. Consult a medical professional regarding type and recommended amount of supplement.

Older adults (50+), menopausal, and postmenopausal women: These individuals should consume vitamin B12, calcium, and a vitamin D supplement. Vitamin B12, calcium, and vitamin D, work together to maintain healthy bones and reduce the risk for fractures.

- Vitamin B12 is absorbed less readily from foods as one ages. These individuals should receive vitamin B12 from fortified foods such as breakfast cereals, or through a dietary supplement.
- Calcium may not be absorbed as well in older adults and this population

may experience bone loss. A combination of calcium intake from both food sources and supplemental form is important.

- Vitamin D is not produced as efficiently in older adults upon exposure to sunlight. Additionally, the ability of the kidney to convert vitamin D to a form that the body can use is also dampened with age.

Breastfed and partially breastfed infants:

Since human milk is a poor source of vitamin D, infants who are solely breastfed or drink less than 1 quart per day of vitamin D-fortified formula or milk should receive a supplemental form of vitamin D.

Limited milk intake and sunlight

exposure: Dairy products and sunlight exposure are two primary means of obtaining vitamin D, therefore if either is limited, a supplemental form may be necessary.

Health conditions that may limit nutrient

use and absorption: Those with health conditions that may affect digestion, appetite, and limit nutrient absorption, may not be receiving adequate nutrients from diet alone (examples include those with food allergies, physical trauma, and gluten intolerance). These populations should consider a multivitamin and/or multimineral supplement. Consult a medical professional regarding the type and recommended amount of supplement.

How to Choose a Supplement

It is important for healthy individuals who take vitamin or mineral supplements to limit the potency to 100% or less of the Dietary Reference Intake (DRI) for their age, gender, and life stage (Table 2). Consuming a supplement that contains no more than 100% of the Daily Value (DV) is usually considered safe. High potency supplements that contain more than 100% of the DV are not suggested. Avoid supplements that provide mega doses of any vitamins or minerals, or have added botanicals whose properties are unknown. Information about vitamin and mineral content can be found on the label of all dietary supplements. Be aware of misleading claims that promise the product is a “cure all” or can treat a disease. For more information on how to identify nutrition fraud, see fact sheet [Nutrition](#)

Misinformation: How to Identify Fraud and Misleading Claims.

The term *natural* on a supplement is not synonymous with *safe*. Several natural products may cause negative drug interactions, worsen certain health conditions, and may be harmful at higher doses. Do not take a supplement prior to taking prescription medications, or receiving advice from a medical professional. Before choosing to take a dietary supplement, consider whether the supplement is necessary, and possible dietary modifications that might be a better option (Table 3).

Do Vitamin and Mineral Supplements Pose a Health Risk?

Large doses of either single-nutrient supplements or high potency vitamin-mineral combinations may be harmful. These megavitamins may contain 10 to over 100 times the Dietary Reference Intake (DRI) for a vitamin or mineral and can act like drugs with potentially serious results. Very high doses of many supplements, especially vitamins A, D, C, and B6, can cause serious health problems if taken regularly. Excess of one nutrient may cause nutritional imbalances or increase the need for other nutrients. Severe side effects such as kidney stones, liver or nerve damage, birth defects, and even death can occur from 10 to over 100 times of the DRI.

- Taken in high amounts, some supplements may produce undesirable effects such as fatigue, diarrhea and hair loss.
- Others may cause more severe side effects such as kidney stones, liver or nerve damage, birth defects, or even death. At high levels, single-nutrient supplements function as a drug in the body and not as a nutrient.
- Fat-soluble vitamins such as vitamins A and D are harmful in high doses. For non-smokers, supplements of vitamin A should contain the majority of the vitamin in the beta-carotene rather than the retinol form. Vitamin E may act as a blood thinner and should not be taken for at least one week prior to surgery.
- Water-soluble vitamins are commonly thought of as harmless, however,

Additional Resources

For more information on mineral recommendations for age and life stage, see the [National Institutes of Health \(NIH\) Office of Dietary Supplements website–Vitamin and Mineral fact sheet.](#)

For more information on how to spot a false health claim, see the [Federal Trade Commission \(FTC\) website.](#)

For information on recent supplement alerts and safety information, see the [Food and Drug Administration \(FDA\) website.](#)

research shows that vitamin B-6 can cause nerve damage at the high doses prescribed for pre-menstrual syndrome (PMS). High intakes of folic acid can mask or worsen the symptoms associated with a vitamin B-12 deficiency. Large amounts of vitamin C can cause diarrhea and nausea.

- Many factors influence toxicity. Supplement potency, dose (number and frequency), body size, and how long the supplement is taken, all influence whether a supplement can be toxic.

For more information, see fact sheet [Water-Soluble Vitamins: B-Complex and Vitamin C](#), and [Fat-Soluble Vitamins: A, D, E, and K.](#)

Summary

With the increased availability and wide variety of food accessible to consumers in the United States, most individuals can receive all of the vitamins and minerals needed from food alone—this unique balance cannot be duplicated by taking any combination of supplements. Certain individuals that have dietary restrictions, are pregnant or breastfeeding, older than 50, or with special dietary requirements, may need to supplement their diet with a multivitamin and/or multimineral, or individual nutrient supplements. Consult a medical professional for recommendations regarding the type and amount of supplement best for one’s individual needs.

Table 1. Common myths and facts regarding dietary supplements.

Myth	Fact	Healthy Suggestion
“Vitamin and mineral supplements can make up for an unhealthy diet.”	Supplements supply only a fraction of the nutrients needed daily, and are not a quick fix for suboptimal food choices.	Food contains important components such as phytonutrients, antioxidants, fiber, and dietary fat, which cannot be found in supplements. Consuming whole foods will provide these components naturally, in much higher levels.
“Consuming large quantities of supplements will lead to optimal health.”	The body will only use the vitamins and minerals that it needs. Any extra will be excreted or may pose a risk for toxicity. Consuming more nutrients than the body requires does not give added energy, increased brain power, or greater protection against disease.	Consult a doctor or dietitian before consuming any supplement, and avoid consuming large quantities of supplements.
“Supplements with added enzymes are easier to digest.”	The body makes its own digestive enzymes to breakdown and absorb supplements.	Added enzymes are unnecessary; however, consuming lactase enzymes may be beneficial for those who are lactose intolerant.
“Timed-release supplements aid in absorption throughout the day.”	Timed-release supplements are costly and are not absorbed throughout the day.	Supplements should be consumed when they do not compete for absorption with other foods. Consult a medical professional regarding the type and combination of supplements to consume at certain times of the day.
“More expensive vitamin and mineral supplements are worth the extra cost.”	The cost of the vitamin does not necessarily translate to quality. Generic vitamins are often as good as brand names. Vitamins and minerals are commodity items, and every manufacturer has access to the same ingredients. For that reason, paying more for a brand name won’t necessarily buy you better vitamins. Also, vitamins lose their potency over time and must be stored at, or below, room temperature. If bottles are sitting on a shelf in warm room or in direct sunlight, they may degrade even before their expiration date.	Consider purchasing your vitamins from well-known retailers that restock frequently.
“Taking supplements that contain antioxidants such as vitamin A, E, and C will prevent cancer and heart disease.”	Antioxidant supplements do not offer protection against cancer or heart disease, and may even do some harm. Heart disease, cancer, diabetes and high blood pressure are affected by many factors, one of which is eating patterns. If a variety of foods are consumed in adequate and moderate amounts, supplements are unnecessary and will not provide added protection.	Consuming foods rich in antioxidants, such as green vegetables, citrus fruits, deep-orange colored produce, and other fruits and vegetables have many cancer and disease fighting properties.
“Osteoporosis can be prevented by consuming calcium supplements.”	Many factors such as calcium, estrogen levels, exercise, gender, body size, smoking, race, and genes, contribute to the development of osteoporosis. The most effective treatment in postmenopausal women may be a combination of additional calcium, vitamin D, exercise, and estrogen.	While calcium consumption from foods such as milk and yogurt is the best way to meet daily needs, a daily calcium supplement with vitamin D may be beneficial if calcium intake is below recommended levels.
“Those who are sick or stressed will benefit from vitamins.”	Emotional stress does not increase nutrient needs. Physiological stress such as burns, trauma, and surgery, do increase nutrient needs, and a supplement may be prescribed.	Individuals who are sick or stressed should aim for a healthful balanced diet with adequate intake of all recommended vitamins and nutrients. Additionally, research shows that 30 minutes of exercise for 5 days out of the week is an important part of a healthy lifestyle, and acts to combat the effects of stress on the body.
“Those who smoke or consume alcohol in excess should take vitamins to protect their body from the harmful effects of smoking and drinking.”	Smoking will increase the body’s need for vitamin C, and alcohol can interfere with the body’s ability to utilize several nutrients. However, taking additional vitamins and minerals will not protect people from the harmful effects of smoking or alcohol abuse.	Individuals who smoke or drink alcohol in excess should speak to a medical professional who will provide resources to help one discontinue these harmful behaviors.

Table 2. How to choose a vitamin or mineral supplement. The following list includes the recommended daily intakes of important vitamins and minerals for certain populations at greatest risk for deficiency.

Supplement	Which Form?	Daily Recommended Intake (Dietary Reference Intakes—DRI)	
		Life Stage Group	Milligrams/Day (mg/d)
<p>Calcium: Important for women who are pregnant, may become pregnant, vegetarians, vegans, adults over 50, menopausal, and postmenopausal women</p>	<p>Calcium is best absorbed in several smaller doses, rather than all at once. Calcium carbonate is the most popular calcium supplement, and contains more calcium per tablet than calcium lactate, calcium gluconate or calcium citrate, though all will provide adequate calcium. Consume calcium carbonate with meals- stomach acids will aid in calcium absorption. Avoid tablets containing bone meal or dolomite, which may be contaminated with lead.</p>	Life Stage Group	Milligrams/Day (mg/d)
		Infants 0-6 months	200**
		7-12 mo	260**
		1-3 years	700*
		4-8 years	1,000*
		9-18 years	1,300*
		19-50 years	1,000*
		Men 51-70 years	1,000*
		Women 51- 70 years	1,200*
		Adults 71+	1,200*
		Pregnancy and Lactation 19+	1,000*
<p>Vitamin D: An important and widely under consumed nutrient, especially in vegetarians, vegans, infants, those with dark skin, those who may not receive enough sunlight, and those over the age of 50.</p>	<p>Vitamin D is found in 2 forms: D2 (ergocalciferol) and D3 (cholecalciferol). Both forms are effective and will increase vitamin D concentrations in the blood.</p> <p>For infants, the fortification of formula with vitamin D has been mandated, and contains between 40-100 IU / 100 kcal.</p>	Life Stage Group	Micrograms/Day (ug/d)
		Infants 0-12 months	10 (400 IU)
		1-70 years	15* (600 IU)
		71+ years	20 * (800 IU)
<p>Iron: Important for women with heavy menstrual bleeding, vegetarians, and vegans.</p>	<p>The most common iron supplements include ferrous fumarate, ferrous sulfate, and ferrous gluconate, all of which are absorbed well. Since the amount of iron that is absorbed decreases with an increasing dose, it is best to take an iron supplement in 2 to 3 equally spaced doses throughout the day. Iron supplements should be consumed with water on an empty stomach (meals may reduce absorption by 30%). Taking iron with vitamin C will aid in absorption.</p>	Life Stage Group	Milligrams/Day (mg/d)
		7-12 months	11*
		1-3 years	7*
		4-8 years	10*
		9-13 years	8*
		Males 14-18 years	11*
		Females 14-18 years	15*
		Males 19-50 years	8*
		Females 19-50 years	18*
		Adults 51+	8*
Pregnancy	27*		
<p>Vitamin B12: This nutrient is important, especially for vegetarians and vegans (including those who are pregnant or breastfeeding), and those over the age of 50.</p>	<p>Supplements contain vitamin B12 as cyanocobalamin, which the body can readily convert to an active form for use. Research suggests little difference among forms (oral or injection) regarding the body's ability to absorb vitamin B12. However, the body absorbs vitamin B12 through an intrinsic factor in the stomach, which can only absorb 0.02% of a typical supplement.</p>	Life Stage Group	Micrograms/Day (ug/d)
		Infants 0-6 mo	0.4**
		Infants 6-12 mo	0.5**
		1-3 years	0.9*
		4-8 years	1.2*
		9-13 years	1.8*
		14-70 years	2.4*
		Pregnancy	2.6*
		Lactation	2.8*

Table 2. How to choose a vitamin or mineral supplement continued. The following list includes the recommended daily intakes of important vitamins and minerals for certain populations at greatest risk for deficiency.

Supplement	Which Form?	Daily Recommended Intake (Dietary Reference Intakes—DRI)	
		Life Stage Group	Milligrams/Day (mg/d)
Zinc: This important mineral may be lacking especially in a vegetarian or vegan diet, as well as zinc deficient women who are pregnant or breastfeeding.	Supplements may contain zinc gluconate, zinc sulfate, or zinc acetate, each with varying levels of elemental zinc. There is still some debate as to which form of zinc is most effective regarding absorption, bioavailability, or tolerability. Zinc may also be present in cold lozenges and over the counter medications for the treatment of colds.	Life Stage Group	Milligrams/Day (mg/d)
		Infants 0-6 months	2**
		6-12 months	3*
		1-3 years	3*
		4-8 years	5*
		9-13 years	8*
		Males 14-70+	11*
		Females 14-18 years	9*
		Females 19-70+	8*
		Pregnancy 19+	11*
Lactation 19+	12*		
Folate (Folic Acid): Important for women who are of childbearing age, women who are pregnant, or women who may become pregnant.	Folic acid is available in multivitamins, prenatal vitamins, and supplements that contain other B-complex vitamins. The bioavailability of folic acid decreases when taken with food, from 100% to 85%.	Life Stage Group	Micrograms/Day (ug/d)
		Pregnancy	600*
		Lactation	500*

*RDA (Recommended Dietary Allowance): The average daily dietary intake level that is sufficient to meet the nutrient requirements of 97%-98% of health individuals in a population

**AI (Adequate Intake): For healthy infants, AI is the average intake. For other individuals, the AI is believed to cover the needs of all healthy individuals in a population, but lack of available data prevent specificity of a particular percentage of individuals covered by this intake.

Table 3. Food first. Acquiring important nutrients from food sources.

Nutrient	Food Sources	Strategies
Calcium	Low-fat dairy products, dark green leafy vegetables like broccoli and kale, tofu, most grains, and fortified food products such as milk alternatives (soy or almond milk), orange juice, and breakfast cereals.	Calcium is best absorbed from food rather than supplements. Consume foods rich in calcium along with vitamin D for maximal absorption.
Vitamin D	Fatty fish such as salmon, tuna, and mackerel, and fortified foods like milk, milk alternatives, breakfast cereals, and yogurt.	Expose skin to brief amounts of sunlight (5-30 minutes between 10am and 3pm, twice a week to face, arms, legs, or back without sunscreen), in addition to consuming food sources rich in vitamin D.
Iron	Animal sources include red meats, fish, oysters, and poultry. Plant sources include beans, spinach, fortified cereal and oatmeal, beans, and tofu.	It is important to select iron sources from both animal and plant sources. Vitamin C will also aid in iron absorption from plant sources.
Magnesium	Bran cereals, almonds, spinach, soy beans, peanut butter, bananas, potatoes, and yogurt.	Consuming the recommended daily amount (RDA) is important. Only one-third to one-half of dietary magnesium is actually absorbed into the body.
Vitamin B12	Animal products such as fish, meat, poultry, eggs, milk, and other dairy products. It can also be found in fortified breakfast cereals and nutritional yeast products.	When selecting animal products with vitamin B12, choose those that are low in fat. Fortified breakfast cereals are a good source of readily absorbed vitamin B12 for vegetarians and vegans.
Zinc	Animal products such as red meat, poultry, seafood, and dairy products. Plant based sources include beans, nuts, whole grains, and fortified breakfast cereals.	Phytates that are present in breads, cereals, and legumes bind zinc and inhibit its absorption. It is important for strict vegetarians and vegans to soak beans, grains, and seeds before cooking, to increase the bioavailability of zinc. Leavened products such as bread, break down more phytate than unleavened products like crackers, resulting in more zinc absorption.
Folate (Folic Acid)	Dark leafy vegetables such as spinach, peas, fortified breakfast cereals, rice, asparagus, brussel sprouts, romaine lettuce, avocado, broccoli, dairy products, and peanuts.	Some women have a difficult time obtaining adequate amounts of folate, therefore a combination of food and dietary supplements is recommended for women of childbearing age.

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