

Vitamin D

Fact Sheet for Consumers



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National Institutes of Health
Office of Dietary Supplements

What is vitamin D and what does it do?

Vitamin D is a nutrient found in some foods that is needed for health and to maintain strong bones. It does so by helping the body absorb calcium (one of bone's main building blocks) from food and supplements. People who get too little vitamin D may develop soft, thin, and brittle bones, a condition known as rickets in children and osteomalacia in adults.

Vitamin D is important to the body in many other ways as well. Muscles need it to move, for example, nerves need it to carry messages between the brain and every body part, and the immune system needs vitamin D to fight off invading bacteria and viruses. Together with calcium, vitamin D also helps protect older adults from osteoporosis. Vitamin D is found in cells throughout the body.

How much vitamin D do I need?

The amount of vitamin D you need each day depends on your age. Average daily recommended amounts from the Food and Nutrition Board (a national group of experts) for different ages are listed on the next page in International Units (IU):

Life Stage	Recommended Amount
Birth to 12 months	400 IU
Children 1–13 years	600 IU
Teens 14–18 years	600 IU
Adults 19–70 years	600 IU
Adults 71 years and older	800 IU
Pregnant and breastfeeding women and teens	600 IU

What foods provide vitamin D?

Very few foods naturally have vitamin D. Fortified foods provide most of the vitamin D in American diets.

- Fatty fish such as salmon, tuna, and mackerel are among the best sources.

- Beef liver, cheese, and egg yolks provide small amounts.
- Mushrooms provide some vitamin D. In some mushrooms that are newly available in stores, the vitamin D content is being boosted by exposing these mushrooms to ultraviolet light.
- Almost all of the U.S. milk supply is fortified with 400 IU of vitamin D per quart. But foods made from milk, like cheese and ice cream, are usually not fortified.
- Vitamin D is added to many breakfast cereals and to some brands of orange juice, yogurt, margarine, and soy beverages; check the labels.

Can I get vitamin D from the sun?

The body makes vitamin D when skin is directly exposed to the sun, and most people meet at least some of their vitamin D needs this way. Skin exposed to sunshine indoors through a window will not produce vitamin D. Cloudy days, shade, and having dark-colored skin also cut down on the amount of vitamin D the skin makes. However, despite the importance of the sun to vitamin D synthesis, it is prudent to limit exposure of skin to sunlight in order to lower

the risk for skin cancer. When out in the sun for more than a few minutes, wear protective clothing and apply sunscreen with an SPF (sun protection factor) of 8 or more. Tanning beds also cause the skin to make vitamin D, but pose similar risks for skin cancer.

People who avoid the sun or who cover their bodies with sunscreen or clothing should include good sources of vitamin D in their diets or take a supplement. Recommended intakes of vitamin D are set on the assumption of little sun exposure.

What kinds of vitamin D dietary supplements are available?

Vitamin D is found in supplements (and fortified foods) in two different forms: D2 (ergocalciferol) and D3 (cholecalciferol). Both increase vitamin D in the blood.

Am I getting enough vitamin D?

Because vitamin D can come from sun, food, and supplements, the best measure of one's vitamin D status is blood levels of a form known as 25-hydroxyvitamin D. Levels are described in either nanomoles per liter (nmol/L) or nanograms per milliliter (ng/mL), where $1 \text{ nmol/L} = 0.4 \text{ ng/mL}$.

In general, levels below 30 nmol/L (12 ng/mL) are too low for bone or overall health, and levels above 125 nmol/L (50 ng/ mL) are probably too high. Levels of 50 nmol/L or above (20 ng/mL or above) are sufficient for most people.

By these measures, some Americans are vitamin D deficient and almost no one has levels that are too high. In general, young people have higher blood levels of 25-hydroxyvitamin D than older people and males have higher levels than females. By race, non-Hispanic blacks tend to have the lowest levels and non-Hispanic whites the highest. The majority of Americans have blood levels lower than 75 nmol/L (30 ng/mL).

Certain other groups may not get enough vitamin D:

- Breastfed infants, since human milk is a poor source of the nutrient. Breastfed infants should be given a supplement of 400 IU of vitamin D each day.
- Older adults, since their skin doesn't make vitamin D when exposed to sunlight as efficiently as when they were young, and their kidneys are less able to convert vitamin D to its active form.
- People with dark skin, because their skin has less ability to produce vitamin D from the sun.
- People with disorders such as Crohn's disease or celiac disease who don't handle fat properly, because vitamin D needs fat to be absorbed.
- Obese people, because their body fat binds to some vitamin D and prevents it from getting into the blood.

What happens if I don't get enough vitamin D?

People can become deficient in vitamin D because they don't consume enough or absorb enough from food, their exposure to sunlight is limited, or their

kidneys cannot convert vitamin D to its active form in the body. In children, vitamin D deficiency causes rickets, where the bones become soft and bend. It's a rare disease but still occurs, especially among African American infants and children. In adults, vitamin D deficiency leads to osteomalacia, causing bone pain and muscle weakness.

What are some effects of vitamin D on health?

Vitamin D is being studied for its possible connections to several diseases and medical problems, including diabetes, hypertension, and autoimmune conditions such as multiple sclerosis. Two of them discussed below are bone disorders and some types of cancer.

Bone disorders

As they get older, millions of people (mostly women, but men too) develop, or are at risk of, osteoporosis, where bones become fragile and may fracture if one falls. It is one consequence of not getting enough calcium and vitamin D over

the long term. Supplements of both vitamin D3 (at 700-800 IU/ day) and calcium (500-1,200 mg/day) have been shown to reduce the risk of bone loss and fractures in elderly people aged 62-85 years. Men and women should talk with their health care providers about their needs for vitamin D (and calcium) as part of an overall plan to prevent or treat osteoporosis.

Cancer

Some studies suggest that vitamin D may protect against colon cancer and perhaps even cancers of the prostate and breast. But higher levels of vitamin D in the blood have also been linked to higher rates of pancreatic cancer. At this time, it's too early to say whether low vitamin D status increases cancer risk and whether higher levels protect or even increase risk in some people.

Can vitamin D be harmful?

Yes, when amounts in the blood become too high. Signs of toxicity include nausea, vomiting, poor appetite, constipation, weakness, and weight loss. And by raising blood levels of calcium, too much vitamin D can cause confusion, disorientation, and problems with heart rhythm. Excess vitamin D can also damage the kidneys.

The upper limit for vitamin D is 1,000 to 1,500 IU/day for infants, 2,500 to 3,000 IU/day for children 1-8 years, and 4,000 IU/day for children 9 years and older, adults, and pregnant and breastfeeding teens and women. Vitamin D toxicity almost always occurs from overuse of supplements. Excessive sun exposure doesn't cause vitamin D poisoning because the body limits the amount of this vitamin it produces.

Are there any interactions with vitamin D that I should know about?

Like most dietary supplements, vitamin D may interact or interfere with other medicines or supplements you might be taking. Here are several examples:

- Prednisone and other corticosteroid medicines to reduce inflammation impair how the body handles vitamin D, which leads to lower calcium absorption and loss of bone over time.
- Both the weight-loss drug orlistat (brand names Xenical® and Alli®) and the cholesterol-lowering drug cholestyramine (brand names Questran®, LoCholest®, and Prevalite®) can reduce the absorption of vitamin D and other fat-soluble vitamins (A, E, and K).

- Both phenobarbital and phenytoin (brand name Dilantin®), used to prevent and control epileptic seizures, increase the breakdown of vitamin D and reduce calcium absorption.

Tell your doctor, pharmacist, and other health care providers about any dietary supplements and medicines you take. They can tell you if those dietary supplements might interact or interfere with your prescription or over-the-counter medicines, or if the medicines might interfere with how your body absorbs, uses, or breaks down nutrients.

Vitamin D and healthful eating

People should get most of their nutrients from food, advises the federal government's *Dietary Guidelines for Americans*. Foods contain vitamins, minerals, dietary fiber and other substances that benefit health. In some cases, fortified foods and dietary supplements may provide nutrients that otherwise may be consumed in less-than-recommended amounts. For more information about building a healthy diet, refer to the *Dietary Guidelines for Americans* and the U.S. Department of Agriculture's MyPlate.

Where can I find out more about vitamin D?

For general information on vitamin D:

- Office of Dietary Supplements Health Professional Fact Sheet on Vitamin D
- Vitamin D, MedlinePlus®

For more information on food sources of vitamin D:

- U.S. Department of Agriculture's (USDA's) National Nutrient Database
- Nutrient list for vitamin D (listed by food or vitamin D content), USDA

For more advice on buying dietary supplements:

- Office of Dietary Supplements Frequently Asked Questions: Which brand(s) of dietary supplements should I purchase?

For information about building a healthy diet:

- MyPlate
- *Dietary Guidelines for Americans*

Disclaimer

This fact sheet by the Office of Dietary Supplements provides information that should not take the place of medical advice. We encourage you to talk to your health care providers (doctor, registered dietitian, pharmacist, etc.) about your interest in, questions about, or use of dietary supplements and what may be best for your overall health. Any mention in this publication of a specific brand name is not an endorsement of the product.



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