

Vitamin D Simplified

Vitamin D, the sunlight vitamin. How do we get it, what does it do, and what happens if we get too much or too little?

Nutrition For the Curious Public



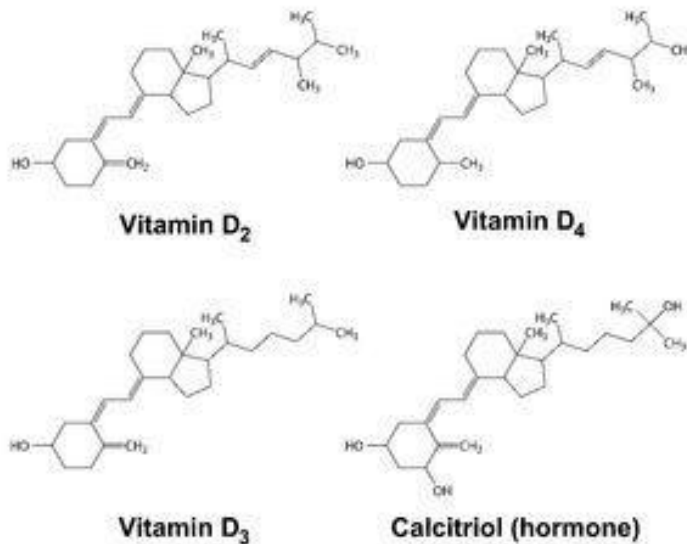
By

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Cholecalciferol (Vitamin D3) is produced in the body when ultraviolet rays from the sun hit the skin and trigger vitamin D synthesis from cholesterol.

Vitamin D is actually a group of fat-soluble vitamins but only two, vitamin D2 also called ergocalciferol, and vitamin D3 also known as cholecalciferol are present in humans. Vitamin D4 is present in certain mushrooms and the benefits of it in humans is uncertain.

Forms of Vitamin D



Sources of Vitamin D

Cholecalciferol (Vitamin D₃) is produced in the body when ultraviolet rays from the sun hit the skin and trigger vitamin-D synthesis from cholesterol. The liver then converts vitamin D₃ to calcidiol, and then the kidneys convert calcidiol to the active form, calcitriol.

In food, Vitamin D₂ is generally plant and fungus based. Vitamin D₂ is then converted in the liver to ercalcitriol, the active metabolite of Vitamin D₂. Ercalcitriol may have less efficacy than calcitriol in reducing human health risks.

Vitamin D₃ is found naturally in fish and fish oils such as salmon, sardines, tuna, mackerel, trout, and cod liver oil. There is a smaller amount of D₃ in eggs and beef liver. Some mushrooms and yeast contain D₂. Other sources of vitamin D include vitamin fortified cereals and either dairy or non-dairy milk products.

Risk Factors for Vitamin D Deficiency

Vitamin D deficiency is common, with one study reporting that vitamin D inadequacy occurred in approximately 36% of healthy young adults and up to 57% of general medicine inpatients in the United States. People with very dark skin may be more susceptible to vitamin D deficiency due to decreased skin absorption of ultraviolet sunlight due to the pigment melanin blocking the UV absorption. Sunscreen with a sun protection factor of 30 reduces vitamin D skin synthesis by more than 95%. Wintertime in cold climate regions may increase the risk of vitamin D deficiency due to less body sun and ultraviolet light exposure. There are also a number of medical conditions and medications that can increase the chance of developing vitamin D deficiency.



Some Vitamin D Rich Foods

Why Vitamin D?

Vitamin D promotes calcium absorption in the gut and maintains serum calcium and phosphate levels to enable bone mineralization. It is also needed for osteoblast (bone producing cells) and osteoclast (bone degrading cells) formation. Osteoblasts and

osteoclasts are needed for bone remodeling which is an ongoing process in the body. Vitamin D deficiency may cause a softening and weakening of bones, which in children is called rickets and in adults osteomalacia.

Low vitamin D levels can also worsen osteoporosis (porous bones that are thin, weakened and susceptible to fracture) by reducing calcium absorption. Calcium and vitamin D supplementation may result in some increase in bone mineral density, and reduce fracture risk, but vitamin D alone appears to have no effect on fracture risk.

Vitamin D also plays a role in cell growth, neuromuscular and immune function, and reduction of inflammation.

A study of vitamin D levels and COVID-19 found that vitamin D levels less than 20 ng/ml were more common in patients with severe COVID-19 infections than in patients with mild or moderate disease. They also found that patients with vitamin D levels less than 20 ng/ml were 14 times more likely to have severe or critical disease than patients with Vitamin D levels equal to or greater than 40 ng/ml.

A review of 25 studies concluded that vitamin D supplementation reduced the chances of getting an upper respiratory infection by 12%.

Sufficient vitamin D status may help to prevent colon, prostate, and breast cancer.

Vitamin D Deficiency Defined

Vitamin D deficiency is defined as a blood level below 20 ng/ml(nanograms per milliliter), and vitamin D insufficiency when blood levels are between 21–29 ng/ml, although some sources feel that in normal individuals 20 ng/ml or greater is an adequate vitamin D level. Serious effects from vitamin D deficiency are seen when the level is below 12 mg/ml. Current guidelines put adequate vitamin D levels at between

20ng/ml (or 30ng/ml depending on the source) to 40 ng/mL, but up to 50 ng/mL might be warranted in cancer patients or other populations. **Over 50 ng/ml can be toxic.**

Too Much Vitamin D ?

Too much vitamin D may be a health hazard and may lead to elevated blood calcium levels which can cause nausea, vomiting, muscle weakness, bone fractures, heart arrhythmias, high blood pressure, abnormal calcium deposition in places like the kidneys, blood vessels or eyes, and possibly an increased risk of pancreatic cancer.

Current Recommendations

Recommendations of supplement dosage vary in the literature. The Endocrine Society Clinical Practice Guidelines suggests that adults aged 19–70 years old require at least 600 IU/day (international units per day) of vitamin D to maximize bone health and muscle function. The guidelines also suggest that adults over 70 years of age may need 800 IU/day of vitamin D. However, in all adult age groups they note that to raise the blood vitamin D level above 30 ng/ml may require at least 1500–2000 IU/day of supplemental vitamin D. Anyone with a medical issue should consult with their physician before adding any new medication including vitamin D.

For more information regarding recommended [Vitamin D](#) levels, Vitamin D supplementation, [deficiencies](#) and more formal indications for treatment check out our FibonacciCOMPENDIUM on [FibonacciMD.app](#)

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References

- LeFevre, M and LeFevre, N. Vitamin D screening and supplementation in community-dwelling adults: Common questions and answers. *American Family Physician*. 2018;97:254-260.

- Institute of Medicine, Food and Nutrition Board: Dietary Reference Intake for calcium and D. Washington DC: National Academy Press. 2010.
- Davis CD. Vitamin D and cancer: current dilemmas and future research needs. *Am J Clin Nutr.* 2008;88:565S-569S.
- Stolzenberg-Solomon RZ, Vieth R, Azad A, et al. A prospective nested case-controlled study of vitamin D status and pancreatic cancer risk in male smokers. *Cancer Res.* 2006;66:10213-10219.
- Jones G. Pharmacokinetics of vitamin D toxicity. *Am J Clin Nutr.* 2008;88:582S-586S.
- Horlick MF, Binkley NC, Bischoff-Ferrari HA, et al. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab.* 2011;96:1911-1930. Retrieved from: <https://doi.org/10.1210/jc.2011-0385>
- Ensrud KE, Ewing SK, Friedman L, et al. Circulating 25-hydroxyvitamin D levels and frailty status in older women. *J Clin Endocrinol Metab.* 2010;95:5266-5273.
- Dror AA et al. Pre-infection 25-hydroxyvitamin D3 levels and association with severity of COVID-19 illness. PLOS One. February 3, 2022. Retrieved from: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0263069>
- Martineau AR et al. Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data BMJ 2017; 356 :i6583. Retrieved from: <https://www.bmj.com/content/356/bmj.i6583>
- Holick MF. High prevalence of vitamin D inadequacy and implications for health. *Mayo Clin Proc.* 2006 Mar;81(3):353-73. Retrieved from: <https://pubmed.ncbi.nlm.nih.gov/16529140/>
- Vitamin D Fact Sheet for Health Professionals. National Institutes of Health. Updated: August 17, 2021. Retrieved from: <https://ods.od.nih.gov/factsheets/VitaminD-HealthProfessional/>

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