

# The Truth About Vitamin D Toxicity

## Vitamin D Toxicity Fears Unwarranted

Is vitamin D toxic? Not if we take the same amount nature intended when we go out in the sun. [Vieth R. Vitamin D supplementation, 25-hydroxyvitamin D concentration, and safety. Am J Clin Nutr. 1999;69:842-56.](#) Vieth attempted to dispel unwarranted fears in medical community of physiological doses of vitamin D in 1999 with his exhaustive and well-written review.

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Is toxicity a concern for you? If so, then increase your levels the way nature intended, with ultraviolet B light! His conclusions: fear of vitamin D toxicity is unwarranted, and such unwarranted fear, bordering on hysteria, is rampant in the medical profession. [Vieth R, Chan PC, MacFarlane GD. Efficacy and safety of vitamin D3 intake exceeding the lowest observed adverse effect level. Am J Clin Nutr. 2001 Feb; 73\(2\):288-94.](#) Even Ian Monroe, the chair of the relevant IOM committee, wrote to the Journal to compliment Vieth's work and to promise his findings will be considered at the time of a future Institute of Medicine review. [Munro I. Derivation of tolerable upper intake levels of nutrients. Letter, Am J Clin Nutr. 2001;74:865.](#) That was more than two years ago.

In 1999, Vieth indirectly asked the medical community to produce any evidence 10,000 units of vitamin D a day was toxic, saying "Throughout my preparation of this review, I was amazed at the lack of evidence supporting statements about the toxicity of moderate doses of vitamin D." He added: "If there is published evidence of toxicity in adults from an intake of 250ug (10,000 IU) per day, and that is verified by the [25\(OH\)D](#) concentration, I have yet to find it." [Vieth R. Vitamin D supplementation, 25-hydroxyvitamin D concentration, and safety. Am J Clin Nutr. 1999;69:842-56.](#)

Like most medication, [cholecalciferol](#) is certainly toxic in excess, and, like Coumadin, is used as a rodent poison for this purpose. Animal data indicates signs of toxicity can occur with ingestion of 0.5 mg/kg (20,000 IU/kg), while the oral LD50 (the dose it takes to kill half the animals) for cholecalciferol in dogs is about 88 mg/kg, or 3,520,000 IU/kg. **An Overview of Cholecalciferol Toxicosis.** The American Board of Veterinary Toxicology (ABVT). This would be equivalent to a 110-pound adult taking 176,000,000 IU or 440,000 of the 400 unit cholecalciferol capsules. Vieth reports human toxicity probably begins to occur after chronic daily consumption of approximately 40,000 IU/day (100 of the 400 IU capsules). [Vieth R. Vitamin D supplementation, 25-hydroxyvitamin D concentration, and safety. Am J Clin Nutr. 1999;69:842-56.](#) Heavy sun exposure when combined with excessive supplement use is a theoretical risk for vitamin D toxicity, but if such a case has been reported, I am not aware of it. Physician ignorance about vitamin D toxicity is widespread. A case report of four patients appeared in the 1997 *Annals of*

*Internal Medicine*, accompanied by an editorial warning about vitamin D toxicity. [Adams JS, Lee G. Gains in bone mineral density with resolution of vitamin D intoxication. Ann Intern Med. 1997 Aug 1;127\(3\):203–6.](#) [Marriott BM. Vitamin D supplementation: a word of caution. Ann Intern Med. 1997 Aug 1;127\(3\):231–3.](#) However, careful examination of the patients reveals that both papers are a testimony to the fact that incompetence about vitamin D toxicity can reach the highest levels of academia. [Vieth R. Vitamin D supplementation, 25-hydroxyvitamin D concentration, and safety. Am J Clin Nutr. 1999;69:842–56.](#) [Heaney R, Davies K, Chen T, Holick M, Barger-Lux MJ. Human serum 25 hydroxycholecalciferol response to extended oral dosing with cholecalciferol. Am J Clin Nutr. 2003;77:204–10.](#) See [worst science](#) for a full critique.

## Cholecalciferol, Not Ergocalciferol, Is Safe

Although there are documented cases of pharmacological overdoses from [ergocalciferol](#), the only documented case of pharmacological—not industrial—toxicity from cholecalciferol we could find in the literature was intoxication from an over-the-counter supplement called Prolongevity. [Koutkia P, Chen TC, Holick MF. Vitamin D intoxication associated with an over-the-counter supplement. N Engl J Med. 2001 Jul 5;345\(1\):66–7.](#) On closer inspection, it seemed more like an industrial accident but it was interesting because it gave us some idea of the safety of cholecalciferol. The capsules consumed contained up to 430 times the amount of cholecalciferol contained on the label (2,000 IU). The man had been taking between 156,000–2,604,000 IU of cholecalciferol a day (equivalent to between 390–6,500 of the 400 unit capsules) for two years. He recovered uneventfully after proper diagnosis, treatment with steroids, and sunscreen.

It is true that a few people may have problems with high calcium due to undiagnosed vitamin D hypersensitivity syndromes such as primary hyperparathyroidism, granulomatous disease, or occult cancers, but a blood calcium level, [PTH](#), 25(OH)D, and [calcitriol](#) level should help clarify the cause of the hypersensitivity. Although D can be toxic in excess, the same can be said for water.

## Therapeutic Index

As a physician, I know that psychotic patients should drink about 8 glasses of water a day. However, many would hurt themselves by regularly drinking 40 glasses a day (called compulsive water intoxication). So you could say that water has a therapeutic index of 5 (40/8).

[Heaney's](#) recent research indicates that healthy humans utilize about 4,000 units of vitamin D a day (from all sources). [Heaney R, Davies K, Chen T, Holick M, Barger-Lux MJ. Human serum 25 hydroxycholecalciferol response to extended oral dosing with cholecalciferol. Am J Clin Nutr. 2003;77:204–10.](#) However, 40,000 units a day, over several years, will hurt them. [Vieth R. Vitamin D supplementation, 25-hydroxyvitamin D concentration, and safety. Am J Clin Nutr. 1999;69:842–56.](#) Therefore, vitamin D has a therapeutic index of 10 (40,000/4,000)—twice as safe as water. We are not saying vitamin D is *as safe as* water, we are saying vitamin D is *safe when used in the doses nature uses*.

## Sun Supplies 10,000 Units Of Vitamin D

The single most important fact anyone needs to know about vitamin D is how much nature supplies if we behave naturally, e.g., go into the sun. Humans make at least 10,000 units of

vitamin D within 30 minutes of full body exposure to the sun, what is called a minimal erythema dose. [Holick MF. Environmental factors that influence the cutaneous production of vitamin D. Am J Clin Nutr. 1995 Mar;61\(3 Suppl\):638S-645S.](#) Vitamin D production in the skin occurs within minutes and is already maximized before your skin turns pink.

Fear of the fatal form of skin cancer, malignant melanoma, keeps many people out of the sun. The problem with the theory is that the incidence of melanoma continues to increase dramatically although many people have been completely avoiding the sun for years. [Hemminki K, Zhang H, Czene K. Incidence trends and familial risks in invasive and in situ cutaneous melanoma by sun-exposed body sites. Int J Cancer. 2003 May 10;104\(6\):764-71.](#) We are not saying sunburns are safe, they are not. We are saying that brief, full-body sun exposure (minimal erythema doses) may slightly increase your risk of skin cancer but it is a much smarter thing to do than dying of vitamin D deficiency.

## Hypersensitivity, Not Toxicity

[Vitamin D hypersensitivity](#) syndromes are often mistaken for vitamin D toxicity, as they cause [hypercalcemia](#). The most common is primary hyperparathyroidism although some cases of "primary" hyperparathyroidism are actually secondary to [Vitamin D deficiency](#). Patients with hyperparathyroidism should only take vitamin D under the care of a knowledgeable [endocrinologist](#). Granulomatous diseases such as sarcoidosis, granulomatous TB, and some cancers can also cause Vitamin D hypersensitivity, as the granuloma or the tumor may make excessive amounts of [activated Vitamin D](#), thus raising serum calcium. These patients should not take vitamin D except when under the care of a knowledgeable physician.

Other syndromes occur when abnormal tissue subverts the kidney's normal regulation of [endocrine](#) calcitriol production. Aberrant tissues, usually [granulomatous](#), convert 25(OH)D into calcitriol causing high blood calcium. The most common such conditions are sarcoidosis, oat cell carcinoma of the lung, and non-Hodgkin's lymphoma but other illnesses can cause the syndrome and they can occur while the patient's 25(OH)D levels are normal, or even low. For that reason, while rare, it is advisable to seek a knowledgeable physician's care when repleting your vitamin D system, especially if you are older, have sarcoidosis, cancer, or other granulomatous diseases. In such high-risk patients, periodic monitoring of 25(OH)D levels and serum calcium will alert the physician to the need to do more tests—such as calcitriol or PTH—and take further action.

It seems clear that restoring physiological serum levels of 25(OH)D will help many more patients than it will hurt. In fact, living in America today while worrying about vitamin D toxicity is like dying of thirst in the desert while worrying about drowning.

[John Jacob Cannell MD](#) Executive Director 2003.09.05 *updated 2009.06.20*

\*These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure, or prevent any disease.