



Vitamin D: What You Need to Know

The sunshine vitamin supports hundreds of processes in your body. Learn why you may need more of it than you think.

BY LAINE BERGESON, FMCHC

When vitamin D was discovered in the early 20th century, it was considered a breakthrough. Public-health officials — armed with the new knowledge that the vitamin helps the body absorb calcium — led the charge against rickets, a crippling bone disease that reached epidemic levels among infants and children in industrialized northern cities in the United States and Europe.

Based on the emerging research, doctors began recommending sunshine and cod-liver oil for bone health, while many food and drink manufacturers started fortifying their products — milk, hot dogs, even beer — with vitamin D.

Since then, the medical establishment has gone back and forth on its vitamin-D recommendations. In the 1950s, British health officials blamed an outbreak of hypercalcemia, or too much circulating calcium in the body, on diets overrich in D (though they never proved causality). Several

European countries subsequently banned vitamin D-fortified foods altogether. And since it takes relatively little D to keep rickets at bay, physicians largely stopped promoting it.

In the 2000s, the attitude toward vitamin D shifted again in light of the vast body of research demonstrating its vital role in overall health. Studies showed that the sunshine vitamin triggers the expression of more than 200 health-supporting genes. Additional studies suggested that D has a protective effect against chronic conditions such as cancer, osteoporosis, cardiovascular disease, diabetes, asthma, and neurodegenerative disease.

“Vitamin D’s role in calcium-level maintenance, or bone health, is the one we’ve known about the longest,” explains nutrition scientist Chris Masterjohn, PhD. “We now have increasing evidence that it regulates hundreds of other processes in the body.”

People flocked back to vitamin D,

and many doctors began recommending higher doses.

Then in 2010 the Food and Nutrition Board of the Institute of Medicine (IOM) — the nonprofit, nongovernmental organization now known as the National Academy of Medicine (NAM), which sets dietary guidelines — recommended vitamin-D levels far below those advised by researchers. Their suggestions considered serum blood levels above 20 ng/mL (nanograms per milliliter) to be adequate.

Many clinicians and health organizations, including the Endocrine Society, argued for recommendations of 30 ng/mL or more.

This left health-conscious consumers confused about which advice to trust — and how to ensure their own vitamin-D levels are high enough for optimal health.

To help clear up the confusion, we asked several leading experts to answer six common questions about this essential nutrient.

1. What is vitamin D and why is it important?

Vitamin D is a nutrient we ingest (from food or supplement) and our bodies synthesize (from sunlight; skin contains a “precursor” molecule that is transformed into vitamin D when exposed to UVB rays).

Once active in the body, vitamin D becomes raw material for making the hormone calcitriol, which supports calcium and phosphorous absorption

and bone health. In fact, virtually every cell and tissue in your body has D receptors, including cells in the immune system.

Research suggests that vitamin-D deficiency may be one reason people get more colds and flu in winter, when it’s difficult for the body to get enough sunshine to make sufficient D. The vitamin’s immune-boosting power may also

help explain the protective relationship between sufficient D levels and reduced risk of cancer — specifically colon cancer. (The colon contains abundant vitamin-D receptors.)

Inadequate vitamin D is also associated with an increased risk for autoimmune diseases and cardiovascular issues. D deficiency is associated with a 50 percent increased risk of myocardial infarction, as

well as a higher chance of hypertension, congestive heart failure, and peripheral vascular disease.

Healthy D levels may also tamp down systemic inflammation. Research published in the *Journal of Immunology* in 2012 found that vitamin D turns on a gene that interferes with the inflammatory response.

In addition, vitamin D has been associated with improved sleep and mood, as well as oral health and muscle maintenance.

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2. Is vitamin-D deficiency really a problem these days?

The Endocrine Society recommends a minimum vitamin-D blood level of 30 ng/mL — and between 40 and 60 ng/mL for optimal health. The Institute for Functional Medicine (IFM), which promotes an integrative medical model, advises between 50 and 80 ng/mL.

Based on the Endocrine Society thresholds, an estimated 70 percent of the world’s population is D deficient. This includes people living where sunshine is plentiful year-round, says P. Michael Stone, MD, MS, a family physician in Ashland, Ore., and IFM faculty member.

Experts point to myriad factors that might help explain the widespread deficiency: the amount of time we spend indoors; liberal use of sunscreen, which hinders D synthesis; and rising rates

of obesity, which correlates with low D levels, though experts aren’t entirely clear why.

Compromised gut function may also play a role. Chronic conditions such as celiac disease, Crohn’s disease, and chronic pancreatitis affect digestion and reduce vitamin-D absorption from food. Certain medications, including laxatives and cholesterol-lowering medicines, may also contribute to a vitamin-D deficiency.

Ultimately, a combination of all these factors could reduce vitamin-D absorption — and it may involve unknown mechanisms and processes.

“I think we’ll know a lot more about vitamin-D metabolism and deficiency in the coming years,” says functional-medicine practitioner Frank Lipman, MD.



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of the world's population is D deficient. This includes people living where sunshine is plentiful year-round.

3. Should I have my vitamin-D level tested?

Yes. “You can’t look at a person and know his or her vitamin-D level,” explains internal-medicine practitioner and vitamin-D researcher Gregory Plotnikoff, MD. “Just like with cholesterol or thyroid assessments, actually getting a blood measurement is necessary.”

Vitamin D affects multiple systems in the body in some not-so-obvious ways. For instance, it plays an influential role in the tightly choreographed dance of your body’s master hormones, including thyroid hormones, cortisol, insulin, and calcitriol.

“You have to be careful,” says San Francisco-based functional-medicine practitioner Tiffany Lester, MD. “If vitamin D is too low, it can affect hormone levels, like cortisol and thyroid.” Too-high levels can also throw off all the others.

Insufficient or excessive levels of vitamin D can contribute to nonspecific symptoms that may be attributed to other health concerns. Symptoms of vitamin-D deficiency, for example, can include migraines, muscle pain, joint and back pain, depression, allergies, and inflammation.

“Low vitamin-D status is not 100 percent causal of these problems, but it can play a role,” notes Stone. “Anywhere there are inflammation control problems, consider D adequacy.”

Excessive levels of fat-soluble vitamin D, on the other hand, can bioaccumulate in your body (unlike water-soluble vitamin C), and in extreme cases may lead to hypercalcemia. Although rare, this can cause poor appetite, nausea, vomiting, frequent urination, and kidney problems.

4. How is vitamin D measured, and how often should I test?

The most common measure of active vitamin D in the bloodstream is called 25-hydroxyvitamin D, or 25(OH)D. Your doctor can order a lab (insurance often covers the cost during an annual physical) or you can purchase a test through a direct-to-consumer lab for around \$60.

Of course, any nutrient’s reference range — which healthcare practitioners use to compare and interpret nutrient levels — is based on averages. A more personalized way of learning whether you have sufficient circulating D is to measure your parathyroid hormone (PTH) levels, says Masterjohn.

Your parathyroid glands sit near the thyroid and release PTH, which helps

regulate calcium levels. If you’re deficient in vitamin D, your parathyroid will release more PTH to help increase blood levels of calcium and initiate the activation of D into

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calcitriol. If your PTH levels are high, you are likely not getting enough vitamin D; if PTH levels are low (or “maximally suppressed”), you likely have adequate D.

“When you get your 25(OH)D measured, the reference range you’re

measured against makes an inference about your PTH,” explains Masterjohn. “But since we know that different people have different needs, we want to look at whether your PTH is maximally suppressed, because you might be different from the average.”

Whichever test you choose, experts recommend monitoring vitamin D regularly, as levels fluctuate with nutrition and sunlight exposure. “Get tested every year — ideally every six months, depending on where you live,” says Cindi Lockhart, RDN, national nutrition program manager for Life Time Medical. She notes that people in northern latitudes might be at higher risk due to less year-round sunshine.



5. How can I boost my vitamin-D levels?

The easiest way is to get outside and let the sun do its work. Keep in mind that the amount of sun exposure it takes for your body to synthesize vitamin D depends on skin tone: Those with fair skin may need as little as 10 to 15 minutes of direct, unprotected sun exposure on a summer day to make several thousand international units (IUs are used to measure many nutrients). For those with darker skin tones, it can take up to two hours. (For information on safe sun exposure, see ELmag.com/sunbenefits.)

You can also get your vitamin D through food. Key whole-food sources include cod-liver oil (which delivers 1,360 IU per tablespoon); fatty fish like canned salmon, sardines, and mackerel (350–920 IU per serving); and eggs (48 IU per egg).

Michael Holick, MD, PhD, of Boston University School of

Medicine, offers this guideline: “When your status is above 20 ng/mL, every hundred units [IUs] you ingest raises your status 0.6 to 1 nanogram per milliliter. We did a study that showed that in healthy adults who had an average status of 18 ng/mL, 1,000 IUs per day raised their levels to 28 ng/mL for three months.”

Because food delivers relatively little D, and many people can’t get adequate levels from sunshine, supplementing is an important strategy.

“Whether you live in Saudi Arabia or Brazil or Sweden, you can’t make D before 8 a.m. and after 4 p.m.,” Holick says. (See “Supplement Wisely,” at right.)

Stone notes that vitamin D from the sun stays in the body for only 24 to 48 hours; D from food and supplements stays just 12 to 24 hours. So it’s important to get D every day.

6. Can I get too much vitamin D?

Yes, but it’s rare. “I’ve been in practice for 26 years,” says Lockhart, “and I could count on one hand the number of people who’ve had vitamin-D levels higher than the reference range.”

In the few situations in which Lockhart has found toxicity, it has been due to other medical issues. “In the cases I’ve seen, the individuals had deeper issues with the parathyroid or liver,” she says, noting that these patients were not oversupplementing.

While the IFM’s optimal range uses 80 ng/mL as the upper limit, some functional and integrative practitioners wave a cautionary

flag at 70 ng/mL. Levels over 90 ng/mL are considered toxic territory. But even regular high doses of D are unlikely to push most people into the danger zone.

“Most adults can take 5,000 to 10,000 IU per day for six months and not have adverse effects,” notes Stone.

Individuals with sarcoidosis, tuberculosis, Lyme disease, lymphoma, or kidney disease, however, should supplement carefully, test regularly, and consult with a clinician. Too much vitamin D can put them at increased risk for dangerously high blood-calcium levels. ☪

Supplement Wisely

If your vitamin-D levels are low and you can’t safely or sufficiently raise them with whole foods or sunshine, taking a supplement can help. “Vitamin-D replenishment represents the single most cost-effective thing we can do in medicine to boost baseline health,” argues Gregory Plotnikoff, MD. Here are a few guidelines:

- **Know your levels.** The Institute for Functional Medicine recommends the following supplement dose based on measured blood levels of vitamin D. Retest in three to six months. If your numbers have improved, lower your dose accordingly. If not, ask your doctor about testing for genetic polymorphisms that may slow or inhibit your body’s ability to convert vitamin D.

25(OH)D Level	Supplement Dose
Less than 10 ng/mL	10,000 IU/day
10–20 ng/mL	10,000 IU/day
20–30 ng/mL	8,000 IU/day
30–40 ng/mL	5,000 IU/day
40–50 ng/mL	2,000 IU/day

- **Choose vitamin D3.** “A lot of people are prescribed D2,” says Tiffany Lester, MD, referring to a synthetic version of the nutrient called ergocalciferol. “This is not the most bioavailable form. D3 (cholecalciferol) is 85 percent more effective in raising blood levels of vitamin D.”
- **Also take vitamin K2.** Vitamins D3 and K2 work together to strengthen bones, explains Lester, adding that high doses of D on its own can deplete vitamin K2 in the body. When taking D, it’s also important to get adequate amounts of magnesium to ensure you can absorb calcium effectively.
- **Try liquid forms.** If you don’t like swallowing pills, or you’re trying to get children to take vitamin D, try sublingual or liquid D. It’s just as effective, says P. Michael Stone, MD, MS.
- **Eat healthy fats.** Vitamin D is fat-soluble, which means it requires dietary fat to be absorbed by the body. A great source is fatty fish, which also delivers vitamin D.

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