Vitamin D and Your Health

What if you heard that there was a safe, natural product you could take for 3-cents a day, that could dramatically:

- Reduce the risk of cancers
- Reduce the risk of autoimmune diseases like MS, Psoriasis, and Type-1 Diabetes[1]
- Lessen allergies, and eczema
- Reduce your susceptibility to a cold or flu
- Slow the aging process[2]
- Maintain healthy bones and mineral balance
- Reduce pain, depression, and chronic fatigue
- Reduce the risk of falls in elderly
- Reduce the possibility of complication in pregnancy, and reduce the risk of ADHD, allergies, autoimmune disease, cancer in offspring.

A Natural Cure-all?

Now what if you heard that this miracle substance is actually a natural steroid-like hormone called Cholecalciferol (Vitamin D) and something you *make in your own skin*? Its major role in the body is in maintaining optimal levels of blood (serum) calcium and is important in growth and maintenance of the skeleton throughout life. It does this by increasing dietary calcium absorption in the intestine, and stimulating calcium withdrawal from bone when needed. Aside from the bones and intestines, Vitamin D also directly affects many other systems, including: the brain, heart, stomach, pancreas, immune system, skin, gonads, etc.[3] We make it just like plants, relying on the sun's ultraviolet rays to perform photosynthesis in our skin to create cholecalciferol (Vitamin D3). Then Vitamin D3 is modified slightly by the Liver and stored fairly equally in many other tissues throughout the body. When needed, the Kidneys convert Vitamin D3 into 1,25-hydroxyvitamin D (25(OH)D), which has powerful body-wide physiologic effects.

The Kidneys draw on the body's stores and activate Vitamin D3 into 25(OH)D when serum levels drop below 50ng/L. *50ng/L is therefore the minimum acceptable level for you to be able to maintain your body's stores*. When we want to measure Vitamin D3 levels, we test for the active form, 25(OH)D, in the blood (serum).

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[1] Holick MF., Vitamin D: A millenium perspective., J Cell Biochem. 2003 Feb 1;88(2):296-307. [PubMed Abstract]
[2] J Brent Richards, Abraham Aviv, et. al., Higher serum vitamin D concentrations are associated with longer leukocyte telomere length in women' American Journal of Clinical Nutrition, Vol. 86, No. 5, 1420-1425, November 2007 [PubMed Abstract]
[3] Holick MF., Vitamin D: A millenium perspective., J Cell Biochem. 2003 Feb 1;88(2):296-307. [PubMed Abstract]

Low levels of serum 25(OH)D are associated with an increase in all the concerns listed above! Conversely, *when people achieve a 25(OH)D serum level of 50ng/L or more, there is a dramatic improvement in health*! The Vitamin D Council supports this, and recommends achieving a level of between 50 and 80ng/L.[4] One problem we face is that *this 50 to 80ng/L recommendation is more than double what the highest government organizations are suggesting* and many people are confused.

The National Vitamin D Deficit

According to the 2000-2004 National Health and Nutrition Examination Survey (NHANES), the *vast majority of Americans (50-78%) have levels below 30ng/L, with African Americans having the lowest of all groups.*[5] We have a huge Vitamin D-deficit and it’s making us sick! Unfortunately for many of us, we just don’t get enough from exposure to the sun, and we certainly don’t get enough in our diet.

A number of factors can contribute to this “national-deficit.” Recent evidence suggests that *men, for example, “spend” as much as 3000-5000IU per day just to maintain a serum 25(OH)D level of 50ng/L*[6] But, the average man does not get this much on a daily basis. Over time it leads to widespread Vitamin D deficiency. There simply isn’t enough found in the diet: *the recommended daily dietary allowance for cholecalciferol is 5 to 10 micrograms (200 to 400 IU)*. Most people don’t get enough from the sun either: a Study in the UK found that casual exposure to the sun in the summer was inadequate, and could only raise serum 25(OH)D by 15ng/L.[7] This means that if your 25(OH)D levels are 25ng/L at the beginning of the summer, they can only be expected to reach 40ng/L by summer’s end.

Our infants are being born with even greater deficiencies as a result. A recent study showed the *vast majority of infants (72.7%) had baseline 25(OH)D levels of less than 20 ng/mL*. Our national Vitamin-D deficit is passed to the next generation! The good news is that these same infants, given an oil emulsion of 400IU per day achieved a steady-state of 42ng/L serum 25(OH)D at 7 months. [8] While this is a move in the right direction for our little ones, it doesn’t fall within the suggested optimal range of 50-80ng/L. This explains why the Vitamin D Council recommends 1000IU per day for infants less than a year old.

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[4] John Jacob Cannell, Executive Director, Vitamin D Council, 2008.10.01Am I Vitamin D Deficient?, online, October 1, 2008. Last accessed May 3, 2010, http://www.vitamindcouncil.org/health/deficiency/am-i-vitamin-d-deficient.shtml

[5] Yetley EA. Assessing the vitamin D status of the US population. Am J Clin Nutr 2008;88:558S-64S. [PubMed abstract]

[6] Robert P Heaney, Michael F Holick, et al. Human serum 25-hydroxycholecalciferol response to extended oral dosing with cholecalciferol. Am J Clin Nutr. 2003 Jan;77(1):204-10. [PubMed Abstract]

[7] Hyppönen E, Power C., Hypovitaminosis D in British adults at age 45 y: nationwide cohort study of dietary and lifestyle predictors., Am J Clin Nutr. 2007 Mar;85(3):860-8. [PubMed Abstract]

[8] Wagner CL, Hollis BW, et al., Circulating 25-hydroxyvitamin d levels in fully breastfed infants on oral vitamin d supplementation., Int J Endocrinol. 2010;2010:235035. Epub 2009 Dec 9. [PubMed Abstract]

Why does the Vitamin D Council recommend 50-80ng/L of serum 25(OH)D, yet the National Institute of Health only believes levels below 20ng/L are "deficient?" Is 50-80ng/L too high and unsafe?

Yes, the Vitamin D Council and many other researchers are recommending *more than double* the national standards, they are clearly too low and need to be revised.[9] The Institute of Medicine of the National Academies of Science (IOM), is conducting 24-month review of Vitamin D right now and results will be published by the end of the summer 2010. Then, we will have their new recommendations for serum 25(OH)D levels. Until they gives us an answer, the research strongly suggests that levels of 25(OH)D above 50ng/L show dramatically decreased risk of many of the diseases I listed above! Many people now believe is time for the IOM to make a dramatic upward revision of their Vitamin D suggestions.

How much should I take?

No one can say how much *you* should take. There are many variables that account for absorption and conversion. The *Vitamin D Council provides general guidelines below*. You will notice that their suggestion is to start at a level more than 10-times the US Recommended Daily Intake (RDI) of 400IU! Even though this is contradictory to the RDI, This is prudent, and no one can get toxic at this dose, but if you would like to test first that's fine.

Vitamin D3	
Age	**Dose**
<1 year, healthy	1000IU
>1 year	1000IU/ 25 pounds body weight
adults and adolescents	5000IU Then after 2-3 months, have a 25OHD test.

If I get tested and I am low, how much *more* should I take every day?

First, know that everyone is different and we all respond with a slight variance to Vitamin D3 supplementation. There can be as much as a two-fold difference the rise in

[9] John Jacob Cannell, Executive Director, Vitamin D Council, 2008.10.01Am I Vitamin D Deficient?, online, October 1, 2008. Last accessed May 3, 2010, http://www.vitamindcouncil.org/health/deficiency/am-i-vitamin-d-deficient.shtml

25(OH)D levels. As a guideline, a large meta-analysis for a report to the Canadian government recently reported that “an exploratory analysis of [25(OH)D levels] demonstrated a significant positive association comparable to an increase of 1 - 2 nmol/L (0.4-0.8ng/L) in serum 25(OH)D for every 100 additional units of vitamin D [depending on the individual.]”[10] This means that *for every 1000IU increase in your Vitamin D3 supplement, your serum levels of 25(OH)D will increase by between 4 and 8ng/L.* Lets say you get tested and your level is 25ng/L. By this guide, in order to raise your 25(OH)D levels to 50ng/L you would need between 3,125 and 6,250IU per day.

But 5000IU is so much higher than the RDA, is that safe?

It is difficult to get too much cholecalciferol through a supplement, although toxicity can cause acute adverse effects of hypercalcemia like fatigue, constipation, back pain, forgetfulness, nausea, vomiting. The maximum safe level of vitamin D has been estimated as 110ng/L with a persistent level of 150ng/L causing hypercalcemia.[11] [12] But at 5000IU per day you will likely never get close to that level. Even when given seemingly mega-doses for months on end, people achieved steady-states of active serum 24OHD that were generally between 50-80ng/L, storing the excess cholecalciferol in the tissues.

One study showed that a single 100,000IU dose was safe. It caused a gradual rise in serum 25(OH)D concentrations to 42ng/L after 7 days, and slowly fell to baseline over the course of a few months. This suggests that the final conversion of cholecalciferol to 25(OH)D in the Kidneys peaks somewhere at or around this level. It also demonstrates that cholecalciferol is stored in the tissues for later conversion. Our skin makes 20,000IU in just 10 minutes of full-body exposure and stores it to maintain a steady level of active 25(OH)D in the bloodstream. Furthermore, according to John Jacob Cannell MD, “Toxicity is simply not a concern in doses below 10,000 units a day.”[13]

Joe Pizzorno ND in Canada found that 81% of 1500 participants had 25(OH)D levels below 32ng/L. They were given loading doses of about 8000 to 15,000IU per day for 3 months followed by maintenance doses of 5000IU. At the end of a year they increased their concentrations by 41%. Yet still only 53% of the participants were above the 32ng/L cutoff level and only 35% were in the optimal range of 50 to 80ng/L. *None of their levels went into the toxic range, although three exceeded 100ng/L, and there were no adverse events.*[14] This dosage is safe, yet perhaps even too low.

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[10] Cranney A, Mamaladze V., et al., Effectiveness and safety of vitamin D in relation to bone health., Evid Rep Technol Assess (Full Rep). 2007 Aug;(158):1-235. [PubMed Abstract]

[11] Lilienfeld-Toal H, Messerschmidt W, Sturm B, Ochs H. 25-hydroxy-vitamin D levels in a patient with hypervitaminosis D. *Klin Wochenschr.* 1978;56(14):715-717.

[12] Jacobus CH, Holick MF, Shao Q, et al. Hypervitaminosis D associated with drinking milk. *N Engl J Med.* 1992;326(18):1173-1177.

[13] John Jacob Cannell, Executive Director of the Vitamin D Council “Treatment,” Online, December 14, 2004, Online: http://www.vitamindcouncil.org/treatment.shtml, last accessed May 3, 2010.

[14] Joe Pizzorno, What Have We Learned About Vitamin D Dosing?, Integrative Medicine • Vol. 9, No. 1 • Feb/Mar 2010

Lower-dose, steady-state studies found that the body chooses a level that is needs, and stores the rest if there's more than it can use at once. When you get just a little, the body rapidly converts cholecalciferol to active 25(OH)D. When you get even more, this conversion slows down and your body stores it in nearly every tissue of the body. These data suggest that, at typical vitamin D(3) inputs and serum concentrations, there is very little native cholecalciferol in the body, and 25(OH)D constitutes the bulk of vitamin D reserves. However, at supraphysiologic inputs, large quantities of vitamin D(3) are stored as the native compound, presumably in body fat, and are slowly released to be converted to 25(OH)D.[15]

Vitamin D3 (cholecalciferol) supplementation is safe. Consider again that the body, when fully exposed to summer sun, can easily produce over 20,000IU.

Toxicity appeared in people that received doses ranging from 50,000-464,000IU for 6 to 8 days. They had achieved serum 25(OH)D concentrations of between 120 and 470ng/L.[16] These are massive doses.

How much is it going to cost to repay this Vitamin D deficit?

If you're like 80% of Americans, you need to be getting more Vitamin D, whether by more exposure to the sun or by supplementation, because diet doesn't cut it. There simply aren't many foods with sufficient amounts. It might cost you 5000IU per day, but if we do a dollar-to-IU conversion for Vitamin D3, you will be looking at pennies per day!

The Deficit Recovery Plan Budget:
$12.00 per bottle of Vitamin D3 in an olive oil suspension.
Potency: 2000IU / drop
Quantity: 900 drops / ounce
VitD3 per bottle: 1,800,000IU per ounce
Daily supplementation: 5000IU / day
Your 1.8 million-IU bottle will last: 360 day supply!
At a cost of: $1.00 per month!
Only: $0.033 per day!

What is the best way to take a Vitamin D supplement?

[15] Heaney RP, Hollis BW. et al., 25-Hydroxylation of vitamin D3: relation to circulating vitamin D3 under various input conditions.Am J Clin Nutr. 2008 Jun;87(6):1738-42.
[16] Jacobus CH, Holick MF, Shao Q, et al. Hypervitaminosis D associated with drinking milk. *N Engl J Med.* 1992;326(18):1173-1177.

The best way is by regular midday spring and summer sun exposure to maximal surface area of oily skin. Be careful to stay in the sun long enough to pink-up, but not so you get a burn. Even 10 minutes will make a world of differenct. After that amount of time it is okay to cover up or wear a natural sunblock.
Because it is fat-soluble, and very stable, you can also get olive oil-based supplements that have a potency of 2000IU of Vitamin D3 (cholecalciferol) per drop. Vitamin D2 (ergocalciferol) is often available through prescription, but it is far less potent and is cleared from the body faster. Ergocalciferol is the form of Vitamin D in mushrooms.

How can I get Vitamin D from my Diet?

As you can see below, besides cod liver oil and fish, there are very few good sources.

The NIH provides this nutrition guide: Selected Food Sources of Vitamin D

Food	IUs per serving*	Percent DV**
Cod liver oil, 1 tablespoon	1,360	340
Salmon (sockeye), cooked, 3 ounces	794	199
Mushrooms that have been exposed to ultraviolet light to increase vitamin D, 3 ounces (not yet commonly available)	400	100
Mackerel, cooked, 3 ounces	388	97
Tuna fish, canned in water, drained, 3 ounces	154	39
Milk, nonfat, reduced fat, and whole, vitamin D-fortified, 1 cup	115-124	29-31
Orange juice fortified with vitamin D, 1 cup (check product labels, as amount of added vitamin D varies)	100	25
Yogurt, fortified with 20% of the DV for vitamin D, 6 ounces (more heavily fortified yogurts provide more of the DV)	80	20
Margarine, fortified, 1 tablespoon	60	15
Sardines, canned in oil, drained, 2 sardines	46	12
Liver, beef, cooked, 3.5 ounces	46	12
Ready-to-eat cereal, fortified with 10% of the DV for vitamin D, 0.75-1 cup (more heavily fortified cereals might provide more of the DV)	40	10
Egg, 1 whole (vitamin D is found in yolk)	25	6

Food	IUs per serving*	Percent DV**
Cheese, Swiss, 1 ounce	6	2

*IUs = International Units.

**DV = Daily Value. DVs were developed by the U.S. Food and Drug Administration to help consumers compare the nutrient contents of products within the context of a total diet. The DV for vitamin D is 400 IU for adults and children age 4 and older. Food labels, however, are not required to list vitamin D content unless a food has been fortified with this nutrient. Foods providing 20% or more of the DV are considered to be high sources of a nutrient.

The U.S. Department of Agriculture's Nutrient Database Web site,http://www.nal.usda.gov/fnic/foodcomp/search, lists the nutrient content of many foods and provides a list of foods containing vitamin D:http://www.ars.usda.gov/SP2UserFiles/Place/12354500/Data/SR22/nutrlist/sr22a324.pdf. A growing number of foods are being analyzed for vitamin D content. Simpler and faster methods to measure vitamin D in foods are needed, as are food standard reference materials with certified values for vitamin D to ensure accurate measurements.

Curious what the experts have to say?

The Vitamin D Council suggests three ways to get more Vitamin D (from their website):

- Regularly receive midday sun exposure in the late spring, summer, and early fall, exposing as much of the skin as possible (being careful to never burn).
- Regularly use a sun bed (avoiding sunburn) during the colder months.
- Take 5,000 IU per day for 2–3 months, then obtain a 25-hydroxyvitamin D test. Adjust your dosage so that blood levels are between 50–80 ng/mL (or 125–200 nM/L) year-round.

When should I get tested?

If you are chronically ill and you are concerned that your Vitamin D levels are dangerously love, you might want to test immediately. If you test very low, perhaps higher loading doses are warranted. If you are concerned that you already have high Vitamin D status and fear toxicity, you might want to test immediately. However, most adults “spend” as much as 5000IU per day, so supplementing with this much for 2 to 3 months and then testing can’t hurt. Chances are, you’ll still be deficient and will have to up the dose. This way you’ll be closer to your goal and a modification to the regimen will be easier to fine-tune.

NEWSLETTER TEXT:

Heard about Vitamin D in the news lately? Vitamin D has been grabbing headlines because much of the research into this important nutrient has been showing that we have a national Vitamin D deficit, and alarms are going off everywhere! That’s right, just about all of us are low in Vitamin D, and we need it to:

- Reduce the risk of cancers
- Reduce the risk of autoimmune diseases like MS, Psoriasis, and Type-1 Diabetes[17]
- Lessen allergies, and eczema
- Reduce your susceptibility to a cold or flu
- Slow the aging process[18]
- Maintain healthy bones and mineral balance
- Reduce pain, depression, and chronic fatigue
- Reduce the risk of falls in elderly
- Reduce the possibility of complication in pregnancy, and reduce the risk of ADHD, allergies, autoimmune disease, cancer in offspring.

Recent research has shown that optimal Vitamin D levels should be in the range of 50 to 80ng/L (125-200nmol/L), when we perform a blood test. The Vitamin D Council recommends three ways to achieve this:

- Regularly receive midday sun exposure in the late spring, summer, and early fall, exposing as much of the skin as possible (being careful to never burn).
- Regularly use a sun bed (avoiding sunburn) during the colder months.
- Take 5,000 IU per day for 2–3 months, then obtain a 25-hydroxyvitamin D test. Adjust your dosage so that blood levels are between 50–80 ng/mL (or 125–200 nM/L) year-round.

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[17] Holick MF., Vitamin D: A millenium perspective., J Cell Biochem. 2003 Feb 1;88(2):296-307. [PubMed Abstract]

[18] J Brent Richards, Abraham Aviv, et. al., Higher serum vitamin D concentrations are associated with longer leukocyte telomere length in women, American Journal of Clinical Nutrition, Vol. 86, No. 5, 1420-1425, November 2007 [PubMed Abstract]

This plan of getting your Vitamin D from the sun is a best-case scenario. But if you are not regularly getting sun exposure to a large part of your body, you need to supplement. These suggested amounts are consistent with prevailing research, and the National Institute of Medicine will publish their revisions to dietary guidelines and optimal concentration ranges in serum tests by the end of this summer. Stay tuned! We expect that the standards will increase from the paltry 200 to 400IU that is presently recommended based on the mountains of evidence that suggest higher levels are needed to maintain adequate Vitamin D levels in the blood. Until then, it is safe to begin with their recommendations and start improving your health dramatically!

Read the paper on our website to find answers to common questions like:

How much should I take?
If I get tested and I am low, how much *more* should I take?
But 5000IU per day is so much higher than the RDA, is that safe?
How much is it going to cost to repay this Vitamin D deficit?
What is the best way to take a Vitamin D supplement?
How can I get Vitamin D from my diet?
When should I get tested?

Get informed! And find out how you can prevent nearly every cancer for 3-cents a day.