

JIVE TURKEY PART II:

Vitamin D Toxicity

By

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Jive Turkey: a quick step dance in Germany in the 1930s; slang word used to refer to someone who was unreliable, made empty promises, or who was full of bluster

Let's talk about some of the controversy surrounding vitamin surrounding vitamin D on, you know the vitamin/hormone the body makes when exposed to sunlight. How many times over the past years have you heard to stay out of the sun or too much vitamin D can be toxic. For years the RDA and doctor recommended dosage on vitamin D was 400IU, with the now current "Upper Limit", that being the National Institute of Health's upper tolerable limit of vitamin D being 2000 International Units (IU).

On that note, have you ever wondered what and where international units come from? It is nearly impossible to find the entire history, but apparently back in the 1930's after the medical authorities were trying to sway the public's awareness of possible toxicity from mega doses (practically enough to poison a horse) of vitamin D, "they" also began to point the "toxic" label at two of the other most crucial vitamins, Vitamin A and Vitamin E. They decided to change the dosage vernacular from milligrams to International units.

The problem with the change was one on a psychological level as 20milligrams of vitamin D was the equivalent of 1,000,000 (yes, 1 million) International Units. Now what sounds like it would be more toxic, 1million international units of a vitamin, or 20 milligrams of that same vitamin? Hmmmmm. So if you do the math, 1 microgram of vitamin D is equal to 40 International Units. But yet, when you look at vitamin A and vitamin E the conversion is not the same. 1 International Unit of vitamin E (in the form of alpha tocopherol) is equivalent .67mg or natural form or .45mg of synthetic form. And to make matters even more confusing vitamin A is listed as RAE, Retinol Activity Equivalents, with 1 RAE (or mcg) being

equal to 3.3 International Units. Not sure if you are thinking the same thing I am, but why the different International Unit conversions for each of the 3 vitamins??? Wouldn't it be easier just to keep it in milligrams or micrograms?

If all the jargon were true about vitamin D toxicity, then wouldn't going out in the sun for oh, say, more than 5 minutes be dangerous for our health, never mind the possible cancer and toxicity side effects. Did you know that when sunlight passes through the eyes it stimulates the pituitary, hypo thymus, and pineal gland to secrete hormones including melatonin, serotonin, and calcitonin? Hmm. So let's look at this with a little logic. According to some health "authorities" more than 1200 or 2000IU per day can be toxic, but the average person can produce 18,000 or more IU of vitamin D with just 30 minutes of sun exposure during the day. Wait a minute, 1200IU can be toxic, but spending 30 minutes in the sun in which you produce over ten times the amount of the same vitamin can be toxic, according to the previously mentioned authorities.

That would mean if you spent the entire day, lets just say 8 hours on the beach, you would be capable of making approximately 144,000IU (depending on many factors including your skin color and how pink or dark your skin gets in the sun. If you turn pink after being in the sun, you have probably absorbed enough vitamin D for the day). That is over 100 times the current RDA value recommended by the AMA and many primary care physicians.

On the same note, wouldn't a diet consisting of more than 2 tablespoons of Cod liver oil a day (2720 IU), or 9oz of Sockeye Salmon (2382 IU) a day effectively be considered "toxic" with regards to vitamin D ingestion, at least according to the national institute of health's upper tolerable limit of 2000 IU vitamin D per day. Below are some of the more common food sources of vitamin D: (notice the fortified products such as cereal, yogurt, orange juice, and milk, as well as the margarine!!!)

Food Sources of Vitamin D

Cod Liver Oil, 1 tbsp	1360 IU
3 oz Sockeye Salmon	794 IU
3 oz ultraviolet light exposed mushrooms	400 IU
3 oz Mackerel	388 IU
3 oz canned Tuna fish in water	154 IU

1 cup Vitamin D fortified nonfat milk	115-124 IU
1 cup fortified Orange Juice	100 IU
6 oz fortified Yogurt	80 IU
1 Tbsp Margarine	60 IU
Sardines	46 IU
3.5 oz liver, beef	46 IU
Ready to eat fortified cereal	40 IU
1 whole egg	25 IU
1 oz Swiss Cheese	6 IU

So, is vitamin D at dosages above those recommended by the medical authorities toxic to our health, or could this be a slight case of misinformation. Even on their own website, the NIH states, “Long term intakes above the upper limit increase the risk of adverse health effects.” But then in the very next sentence, they go on to state, **“Substantially larger doses administered for a short time or periodically (e.g.: 50,000 IU/week for 8 weeks) do not cause toxicity.** Rather the excess is stored and used as needed to maintain normal serum 25(OH) D concentrations when intakes or sun exposure are limited.” So which is it, is it bad or good, and where are the studies showing the toxicity of long-term usage over the “upper tolerable limit”?

A brief look at the research may provide some information on this topic, as proper vitamin D levels are crucial to our health as they are linked to just about every health disorder/disease, including cancer, autoimmune dysfunction, hormonal disorders, and general health.

Before we start, did you know that back in the 1930’s 3 drugs, Dalsol, Drisdol, and Deltalin were introduced to the market, each containing a common element: 50,000 IU vitamin D. Hmmm.

Let’s start way back in 1939 with a study by Klassen and Curtis out of the Ohio State College of Medicine. The beauty of studies back then is there was no conflict of interest, biased results, or funding by those whom seek to profit from the results of the study, as they were purely driven by science and education of the researchers and general public.

1. Klassen K, Curtis G. **Effect of Massive doses of vitamin D on calcium and phosphorus metabolism.** *Archives of Internal Medicine.* 1939.

The subjects were given vitamin D in doses of 200,000IU per day for a period of 3 days. If there were no signs of toxicity the dose would then be increased by another 200,000IU for another 3 days. This would be continued until each subject received 1,000,000IU a day for 3 days. You will never guess what the researchers found. "The subjects showed no, yes, NO signs of toxicity. Lets think about this for a minute, at a dosage roughly 2,500 times higher than our current RDA of vitamin D, the subjects showed no signs or symptoms of toxicity. Perhaps our current RDA may need to be re-evaluated?"

Let's look a longer-term study, perhaps one over a period of years. Take for example a study from the New York State Journal of Medicine from 1940.

2. Snyder G, Squires W. **A preliminary report on activated ergosterol.** *New York State Journal of Medicine.* Pp 708-719. 1940.

Over a 4-year period, subjects began with a dosage of 50,000IU and gradually increased to dosages of roughly 300,000IU, with some subjects receiving as high as 600,000IU per day. After 4 years the researchers concluded that the "hazards of toxicity in high dose vitamin D therapy have been greatly exaggerated", as none of the mega-dosing subjects had any adverse toxicity induced side effects.

3. Reynolds C. **Comparative therapeutic value and toxicity of various types of vitamin D.** *The Journal Lancet.* 10; Pp 372. 1942.

Subjects taking over 250,000 times our current IU showed no toxic manifestations even over long-term periods of intensive vitamin D treatment. Rather any toxic effects might be due to the procedures utilized in production of the vitamin D or toxic impurities that may have crept their way into the preparations.

4. Stephenson D, Peiris A. **The lack of vitamin D toxicity with mega dose of daily ergocalciferol (D2) therapy: a case report and literature review.** *South Med J.* 102(7); Pp 765-768. 2009.

After 8-12weeks of mega dosing 50,000IU vitamin D, the literature had yet to report any signs of Vitamin D toxicity. Even more impressive was the case study mentioned in this review, in which a 56-year-old woman was taking 150,000 IU orally, every day for 28 years. And guess what, no toxicity.

5. Vieth R. **Why the optimal requirement for Vitamin D3 is probably much higher than what is officially recommended for adults.** *J Steroid Biochem Mol Biol.* 89-90(1-5); Pp 575-579. 2004.

The recommended 15mcg per day does not provide enough vitamin D to meet the minimum desirable target of 70nmol/L of 25(OH) D (vitamin D).

6. Jones G. **Pharmacokinetics of vitamin D toxicity.** *Am J Clin Nutr.* 88(2); Pp 582-586. 2008.

Just in case you were wondering after reading the previous study (Vieth R 2004), at what concentration does vitamin cause toxicity. In this study, Jones presents that concentration at 750nmol/L to produce toxicity, but recommends the upper limit be 250nmol/L, to ensure a wide safety margin.

7. Hathcock J, Shao A, Vieth R, Heaney R. **Risk assessment for vitamin D.** *Am J Clin Nutr.* 85(1); Pp 6-18. 2007.

Upon review of the trials collected in healthy individuals using 250mcg (10,000 IU/d) vitamin D, the researchers found no signs of toxicity in any of the trials, and concluded that a dosage of 250mcg (10,000 IU/d) is a safe dosage.

8. Vieth R. **Vitamin D and cancer mini-symposium: the risk of additional vitamin D.** *Ann Epidemiol.* 19(7); Pp 441-445. 2009.

“Prolonged intake of 10,000 IU/d of vitamin D3 poses no risk of adverse effects for adults, even if this is added to rather high physiologic background level of vitamin D.”

9. Vieth R. **Vitamin D toxicity, policy, and science.** *J Bone Miner Res.* 2; Pp 64-68. 2007.

“The clinical trial evidence shows that a prolonged intake of 250 mcg (10,000 IU/d) of vitamin D3 is likely to pose NO risk of adverse side effects in almost all individuals in the general population.”

10. Leventis P, Kiely P. **The tolerability and biochemical effects of high dose bolus vitamin D2 and D3 supplementation in patients with vitamin D insufficiency.** *Scan J Rheumatol.* 38(2); Pp 140-153. 2009.

19 subjects received 300,000 IU vitamin D3, and 50 subjects received 300,000 IU vitamin D2 in bolus form at 6, 12, and 24 weeks. The researchers found no toxic side effects from either vitamin D, and concluded that a 300,000 IU bolus was safe and effective.

11. Boas S, Hageman J, Ho L, Liveris M. **Very high doses ergocalciferol is effective for correcting vitamin D deficiency in children and young adults with cystic fibrosis.** *J Cyst Fibros.* 8(4); Pp 270-272. 2009.

The subjects were given 700,000 IU vitamin D over 14 days, averaging roughly 50,000IU per day. No toxic side effects were seen in any of the subjects after the 14-day mega dosing period.

12. Ebbeling P. **Mega dose therapy for vitamin D deficiency.** *Med J Aust.* 183(1); Pp 4-5. 2005.

13. Lips P. **Vitamin D physiology.** *Prog Biophys Mol Biol.* 92(1); Pp 4-8. 2006.

