

Bio D-Mulsion Forte (Vitamin D-3) (Emulsified Vitamin D-3)
cholecalciferol; Sunshine In A Bottle!

Did you know:

Most of us make about 20,000 units of vitamin D after about 20 minutes of summer sun. This is about 100 times more vitamin D than the government says you need every day. (hmmm, listen to nature or government?)

If you don't get vitamin D the way Mother Nature intended, from sunshine, you need to take vitamin D supplements. As most of us get a lot more vitamin D from sunshine than we think, most of us need about 2,000 units a day extra.

Our vitamin D is micro-emulsified to enhance absorption. As the principal regulator of calcium homeostasis, Vitamin D, a pro-hormone, is the key to skeletal development and bone mineralization.

Vitamin D has a well-established role in calcium homeostasis and the maintenance of healthy bone.

Recent articles indicate that the prevalence of vitamin D deficiency is much higher than previously recognized (more than 90% in patients with chronic pain, according to a recent study published by the Mayo Clinic), and that vitamin D supplementation is much safer than previously recognized. The recent studies by Al Faraj (2003), Vieth, Chan, and MacFarlane (2001), and Heaney et al (2003) all used daily doses of 4,000 IU per day or more with no evidence of adverse effects. Recent articles have also suggested that vitamin D may have a role in the prevention and treatment of many chronic diseases. We are clearly on the verge of a paradigm shift with regard to our understanding and clinical use of vitamin D.

Vitamin D Physiology

- Cholecalciferol is the naturally occurring form of vitamin D. It is sometimes called vitamin D3. cholecalciferol is made in large quantities in your skin when sunlight strikes your bare skin. It can also be taken as a supplement.
- Calcidiol, is a prehormone in your blood that is directly made from cholecalciferol. When being tested for vitamin D deficiency, calcidiol is the only blood test that should be drawn. Your doctor can order calcidiol levels but the lab will know calcidiol as 25-hydroxy-vitamin D or 25(OH)D as the better marker of overall D status. It is this marker that is most strongly associated with overall health.
- Calcitriol (1,25 dihydroxy-vitamin D) is made from calcidiol in both the kidneys and in other tissues and is the most potent steroid hormone derived from cholecalciferol. Calcitriol has powerful anti-cancer properties. It is sometimes referred to as the active form of vitamin D. Calcitriol levels should never be used to determine if you are deficient in vitamin D.

Cholecalciferol is formed in the skin when ultraviolet light of the correct wavelength, called UVB, strikes bare skin. Enormous quantities of cholecalciferol are rapidly made in the skin: if the sun is high in the sky (midday and the summer season), if the skin is not covered by clothes or sun block, if you stay in the sun until your skin just begins to turn pink (not red), and if you are not behind glass. Glass blocks virtually all the UVB, preventing vitamin D from being made.

Studies show that if you go out in the summer sun in your bathing suit until your skin just begins to turn pink, you make between 10,000 and 50,000 units of cholecalciferol in your skin.

Professor Michael Holick of Boston University School of Medicine, has studied this extensively and believes a reasonable average of all the studies is 20,000 units. That means a few minutes in the summer sun produces 100 times more vitamin D than the government says you need!

The skin does another amazing thing with cholecalciferol. It prevents vitamin D toxicity. Once you make about 20,000 units, the same ultraviolet light that created cholecalciferol, begins to degrade it. The more you make, the more is destroyed. So a steady state is reached that

prevents the skin from making too much cholecalciferol. This is why no one has ever been reported to develop vitamin D toxicity from the sun but they can when taking it by mouth. It is manufactured from the fat of lamb's wool by purifying the fat and extracting the cholecalciferol. Fur bearing animals and many birds make cholecalciferol in their fur or feathers as sunlight can not get to their skin. Interestingly, mammals and birds then eat the cholecalciferol by licking their fur (grooming) or rubbing their beaks on their feathers (preening). So, when you take cholecalciferol by mouth, you are doing what a number of other mammals do!

Cholecalciferol is quite potent; which means that it works in small amounts. A 1,000 unit capsule contains 25 micrograms of cholecalciferol. One thousand such capsules would make 25 milligrams. Most of the vitamin D toxicity that has been reported in the medical literature is when manufacturers mistakenly substitute milligrams of cholecalciferol (or even grams) for micrograms, thus making a vitamin D preparation that is 1,000 times (or 1,000,000 times) stronger than it should be. For this and other reasons, in most European countries vitamin D preparations are only available by prescription.

After it is made in the skin or taken by mouth, cholecalciferol is transported to the liver where it is metabolized into calcidiol or 25(OH)D. Calcidiol is now thought by some scientists to have steroid hormone properties. It certainly helps maintain your blood calcium levels. But calcidiol's main importance is that it is the storage form of vitamin D. Calcidiol is what fills your vitamin D gas tank. If your serum calcidiol level is less than 40 ng/ml, your tank is low, and you should fill it up and keep it full unless you have one of those rare medical conditions called vitamin D hypersensitivity.

In order to understand why you should keep your vitamin D tank full, you need to understand the next step in the metabolism of cholecalciferol. After your liver turns cholecalciferol into calcidiol, calcidiol follows one of two roads. The first road takes priority, as your life literally depends on it, but the second road is causing all the excitement. However, if your tank is low, most of your calcidiol takes the first road.

The first road leads to the kidney, where calcidiol is turned into calcitriol. Calcitriol is a potent steroid hormone, in fact, it the most potent steroid hormone in the human body. (A steroid hormone is simply any molecule in the body that is made from cholesterol and that acts to turn your genes on and off.).

Remember how cholecalciferol is active in microgram quantities, 1/1,000,000 of a gram? Well calcitriol is active in picogram quantities, a picogram is 1/1,000,000,000,000 of a gram!

Calcitriol made by the kidney circulates in the blood to maintain your blood calcium levels.

Without enough calcitriol in your blood, your calcium will fall and you will get sick as calcium is vital to the function of the cells in your body. Therefore, the first priority for calcidiol, is to go to the kidney and make enough calcitriol to regulate your serum calcium. This is called the endocrine function of vitamin D as the kidney makes the hormone calcitriol and then secretes into the blood.

The second vitamin D road leads to your tissues and that where all the action is. All of the amazing health benefits of vitamin D discovered in the last 10 years are from vitamin D going down the second road. If any calcidiol is left over, that is, if your tank is full and your kidneys are getting all the calcidiol they need to maintain serum calcium, then calcidiol is able to take another road, one that leads directly to the cells. This path is only now being fully understood and is causing excitement all around the world, especially concerning cancer. These are the autocrine (inside cell) and paracrine (around the cell) function of vitamin D system.

These functions are crucial to understanding why you should keep your vitamin D tank full. If you only have a small amount of calcidiol in your blood, virtually all of it goes to your kidney, which then makes extra calcitriol to keep your serum calcium levels from falling. Almost no calcidiol gets to your tissues to make tissue calcitriol.

But, when your tank is full, the left over calcidiol goes to the many cells in the body that are able to make their own calcitriol to fight cancer. They do so with gusto. In fact, they appear to make as much calcitriol as they can. The more calcidiol they get, the more calcitriol they make. The step is not rate limited by its product (calcitriol) and is thus uncontrolled. No other steroid hormone system in the body works this way; the manufacture of calcitriol in the tissues is unique. This is the second most important fact about vitamin D.

Other steroids limit their own production by inhibiting the very chemical reactions that make them. For example, a chemical reaction in the body turns cholesterol into progesterone, a female hormone. When enough progesterone is made, progesterone shuts down (inhibits) the chemical reaction so no more progesterone is made. This is called negative feedback. This occurs with all other steroids, somewhere in the metabolic process.

It does not appear to occur with calcitriol in the tissues! Throughout the entire range of normal calcidiol levels, tissue calcitriol levels continue to increase. The scientific way of saying that is the Michaelis Menton constant remains above one through the full range of the substrate concentration.

This is a crucial piece of information, because it has such profound implications for the normal state of human affairs. Just as modern humans have been living (and dying) with historically low levels of calcidiol in their blood, their tissues have been living (and dying) with historically low levels of calcitriol. And calcitriol is the most potent steroid hormone in the human body. It turns genes on and off at a dizzying rate, genes that are either making proteins that are essential to fighting cancer or genes that are making proteins that are promoting diseases like cancer.

What prevents tissue calcitriol levels from getting too high? Something has to or your tissues would make too much. One thing that helps is called catabolism or breakdown. The more calcitriol that is made, the more is metabolized and excreted in the bile. But that doesn't prevent too much from being made in the first place.

Let's go backwards for a minute. One possible way of limiting calcitriol in the tissues is by limiting the amount of calcidiol in the blood. That is, maybe chemical reaction that turns cholecalciferol into calcidiol in the liver is rate limited, or has a negative feedback loop?

No, it does not. In normal humans, the more cholecalciferol in the blood, the more calcidiol the liver makes. So, in the natural state, what limits the amount of cholecalciferol in the blood? What is the rate limiting step for the production of calcitriol in the tissues?

Your skin! How much you go into the sun. Remember, the body has a fool proof method of limiting cholecalciferol. Only about 20,000 units can be made in the skin every day because the same sunlight that makes it, begins to break it down. After your skin turns dark (tan) even less cholecalciferol is made, maybe 10,000 units. Humans have a natural system in the skin that prevents toxicity. Another way of saying this is that the rate-limiting step for the production of calcitriol in the tissues is your behavior; how often you go into the sun or how much cholecalciferol you take as a supplement. This makes vitamin D unique.

Remember, our ancestors lived naked in the sun for several million years. Then, 50,000 years ago, some of us migrated north and south to places with less sun. Then we put on clothes, started working inside and living in cities where buildings blocked the sun. Then we started traveling in cars instead of walking or riding horses and glass blocked even more of the UVB in the sunlight. Then, only a few years ago, we started actively avoiding the sun and putting on sun block. All this time we have been steadily reducing the tissue levels of the most potent steroid hormone in your body, one with powerful anti-cancer properties.

The really significant reductions in sunlight exposure have occurred since the industrial revolution, just the time the "diseases of civilization," like cardiovascular disease, diabetes and cancer, seem to have greatly increased. Pretty frightening when you think about it.

So, how much vitamin D should you take to help prevent cancer? No one knows. It is a more complicated question than it first appears because most of us get most of our vitamin D from the sun, although we avoid the sun! We get a little in our diet, almost all of it from milk or fish, but

none of us get enough from our diet. We also get some in multivitamins, but multivitamins only contain 400 units, about 10 % of the body's daily needs. Remember your daily or optimum needs may be even greater.

How much should you take if you have cancer? We don't know. The research is far from complete. As we will say repeatedly, although vitamin D may help, it should only be taken in addition to standard cancer treatment. It is never the first or only treatment.

Remember, vitamin D may be toxic in overdose although one expert recently said, "worrying about vitamin D toxicity is like worrying about drowning when you are dying of thirst That said, many people think if a little is good then a lot is better. This is definitely not true about vitamin D. Forewarned is forearmed.

Vitamin D deficiency and musculoskeletal pain

Vitamin D deficiency causes dull, achy musculoskeletal pain that is incompletely responsive to both pharmacologic and manual treatments. The pain may be widespread or confined to a particular area, most commonly the low back and lumbar spine. The mechanism by which this pain is produced has been clearly elucidated: 1) vitamin D deficiency causes a reduction in calcium absorption, 2) production of parathyroid (PTH) hormone is increased to maintain blood calcium levels, 3) PTH results in increased urinary excretion of phosphorus, which leads to hypophosphatemia, 4) insufficient calcium phosphate results in deposition of unmineralized collagen matrix on the endosteal (inside) and periosteal (outside) of bones, 5) when the collagen matrix hydrates and swells, it causes pressure on the sensory-innervated periosteum resulting in pain.(3) Indeed, several clinical investigations have recently shown that vitamin D deficiency is particularly common among people with musculoskeletal pain.(4, 5)

Non-musculoskeletal manifestations of hypovitaminosis D

Both the peripheral and central nervous systems have multiple sites of action for vitamin D, and it appears likely that vitamin D modulates serotonin and melatonin synthesis and metabolism. Alterations in vitamin D levels appear to explain, at least in part, the adverse psychological effects of sunlight deprivation, such as which occurs in winter.(6) Preliminary evidence suggests that vitamin D deficiency may also be particularly common among patients with inflammatory and autoimmune disorders, and that vitamin D may modulate inflammatory responses.(7, 8, 9)

Bio-D-Mulsion and the importance of micro-emulsification
Our vitamin D is micro-emulsified to enhance absorption. Independent clinical experience suggests that our micro-emulsion form of vitamin D provides significant improvements in serum levels of 25-OH-vitamin D following supplementation.(10)

With an increased knowledge of the importance of maintaining adequate Vitamin D levels, many clinicians recommend supplementation and annual screening for 25-OH-Vitamin D levels, especially for patients at risk for deficiency and those who may benefit from supplementation.

References

- Norman AW. Vitamin D. In: Brown ML (Editor). Present Knowledge in Nutrition. Sixth Edition. Washington: International Life Sciences Institute Nutrition Foundation; 1990. P.108-116
- Vieth R. Vitamin D supplementation, 25-hydroxyvitamin D concentrations, and safety. Am J Clin Nutr. 1999 May;69(5):842-56 Available on-line at <http://www.ajcn.org/cgi/reprint/69/5/842.pdf> on March 29, 2004
- Holick MF. Vitamin D deficiency: what a pain it is. Mayo Clin Proc. 2003 Dec;78(12):1457-9
- Al Faraj S, Al Mutairi K. Vitamin D deficiency and chronic low back pain in Saudi Arabia. Spine. 2003 Jan 15;28(2):177-9
- Plotnikoff GA, Quigley JM. Prevalence of severe hypovitaminosis D in patients with persistent, nonspecific musculoskeletal pain. Mayo Clin Proc. 2003 Dec;78(12):1463-70
- Lansdowne AT, Provost SC. Vitamin D3 enhances mood in healthy subjects during winter. Psychopharmacology (Berl). 1998 Feb;135(4):319-23

Yamashita H, Noguchi S, Takatsu K, Koike E, Murakami T, Watanabe S, Uchino S, Yamashita H, Kawamoto H. High prevalence of vitamin D deficiency in Japanese female patients with Graves' disease. *Endocr J*. 2001 Feb;48(1):63-9

Huisman AM, White KP, Algra A, Harth M, Vieth R, Jacobs JW, Bijlsma JW, Bell DA. Vitamin D levels in women with systemic lupus erythematosus and fibromyalgia. *J Rheumatol*. 2001 Nov;28(11):2535-9

Van den Berghe G, Van Roosbroeck D, Vanhove P, Wouters PJ, De Pourcq L, Bouillon R. Bone turnover in prolonged critical illness: effect of vitamin D. *J Clin Endocrinol Metab*. 2003 Oct;88(10):4623-32

"I Have Tested Nearly 2,000 Patients. [W]hen we switched our patients to a vitamin D that was in a form that made it easier to absorb - their vitamin D levels normalized very rapidly. Biotics Lab called Bio-D-Mulsion it is micro-emulsified for even greater absorption and utilization."

Mercola J. Bio-D-Mulsion (Emulsified Vitamin D): March 25, 2004.

➤ **June 16, 2009, Life Extension Update**

At The Endocrine Society's 91st Annual Meeting, held this month in Washington, D.C., University of Minnesota assistant professor of medicine Shalamar Sibley, MD, MPH reported that men and women with higher vitamin D levels experienced a greater amount of weight loss when dieting compared to those with lower levels.

For their study, Dr Sibley and colleagues measured plasma 25-hydroxyvitamin D and 1,25-dihydroxyvitamin D (the precursor and hormonal forms of vitamin D) in 38 obese subjects prior to and following an 11 week diet plan that provided 750 calories less per day than the participants' estimated needs. Fat distribution and body composition were measured using dual-energy X-ray absorptiometry and computed tomography before and after the treatment period. The participants' vitamin D levels were found to be insufficient on average. The researchers observed a linear relationship between baseline vitamin D levels and weight loss, with close to an additional half pound of weight loss associated with each 1 nanogram per milliliter (ng/mL) increase in plasma 25-hydroxyvitamin D, as well as nearly one quarter pound loss with each nanogram increase in 1,25-dihydroxyvitamin D. Higher levels of both forms of the vitamin were associated with more abdominal fat loss, and neither form was associated with lean mass loss. "Plasma vitamin D predicts subsequent weight loss, suggesting a potential role for vitamin D in promotion of weight loss, perhaps through effects on adipose metabolism," the authors conclude in their abstract concerning the findings.

"Vitamin D deficiency is associated with obesity, but it is not clear if inadequate vitamin D causes obesity or the other way around," Dr Sibley commented. "Our results suggest the possibility that the addition of vitamin D to a reduced-calorie diet will lead to better weight loss." "Our findings need to be followed up by the right kind of controlled clinical trial to determine if there is a role for vitamin D supplementation in helping people lose weight when they attempt to cut back on what they eat," she added.