Vitamin D and the Decreased Incidence of Chronic Disease

By Ladd R. McNamara, M.D.

It is well known that vitamin D deficiency is associated with osteoporosis, bone fracture, increased falls, muscle weakness, increased risk of certain cancers (particularly breast and colon, and possibly prostate), autoimmune diseases, obesity, insulin resistance, type 2 diabetes, schizophrenia, depression, asthma, lung dysfunction, influenza (the "flu"), kidney disease, high blood pressure, and cardiovascular disease. Even complications of pregnancy, preeclampsia (pregnancy-induced hypertension) and gestational diabetes, are associated with vitamin D deficiency.

Vitamin D insufficiency in pregnant mothers has also been linked to infant low birth weight, neonatal hypocalcemia (low blood calcium), poor postnatal growth, bone fragility, and increased incidence of autoimmune diseases and childhood asthma.

There seems to be no debate any longer in the medical community that there is a vitamin D deficiency epidemic causing a myriad of problems, and that everyone should supplement with vitamin D3 well above the previous recommended doses of only 400 IU per day; the dose found in most multivitamins and prenatal vitamins. Even 800 IU/day is not enough. It appears that the daily minimum is 2000 IU/day, and even better, 4000 - 6000 IU/day.

VITAMIN D HELPS PREVENT OSTEOPOROSIS

The standard recommended dose of 400 IU/day of vitamin D3 was in general to help maintain “good health,” and to help reduce the risk of osteoporosis, falls, and hip fractures. Over the last several years, there has been an explosion of studies expanding our knowledge and indicating that higher doses of vitamin D has much more of an effect on overall health and the prevention of various chronic diseases than just bone development and the prevention of osteoporosis.

VITAMIN D MAY HELP PREVENT INSULIN RESISTANCE

As people age, and with the added physiological stress to the body from a poor diet, lack of exercise, and a lack of nutritional supplementation, insulin receptors undergo excessive oxidative damage, and insulin resistance results. With continued excessive oxidation and inflammation of insulin receptors full-blown type 2 diabetes develops. In addition to repetitive spiking of blood sugar and obesity, vitamin D deficiency is a contributing cause to insulin resistance and type 2 diabetes.

Although not all studies have demonstrated consistent and conclusive proof, there is support that adequate vitamin D supplementation may help restore insulin sensitivity. Studies have shown a reduction in insulin resistance when blood serum vitamin D concentrations (25-hydroxvitamin D, or 25-OH-D) were maintained in the range of at least 35 - 42 ng/ml.(1 - 3)

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VITAMIN D IS ASSOCIATED WITH DECREASED RISK OF BREAST AND COLON CANCER

A decreased risk of breast and colon cancer (and possibly prostate cancer) is associated when blood serum levels of vitamin D (25-OH-D) are 40 ng/ml or above, and in particular when levels are closer to 70 ng/ml. Much like drugs that are used to treat breast cancer, such as tamoxifen, vitamin D enters breast cancer cells and triggers apoptosis, or programmed cell death. There are many other antioxidants; e.g., turmeric extract, polyphenolic compounds (grape seed extract, cruciferous extract, resveratrol, green tea extract), that triggers apoptosis as well. They all work better in conjunction.

Studies have shown that women whose serum 25-OH-D levels were at least 52 ng/ml had a 50% associated decreased incidence of breast cancer. There was nearly a 65% associated reduction when levels were near 68 ng/ml. Certainly, more studies are needed to verify such associations regarding the decreased incidence of cancer to draw definitive conclusions, but the indications are very promising.(4 - 7) It is particularly promising when one considers there is no downside to vitamin D3 supplementation; only health benefits. There has been no toxic effects even from vitamin D doses as high as 10,000 IU/day.

VITAMIN D AND REDUCED RISK OF HEART DISEASE

Vitamin D deficiency increases the risk of both ischemic and non-ischemic heart disease. Vitamin D helps with blood pressure regulation, it influences parathyroid hormone levels (which controls serum calcium levels), influences the function of heart muscle, and plays a role in reduction of inflammation and calcification of blood vessels, thus helping to reduce atherosclerosis.

The risk for heart disease, let alone rickets, is particularly high when vitamin D blood levels are below 15 ng/ml. With 25-OH vitamin D levels above 30 ng/ml cardiac benefits may be substantial.(8) As mentioned, more studies are needed to draw definitive conclusions, but once again, there is enough evidence when taken as a whole for everyone to consider supplementing with adequate doses of this all-important vitamin. It has been suggested that the optimal blood serum range for vitamin D (25-OH vitamin D) is between 50 - 80 ng/ml, and it requires taking around 4000 - 8000 IU to obtain those levels.

VITAMIN D AND REDUCED RISK OF INFLUENZA

It is well established that vitamin D3 reduces the incidence of respiratory infections.(9, 10) Children who have been found to have the lowest 25-hydroxyvitamin D blood levels are 11 times more likely to develop respiratory infections.(11) In one study, children susceptible to recurrent and frequent respiratory infections were each given 60,000 IU of vitamin D each week for six weeks and followed for 6 months. During the following 6 months, not one child came down with a single respiratory infection.(12)

Many people suffer and die from influenza, more commonly known as “the flu.” They don’t die of the viral infection per se, as much as they die from the body’s over-reaction. The influenza virus causes an uncontrolled over-production of pro-inflammatory cytokines. It is as if people suffering from the flu virus are experiencing a process similar to an acceleration of a chronic disease. The elderly and immuno-compromised are particularly at risk. Interestingly, vitamin D turns down this process by “down regulating” the expression of pro-inflammatory cytokines, such as tumor necrosis factor-alpha.(13)

Actually, the pro-inflammatory cytokine process is the same inflammatory process that occurs in chronic disease, such as inflammation of arteries in atherosclerosis, inflammation in arthritis, damage to neurons, and inflammation and damage caused by cancer cells and by the aging process itself.(14,15)

Think about the possibilities of reducing inflammation, by down regulating cytokines (tumor necrosis factor alpha, etc.) and thus reducing the incidence and progression of many chronic degenerative diseases, including heart disease, cancer, Alzheimer’s disease, arthritis, diabetes, respiratory infections, liver and kidney disease, and the aging process itself!

Regarding vitamin D and the protection against respiratory infections and influenza; in addition to the down regulation of inflammatory cytokines, vitamin D also up-regulates the expression of anti-microbial peptides, or proteins, in immune cells. Anti-microbial peptides damage the outer lipid membranes of influenza viruses, bacteria, and fungi allowing the white blood cells (macrophages) from the immune system to eliminate them from the body.(16)

This is similar to how beta glucans, from the cell membranes of the shiitake and reishi mushrooms, as well as baker's yeast extract work. Beta glucans connect with cell receptors on macrophages and natural killer cells causing them to target cancer cells and foreign invaders, such as bacteria, viruses, and yeast.

VITAMIN D AND REDUCED RISK OF COMPLICATIONS OF PREGNANCY

Vitamin D plays a key role for calcium metabolism during pregnancy and development in order to prevent infantile rickets and adult osteomalacia. During pregnancy, calcium demands rapidly increase, particularly in the third trimester. Because of this, vitamin D, which is required for calcium incorporation into the bones, becomes crucial for proper skeletal growth and optimal maternal and fetal outcomes.

Despite widespread use of prenatal vitamins providing what is thought to be “adequate” doses of vitamin D, there is still a vitamin D deficiency epidemic among pregnant and lactating women. Therefore, by definition, the dosage of vitamin D in prenatal vitamins is not adequate, and must be re-evaluated.

A pregnant woman's vitamin D (25-OH vitamin D) status must be measured to attain an optimal target level. It is even more important that a pregnant woman have optimal vitamin D blood levels than a non-pregnant woman, as her baby's health depends on it, …not only during fetal life, but during the next two decades of that child's life!

Low vitamin D levels during pregnancy are associated with maternal preeclampsia and pregnancy-induced hypertension, neonatal low birth weight, hypocalcemia, poor postnatal growth, bone fragility, and increased incidence of autoimmune diseases and asthma of the child.(17, 18)

During pregnancy a minimum blood level of vitamin D (25-hydroxyVitamin D) should be at least 32 ng/ml, and optimally closer to 50 - 80 ng/ml. In order to achieve and maintain 25-hydroxvitamin D serum levels at 32 - 50 ng/ml, pregnant and lactating women would possibly need to supplement with a dose between 2000 and 4000 IU/day of vitamin D3, which is safe. Of course, this is beyond the level provided in all prescription prenatal vitamins.

CHILDHOOD ASTHMA LINKED TO VITAMIN D DEFICIENCY

The current asthma epidemic may be explained in part by the vitamin D deficiency epidemic. There is a direct correlation between low serum vitamin D levels and higher risks for asthma exacerbations. Vitamin D plays a role in fetal lung growth and development. Epidemiologic evidence suggests that higher prenatal vitamin D intake has a protective role against wheezing illnesses in children.

Vitamin D may protect against wheezing illnesses through its multiple immune effects as discussed above. In addition, vitamin D may play a therapeutic role among asthmatics from becoming steroid resistant.(19)

MEASURING YOUR VITAMIN D STATUS

The question on most people's minds in regards to discussing vitamin D, is what is the "right dose." The best way to know one's "right" dose is to know your 25-hydroxy-vitamin D blood serum level. 25-hydroxy-vitamin D is the metabolically-active form of vitamin D, which is also known as calcidiol. It is abbreviated as 25-OH-D.

In the past, "adequate" blood level recommendations were set to prevent rickets, and later osteoporosis. However, with the myriad benefits and safety of vitamin D coming to light, we now know that optimal levels are much higher than what is required to prevent rickets and osteoporosis.

Most laboratories have a 'normal reference range' for 25-OH-D as 32 – 100 ng/ml. Many experts in the field of vitamin D deficiency treatment have recommended that “optimal” serum 25-OH-D levels should be at least 42 ng/ml, with the ideal target range being achieved between 50 - 80 ng/ml.

WHAT DOSE OF VITAMIN D IS OPTIMAL?

The vitamin D dose required to attain a serum level range of 50 – 80 ng/ml will vary from person to person, mostly based upon body mass (weight) and sun exposure. Also, probiotic supplementation helps make vitamin D absorption more efficient.

Although this will vary considerably, a 150 lb person who supplements with 2000 IU of vitamin D per day may attain a blood serum 25-OH-D level between 30 and 45 ng/ml, depending upon sun exposure. To attain the optimal levels between 50 and 80 ng/ml that same person may need to supplement with 4000 - 6000 IU per day, or more.

On the other hand, a person who weighs 225 lbs. may require 10,000 IU/day to maintain a 25-hydroxy vitamin D blood serum level between 50 and 80 ng/ml. Again, this is very rough, and can only be determined by blood tests and titration (adjustments based upon the blood tests).

Although one must talk to their doctor before initiating any supplement regimen, my suggestion would be to take 4000 to 6000 IU/day of vitamin D3, preferably with vitamin K2. A larger person may safely take between 8,000 - 10,000 IU per day. Either way, I suggest a blood serum test for 25-OH-D in the Spring and Fall, with a target range between 50 to 80 ng/ml.

IS LONG-TERM “HIGH DOSE” OF VITAMIN D3 SAFE?

There may be concern that high doses of vitamin D may elevate serum calcium levels and cause kidney stones in those at risk. One study in which participants were administered extremely high doses of vitamin D will give some insight into the effects on blood calcium levels.

In a 12-week study, 69 vitamin D deficient patients received either a single oral, or a single intramuscular injection of 300,000 IU of vitamin D. During the 12-week study, no case of hypercalcemia (elevation of blood calcium) was observed.(20)

This doesn’t mean that chronic super high doses of vitamin D will not raise blood calcium levels; however, there are no credible reports of vitamin D toxicity with chronic daily vitamin D3 supplementation up to 10,000 IU. In fact, many vitamin D expert clinicians are routinely recommending doses well above 10,000 IU/day.

Hypercalcemia (an elevated serum calcium level) is only observed with synthetic vitamin D analogues, such as calcitriol.(21)

ARE THERE CONTRAINDICATIONS FOR HIGH-DOSE VITAMIN D?

Primary hyperparathyroidism is the main contraindication! Also, high-dose vitamin D supplementation may cause elevation of serum calcium levels in patients with sarcoidosis, tuberculosis, or lymphoma. Therefore, in such cases, patients dosing with levels above 2000 IU per day should do so only with caution AND under the care and direction of a physician.

MAINTAIN PROPER RATIOS AND BALANCE OF VITAMINS

Vitamin D is obviously safe. For many decades, vitamin D has been underestimated as an important vitamin for at least maintaining optimal health, and possibly for reducing the risk of many chronic diseases. However, as will all vitamins, minerals, antioxidants, essential fatty acids, or any other micronutrient, vitamin D should be taken in appropriate balance! All nutrients should be used to supplement a healthy diet, and used in conjunction with exercise and a healthy lifestyle.

Balance and proper ratios of nutrients are critical, as in the case of vitamin D and vitamin A. Vitamin A can neutralize the beneficial effects of vitamin D.(22) Many doctors are aware that high doses of vitamin A can be toxic to the liver and cause birth defects. However, most are not aware that vitamin A and vitamin D compete for each other's function in the body. Supplementing with excess amounts of vitamin A can suppress the important cancer-fighting effects of vitamin D.(23, 24)

Most multivitamin preparations contain vitamin A. Vitamin A (or pre-formed vitamin A) is different from pro-vitamin A, or beta-carotene. Beta-carotene does not interfere with vitamin D, nor is beta-carotene associated with birth defects or liver problems.

Therefore, in choosing a quality, broad-spectrum supplement brand, it is important to choose one that provides vitamin A mostly as beta-carotene (a.k.a. "pro-vitamin A"), and only about 25% of the amount as vitamin A. This is just one of many criteria in choosing a quality supplement brand.

Choose a supplement that provides a daily dose of at least 2000 IU of vitamin D3 per day, and consider taking an additional 4000 - 6000 IU/day, and having your blood tested to achieve the target range of 50 – 80 ng/ml.

We should never rely on one vitamin, juice, or 'magic potion' to cure all our problems. However, we should not ignore the ever-emerging evidence and promise that science is uncovering regarding the benefits nature has to offer in helping us to maintain optimal health.

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I am a major proponent of using high quality, broad-spectrum vitamins, minerals, antioxidants, and essential fatty acids at proper doses and balance, along with healthy eating and proper lifestyle. I do not claim that all the answers are found in one vitamin or antioxidant, but many of the answers to optimal health are found in the synergistic action of the blend and balance of the fullest range of supplementation that we are willing to incorporate into our lives.

CONSIDERATIONS FOR NUTRITIONAL SUPPLEMENTATION

Ingredients, and daily total, that I like to see provided collectively by vitamin-antioxidant & chelated mineral tablets

Vitamin A, mostly as beta carotene 12,000 IU (beta carotene is not associated with birth defects or liver concerns)
Vitamin C 1000 mg
Vitamin D3 2000 IU (and an additional 2000 – 4000 IU supplied by a stand-alone Vitamin D3 product)
Vitamin E 300 – 400 IU (of mix of D-alpha tocopherol, D-gamma tocopherol, D-beta & D-delta tocopherols)
Vitamin K (K1 & K2) about 500 – 550 mcg
B-Complex Vitamins various doses, with at least 600 mcg of folic acid, or methyl folate (500 mcg of methyl folate can be added)
Curcumin (turmeric extract) 70 mg in these tablets, and an additional 45 mg from a liver support product
Quercetin 60 mg
Green Tea Extract 70 mg from these tablets, and an additional 45 mg from a liver support product
Olive Extract 30 mg from these tablets, and an additional 45 mg from a liver support product
Rutin 40 mg
Resveratrol 40 mg
Choline 250 mg
Lutein 600 mcg
Lycopene 1000 mcg
N-Acetyl-L-Cysteine (NAC) 160 mg
Calcium at least 200 mg (and an additional 800 mg supplied by a separate magnesium-calcium tablet)
Magnesium at least 200 mg (and an additional 200 mg supplied by a separate magnesium-calcium tablet)
Iodine (as potassium iodide) 500 mcg
Zinc 20 mg
Selenium 200 mcg
Copper 2 mg
Manganese 2 mg
Chromium 300 mcg
Molybdenum 50 mcg
Boron 3000 mcg
Silicon 4 mg
Vanadium 40 mcg
Including Ultra Trace Minerals around 3000 mcg

Additional Vitamin D3 (with vitamin K2): 2000 - 4000 per day, in addition to above

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