

Vitamin D



The New Awareness for Higher Optimal Levels

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Vitamin D Benefits:

SKELETAL SYSTEM⁴

Plays a role in:

- calcium metabolism
- strength of bone and cartilage
- teeth and gum health

Deficiency may lead to:

- osteoporosis, osteomalacia, osteoarthritis, muscle weakness and pains, periodontal disease
- secondary hyperparathyroidism¹⁵

GLUCOSE METABOLISM¹

- role in insulin production
- improves glucose tolerance

CARDIOVASCULAR⁹

May reduce:

- lipid peroxidation
- certain types of hypertension
- CRP, fibrinogen, IL-6¹⁵

IMMUNE SYSTEM^{2,4}

May reduce:

- inflammation, such as caused by neuronal injury¹⁴
- autoimmune reactions: MS, Type I Diabetes,^{1,13} rheumatoid arthritis, psoriasis, inflammatory bowel disease (Crohn's, ulcerative colitis), lupus, thyroiditis
- reduces transplant rejection
- cancer risk & development⁴
- cancers: colon, breast, prostate, melanoma

May enhance:

- vaccines antibody response¹²
- NK cell activity

MOOD DISORDERS

- may alleviate PMS and seasonal affective disorder

ADRENAL SUPPORT

- supports adrenaline synthesis
- deficiency may cause fatigue and fibromyalgia like symptoms

May counteract some detrimental effects of corticosteroids, such as osteoporosis and susceptibility to infections^{8,13}

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The current RDA for vitamin D is set at 200-600IUs for 20 -75 year olds respectively. This level of supplementation seems inadequate in the light of recent research, the increase in immune problems, and the shockingly high number of patients showing up deficient in blood tests today. Vitamin D contributes in multiple ways to the optimal function of the human body because virtually every cell has a receptor for it including the islet beta cells of the pancreas which is where vitamin D has its impact on aiding the production of insulin.² Vitamin D₃ (cholecalciferol) is synthesized in the skin from cholesterol in response to absorbing UVB rays. It gets converted in the liver to 25 hydroxycholecalciferol, known as 25 (OH)D₃. In the kidneys it meets up with an important enzyme, 1-alpha-hydroxylase and finally gets converted into its active hormonal form 1,25 dihydroxycholecalciferol, known as 1,25 (OH)₂D₃, which goes straight to the heart of every cell, the nucleus, and influences its physiology to take the healthy pathways by dictating genetic expression.

The Body's Control of Vitamin D Synthesis

Hepatic synthesis of 25 (OH)D₃ is only loosely regulated, and blood levels of this molecule largely reflect the amount of vitamin D produced in the skin or ingested. In contrast, the activity of 1-alpha-hydroxylase in the kidney is tightly regulated and serves as the major control point in production of the active hormone. Parathyroid hormone is the major inducer of 1-alpha-hydroxylase. Low blood phosphate levels induce it as well. This means that 25 (OH)D₃ is the best marker for vitamin D status because it best reflects vitamin D stores and is telling us how much the skin is making and how much we are consuming.

It is Very Important to Supplement Vitamin D With Vitamin K

In a study on postmenopausal women given a vitamin D supplement with minerals, these subjects showed a worsening of the elasticity of the arteries. In the other group given vitamin D with K and minerals, artery elasticity remained stable.²¹ This is due to their interaction in the use of MGP, Matrix Gla Protein, which is a strong inhibitor of arterial calcification. The expression of MGP is D dependent and the gamma-carboxylation step, making it active, is K dependent. Another study out of Wake Forest University, says "hyperlipidemia, vitamin D, nicotine, and warfarin, alone or in various combinations, produce arterial calcification in animal models. MGP has recently been discovered to be an inhibitor of bone morphogenetic protein-2, the principal osteogenic growth factor. Many of the forces that induce arterial calcification may act by disrupting the essential post-translational modification of MGP, allowing BMP-2 to induce mineralization. MGP requires gamma-carboxylation before it is functional, and this process uses vitamin K as an essential cofactor. Vitamin K deficiency, drugs that act as vitamin K antagonists, and oxidant stress are forces that could prevent the formation of Gla residues on MGP."²²

So, don't think of just vitamin D for the bones, vitamin K is also necessary for directing the transport of calcium into bone and teeth for optimal strength.¹⁶ Increasing the amount of calcium in the blood stream by proper supplementation with calcium and vitamin D in the presence of inadequate levels of vitamin K, can increase the risk of calcium deposition in arteries and soft tissue. Vitamin K can be obtained from vegetables, supplements and can

also be synthesized by intestinal friendly bacteria. DFH Osteoforce provides calcium, magnesium, vitamin D and vitamin K along with all the necessary cofactors for proper bone metabolism. PaleoGreens is also a great source of vitamin K due to the many vegetables it contains. Vitamin D and vitamin A compete for absorption and excessive vitamin A levels can antagonize some of the beneficial effects of vitamin D, and this may be why high intakes of vitamin A (20,000 IUs) were shown to increase the risk of bone fractures.

Many People are Susceptible to Vitamin D Deficiency

Deficiency of vitamin D has been linked to exacerbation of many conditions (see box on reverse). Vitamin D supplementation may be needed to support optimal physiological function. Deciding how much vitamin D to supplement should be based on the degree of deficiency as seen by blood test results. Vitamin D is fat soluble and excessive levels can be toxic, so blood levels need to be followed up regularly. Supplementation above 1000 IU's should continue until patient reaches optimal reference range. See Table 1.⁷ Most reference ranges for commercial labs are around [9-54]ng/mL, but so-called normal range for 25(OH)D3 was probably defined in early studies by assessing a population of subjects with inadequate vitamin D nutrition or sunlight exposure.²⁰ Most doctors are aiming for 100 ng/mL as optimal. **Vitamin D toxicity symptoms:** nausea, headaches, constipation, kidney stones, mental confusion, heart arrhythmia. **Do not supplement additional vitamin D in cases of hyperparathyroidism, sarcoidosis or patients on Coumadin or Warfarin.**

Table 1: Vitamin D Status Based on Blood Levels¹⁹

25 (OH)D3		HEALTH IMPLICATIONS
(ng/mL)	(nmol/L)	
<20	<50	Deficiency, high risk of various conditions (see left box)
20-32	50-80	Insufficiency, mild risk of various conditions (see left box)
32-100	80-250	Sufficiency , possibly enough in certain individuals
54-90	135-225	Possibly optimal level, normal in sunny countries, reduces severity of various conditions (see left box) and possibly necessary for optimal health in certain individuals
>100	>250	Possibly unsafe levels
>150	>325	Toxic levels, impossible to achieve with sun alone

For information on how to test vitamin D levels call Metamatrix labs at (800) 221-4640, or visit www.metamatrix.com.

A high percentage of modern humans have suboptimal levels of vitamin D body stores because UVB exposure is too low at latitudes above 40 degrees, such as all northern American states, especially during cold seasons and due to the: smog/ozone layer, spending time indoors, clothing and sunblock usage.³ Some drugs bind fats, including fat soluble vitamin D and contribute to low vitamin D levels. These drugs include cholestyramine, a bile acid sequestering medication, and laxatives. Intake of Olestra and soluble fiber can also potentially reduce vitamin D absorption from food. Statin drugs can cause cholesterol levels to fall lower than ideal which may contribute to vitamin D deficiency. Patients with fat malabsorption and problems with bile production or production of lipase for digesting fats are also susceptible to low vitamin D levels. For these individuals consider LV-GB Complex (liver-gallbladder support formula) and/or Digestzymes (digestive support formula containing the lipase enzyme). Patients with dark skin pigmentation or a dark tan may require up to four times longer sun exposure to absorb the same amount of UVB as light or untanned skin, because melanin blocks UVB. African decent individuals have a much higher incidence of vitamin D deficiency, especially in northern states. Obese individuals can have 50% lower plasma levels of vitamin D than normal weight people, for the same supplementation levels or sun exposure.¹⁰ Women with low hormone levels are more susceptible to vitamin D deficiency. Estrogen or progesterone deficiency (amenorrhea, surgical or age-onset menopause) impairs the formation of the active form of vitamin D.¹⁸ This is especially critical because the risk of autoimmune diseases increases with aging and vitamin D would be protective.¹² Aging skin has a reduced capacity of vitamin D synthesis. By age 75 levels can be 25% lower than younger individuals.

Vitamin D Protects from Autoimmune Disease

Vitamin D acts as a controller that reduces excessive proliferation of the immune cells (TH1 type) that are responsible for attacking our own body cells (such as nerve/brain cells in the case of Multiple Sclerosis, joint structures in case of arthritis, pancreatic cells in the case of Diabetes Type I).¹² The effect of vitamin D supplementation can be noticed almost immediately, although body stores take time to get to optimal levels. One study noted that the down regulation of the autoimmune attack was dramatically reduced within 24-48 hrs, following the ingestion of a high dose of vitamin D. **“Altogether, vitamin D immunomodulatory potency is comparable to other established immunosuppressants without sharing their typical adverse effects.”**¹³ One important advantage of using vitamin D for calming auto immune disease is that it does not impair the resistance to infections and does not cause osteoporosis, like corticosteroids or other immune suppressants do.⁸ Adequate calcium intake was also shown to be important in realizing some of the immunological effects of vitamin D. DFH Calcium Malate Chelate, found in Twice Daily Essential Packets, contains vitamin D and should be considered along with Designs for Health's new Vitamin D 2000 IU. For osteoporosis consider Vitamin D 2000 IU along with OsteoForce bone formula.

Vitamin D Mechanisms of Reducing Cancer Risk and Survival⁴

Vitamin D induces cell differentiation and apoptosis of cancer cells, reduces excessive cell proliferation and increases natural killer cell activity. Resveratrol, from red wine, was shown to sensitize breast cancer cells to the apoptotic action of vitamin D. Resveratrol can be found in DFH FemGuard + Balance, Grape Seed Supreme and Ultimate Antioxidant HS.

Vitamin D and Insulin Sensitivity

According to a study performed at UCLA, published in the American Journal of Clinical Nutrition May 2004, there is a positive correlation between vitamin D levels and insulin sensitivity. In other words, subjects **with normal glucose tolerance tests with low vitamin D levels**, showed poor insulin sensitivity based on beta cell function and were much more likely to have at least two other components of metabolic syndrome.²³

References & research studies available by request, or online at www.designsforhealth.com/references/vitaminD.html