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Why You Need More Vitamin D. A Lot More.

by William B. Grant, Ph.D.

(OMNS, Sept 16, 2011) Vitamin D has emerged as the nutrient of the decade. Numerous studies have found benefits for nearly 100 types of health conditions. These health benefits include reduced risk of bone diseases, many types of cancer, cardiovascular disease (CVD), diabetes mellitus, bacterial and viral infectious diseases, and autoimmune diseases such as multiple sclerosis,[1] neurological conditions such as cognitive dysfunction,[2] and improved athletic and physical performance.[3]

Sunshine, Skin, Sunburn, and Sunscreen

The primary source of vitamin D for most people is solar ultraviolet-B (UVB) light. Skin pigmentation has adapted to where a population lives for a thousand years or more as those with skin too dark or light do not survive as well as those with the appropriate skin pigmentation.[4] Dark skin protects against the harmful effects of UV, but also blocks the UVB from penetrating deeply enough into the skin to produce vitamin D from 7-dehydrocholesterol. Those with lighter skin can produce vitamin D more rapidly, but are more prone to melanoma and other skin cancer. Sunscreens block UVB and thus limit vitamin D production. While sunscreens are useful in reducing risk of sunburning, they do not block the long wave UV (UVA) as well as UVB. UVA is linked to risk of melanoma. Wearing sunscreen when there is no danger of burning can actually increase the risk of melanoma.[5]

Understanding Vitamin D Research

Since vitamin D production is the primary source of vitamin D, ecological and observational studies have been very useful in teasing out the effects of vitamin D on health. There are two types of ecological studies, based on geographical and temporal (over time) variations. In geographical studies, populations are defined geographically and both health outcome and risk-modifying factors are averaged for each geographical unit. Statistical analyses are then used to determine the relative importance of each factor. The first paper linking UVB and vitamin D to reduced risk of colon cancer was published in 1980.[6] This link has now been extended to about 15 types of cancer in the United States with respect to average noontime solar UVB doses in July.[7] Solar UVB doses in July are highest in the Southwest and lowest in the Northeast.[8] Mortality rates are generally lowest in the Southwest and highest in the Northeast.[9] Similar results have been found in Australia, China, France, Japan, Russia, and Spain, and the entire world.[10]

In temporal studies, seasonal variations in health outcomes are sought. A good example of a seasonal effect linked to solar UVB doses and vitamin D is influenza, which peaks in winter.[11]

Observational studies are generally of three types: case-control, cohort, and cross-sectional. In case-control studies, those diagnosed with a disease have serum 25-hydroxyvitamin D [25(OH)D] level or oral vitamin D intake determined at that time and are compared statistically with others with similar characteristics but without that disease. In cohort studies, people are enrolled in the study and the vitamin D index determined at that time. The cohort is followed for a number of years and those who develop a specific disease are compared statistically with matched controls who did not. The main problem with cohort studies is that the single value of the vitamin D index may not relate to the time in the individual's life when vitamin D had the most impact on the disease outcome. Cross-sectional studies are essentially snapshots of a population and look at various factors in relation to the prevalence of health conditions. As biochemistry can be affected by health status, such studies provide less reliable information on the role of UVB and vitamin D on health outcome.

The role of vitamin D in CVD and diabetes mellitus type 2 have largely been studied using cohort studies. Significantly reduced risk of CVD and diabetes mellitus incidence have been reported in a number of studies in the past three years.[12]

Health policy officials like to see randomized controlled trials (RCTs) reporting health benefits with limited adverse effects. RCTs are certainly appropriate for pharmaceutical drugs which, by definition, are artificial substances that the human body has no experience with. RCTs with vitamin D are problematic for a number of reasons. For one, many RCTs used only 400 IU/day vitamin D3, which is much lower than the 10,000 IU/day that can be produced with whole-body exposure to the midday sun in summer, or 1500 IU/day from casual sunlight exposure in summer.[13] For another, there are both oral and UVB sources of vitamin D, so the

amount taken in the study will compete with the other sources. There is considerable individual variation in serum 25(OH)D for a given oral vitamin D intake.[14] Unfortunately, serum 25(OH)D levels are generally not measured in oral vitamin D RCTs.

Nonetheless, there have been several vitamin D RCTs that found significant health benefits beyond preventing falls and fractures.[15] These include ones for cancer,[16],[17] influenza and colds,[18] type A influenza,[19] and pneumonia.[20]

Important Benefits of Vitamin D

The evidence of beneficial roles of UVB and vitamin D for a large number of health conditions have recently been posted at the Vitamin D Council's website: <http://www.vitaminDCouncil.org/health-conditions/>

In addition to an overview of the literature, the website also includes a feature to pull up a large number of titles on each condition from www.pubmed.gov.

Sufficient information is currently available from observational studies with support from ecological studies and RCTs to determine relationships between serum 25(OH)D levels and incidence rates for breast and colorectal cancer,[21] CVD,[22] and influenza.[23] Risk decreases rapidly for small increases in 25(OH)D for those with initial values below 10 ng/ml (25 nmol/L), then decrease at a slower rate to levels above 40 ng/ml (100 nmol/L). These relations have been used to estimate the change in mortality rates and life expectancy if population mean serum 25(OH)D levels were raised from current levels of 20-25 ng/ml (50-63 nmol/L) to 45 ng/ml (113 nmol/L). For the U.S., it was estimated that 400,000 deaths/year could be delayed,[24] which is about 15% of all deaths/year. For the entire world, it was estimated that the reduction in all-cause mortality rates would correspond to an increased life expectancy of two years.[22]

The mechanisms whereby vitamin D reduces the risk of disease are largely understood. For cancer, they include effects on cellular differentiation and proliferation, angiogenesis and metastasis.[25] For infectious diseases, they include induction of cathelicidin and defensins [26] and shifting cytokine production from proinflammatory T-helper 1 (Th1) cytokines to Th2 cytokines.[27] For CVD, they may include reducing blood pressure and keeping calcium in the bones and teeth and out of the vascular tissues.[28] For diabetes mellitus type 2, they may include improving insulin sensitivity.[29]

Current Government-Sponsored Recommendations are Too Low

In spite of the large and expanding body of scientific evidence that vitamin D has many health benefits, the US Institute of Medicine issued a report in November 2010 claiming that the evidence was strong only for effects on bones.[30],[31] The reason given was lack of convincing randomized controlled trials on other health conditions. The one on cancer showing a 77% reduced risk of all-cancer incidence between the ends of the first and fourth years involved 1100 IU/day vitamin D plus 1450 mg/day calcium.[16] However, the IOM Committee relied on the findings from the start of the study, which was not statistically significant. In addition, the IOM Committee pointed to observational studies reporting a U-shaped serum 25(OH)D-disease incidence relation as a reason to be concerned about higher doses of vitamin D. However, these studies used a single serum 25(OH)D value from the time of enrollment followed by follow-up times as long as 17 years. Two studies reported that the sign of the correlation between disease outcome and serum 25(OH)D level changes from negative to positive after seven-to-15 years.[32],[33] Thus, the U-shaped relations are not reliable and should not be used as the basis for policy decisions, especially since the Committee refused to consider the largely beneficial findings from observational studies.

How Much Vitamin D Do We REALLY Need?

The IOM committee set the recommended vitamin D intake at 600 IU/day for those under the age of 70 years and 800 IU/day for those over 70, and stated that 20 ng/ml (50 nmol/L) was an adequate level. The scientific consensus is that oral intake should be 1000-5000 IU/day vitamin D with a goal of 30-40 ng/ml (75-100 nmol/L).[34] The vitamin D research community has responded to the IOM report on vitamin D with over 60 letters and articles in peer-reviewed journals pointing out the absurdity and illogic of the IOM report.[35] The Endocrine Society published a paper recommending 1500-2000 IU/day and 30 ng/ml.[36] Meanwhile, members of the IOM Committee have been publishing articles in mainstream journals promoting their report.

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For More Information:

For additional information on vitamin D, the reader is directed to PubMed at <http://www.ncbi.nlm.nih.gov/pubmed> or www.pubmed.gov to search "vitamin D" along with any keyword of interest. Some representative papers found there, with free access, are listed below. Papers published in the *Journal of Orthomolecular Medicine* are (still) not listed on PubMed. Reasons for this are presented at <http://orthomolecular.org/resources/omns/v06n03.shtml> and <http://orthomolecular.org/resources/omns/v06n07.shtml> . All *J Orthomolecular Med* papers may all be accessed at the Journal's free archive: <http://orthomolecular.org/library/jom/index.shtml> .

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