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Vitamin D & Your Health

by Raymond Francis

Humans evolved with the sun. That is obvious from the variation of skin pigmentation depending on ancestral roots: skin is very dark in the tropical plains regions of Africa, brown in the tropical forests, becoming paler with increasing latitude in Europe.

The evolution of human skin pigmentation was a balancing act between the health benefits and the risks of solar ultraviolet (UV) radiation. UV light produces vitamin D, which has many health benefits, including enhancing immunity. On the other hand, it also produces free radicals involved in skin aging and skin cancer, destroys folate and vitamin A, and damages immunity. As long as people lived in their ancestral homelands and spent plenty of time out of doors, they produced enough vitamin D for optimal health

The only exception to the requirement of sufficient UV light for vitamin D production was for those living near the poles, who obtained their vitamin D from fish and ocean mammals.

In modern times, things changed. People started spending more time indoors. Dark skinned people moved north and light skinned people moved south. People accustomed to less sunlight have lighter skin. These people produce vitamin D quickly, but are also more vulnerable to skin cancer from too much sunlight. People with darker skin produce vitamin D slowly and when they move north, getting less sunlight, they are more prone to vitamin D deficiency.

So, what are the health benefits of vitamin D? Vitamin D is essential for bone health and is known to help regulate calcium absorption and metabolism. However, it is now realized that vitamin D has effects that go far beyond calcium and that higher levels are recommended for optimal health.
One of the more important roles of vitamin D is reducing the risk of death from cancer. Vitamin D was first proposed as having this role by Cedric and Frank Garland in 1980 after observing that colon cancer death rates were lowest in the desert Southwest and highest in the Northeast.

They used to hike in Arizona and New Mexico and knew that it was quite sunny there. They reasoned that since the most important physiological effect of solar radiation was production of vitamin D, vitamin D must be the active agent. It wasn't until the late 1990s that the mechanisms were identified. Vitamin D does such things as increase cell differentiation and apoptosis and reduce angiogenesis around tumors and metastasis. Solar ultraviolet B (UVB) and vitamin D are associated with reduced risk for at least 18 types of cancer. The poster that Cedric Garland and I presented at the annual meeting of the American Association for Cancer Research on April 18, 2005, is available for download from www.sunarc.org.

Interest in the effects of vitamin D on cancer survival took a big step forward when Edward Giovannucci, Wei Zhou, and David Christiani of Harvard University reported in April 2005 that higher vitamin D levels were associated with better survival of lung cancer. These

results were anticipated by other researchers who observed that Norwegians whose cancer was discovered in summer or fall in (when their vitamin D levels were higher) had a better prognosis than those for whom the cancer was discovered in winter or spring (when D levels were lower from lack of sunlight). These results strongly suggest that those diagnosed with cancer should have their serum vita-min D levels measured.

Another disease linked to vitamin D insufficiency is multi-ple sclerosis (MS). It is well known that the incidence of MS increases the further north you live. The only exception is that countries with high fish consumption have lower MS rates than indicated by latitude alone. It has also been shown that the seasonal variation of MS symptoms is very likely related to seasonal variations of serum vitamin D. Thus, those with MS should be encouraged to have adequate vitamin D levels.

Maternal vitamin D levels during pregnancy and nursing are also important for the health of both mother and fetus/infant. Women in all ethnic groups have paler skin than men, and this is thought to be due to greater need for vitamin D during pregnancy and nursing. Black infants nursed by their mothers in the U.S. still develop rickets at a higher rate than whites. A number of birth defects and mental disorders are associated with seasonal variations in birth rate. These include type 1 diabetes, bipolar disorder and anxiety neurosis. Vitamin D supplementation in infancy has been shown to reduce the risk of type 1 diabetes.

Whether the numerous birth defects and mental disorders are related to maternal vitamin D levels or some other factors are still the subject of active research. However, there is enough known about vitamin D requirements during this period that higher vitamin D intake or production during pregnancy is recommended.
There are a number of other diseases and conditions for which vitamin D is beneficial as well. A number of reviews on the health benefits of vitamin D can be found through PubMed. The paper by Grant and Holick [2005] is now freely available from the publisher.

There are, of course, adverse effects from excessive UV exposure, but these risks have been overblown by the dermatologists. The most worrisome are skin cancer and melanoma Basal cell carcinoma (BCC) is very common, but easily treated and seldom fatal. Squamous cell carcinoma (SCC) is least common but is associated with about 2000 deaths per year in the U.S. Melanoma is discovered on about 55,000 Americans annually and is responsible for about 8000 deaths annually. SCC is related to total lifetime solar UVB irradiance. BCC and melanoma are linked more to solar UVA and sunburning, especially in childhood. Unfortunately, sunscreens sold in the
U.S. do not have much UVA blocking, so probably do not protect against BCC or melanoma.

There is good reason to believe that vitamin D insufficien-cy is a national public health problem. This is why it is a good idea to ask your doctor to measure your vitamin D. Ask to measure your **serum 25-hydroxyvitamin D** (25(OH)D).This is a simple and readily available blood test. The consensus of scientific understanding appears to be that vitamin D deficiency is reached for serum levels less than 16 ng/mL (40 nmol/L), insufficiency in the range from 20 to 32 ng/mL, sufficiency in the range from 32 to 80, with normal in sunny countries at 54–90, and excess greater than 100 ng/mL.

As for sources of vitamin D, UVB from the sun is the nat-ural way. Artificial lamps that simulate the solar UV spectrum and have 3-5% of the UV in the UVB spectral region, such as in most modern sunbeds, are an alternate source, and have been shown to greatly increase the vitamin D production among those who use sunbeds 2-3 times a week. The primary natural food source is cold water oily fish. Many foods are fortified including milk

and orange juice. There is an effort to get bread fortified. However, fish are being depleted and many contain mercury, and milk is associated with risk of a number of diseases, and orange juice has too much sugar.

Supplements are also a good source of vitamin D, and one should seek vitamin D3, which is several times more effective than vitamin D2. For younger people optimal vitamin D levels can be maintained with 400-600 international units (I.U.) of vitamin D per day in the absence of UVB irradiance and 1000-2000 IU for older people.

People who are deficient may require as much as 3000 I.U. of vitamin D3 per day to reach normal blood levels. (These values represent those of an evolving scientific consensus; increases in official recommendations are expected in the near future.)

Try to avoid supplements with vitamin A, as it is antago-nistic with vitamin D. However, some vitamin A may be useful in summer since UV degrades vitamin A in the skin.

It should be noted that the ratio of solar UVB to UVA changes as a function of the solar elevation angle: the higher the sun is in the sky, the more UVB you get. Therefore, the best time to be in the sun is near solar noon: the beneficial effects of solar radiation are highest then and the amount of time required for vitamin D production is minimal. Note, however, that the time required to produce adequate levels of vitamin D from solar UVB depends on a number of factors including amount of skin surface area exposed, skin pigmentation, age (production declines with age), body mass index (fat absorbs 25(OH)D), geographic location, season, smog levels and cloud cover, surface reflectance, etc.

As little as 10 to 15 minutes several days a week with 25% of the body exposed may be adequate for those living in the sunny southwest, but it is impossible to produce any vitamin D during the “vitamin D winter” for 4 to 5 months each year in Boston. Also note that for states from the Rocky Mountains to the west, there is generally more UVB at the surface than to the east due to higher surface elevation and thinner stratospheric ozone layer (see the UVB map at www.sunarc.org).

Grant WB, Holick MF. Benefits and requirements of vitamin D for optimal health: a review. Altern Med Rev. 2005;10:94-111. www.thorne.com/altmedrev/.fulltext/10/2/94.pdf
William Grant obtained a Ph.D. in physics from UC Berkeley, had a 30-year career in optical remote sensing of the atmosphere and atmospheric sciences, and turned his attention to health studies in 1996. His achievements in the health field include the first paper linking dietary factors to risk of Alzheimer’s disease and identifying over a dozen types of vitamin D-sensitive cancers. He retired from NASA in early 2004 and established Sunlight, Nutrition and Health Research Center (SUNARC) (www.sunarc.org) to extend his health studies.

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