The Vitamin D Dilemma

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After more than 100 years of debate, this supposed "dilemma" still exists: How do you achieve favorable vitamin D levels yet also practice skin cancer prevention?[1] Ultraviolet (UV) radiation from the sun is a carcinogen and responsible for DNA damage that results in skin cancer.[2,3] This same UV radiation is also responsible for cutaneous production of pre-vitamin D3. These effects of UV radiation are inseparable, giving rise to the question, "Can appropriate vitamin D levels be maintained without risking sun damage?"[4-6] On closer look, this misunderstood situation is not as tricky as it seems.

WHY IS VITAMIN D IMPORTANT?

Vitamin D is fundamental to bone development and maintenance. Rickets, once a common childhood ailment, is now understood to be caused by vitamin D deficiency and is readily curable as well as avoidable with supplementation and proper nutrition. Recent studies have linked this nutrient to more than just peak bone mass and proper muscle functioning. Inadequate vitamin D levels are loosely correlated with immune-related diseases such as type 1 diabetes, hypertension and rheumatoid arthritis as well as cancers of the colon, prostate, and breast.[7,8]

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HOW MUCH VITAMIN D DO I NEED?

The current DRI (Dietary Reference Intake, which replaces the old RDA) for Vitamin D, based on the 1997 Standing Committee for the Department of Agriculture, is 200 IU for children and adults under age 50, 400 IU for adults 50 and older and 800 IU for the elderly.[6,14] These values were calculated as the dose needed to prevent vitamin deficiency. Some experts suggest increasing the DRI. Many studies have shown that doses of 800 IU or lower are not enough to prevent bone fractures induced by osteopenia (low bone density).[1,6] Also supporting the DRI increase: those who propose raising the definition of serum vitamin D "insufficiency" from 50 nmol/L to 70 nmol/L 25-OH.[1,14-16]

HOW DO I GET VITAMIN D?

Humans obtain vitamin D from UVB exposure, diet and supplements.[9,11] UVB rays (290-320 nanometers) convert 7-dehydrocholesterol (7-DHC) in the skin to previtamin D3, which is then converted to vitamin D3.[6,17,18] This inactive vitamin D3 travels to the liver and kidneys, where it becomes biologically active.[1,6,18,19]

After limited UVB exposure (determined by season, time of day, skin type and latitude; approximately five minutes daily for a Caucasian in New York at noontime in summer),[1,11,18] cutaneous vitamin D production reaches its maximum, which equals 10-20 percent of the concentration of 7-DHC in the skin.[6,17] Further UV exposure will progressively increase DNA damage but will not produce more vitamin D. In fact it will actually have the *reverse* effect, breaking down vitamin D to inactive compounds.[1,10,11,18]

Vitamin D can also be obtained from oily fish (salmon, mackerel, sardines) and cod liver oil as well as from fortified orange juice and milk (both with 100 IU per 8 oz), yogurts, and some cereals such as Kashi, Grape Nuts and Total (100 IU per serving).[7,20-22] Finally, supplements are readily obtained and inexpensive.[3]

DIET AND SUPPLEMENTS VS. SUN EXPOSURE

Some propose "sensible sun exposure," a.k.a. intentional UV exposure, as the "most cost-effective and efficient method for preventing vitamin D deficiency."[23] This conclusion fails to acknowledge several important facts: First, vitamin D photosynthesis is limited to the maximum amount produced from 7-DHC and by skin pigmentation, as melanin directly competes with vitamin D precursors for UV radiation. Those at risk for vitamin D deficiency, including African Americans and dark-skinned Hispanics, are unlikely to be adequately helped by proposed sun exposure; nor are the elderly, who are more likely to be homebound.[1,24] Second, UV radiation is a carcinogen.[2,3] With skin cancer comprising half of all cancers in humans, the United States alone spends over an estimated $800 million per year managing skin cancers. In addition, the expenditures for treating photoaging (UV-induced skin aging) well exceed an estimated $35 billion.[3] Cost, efficiency, morbidity and mortality are better served by diet and supplements.

IF I WEAR SUNSCREEN, WILL I BE VITAMIN D-DEFICIENT?

Arguments have been made for unprotected sun exposure because sunscreens with an SPF 8 or higher are alleged to reduce photosynthesis of vitamin D by 95 percent.[5,23,25] Data to support this interpretation are lacking. Sunscreens allow constant permeability of a fraction of UV light equal to 1/SPF of the total, e.g. 1/15th or 7 percent with SPF 15. Moreover, sunscreen users tend to apply much less than the recommended FDA amount, thus yielding far less actual protection.[1,26,27] Incidental sun exposure — walking the dog, etc. — with effectively used SPF 15 still allows adequate vitamin D levels to be achieved, even considering the higher intake levels recently proposed.[3,28-30] One study of elderly

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patients, who generally synthesize less vitamin D from the sun due to thinning epidermis, showed that exposing just five percent of their skin surface to the sun (less than the surface area of the face and backs of the hands) yielded vitamin D levels well above deficient ranges. Such exposure would be equivalent to the incidental exposure that most humans experience daily.

DISCERNING THE IMPORTANT MESSAGES

Studies showing the benefits of increased vitamin D intake have been used as evidence for increasing sun exposure in order to obtain these higher levels. In fact, the majority of these studies utilized oral vitamin D and calcium supplements. It is unknown if sun exposure would provide the same benefit, and thus the conclusion is premature.[6,33-37] Despite this lack of evidence, the tanning industry has capitalized on the perceived health benefits of enhanced vitamin D levels in order to promote its product. The indoor tanning industry is a $5 billion per year business with customers comprised primarily of Caucasian women ages 16-49, mostly female teenagers, who are at greatest lifetime risk for developing skin cancers and unlikely to be vitamin D-deficient.[1,38-41]

CONCLUSION

The benefits of exposure to UVB radiation cannot be separated from the harmful effects.[4-6] Future studies will determine optimal vitamin D intake and whether sun-produced vitamin D confers the same health benefits as enhanced doses of oral supplements.[1] Until results of such investigations are known, prevention of vitamin D deficiency can be achieved through a combination of adequate nutrition and daily oral supplements. Maintaining proper sun protection to avoid the risk of skin cancer and photoaging is of utmost importance.[3] Public health messages should encourage both of these approaches. ■

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footnotes *can be found at* www.skincancer.org.