

Dispelling Disinformation in the Vitamin D Controversy

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Vitamin D was first identified as a vitamin early in the 20th century, but the interest and controversy surrounding this nutrient has never been greater. It is widely accepted to have an essential role in preventing bone disease. Because of some unique characteristics that distinguish it from many other vitamins, vitamin D has been a subject of considerable debate regarding its benefits and proper intake. Dermatologists have been an important part of this controversy because vitamin D can be synthesized directly in the skin through the action of UV radiation. Because there is not an absolute (vital) requirement for vitamin D in our diet, it does not really live up to the term from which *vitamin* is derived (*vital amine*). Some researchers have claimed that sun protection efforts designed to decrease the risk for skin cancers also are harming the population by depriving us of the opportunity for vitamin D synthesis. This belief simply is not true, and I will discuss why it is not true.

Part of the confusion about vitamin D relates to its action as a prohormone and the potential biologic effects beyond calcium homeostasis and bone health including but not limited to beneficial effects in cancer, infectious diseases, cardiovascular disease, asthma, autoimmune disease, diabetes, and autism. With such a list of medically significant diseases for which we currently have limited treatment and/or understanding, it is not surprising that many have been excited to proclaim vitamin D as a simple way to improve our health. Unfortunately, current evidence supporting the benefits of vitamin D in the general population in any way other than bone health is weak. Many mechanistic laboratory studies give reason for optimism, but careful review of the literature clearly shows it is still too early to fall prey to all the hype.

A 14-member committee recently was convened by the Institute of Medicine (IOM) to evaluate the state of current research in vitamin D and calcium and attempt to set new dietary reference intakes for these nutrients.¹ I was honored to be a member of this committee. The group was selected for expertise in endocrinology, bone and skeletal health, immunology, oncology, dermatology, nutrition, epidemiology, toxicology, and statistics. All participants also were selected to be impartial (to the best of their ability), without clear bias toward how the dietary reference intake guidelines should be set. The last time a committee reviewed the literature was in 1997.² The 2 central questions addressed by our group included: (1) How much vitamin D and calcium are needed to achieve desirable health outcomes? and (2) How much is too much? During the course of this analysis, it became clear there is no basis for claims that sun protection is dangerous. It also was surprising to find many studies that contradicted conclusions regarding the many possible benefits of vitamin D (reviewed below). Apparently, because negative studies receive much less attention, they have been largely ignored.

The IOM committee studied more than 1000 publications with the assistance of an outstanding and experienced staff. Analysis was assisted by systematic reviews sponsored by the Agency for Healthcare Research and Quality (AHRQ) in 2007³ and 2009.⁴ These evidence-based reviews evaluated the research on vitamin D and calcium in relation to all published disease outcomes. The AHRQ reviews were supplemented by additional literature searches and identification of relevant publications through completion of the report in October 2010. Committee members attempted to read everything published and even gather emerging unpublished information.

The result of this effort was a surprise to many of us on the committee and has triggered several rather passionate rebuttals from individuals who were displeased that the data did not support their position. Instead of rehashing much of this argument, I will take this opportunity to attempt to clarify 2 points of importance to dermatologists: (1) Are we harming our patients and contributing

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The author reports no conflict of interest.

to vitamin D deficiency by promulgating sun protection? and (2) Could other diseases, such as cancer, infectious diseases, or autoimmune disorders, benefit from higher intake of vitamin D through sun or other sources? The results of a very exhaustive and unbiased analysis of the current literature provide rather simple answers to these questions: no and maybe.

To address the sunlight and vitamin D controversy, there is no doubt that UV exposure can generate vitamin D in the skin, and in the population as a whole, average serum 25-hydroxyvitamin D (25[OH]D) levels (chosen as the best indicator of vitamin D intake) are higher in seasons with more average sun exposure. However, there is no study that can reliably predict how much sun exposure is necessary for an individual to achieve a certain vitamin D level because there are too many variables that affect the outcome, such as the well-known variables of skin pigmentation and body surface area exposed, as well as variables that are less understood such as age, genetic influence,⁵ and current serum 25(OH)D levels.⁶ For example, if an individual starts with a 25(OH)D level below 10 ng/mL, the sun will have a much greater effect than if the starting serum level was 30 ng/mL. There is no reliable reference in the literature to support the common claim that 15 minutes of daily direct sun exposure will provide sufficient vitamin D for all individuals. It was shocking for me to discover that some authors had advocated such claims but relied solely on referencing their own earlier publications that in turn referenced more commentary and review articles that often were written by them. Following the reference trail in an attempt to find the primary study led to dead ends with little or no experimental evidence to support the conclusion. In contrast, several studies have shown the highly variable individual nature of the response to UV exposure as well as the presence of vitamin D deficiency in many individuals, even if they were avid sunbathers.⁷ For this reason, and after recognizing the proven risks for cutaneous malignancy from sun exposure, the IOM committee set its recommendation for vitamin D intake with the assumption that there should be minimal contribution from sun exposure. Of course we all have some UV exposure that will contribute to our vitamin D stores, but only dietary sources should be relied on to meet our needs. Common sense ruled the day; the recommended dietary intake was set in such a way that it supports dermatologists doing their best to educate patients to protect themselves from the sun.

A big surprise for all of us on the committee was the lack of consistent evidence associating vitamin D

intake with any health outcome other than bone health. Although my own research has shown a role for vitamin D in improving immune function,^{8,9} it was with some sense of regret that we saw few large-scale studies that have shown conclusive clinical evidence for other health benefits. Large clinical trials, such as the Women's Health Initiative that studied more than 36,000 women aged 50 to 79 years, saw no benefit for vitamin D supplementation aside from bone health.¹ The AHRQ report summarized many other studies with similar null outcomes.⁴ Although one can point to a few studies that suggest other benefits of vitamin D and the science behind the hopefulness is sound, evidence in the human population is not there yet. A recent study has even suggested an increased risk for cancer with higher vitamin D levels.¹⁰

There is a great need for additional research to better understand the function of vitamin D in human health. Abundant laboratory data support the notion that vitamin D may have many benefits, but clearly we do not understand all the important variables that may influence the outcome. Without this understanding, blindly following disinformation promoted by overzealous advocates risks relegating vitamin D to the long list of failed wonder drug cures. Do not expect that simply providing supplements to everyone will be useful. We need to understand under what conditions vitamin D acts so that better studies can be designed to provide clear and compelling evidence in humans. We should be hopeful but not convinced.

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