

Evidence is mounting on the sunshine vitamin's role in disease prevention. But some of your patients – especially the elderly, the dark-skinned and the obese – could be deficient

As doctors know, vitamin D is making headlines. Data are pouring in from all over the world about how much your patients need, how they can get it, and how much is too much. Here is a primer for busy physicians.

Aside from its role in calcium homeostasis and bone health, vitamin D also functions like a hormone and is now believed to play a key role in the prevention of colon, breast and prostate cancer, autoimmune diseases such as multiple sclerosis, rheumatoid arthritis, type 1 diabetes, Crohn's, Alzheimer's disease, metabolic syndrome and even infectious diseases like the flu.

Two separate meta analyses published in 2006 concluded taking 2,000 IU of vitamin D and getting 15 minutes of sunshine daily might reduce the incidence of colon cancer by two-thirds and cut the risk of breast cancer in half (Food and Fitness Advisor, Weill Medical College of Cornell University newsletter, April 2007).

Vitamin D is known for helping eradicate rickets in the past, but Dr. Michael Holick from Boston University said he believes vitamin D deficiency and rickets are on the rise again in epidemic proportions. Dr. Holick recommends vitamin D status be checked as part of the annual physical exam.

Prevalence of vitamin D deficiency

As many as 80% of older women worldwide may have vitamin D deficiency, according to Dr. Joseph Lane, head of the osteoporosis prevention centre at the Weill-Cornell-affiliated Hospital for Special Surgery in New York (Food and Fitness Advisor, April 2007).

Among North American women of childbearing age, the prevalence of vitamin D deficiency is 1% to 25% in light-skinned and 29% to 42% in dark-skinned individuals, with the degree of variation reflected by season. The prevalence of deficiency among North American breastfed infants ranges from 21% to 78% (Carole McCorry, American Dietetic Association newsletter, Fall 2007).

Assessing Vitamin D status

Vitamin D status is assessed by measuring serum 25 dihydroxy vitamin D (25 (OH)D which reflects the contribution of both diet and sunshine exposure. Preferred levels are 30-60 ng/ml (80-150 nMol/L). Insufficient vitamin D status in adults is reported to be 20 ng/ml to 29 ng/ml (50-80 nMol/L) and deficiency less than 15-20 ng/ml (<37-50 nMol/L). Deficiency for infants is less than 11 ng/ml (<27.5 nMol/L). (McCorry 2007; Tavera-Mendoza, L and White JF. Scientific American, Nov. 2007).

Vitamin D receptors (VDREs)

VDREs are found in every major organ system, including the immune system, they promote cell

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function. For example, VDREs in skeletal muscle may be important in the prevention and treatment of multiple sclerosis, while VDREs in the brain may play a role in the treatment of Parkinson's and Alzheimer's disease.

In a review article on Vitamin D (Scientific American, November 2007), recent research on genetic mapping by researchers at McGill and Harvard universities have found that VDREs are associated with the synthesis of natural antibiotics. Further, the work of researchers at the University of California at Los Angeles may help explain the mystery of why sunshine appeared to help cure tuberculosis in the past. These researchers suggest that exposing convalescents to an abundance of sunshine may have provided their immune cells with the necessary raw material needed to fight off the TB bacteria.

Who is at risk for deficiency?

People at risk are those who live in northern latitudes, those with dark skin, adults over age 65, those who have a tradition of being fully clothed, stay mostly indoors or use sunscreen faithfully.

Interestingly, it is reported that obese populations have significantly lower vitamin D levels than non-obese counterparts because 25 (OH)D appears to be sequestered within adipose tissue stores, making it unavailable for systemic use (McCorry 2007).

The use of anticonvulsants, glucocorticoids, rifampin and cholestyramine may adversely affect the bioavailability and metabolism of vitamin D. Patients with malabsorption syndromes are at risk. Vitamin D may also be deficient in vegan diets.

Breastfed infants may be at significant risk for deficiency. The current adequate intake for infancy and lactation is 200 IU but future recommendations may likely be much higher.

Sources of vitamin D

Sunlight is the most significant source of vitamin D, and exposure to UVB light induces production of cholecalciferol (the active form is called vitamin D3) in the skin. The quantity of vitamin D3 produced is related to the amount of UVB exposure and degree of skin pigmentation.

Dietary sources are fatty fish, egg yolk, lean beef, foods fortified with vitamin D such as milk, soy beverages and margarine, and infant formula. Current regulations do not allow yogurt to be fortified with vitamin D although some brands are made with vitamin D-fortified milk.

Multivitamins and cod liver oil supplements are also sources of vitamin D. Most multivitamins contain 400 IU. Look for vitamin D3 (cholecalciferol) versus D2 (ergocalciferol), which is only 30% as effective as D3.

Both D2 and D3 precursors are converted to 25(OH)D (inactive storage form) and 1,25 (OH)D (active form that is tightly controlled by the body). The 1,25 (OH)D functions as a switch that can turn at least 1,000 different genes "on" and "off" (Scientific American 2007).

New dietary reference intakes?

The mounting evidence on vitamin D in relation to preventing certain cancers, aiding in muscle function and enhancing immunity is so convincing that scientific experts including Dr. Reinhold Vieth (Mr. Sinai Hospital and University of Toronto) are strongly advocating an increase in dietary reference intakes (DRIs) and tolerable upper limits of safety (UL) due for revision in 2010.

The current adequate intake for vitamin D is 200 IU (younger than 50 years of age); 400 IU (51 to 70 years); and 600 IU (older than 70 years).

Since the 1997 DRIs for vitamin D were published, serum values for 25 (OH)D have become available and multiple studies indicate the current recommendations do not achieve optimal vitamin D status. Last year, the Harvard School of Public Health and now many physicians, the Canadian Cancer Society and the Osteoporosis Society are recommending 1,000 IU of vitaminD daily for adults.

Can you get too much?

Vitamin D toxicity in infants by supplementation is possible at doses of 40,000 IU/day in one to four months. In adults, doses of 100,000 IU can cause toxicity if taken daily for several months. Toxicity symptoms and hypercalcemia are noted at greater than 150 ng/ml of 25(OH)D (Scientific American November 2007).

Bottom Line

Screen patients for potential deficiency, check serum 25 (OH)D in high-risk individuals and provide logical and safe levels of supplementation as appropriate.

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