Michael F. Holick, MD, PhD, the Boston University professor of medicine and well-known “apostle of vitamin D,” attracted a standing-room-only crowd Friday for a presentation on his favorite topic. It was a performance that had the audience at rapt attention for a full hour—not just because of the celebrity of the speaker, but because of the extraordinarily clever and engaging nature of his talk. Holick combined clips from classic movies, TV shows, and old advertisements with dozens of scientific studies to support the position that his claim of an epidemic of vitamin D deficiency and his recommendations for notably-higher-than-commonly-seen levels of vitamin D supplementation and sensible sun exposure are neither hypothesis nor hype.

Why vitamin D is so important. Probably all physicians are aware that vitamin D is necessary to prevent rickets, and most know of its role in the prevention of other bone diseases, such as osteoporosis and osteomalacia. However, Holick stressed that vitamin D affects far more than the bones. He pointed out that every tissue and cell has a vitamin D receptor, and he presented evidence of a role for the vitamin in maintaining the health and optimal functioning of nearly every bodily system.

Higher levels of 25-hydroxyvitamin D (25(OH)D) are associated with greater muscle strength and better balance and lower extremity function. Vitamin D has been shown to fight infection: a vitamin D regimen in postmenopausal women reduced the incidence of urinary tract infections by 90%, and as long ago as the nineteenth century, physicians were getting results using cod liver oil and sunlight to treat tuberculosis. Recently, strong evidence has been presented of an inverse relationship between vitamin D levels and a variety of autoimmune diseases, such as type 1 diabetes, multiple sclerosis, and rheumatoid arthritis (in Finland, which has some of the highest rates of type 1 diabetes in the world, the risk of that disease was reduced by 88% in children who received long-term vitamin D supplementation [2000 IU/d]). Vitamin D also plays a role in cancer prevention: in one study, the risk of breast cancer was 50% lower in women with higher 25(OH)D levels (48 ng/mL), and in another, there was a projected 50% reduction in colon cancer in adults receiving 1000 IU/d of vitamin D.

Perhaps less well known, vitamin D also appears to play a role in cardiovascular health and healthy pregnancies. Exposure to UVB light has been shown to lower blood pressure, and there is a 50% increase in the risk of a first myocardial infarction in patients with vitamin D deficiency. The risks of preeclampsia and prematurity are much greater in pregnant women with 25(OH)D levels of less than 20 ng/mL, and the higher a pregnant woman’s 25(OH)D level, the lower the chances that she will need a cesarean section.

How widespread is D deficiency—and why? “Vitamin D deficiency is the most common medical condition in the world,” Holick said. Across many different populations, the percentage of those with inadequate vitamin D levels is surprisingly high. Between 30% and 50% of African Americans are vitamin D deficient. Among adults older than 50 years, the percentage of those who were vitamin D deficient in August ranged from 30% in those who were white to 84% in those who were black. Nor are the young spared. Holick noted that in one study, 52% of healthy adolescents were deficient in vitamin D.

The reason for the high incidence of deficiency is two-fold. First, vitamin D is rare in foods. It occurs naturally in just a few—principally oily fish. However, even this source has become less potent; the amount of vitamin D in farm-raised salmon is only 10% to 25% of that found in wild-caught salmon. Milk, other dairy products, and some juices are fortified with vitamin D—but only 100 IU per serving.

Historically, humans got nearly all the vitamin D they needed from sun exposure—which, Holick pointed out, is an incredibly good source (exposing most of the body of a white person to the sun just long enough to turn the skin a light pink produces 20,000 units of vitamin D). However,
sunlight is less strong at northern latitudes: at any latitude north of 35 degrees above the equator (that of Atlanta), no cutaneous vitamin D synthesis at all occurs from November through February. In addition, modern life styles are keeping people indoors during the hours of the sun’s strongest rays. And on top of this, people are increasingly applying sunscreen when they do happen to be outside. Holick noted that the application of SPF 30 sunscreen blocks 99% of cutaneous vitamin D production.

**What should our vitamin D level be?** It’s not enough to have a “normal” vitamin D level, Holick said. According to present-day metrics, any level above 20 ng/mL is considered normal. Instead, he said, the goal should be a “healthy” level—between 30 and 100 ng/mL. It is only when the 25(OH)D level is in this range that the full benefits of the vitamin are reaped.

**Should physicians test all patients?** Holick noted that the 25(OH)D assay is currently the most commonly ordered assay in the United States; however, he does not necessarily advocate additional huge increases in use of the test. Despite his campaign to raise vitamin D levels, he does not recommend universal screening. Instead, he suggests that clinicians screen patients with risk factors for insufficiency and deficiency (eg, those with a body mass index above 30 [vitamin D requirements are 2 to 3 times greater in obese persons], patients with osteoporosis, pregnant women, patients taking certain medications).

**How much vitamin D to prescribe.** To correct a condition of vitamin D deficiency, Holick recommends an intensive regimen: 50,000 IU/wk for 8 weeks. He notes that because the body uses 3000 to 5000 IU per day, having patients who are deficient take daily 1000-IU supplements will never get their 25(OH)D levels up to 30 ng/ML. Anticipating concerns about vitamin D intoxication, he stressed repeatedly that the risk of intoxication has been exaggerated. There is no need to worry about vitamin D intoxication as long as 25(OH)D levels are below 150 ng/mL, he said.

To maintain adequate levels (once a person’s 25(OH)D level has been brought into the healthy range), Holick would like to see supplementation recommendations of 400 to 1000 IU/d for infants, 1000 to 2000 IU/d for children aged 1 to 12 years, and 1500 to 2000 IU/d for adolescents and adults. He emphasized, however, that the vitamin D taken in supplement form (either as D$_2$ or D$_3$; he said there was little difference in efficacy between the two) should be in addition to that derived from milk consumption and sun exposure.

**What role for sun exposure?** Holick noted that human beings—like nearly all creatures—evolved to live in the sun. Thus, he recommends what he calls “sensible sun exposure” as part of a vitamin D maintenance regimen. For a person living in Boston or at a similar latitude, this would consist of 5 to 15 minutes of sunlight on the arms and legs (not the face) 2 or 3 times a week.

Holick cited the irony of people’s quickness to acknowledge other animals’ need for sunlight (pet stores sell devices to provide UV radiation for pet iguanas, to keep these reptiles from developing rickets and osteomalacia) while maintaining a state of near sun-phobia with regard to themselves. He took pointed aim at dermatologists who advise always wearing sunscreen—but he also defended himself against anticipated charges that his sun exposure recommendations are dangerous. He noted that most melanomas occur on the least sun-exposed areas of the body, and he underscored that he does not advocate tanning and cautions against burning.

Holick’s last slide was projected to the tune of “Here Comes the Sun.” It was followed by thunderous applause.

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