



IOM Endorses Vitamin D, Calcium Only for Bone Health, Dispels Deficiency Claims

Anita Slomski

IF WIDESPREAD DEFICIENCY OF VITAMIN D is a “silent epidemic” plaguing North America, as some researchers have warned, then a recent Institute of Medicine (IOM) report has just restored us to good health. The majority of persons in the United States and Canada are getting enough vitamin D and calcium to maintain bone health, concluded a committee of 14 scientists charged by the US and Canadian governments with updating the Dietary Reference Intakes (DRIs) for the 2 interrelated nutrients.

And in a blow to a growing number of claims that vitamin D can help protect against other conditions—such as cancer, cardiovascular disease, diabetes, immune dysfunction, multiple sclerosis, and preeclampsia in pregnancy, to name just a few—the IOM committee flatly declared that “the data just aren’t there” to recommend that people consume higher amounts of vitamin D or calcium.

After reviewing nearly 1000 studies on 25 health outcomes, the IOM committee did, however, recommend a higher vitamin D intake—a threefold increase for some age groups—compared with the levels set by the IOM in 1997. To maintain bone health, the new requirements are for 600 IU of vitamin D daily, although individuals aged 71 years or older may need up to 800 IU if they are not physically active or have significant declines in kidney function affecting their vitamin D metabolism. In 1997, the IOM recommended 200 IU daily for individuals up to age 50 years, 400 IU for those aged 51 to 70 years, and 600 IU for those aged 71 years or older.

The calcium requirements did not change appreciably from the earlier recommendations. North Americans need from 700 to 1300 mg/d of calcium depending on age, according to the new IOM report.

The committee also set upper daily intake levels of 4000 IU of vitamin D for adults and children aged 9 years or older—double the level from 1997—and 2500 to 3000 mg/d of calcium depending on age. These nutrient amounts represent the upper safe boundaries, not amounts that people should aim to consume, the committee stressed.

The new statement marks the first time the IOM has set Recommended Dietary Allowances—a measure for nutrient intake that meets the needs of 97.5% of the population—for calcium and vitamin D. In 1997, when there

weren’t nearly as many studies on the 2 nutrients, the IOM set an Adequate Intake range, which estimates sufficient levels of the nutrients for 50% of the population.

CALCIUM FROM DIET, SUPPLEMENTS

Most individuals can achieve the recommended amounts of calcium through diet alone, although some girls aged 9 to 18 years are falling short of the 1300 mg/d, the IOM committee said. Postmenopausal women are also at risk for not consuming the recommended 1200 mg/d of calcium through diet, but many take calcium supplements—and may be getting too much calcium. “Many physicians have incorrectly interpreted women’s total 1200-milligram intake of calcium as the amount they should be getting in a

Potential Indicators of Adverse Outcomes Associated With Excess Intake of Calcium and Vitamin D

Calcium

- Hypercalcemia
- Hypercalciuria
- Vascular and soft-tissue calcification
- Nephrolithiasis (kidney stones)
- Prostate cancer
- Interactions with iron and zinc
- Constipation

Vitamin D

- Intoxication and related hypercalcemia and hypercalciuria
- Serum calcium
- Measures in infants: retarded growth, hypercalcemia
- Emerging evidence for all-cause mortality, cancer, cardiovascular risk, falls, and fractures

Source: Ross AC, Taylor CL, Yaktine AL, Del Valle HB, eds. *Dietary Reference Intakes for Calcium and Vitamin D*. Washington, DC: National Academies Press; 2011.
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A recent Institute of Medicine report on recommended intake levels for calcium and vitamin D also cautions that excessive intake can have adverse effects.



supplement,” said Bess Dawson-Hughes, MD, senior scientist and director of the Bone Metabolism Laboratory at the Jean Mayer US Department of Agriculture Human Nutrition Research Center on Aging at Tufts University, in Boston. “Most people get at least 600 milligrams and up to 900 milligrams of calcium from their diets. If they are also taking a 1200-milligram supplement, they may be beyond the 2000-milligram safe upper limit for calcium.” The IOM committee found that 5% of women older than 51 years had a calcium intake above the upper limit, putting them at risk for kidney stones and possibly cardiovascular disease.

CAUTIOUS APPROACH

Although most North Americans get a quarter to a third of their vitamin D through incidental skin synthesis from sunlight, the IOM committee took a “markedly cautious approach” in setting its new levels for vitamin D based on sunlight exposure. “Recommending that people rely on sun exposure as a source of vitamin D is a problem because of the known risk of UV-induced skin cancer and because the ways in which sun exposure contributes to our overall status of vitamin D are not well understood,” said A. Catharine Ross, PhD, chair of the IOM committee and professor of nutrition at Pennsylvania State University. Getting enough vitamin D from diet alone is problematic, Ross acknowledged, yet most individuals have adequate levels of 25-hydroxyvitamin D, the serum marker for vitamin D, because sun exposure is substantially contributing to those levels.

So why the claims that North Americans have widespread vitamin D deficiency? The answer lies in the lack of consensus on how to define adequate serum levels of 25-hydroxyvitamin D. According to the IOM committee, vitamin D deficiency occurs at 25-hydroxyvitamin D levels below 12 ng/mL and inadequate vitamin D at 12 to 20 ng/mL. “We think 20 ng/mL meets the needs of essentially all of the healthy population, and we found no

evidence that going higher confers additional benefit,” said Ross.

Yet specialty societies such as the National Osteoporosis Foundation and the International Osteoporosis Foundation cite serum 25-hydroxyvitamin D levels of 30 ng/mL as the threshold for adequate vitamin D. “These groups recommend 800 to 1000 IU of vitamin D daily for those older than 60, and the American Geriatric Society recommends at least 800 IU per day for older persons on evidence from randomized clinical trials that there is a reduced risk of fractures and falls at this intake level,” said Dawson-Hughes, who was a member of the 1997 IOM committee.

She noted also that some people get no effective sun exposure, and others could also benefit from higher amounts of vitamin D. In particular, dark-skinned individuals synthesize less vitamin D from sunlight exposure than lighter-skinned people, and obese people have lower serum 25-hydroxyvitamin D levels and respond less to vitamin D supplements than do people of normal weight. “The committee set the upper limit at 4000 IU, so there is no downside to individuals increasing their daily vitamin D intake to 1000 IU,” said Dawson-Hughes.

Others advocate even higher 25-hydroxyvitamin D levels for all individuals. Michael F. Holick, MD, PhD, professor of medicine, physiology, and biophysics at Boston University School of Medicine, wants all his patients to have 25-hydroxyvitamin D serum levels between 40 and 60 ng/mL. “There is wide variability in the assay—values can be off by 15% to 20%—and I want to make sure my patients are above 30 ng/mL,” said Holick, who has described vitamin D deficiency among individuals in the United States as a “silent epidemic.” Holick, who was also on the 1997 IOM committee, maintains that a serum level of up to 100 “is perfectly safe. Lifeguards can get up to 100 ng/mL without any [adverse] consequences. In our experience, the higher your 25(OH)D [25-hydroxyvitamin D], the greater your bone density and strength in the muscles in the shoulder and hip girdle areas.”

The IOM committee disagrees. “There is evidence that higher levels of serum vitamin D at about 40 ng/mL are associated with all-cause mortality, fractures, pancreatic cancer, and prostate cancer,” said Ross. “Above 10 000 IU of vitamin D, there is clear evidence of risk, and because we are making long-term recommendations that may stand for many years, we were cautious in choosing 4000 IU as the upper limit.”

MANY REMAIN DEFICIENT

But even assuming that 20 ng/mL is the threshold for adequate serum levels of vitamin D, as the IOM committee contends, a significant portion of the US population remains deficient in vitamin D, said Michal L. Melamed, MD, MHS, assistant professor of medicine, epidemiology, and population health at Albert Einstein College of Medicine, in Bronx, NY. Analyzing data from the National Health and Nutrition Examination Survey (NHANES) 2001-2004, Melamed found that 50% of non-Hispanic black children and teenagers had serum 25-hydroxyvitamin D levels of less than 15 ng/mL, as did 9% of all children and teens studied. And 61% had vitamin D insufficiency, at 25-hydroxyvitamin D levels of 15 to 29 ng/mL (Kumar J et al. *Pediatrics*. 2009; 124[3]:e362-e370). “Other research using NHANES data shows that 25% of adult men have less than 20 ng/mL, and close to 35% of women are vitamin D deficient at less than 20 ng/mL,” said Melamed (Looker A et al. *Am J Clin Nutr*. 2008;88[6]:1519-1527).

Holick points to his own prospective study of pregnant women, who received an average of 600 IU of vitamin D daily during pregnancy (Lee JM et al. *Clin Pediatr [Phila]*. 2007;46[1]:42-44). “At the time they gave birth, 76% of moms and 81% of newborns were vitamin D deficient at less than 20 ng/mL,” he says.

Melamed maintains that most individuals can benefit from a vitamin D supplement, especially during the winter in northern latitudes. “You simply cannot get 600 IU from diet unless you eat salmon three times a day and drink



2 gallons of milk each day,” said Melamed, who plans to continue prescribing 800 to 1000 IU of vitamin D for her patients. Holick goes further, recommending 1000 IU of vitamin D per day for children and 2000 to 3000 IU for adults.

That some laboratories use clinical reference values above 30 ng/mL as the cut point for adequate vitamin D was also worrisome to the IOM committee, which declared an “urgent need” to standardize the assay and develop consensus reference values. “There is no central authority to set standards for these tests, and some labs are declaring people deficient in vitamin D when their blood levels would suggest they are not,” said Ross.

Nor should physicians routinely order the assay for all their patients, according to the committee.

“In the last couple of years we’ve seen a dramatic increase in the vitamin D assay as part of routine medical care, and this is probably to a great degree unnecessary,” said oncologist Steven K. Clinton, MD, PhD, professor of internal medicine at Ohio State University and member of the IOM committee. “Physicians should judge the risk of low vitamin D in each individual patient and then decide whether the assay should be ordered.” Clinton also stressed that the IOM’s recommendations are for the general, healthy population and do not pertain to people with medical condi-

tions that can cause malabsorption of vitamin D and calcium.

In evaluating vitamin D’s “purported” role in preventing numerous diseases, the IOM committee said the paucity of randomized clinical trials and conflicting evidence from observational studies led it to conclude that the nutrient’s links to outcomes other than bone health is “best described as hypotheses of emerging interest.” Added Ross, “We describe the biological plausibility that vitamin D may have an effect on certain cancers, for example, and we know that in animal models there are some good data. But we were not able to take the currently available clinical data and use that information to define DRIs.” □

Picture This: The Average US Child Has Nearly 8 Imaging Tests by Age 18

Rebecca Voelker

THE NUMBER OF DIAGNOSTIC imaging tests that children in the United States receive has raised concerns that such tests might pose increased risks of cancer and other health conditions developing later in life.

Excluding dental x-rays, a new study shows that the average US child undergoes nearly 8 diagnostic imaging procedures by age 18 years (Dorfman AL et al. *Arch Pediatr Adolesc Med*. doi:10.1001/archpediatrics.2010.270 [published online ahead of print January 3, 2011]). The analysis is the first large, population-based study examining the use of radiography, computed tomographic (CT) scans, and other imaging procedures in pediatric populations. Its findings are based on health insurance records of 355 088 children in 5 large US health care markets.

Overall, the researchers found that 42.5% of the children had undergone an imaging procedure during the 3-year study period ending in 2007. About one fourth had 2 or more procedures while 16% had 3 or more. Radiography, which

typically has low radiation exposure levels, accounted for nearly 85% of the procedures. But the study authors cautioned that CT scans, fluoroscopy, and other techniques that deliver higher exposures are not infrequent. Nearly 8% of children in the study had undergone a CT scan, and the rate of use increased dramatically in older children.

Cancer that develops later in life is not the only risk that children face from radiation exposure during imaging pro-

cedures. The authors noted that head CT scans that include imaging of the lens of the eye increase the risk that cataracts will develop.

Outside of pediatric hospitals, age- and weight-dose protocols for many imaging techniques are not widespread, the authors note. They underscore the need for evidence-based guidelines to help clinicians determine the appropriateness of performing imaging procedures in children. □



New research raises concerns that frequent imaging tests in children might pose future health risks.