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Vitamin D

The Institute of Medicine did not find the vitamin D–cancer link because it ignored UV-B dose studies

Madam

When The Institute of Medicine (IOM) of the National Academies released its new *Dietary Reference Intakes for Calcium and Vitamin D* report on 30 November 2010[1,2], the vitamin D research community was shocked and dismayed at the findings. The committee found a benefit only for bones, leading to the finding that a 25-hydroxy-vitamin D (25(OH)D) level of 20 ng/ml was adequate and a recommended intake of 15 μg/d for most people. These are well below the recommendations of vitamin D experts: intakes of up to 50 μg/d and achieving serum 25(OH)D levels of 40–60 ng/ml[3]. Casual solar UV-B irradiance in summer in England raises serum 25(OH)D levels by nearly 40 nmol/l, equivalent to the production of about 37.5 μg/d for those aged 45 years[4], far more than suggested by the IOM[1].

The UV-B–vitamin D–cancer hypothesis was based on an ecological study of the geographical variation of colon cancer mortality rates and sunlight doses in the USA[5] and has been extended by subsequent ecological studies in Australia, Asia, Europe and the USA to about twenty types of cancer[6–9]. While the IOM considered some ecological studies as background information, it noted they have the primary weakness that 'Outcome measures are not predictable at the individual level' and, thus, are of low quality for dietary reference intakes[1]. This summary dismissal is not warranted: in part because no mechanism other than production of vitamin D has been proposed to explain the ecological study findings, in part since the findings of ecological studies of cancer have been supported by other studies[10], and in part since ecological studies integrate the effect of UV-B and vitamin D over much of the lifetime and include many cases.

A second type of study based on solar UV-B is that of cancer risk with respect to diagnosis or death from non-melanoma skin cancer (NMSC). The primary risk factor for NMSC is UV irradiance, with UV-B the most important risk factor for NMSC death[11]. An ecological study for Spain found fifteen types of cancer inversely correlated with NMSC mortality rate after adjusting for smoking[12]. A record linkage study found significant inverse correlations between diagnosis of NMSC and incidence of gastric, liver, pancreatic and prostate cancer and non-significant inverse correlations for five other types of cancer[13]. A reduced risk of prostate cancer incidence was noted with more early-life UV-B irradiance[14].

A third type of study is based on solar UV-B exposure related to occupation. A death certificate-based case–control study of cancer mortality rates in the USA found significant inverse correlations for breast and colon cancer with respect to occupations with high occupational exposure to sunlight[15]. A study of cancer risk in Rhineland-Palatinate, Germany found significantly reduced risk of nearly a dozen types of internal cancer compared with incidence of NMSC plus melanoma in regions with more land devoted to winegrowing[16,17].

A fourth type of study is the case–control study using self-reported personal sun exposure. A pooled study of this nature found a protective effect of recreational sun exposure at 18–40 years of age and in the 10 years before diagnosis for non-Hodgkin's lymphoma[18].

Together with other studies such as case–control studies of vitamin D and breast cancer[19] and improved survival rate after diagnosis of non-Hodgkin's lymphoma and other types of cancer with higher serum 25(OH)D at time of diagnosis[20], there is strong support for a causal relationship between vitamin D and reduced risk of cancer[10] which could have permitted the IOM to find a beneficial effect of vitamin D in reducing the risk of cancer.

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Vitamin D

A Canadian response to the 2010 Institute of Medicine vitamin D and calcium guidelines

Madam

The new Institute of Medicine (IOM) guidelines[1] for vitamin D are a step in the right direction to indicate a greater amount of vitamin D is needed than previously thought; however, there are a number of shortcomings and unanswered questions.

First, the minimum daily requirement has tripled from 5 to 15 μg/d for bone health. This information is welcome. This would bring most people in the general population to a 25-hydroxyvitamin D (25(OH)D; the metabolite measured for status) level >50 nmol/l, according to this report. However, this is not an adequate cut-off since maximum absorption of Ca improves up to about 80 nmol/l[2], which would in turn improve bone health. Parathyroid hormone (PTH) levels increase rapidly with 25(OH)D levels <50 nmol/l, but there are clinical studies that show a gradual rise in PTH with levels of 25(OH)D <78 nmol/l[3]. Thus, the cut-off should be 80 nmol/l, not 50 nmol/l, and many researchers across the world would agree with this. The Canadian Osteoporosis Society recommends achieving >75 nmol/l with 20 μg of vitamin D daily but acknowledges that intakes up to 50 μg/d are required[4]. Dental health would be improved in all people with levels above 20 μg/d, as 10 or 15 μg/d did not show any benefit[5]. This has been known since the 1930s and 1940s but has not been addressed.

Second, to say that most people have adequate levels from diet, even for bone health, using the conservative cut-off of 50 nmol/l is certainly not true. This is especially so in Canada where the latitude and long winters contribute to the low vitamin D levels. Two studies show that many population groups in Canada have very low levels of vitamin D and about 18% of Canadians have levels below 40 nmol/l[6,7]. In the Canadian Health Measures Survey, respondents who were not white had 25(OH)D levels 20 nmol/l lower than those of white European origin[4]. Supplementation with vitamin D at 50 μg/d in a nursing home setting, where levels average about 35–40 nmol/l because of little or no sun exposure, did not achieve levels over 80 nmol/l in 6% of the population studied and did not result in any toxic levels or elevation of Ca[8].

Third, the IOM did not address the needs in pregnancy. The Canadian Pediatric Society recommends all pregnant women take 50 μg/d, which is only reasonable since this group has very low vitamin D levels and consequences are grave if vitamin D levels are not adequate[9]. Low vitamin D levels have been associated with pre-eclampsia[10] and bacterial vaginosis in pregnancy[11]. The use

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