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EDITORIAL

Vitamin D status of Australians

The main source of vitamin D for Australians is derived through the exposure to ultra violet (UV) radiation through the action of sunlight on the skin. The emerging public health issue of an increased prevalence of vitamin D deficiency in Australia is probably a function of our changing lifestyle, spending less time out of doors, both travelling to and from work, at work and pursuing more leisure time activities indoors. From an evolutionary perspective humans were designed to maintain vitamin D status through sunlight, and maintaining adequate vitamin D status through exposure to sunlight is preferable. It has been estimated that around 10–15 minutes exposure to noonday sun in summer in Sydney is comparable to taking around 15 000 IU (375 µg) of vitamin D orally; however, this level of exposure is not recommended for skin and eye health, particularly for Australians who have one of the highest rates of skin cancer in the world. Previous public health messages have encouraged people to reduce their exposure to sunlight when UV levels are highest, and have promoted the use of shade, hats, clothing, sunglasses and sunscreen when outside. It now appears that a significant number of Australians have low levels of circulating vitamin D due to inadequate exposure to sunlight. Dark-skinned people, those who are housebound or bedridden, and those who cover their skin for cultural or religious reasons, are more likely to develop vitamin D deficiency. Additionally there is also evidence of low levels of circulating vitamin D (25(OH)D) in other population groups. Two studies have found rates of vitamin D insufficiency of 43% in young women in winter and 23% in the general adult population. Furthermore there is evidence of poor vitamin D status in children and adolescents, particularly in less sunny areas such as Tasmania and New Zealand. Deficiency has been defined as 25(OH)D <25 or <28 nmol/L and marginal status between 25 and 50 nmol/L; however, higher levels: 80–100 nmol/L 25(OH)D have been proposed as being optimal for health. We currently have no strong evidence of detrimental effects on health of low levels of circulating 25(OH)D (excluding frank deficiency) in young and middle-aged people, although reduced exposure to sunlight and poor vitamin D status have been linked to increased risk of malignancies, chronic inflammatory and autoimmune diseases (e.g. insulin-dependent diabetes mellitus, inflammatory bowel disease and multiple sclerosis).

A dietary supply of vitamin D is only required by those who do not produce sufficient vitamin D through endogenous synthesis through the action of UV light on the skin. The amount of dietary vitamin D required is therefore dependent on the shortfall of exposure to UV radiation. We do know that in elderly populations, with minimal exposure to sunlight, that supplementation of at least 20 µg of vitamin D can reduce the rate of falls and fractures. It was thought that only those who were truly deficient in vitamin D would receive some benefit from supplementation; however, a recent study conducted in Australia demonstrated that for elderly people in residential care with serum 25(OH)D levels in the range 25–90 nmol/L (marginal rather than deficient), supplementation with 25 µg per day of vitamin D₃ (in combination with calcium) reduced the rate of falls in those who were compliant with the medication. It should be noted however, that all studies demonstrating a significant reduction in rates of falls and fracture with vitamin D supplementation combine vitamin D with calcium supplementation, such that there is no evidence that vitamin D supplementation, without an adequate intake (AI) of dietary calcium, has a similar positive effect of reducing falls and fractures.

As highlighted by Shrapnel and Truswell in this issue, only a few foods such as sardines contain significant amounts of vitamin D. Margarine provides approximately 50% of the total vitamin D intake for Australian adults. The average estimated dietary intake of vitamin D for adults is less than 3 µg/day, which is significantly lower than the estimated AI. The food regulations in Australia, apart for the mandatory fortification with vitamin D of margarine, only allow voluntary fortification of low-fat milk and milk products (sufficient to replace the vitamin D that may have been present in the fat component of the food). This contrasts to the fortification practices in other countries, for example Finland where voluntary fortification with vitamin D was permitted in February 2003 for all fluid milk products (milk, sour milk, yoghurt) at a level of 0.5 µg vitamin D₃/100 g, and all spreads with 10 µg vitamin D₃/100 g. This raised estimated median intakes of dietary vitamin D into the range of 6–14 µg per day and there was an improvement...
in the winter circulating levels of serum 25(OH)D. However, girls aged 14–17 years, adults aged 27–35 years and middle-aged (35–60 years) women had median levels of 25(OH)D, which were <50 nmol/L in 2004 (personal communication, Christel Lamberg-Allardt, Heli Viljakainen, University of Helsinki, 5 May 2006). Therefore it appears that additional voluntary fortification of the food supply can take the younger groups close to the AI for dietary vitamin D, facilitating a maintenance in serum levels of 25(OH)D during winter.

Evidence from supplementation studies indicates that at least 20 µg vitamin D per day is required to prevent falls and fractures in the housebound/bedbound elderly population; however, there have been no long-term studies assessing the impact of food fortification achieving lower daily intakes in this population. Accordingly the evidence to date indicates that for high-risk older groups confined indoors a supplement is likely to be necessary, unless regular controlled exposure to sunlight outside during the hottest part of the day can be arranged. This presents a challenge, as for some areas at lower latitudes (southern Australia), older people may require sun exposure for three to four times per week (at 10:00 a.m. and 3:00 p.m.) with the need to expose 15% of their bodies. This exposure to sunlight would need to be for up to 15 minutes with extreme care from October to March and 21 minutes to at least one hour with care from April to September, for fair-skinned people. This level of exposure is required to produce vitamin D levels equivalent to current recommended intakes in Australia. This controlled safe level of sun exposure, which does not compromise skin and eye health risk, would be difficult for many people to achieve and may be insufficient for housebound elderly people and those with darker skins, who would need to expose a greater body surface area. It seems likely that oral vitamin D supplementation may be the easier option to maintain vitamin D status and reduce the risk of skin cancer in the housebound elderly and high-risk groups. The increased availability of higher doses of supplements, which could be taken orally three or four times per year would increase the acceptability of supplementation, as compliance with a daily regimen of vitamin D supplementation is difficult for many people. Although maintaining an AI of calcium still remains a problem for many elderly people in this high-risk group and a reduction in the rate of fractures may not occur without maintenance of an AI of calcium. The general population, whose serum levels of 25(OH)D levels are higher than the high-risk groups may benefit through increased vitamin D fortification of the food supply by reducing the seasonal dip in serum 25(OH)D levels. This may have positive effects on health over the long term, but more research is required to confirm this.

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REFERENCES