

## NUTRITION

## Preventing falls in the elderly—benefits of vitamin D supplementation revealed

Ensuring elderly individuals maintain sufficient levels of vitamin D might help prevent falls in this vulnerable subgroup of the general population, according to the results of a meta-analysis published in the *British Medical Journal*. “Vitamin D deficiency contributes to the increased rate of falls that often occurs in old age,” explains lead investigator Heike Bischoff-Ferrari (University Hospital Zurich, Switzerland). “We have established that vitamin D supplementation at a high enough dosage (700–1,000 IU) reduces the risk of falling by at least 19%, with a rapid benefit occurring between 2 and 5 months after starting treatment.”

A close relationship exists between muscle weakness, falls and fracture in the elderly; furthermore, muscle weakness is considered a sign of severe vitamin D deficiency. Bischoff-Ferrari and coworkers previously demonstrated expression of the vitamin-D receptor (a member of the nuclear receptor family of transcription factors) in human muscle, and noted that high serum levels of vitamin D correlated with improved muscle strength and function in two independent populations of elderly individuals, possibly as a consequence of increased protein synthesis.

Their next step was to assess the effect of vitamin D supplementation on muscle strength: data published in 2003 suggested that daily supplementation with vitamin D<sub>3</sub> plus calcium markedly reduced falls in elderly women undergoing long-term geriatric care. Since then, a number of additional studies of vitamin D supplementation as an aid to fall prevention have been published. As a consequence, Bischoff-Ferrari *et al.* have now performed a meta-analysis of the available data to evaluate the efficacy of this novel approach to preventing falls in the elderly.

The meta-analysis included double-blind, randomized, controlled trials of vitamin D supplementation (with or without calcium supplementation) in



individuals aged 65 years or older, with assessment of falls specified as a primary outcome measure and a minimum follow-up period of 3 months. A total of 10 trials met the study criteria: eight of these trials assessed the effects of vitamin D<sub>2</sub> or vitamin D<sub>3</sub> (‘supplemental vitamin D’), whereas the remaining two trials evaluated treatment with the vitamin D metabolites 1 $\alpha$ -hydroxyvitamin D<sub>3</sub> or 1,25-dihydroxyvitamin D<sub>3</sub> (‘active vitamin D’).

Supplemental vitamin D at a dosage of 700–1,000 IU per day reduced the risk of falls by 19%; however, a daily dosage of <700 IU did not reduce the risk of falling. The greatest risk reduction was achieved with vitamin D<sub>3</sub> (26% versus 12% for vitamin D<sub>2</sub>) and the protective effects of supplemental vitamin D seemed independent of calcium supplementation. At a biochemical level, a serum 25-hydroxyvitamin D level of  $\geq 60$  nmol/l was associated with a 23% reduction in the risk of falls, whereas serum 25-hydroxyvitamin D levels below this threshold had no effect.

Treatment with active forms of vitamin D also reduced the risk of falling (by 26%); however, individuals who received these drugs were more likely to develop

hypercalcemia than those who received placebo (12% versus 6%, respectively). A head-to-head comparison of high-dose supplemental vitamin D and active vitamin D suggested that they were essentially equivalent in terms of fall prevention.

A key finding of this meta-analysis is that dose really does matter. The protective effects of supplemental vitamin D were only manifest at doses above 700 IU daily. This dosage is considerably higher than that currently recommended by the Institute of Medicine (400–600 IU per day). As all subgroups of elderly people (for example, community dwelling and those living in institutions) were found to benefit from high doses of supplemental vitamin D, Bischoff-Ferrari and colleagues suggest that these guidelines should be revised. In addition, they plan to evaluate the effects of even higher doses of vitamin D (>1,000 IU daily) on the risk of falls in the elderly.

Active forms of vitamin D also worked well in terms of fall prevention; however, they were no better than high doses of supplemental vitamin D. Given that supplemental vitamin D is considerably cheaper than the active forms of vitamin D, with virtually no adverse effects, the way forward in terms of public health might be to implement programs of high-dose vitamin D supplementation in the elderly.

“Vitamin D is a key partner in the treatment of osteoporosis,” Bischoff-Ferrari concludes. “Most osteoporosis drugs target bone alone. We suggest that they should always be combined with vitamin D, particularly in old age, when falls are the primary risk factor for fracture.”

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