

**Long-term effects of giving nursing home residents bread fortified with 125 µg (5000 IU) vitamin D3 per daily serving.** Veronica Mocanu et al. *Am J Clin Nutr* 2009;89(4):1132-1137.

**Background:** In older adults, a serum 25-hydroxyvitamin D [25(OH)D] concentration >75 nmol/L lowers the risk of fracture. An oral intake of 125 µg (5000 IU) vitamin D3/d may be required to achieve this target. **Objective:** The objective was to characterize the safety and efficacy of fortifying bread with a biologically meaningful amount of vitamin D3. **Design:** In a single-arm design, 45 nursing home residents consumed one bun daily that had been fortified with 125 µg (5000 IU) vitamin D3 and 320 mg elemental calcium. **Results:** The initial mean (±SD) serum 25(OH)D concentration was 28.5 ± 10.8 nmol/L. After 12 mo, the 25(OH)D concentration was 125.6 ± 38.8 nmol/L, and it exceeded 74 nmol/L in 92% of the patients. At every 3-mo follow-up, serum parathyroid hormone was lower than at baseline (P = 0.001). No changes in serum calcium or cases of hypercalcemia were observed at the follow-up assessments. Both mean total urinary calcium and the mean urinary calcium-creatinine ratio increased from baseline at one follow-up time point (P < 0.05). Between baseline and the 12-mo visit, z scores for bone mineral density at the lumbar spine and the hip both increased significantly (P < 0.001). **Conclusions:** Fortification of bread with much more vitamin D than used previously produced no evident adverse effects on sun-deprived nursing home residents and improved bone density measures. Fortification of bread with 5000 IU vitamin D3/d provided reasonable assurance that vitamin D-deficient older adults attained a serum 25(OH)D concentration greater than the desirable objective of >75 nmol/L. This trial was registered at clinicaltrials.gov as NCT00789503.

**Prevention of Nonvertebral Fractures With Oral Vitamin D and Dose Dependency: A Meta-analysis of Randomized Controlled Trials.** Heike A. Bischoff-Ferrari et al. *Arch Intern Med* 2009;169(6):551-561.

**Background:** Antifracture efficacy with supplemental vitamin D has been questioned by recent trials. **Methods:** We performed a meta-analysis on the efficacy of oral supplemental vitamin D in preventing nonvertebral and hip fractures among older individuals (≥65 years). We included 12 double-blind randomized controlled trials (RCTs) for nonvertebral fractures (n = 42 279) and 8 RCTs for hip fractures (n = 40 886) comparing oral vitamin D, with or without calcium, with calcium or placebo. To incorporate adherence to treatment, we multiplied the dose by the percentage of adherence to estimate the mean received dose (dose × adherence) for each trial. **Results:** The pooled relative risk (RR) was 0.86 (95% confidence interval [CI], 0.77-0.96) for prevention of nonvertebral fractures and 0.91 (95% CI, 0.78-1.05) for the prevention of hip fractures, but with significant heterogeneity for both end points. Including all trials, antifracture efficacy increased significantly with a higher dose and higher achieved blood 25-hydroxyvitamin D levels for both end points. Consistently, pooling trials with a higher received dose of more than 400 IU/d resolved heterogeneity. For the higher dose, the pooled RR was 0.80 (95% CI, 0.72-0.89; n = 33 265 subjects from 9 trials) for nonvertebral fractures and 0.82 (95% CI, 0.69-0.97; n = 31 872 subjects from 5 trials) for hip fractures. The higher dose reduced nonvertebral fractures in community-dwelling individuals (−29%) and institutionalized older individuals (−15%), and its effect was independent of additional calcium supplementation. **Conclusion:** Nonvertebral fracture prevention with vitamin D is dose dependent, and a higher dose should reduce fractures by at least 20% for individuals aged 65 years or older.

**Vitamin D supplementation enhances the beneficial effects of weight loss on cardiovascular disease risk markers.** Armin Zittermann et al. *Am J Clin Nutr* 2009;89(5):1321-1327.

**Background:** High blood concentrations of parathyroid hormone and low concentrations of the vitamin D metabolites 25-hydroxyvitamin D [25(OH)D] and calcitriol are considered new cardiovascular disease risk markers. However, there is also evidence that calcitriol increases lipogenesis and decreases lipolysis. **Objective:** We investigated the effect of vitamin D on weight loss and traditional and nontraditional cardiovascular disease risk markers in overweight subjects. **Design:** Healthy overweight subjects (n = 200) with mean 25(OH)D concentrations of 30 nmol/L (12 ng/mL) received vitamin D (83 µg/d) or placebo in a double-blind manner for 12 mo while participating in a weight-reduction program. **Results:** Weight loss was not affected significantly by vitamin D supplementation (−5.7 ± 5.8 kg) or placebo (−6.4 ± 5.6 kg). However, mean 25(OH)D and calcitriol concentrations increased by 55.5 nmol/L and 40.0 pmol/L, respectively, in the vitamin D group but by only 11.8 nmol/L and 9.3 pmol/L, respectively, in the placebo group (P < 0.001), whereas a more pronounced decrease

occurred in the vitamin D group than in the placebo group in blood concentrations of parathyroid hormone (−26.5% compared with −18.7%;  $P = 0.014$ ), triglycerides (−13.5% compared with +3.0%;  $P < 0.001$ ), and the inflammation marker tumor necrosis factor- $\alpha$  (−10.2% compared with −3.2%;  $P = 0.049$ ). The beneficial biochemical effects were independent of the loss in body weight, fat mass, and sex. However, compared with placebo, vitamin D supplementation also increased LDL-cholesterol concentrations (+5.4% compared with −2.5%;  $P < 0.001$ ). **Conclusions:** The results indicate that a vitamin D supplement of 83  $\mu\text{g}/\text{d}$  does not adversely affect weight loss and is able to significantly improve several cardiovascular disease risk markers in overweight subjects with inadequate vitamin D status participating in a weight-reduction program. This trial was registered at [clinicaltrials.gov](http://clinicaltrials.gov) as NCT00493012.

**Vitamin D: emerging new roles in insulin sensitivity.** Dorothy Teegarden and Shawn S. Donkin. *Nutr Res Rev* 2009;22(1):82-92.

**Abstract:** The growing incidence of prediabetes and clinical type 2 diabetes, in part characterised by insulin resistance, is a critical health problem with consequent devastating personal and health-care costs. Vitamin D status, assessed by serum 25-hydroxyvitamin D levels, is inversely associated with diabetes in epidemiological studies. Several clinical intervention studies also support that vitamin D, or its active metabolite 1,25-dihydroxyvitamin D (1,25(OH) $_2$ D), improves insulin sensitivity, even in subjects with glucose metabolism parameters classified within normal ranges. The mechanisms proposed which may underlie this effect include potential relationships with improvements in lean mass, regulation of insulin release, altered insulin receptor expression and specific effects on insulin action. These actions may be mediated by systemic or local production of 1,25(OH) $_2$ D or by suppression of parathyroid hormone, which may function to negatively affect insulin sensitivity. Thus, substantial evidence supports a relationship between vitamin D status and insulin sensitivity; however, the underlying mechanisms require further exploration. **Key Words:** [Vitamin D](#); [Diabetes](#); [Insulin sensitivity](#); [Insulin resistance](#).

**Health impacts of vitamin D: are we getting enough?** C. H. S. Ruxton and E. Derbyshire. *Nutr Bull* 2009;34(3):185-197.

**Abstract:** Increasingly, scientists are debating whether photochemical synthesis of vitamin D in Western countries is adequate, and whether dietary intakes can plug the gap between endogenous vitamin D production and requirements, particularly in young and older populations. The debate is driven by the plethora of evidence suggesting that, in addition to its important role in maintaining bone health, vitamin D may be involved in ameliorating cell ageing and preventing cardiovascular disease, diabetes, immune dysfunction and some cancers. Observational evidence from different populations suggests a significant degree of vitamin D insufficiency, often defined as plasma 25-hydroxyvitamin D [25(OH)D]  $< 25$  nmol/l. Some experts have argued that daily intakes up to 40  $\mu\text{g}/\text{day}$  may be needed to ensure a desirable vitamin D status, even after accounting for sun exposure. However, there is presently no consensus on the most appropriate vitamin D status for maintaining bone health and preventing chronic disease. In addition, the UK has not set a vitamin D recommendation for most adults under 65 years. Given the plethora of information about vitamin D and bone health, this article reviews evidence for a link between vitamin D and other aspects of health. In conclusion, three actions are suggested: (1) agreement on optimal plasma 25(OH)D levels for health; (2) a debate on whether UK dietary recommendations need revision; and (3) better promotion of dietary vitamin D via food sources and, for certain groups, supplements. **Keywords:** health • intakes • recommendations • status • vitamin D.