

Concurrent Session 5: Bone Mass and Body Composition

Calcium requirement and osteoporosis

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Background – The index disease for calcium deficiency is osteoporosis because the maintenance of the serum (ionised) calcium takes precedence over the integrity of the skeleton; in states of negative calcium balance the ionised calcium is maintained at the expense of the skeleton. In adult humans, there are significant obligatory losses of calcium via skin, bowel and kidneys, amounting to at least 300 mg daily and entailing a significant calcium requirement to preserve calcium balance.

Objective – To determine more accurately the calcium requirement of young adult men and women.

Design – Analysis of 157 published calcium balances on 72 men up to the age of 60 (mean age 34.1 years and mean duration of balances 107 days) and of 109 balances on premenopausal women of mean age 22.7 years with a balance duration of 14-28 days.

Outcomes – In both sexes, the regression of net calcium absorbed on calcium intake could be linearised by logarithmic transformation of intake. In the men, 58.8% of the variance on absorbed calcium and 90.5% of the variance on urine calcium could be accounted for by calcium intake. In the women, only 24% of the variance on absorption and 12% of the variance on urine calcium could be attributed to intake. The mean intake at which net absorbed calcium became equal to urinary calcium was 550 mg in the men and 675 mg in the women. After allowing for skin losses of 40 mg daily, the corrected mean requirement was 750 mg in the men and 1000 mg in the women, implying allowances of perhaps 900 and 1200 mg respectively.

Conclusions – These calculations suggest for the first time that the calcium requirement of young women is higher than that of young men, due mainly to a lower maximum active calcium absorptive capacity in the women (about 250 mg/day) than in the men (about 350 mg/day).

A dairy-based protein, calcium and vitamin D supplement preserves trabecular bone and reduces falls in aged care residents

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Background – Aged care residents are at high risk of falls and fractures. Nutrient deficiencies may contribute to falls and fracture risk.

Objective – To determine if a dairy-based protein, calcium and vitamin D supplement incorporated into foods would reduce falls and fracture risk in elderly residents.

Design – We studied 950 residents from 13 control and 7 intervention hostels before and during 6 months of supplementation with approximately 5g protein, 300mg calcium and 500 IU vitamin D₃. 71 females provided blood samples, 65 had BMD assessed using densitometry and 44 underwent bone structure assessment at the distal radius and tibia using high-resolution micro-pQCT. Continuous data were analysed using repeated measures ANOVA, and falls before and after treatment compared using Wilcoxon Signed Rank Test.

Outcomes – Compared to controls, supplementation over halved the decline in vitamin D ($-22\% \pm 10\%$ v $-61\% \pm 12\%$, $P < 0.05$), while PTH was lowered with treatment ($-16\% \pm 5\%$, $P < 0.01$), but remained unaltered in controls ($5\% \pm 6\%$). Loss of trabecular BMD ($-5 \pm 3\%$, NS) and bone volume to total volume ($-3 \pm 3\%$) at the radius was prevented compared to controls who lost bone (both $-10 \pm 3\%$), $P < 0.05$). In those who fell before intervention, falls rates were lower during supplementation (1.3 per person) v prior (2.2 per person, $p < 0.01$).

Conclusion – Nutritional supplementation prevents loss of trabecular bone and reduces the incidence of falls rates in those with a history of falls.