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The effect of fruit and vegetable consumption on bone markers in older adults: the ageing and dietary intervention trial

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Observational evidence suggests that increased fruit and vegetable consumption may be associated with better bone health. Of the intervention studies undertaken till date, the results have generally been inconsistent with some demonstrating beneficial effects of fruit and vegetables on bone health[(1)] and others showing no effect[(2,3)]. However, this specific hypothesis has not yet been fully tested in intervention studies involving free living older adults.

The current study was a randomised controlled intervention study to examine the effect of increased fruit and vegetable consumption on bone markers in healthy free living adults aged 65 years and over. Eighty three participants habitually consuming less than two portions of fruit and vegetables per day were randomised to either a low (2 portions/d) or high (5 portions/d) fruit and vegetable group for 16 weeks. Fruit and vegetables were delivered to all participants each week, free of charge. At weeks 0, 6, 12 and 16, fruit and vegetable intake and overall dietary intake was assessed using the diet history method. A fasting blood sample was also obtained and stored at −80°C. Serum samples were analysed for vitamin C, lutein, zeaxanthin, β-cryptoxanthin, α- and β-carotene and lycopene. Biochemical bone markers (osteocalcin and CTX) were measured in serum by ELISA. Ethical approval for the study was obtained from the Office for Research Ethics Committees Northern Ireland.

A total of 82 participants completed the intervention. Self-reported intake of fruit and vegetable significantly increased in both groups. At week 16, participants reported consuming on average 1.8 and 6.0 portions of fruit and vegetables per day in the 2/d and 5/d groups, respectively. The change in vitamin C (at all timepoints), lutein (at week 16), zeaxanthin (at all timepoints), β-cryptoxanthin (at all timepoints) and lycopene (at all timepoints) significantly differed between the two intervention groups, being higher in the 5 portions/d group than in the 2 portions/d group. Comparisons revealed no significant differences between the two intervention groups, with regard to change in bone marker status (osteocalcin and CTX) over the 16-week period.

	2 portions/d			5 portions/d		
	Week 0	Week 16	% week 0–16	Week 0	Week 16	% week 0–16
Osteocalcin (ng/ml)	22.40 (17.2, 28.0)	21.07 (14.8, 28.3)	95 (89, 102)	16.56* (10.6, 25.2)	17.04 (11.1, 23.9)	104 (91, 118)
Cross laps (ng/ml)	0.46 (0.34, 0.61)	0.49 (0.39, 0.66)	107 (95, 119)	0.46 (0.35, 0.60)	0.45 (0.33, 0.66)	98 (90, 106)

Variables are geometric mean (IQ range) and change as geometric mean (equivalent to % of baseline) (95% CI).
*$P<0.05$ for significant difference between 2 portions/d and 5 portions/d (independent samples *t*-test).

Increased fruit and vegetable consumption over a period of 16 weeks had no effect on bone marker status in healthy older adults. Findings therefore do not support the hypothesis that fruit and vegetables have a beneficial effect on bone markers. Further larger intervention studies of longer duration are warranted in order to establish whether or not long-term consumption of fruit and vegetables could have a beneficial effect on bone health. Future studies also need to clarify whether certain types of fruit and vegetables may be more beneficial than others for optimising bone health.

1. Lin PH, Ginty F, Appel LJ *et al*. (2003) *J Nutr* **133**, 3130–3136.
2. MacDonald, Black A, Aucott L *et al*. (2008) *Am J Clin Nutr* **88**, 465–474.
3. McTiernan A, Wactawski-Wende J, Wu L *et al*. (2009) *Am J Clin Nutr* **89**, 1864–1876.