

How important is dietary acid-base balance for bone health in different age groups?

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Epidemiological studies in pre- and postmenopausal women and older men and women suggest that higher fruit and vegetable intakes have a positive effect on bone health. Mechanisms have been attributed to the high alkali salt content of fruits and vegetables, which counteracts the effects of acid generating foods, such as meat and cereals. A higher dietary acid load has been shown to increase bone resorption and urinary calcium losses in adults. In a cross-sectional study spanning adolescence, early and later adulthood, we recently showed significant positive relationships between spine size-adjusted bone mineral content and fruit intake in adolescent boys and girls and older women [1]. To determine whether the fruit and vegetable effects in these subjects was attributable to lower net acid excretion, we evaluated the relationships between bone mineral measurements and two indirect estimates of acid excretion: estimated net acid excretion (NAE_{ind}) and net endogenous non-carbonic acid excretion (NEAP).

The study group consisted of 132 boys and 125 girls (16-18 years of age), 120 young women (23-37 years of age) and 134 older men and women (60-83 years of age). Bone mineral measurements were made of the whole body, hip and spine by dual-energy x-ray absorptiometry (DXA) in all subjects. Information on health and lifestyle and physical activity was obtained by questionnaire. NAE_{ind} and NEAP were calculated from 7-day food diaries using published formulae [2, 3].

Significant positive correlations were found between NAE_{ind} and NEAP in all subjects. In general, NAE_{ind} was more strongly correlated with dairy product intake in each of the groups, and relationships with meat, fruit and vegetable intake were less consistent. This was in contrast with NEAP, which was not correlated with dairy product intake, but consistently negatively associated with fruit and vegetable intake across all groups and positively correlated with meat intake in young women and older men. In contrast to previous findings, no significant relationships were found between either measurement of acid excretion and bone mineral measurements in any age group, suggesting that our previous findings on the positive effects of fruit intake on bone could not be solely attributed to a higher alkali intake (hence a lower acid excretion). It is possible that other components of fruit may have a positive effect on bone mineral accrual and maintenance (e.g. vitamin C and other antioxidants).

Since acid-forming foods (dairy products, meat) have potential benefits for bone health at different life stages, strategies for improving dietary acid-base balance may be best served by promoting increased consumption of fruit and vegetables, rather than decreasing potentially acid foods.

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