Is acid-base balance important for bone health in postmenopausal women? Evidence from cohort and intervention studies in Aberdeen.

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The role of acid base balance in human health is well documented. Recently there has been renewed interest in how acid-base balance affects bone health with evidence mounting from cellular work, population studies and short-term intervention trials using alkaline salts of potassium. Osteoporosis-related fractures affect one in two women and one in five men over the age of 50 years in the UK; and with aging population demographics, dietary approaches to help prevent this disease are urgently required.

Initial studies carried out in Aberdeen, North East Scotland in 996 late premenopausal women showed that nutrients associated with fruit and vegetable intake were associated with increased bone mineral density [(1)]. More recently we showed that dietary acidity estimated from food frequency questionnaire was associated with reduced bone resorption in over 3000 early postmenopausal women [(2)].

In order to test in the long term (2 years) whether the beneficial effects of fruit and vegetables on bone health are because of the organic salts of potassium they provide that could help balance the excess acidity caused by consuming a Westernized diet, we recruited women from our well-characterised cohort to take part in an intervention study. Women were excluded from taking part if they were taking medication for their bones (bisphosphonates, hormone replacement therapy). However, women who were on thyroxine treatment were included provided their thyroid function was stable (as assessed by free T4 and TSH levels) and their dose had not changed in the past year prior to study entry. In the potassium citrate-placebo controlled double blind intervention, women were randomized to high dose potassium citrate, low dose potassium citrate or placebo. Women could also be randomized to a fourth arm involving consuming extra 3 portions of fruit and vegetables a day. This arm was blinded only to the researcher who analysed the data.

The four intervention groups were equally matched using minimisation criteria for gentoype VDR and APOE, in addition to smoking and subgroup participation. Women with the rare COL1A1 'ss' genotype were excluded. It is known that this genotype is associated with increased bone loss in women not taking HRT[(3)]. If these rare women were confined to one or two groups it could have a misleading impact on the outcome of the intervention study.

The study analysis has not yet been finalised and the treatment groups are still unknown at the present. However for a subset of women who provided 24 hour urine samples there was a significant difference by one way ANOVA between urinary potassium at 3 months, 6 months, 12 months, 18 months and 24 months, with no difference between the groups at baseline. Results from the intervention study regarding markers of bone health will be presented at the meeting.

References
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