



ABSTRACT

Dairy and Older People: evidence to support the policies

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National surveys of Western populations clearly show that the proportion of older adults (defined as >65 yrs) is increasing. In Ireland in 2011, older adults represented 11.4% (536,000) of the total population, this is estimated to increase to 22.4% (1.39 million) by the year 2041. With such profound shifts in population demographics, come the corresponding rises in the frequency of age-onset chronic diseases such as osteoporosis, cardiovascular disease and diabetes. Evidence suggests that adequate nutritional status is one of the factors that can delay the onset of such conditions and thus the improvement of diet quality in older adults could be a very cost effective health strategy. Apart from food groups such as lean meats (including meat, poultry and fish) and dairy, few of the foods that are frequently consumed by older adults provide enough of the protein and micronutrients required to maintain health.

Dairy consumption primarily comprises of milk, milk based products, yogurt and cheese and is considered an important provider of protein as well as vitamins and minerals including calcium, zinc, magnesium, vitamins A and D and the B-vitamins. However, each dairy component has varied micronutrient compositions; for example per 100g on average, whole milk contains 8 µg of folate, processed cheese contains 12 µg while plain yogurt contains 18 µg. Importantly, dairy products are the primary source of calcium across most industrialised countries including Europe, the USA and the UK. Furthermore, consumption of dairy products has been associated with a number of positive health outcomes including a lower risk of hypertension, improved bone health and a reduction in the risk of type 2 diabetes and metabolic syndrome. In one 12-yr follow-up analysis of the Framingham Offspring Study (n= 2,506; mean age 55 yrs), yogurt intake alone was positively associated with hip trochanter BMD and had a weak protective trend with hip fracture reduction. Yet despite the reported health benefits, intakes of dairy products are not meeting the recommendations of three servings per day. In the USA NHANES study (2005-2006), the mean daily dairy intake of milk and yogurt for all adults was just 1.02 servings. These reports are not surprising as the trend to reduce dairy

intakes has increased in recent years from a myriad of factors including health concerns over certain dairy components (e.g. saturated fatty acid); the decrease in family meal consumption and more recently, to meet climate change targets.

Few studies have investigated the consequences of these pressures on the dairy intakes of older adults and their subsequent effects on vitamin micronutrient status within this vulnerable sub-group. In addition little information exists on the associations of yogurt intake with bone health bio-markers and with measures of functionality. We examined these issues in data from the Trinity Ulster Department of Agriculture (TUDA) ageing cohort study. This was a large study of older Irish community dwelling adults (>60 yrs) designed to investigate nutritional factors, related gene-nutrient interactions and a range of health and lifestyle factors, in the development of chronic diseases of ageing. Community-dwelling participants were recruited between December 2008 and September 2012 with recruitment focused on three common diseases of aging: osteoporosis or hypertension or mild cognitive dysfunction. Participants were eligible for recruitment if they were aged ≥ 60 years, (without a diagnosis of dementia) but attending a hospital outpatients with any of the aforementioned three diseases. Their parents were required to be ethnically Irish. The mean total reported dairy intake was 1.16 (SD 0.79) portions per day with males consuming significantly fewer total dairy portions compared to females (1.07 vs 1.21 respectively) ($P < 0.05$). Overall, only 3.5% of the total population (n 151) achieved the recommended daily dairy intake of three or more servings per day. A significantly higher proportion of females (4%) compared to males (2.4%) met these dairy requirements ($P = 0.011$). Blood concentrations of vitamin B12 biomarkers, red cell folate, vitamin B2 and vitamin B6 were significantly worse in those with the lowest tertile of dairy intake (0-0.71 servings) compared to those in the highest tertile (1.50-4.50 servings) ($P < 0.05$). Total hip and femoral neck BMD in females were 3.1 - 3.9 % higher among those with the highest yogurt intakes (n= 970) compared to the lowest (n= 1,109; $P < 0.05$) as were the Timed Up and Go (TUG) scores (-6.7%; $P = 0.020$). This score reflects mobility and muscle function. In males, tartrate-resistant acid phosphatase (TRAP 5b) concentrations were significantly lower in those with the highest yogurt intakes (-9.5%; $P < 0.0001$). In females, yogurt intake was a significant positive predictor of BMD at all regions. Each unit increase in yogurt intake in females was associated with a 29% lower risk of osteopenia (OR 0.71; 95% CI 0.51 – 1.01; $P = 0.037$) and a 37% lower risk of osteoporosis (OR 0.63; 95% CI 0.44 - 0.91; $P = 0.014$) and in males, a 51% lower risk of osteoporosis (OR 0.49; 95% CI 0.25 - 0.94; $P = 0.032$).

The findings indicate that the majority of participants sampled (~96%) did not reach the recommended guideline intake of three servings of dairy per day, while we observed significant positive associations of increased frequency of yogurt intakes with bone health and measures of physical function. Females with the highest yogurt intakes had significantly higher BMD concentrations and better physical function scores compared to individuals with the lowest intakes. Furthermore, we show for the first time that, after adjustment for covariate predictors, each unit increase in yogurt intake significantly decreased the odds of being characterized as osteopenic or osteoporotic in both men and women. Dairy products (especially yogurt) are meaningful sources of micronutrients and contribute significantly to the B-vitamin and vitamin D biomarker status of older adults. Improving both dairy and yogurt intakes could be a valuable and cost-effective health measure for maintaining bone health and (ultimately possibly reducing fracture risk), In addition also providing a source of micronutrients and reducing frailty in older adults. They also highlight opportunities for the food industry in developing micronutrient rich, acceptable dairy products for the elderly consumer.