DAIRY PRODUCTS & BONE IN 2017

*From **health benefits** to **health economics***

SATELLITE SYMPOSIUM CERIN

Saturday March 25, 2017
WCO - IOF - ESCEO
Florence

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PROGRAMME

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Chairman: **René Rizzoli,**
President of the ESCEO Scientific Committee

Dairy products: facts and fantasy

Jean-Yves Reginster
Liège, Belgium

Dairy and older people: evidence to support the policies

Miriam Casey
Dublin, Ireland

Saving lives and resources by preventing osteoporotic fractures with dairy products

Mickaël Hiligsmann
Maastricht, the Netherlands

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ABSTRACT

Dairy products : facts and fantasy

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Fracture risk is determined by bone mass, geometry, and microstructure, which result from peak bone mass attained at the end of pubertal growth and from the amount of bone lost subsequently. Nutritional intakes are an important environmental factor that influence both bone mass accumulation during childhood and adolescence and bone loss in later life. Dairy products are rich in nutrients that are essential for good bone health, including calcium, protein, vitamin D, potassium, phosphorus, and other micronutrients and macronutrients. Numerous observational studies and RCTs have shown a favorable effect of dairy products on bone health during growth. In post-menopausal women and elderly studies show a significant inverse association between dairy food intake and bone turnover markers and a positive association with bone mineral content and strength. The association between dairy products and risk of hip fracture is less well established, since available data are only observational. RCT show that both calcium and vitamin D are needed to decrease fracture risk. There is a high prevalence vitamin D insufficiency in the elderly and dietary calcium is low in many postmenopausal osteoporotic women. Recent European consensus recommend adequate vitamin D intake of 800 IU/day as well as calcium intake of 1000 mg/day, dietary sources of nutrients being the preferred option .

Despite the established benefits for bone health, some people avoid dairy in their diet due to beliefs that dairy may be detrimental to health, especially in those with weight or digestion concerns, or trying to avoid cardio-vascular disease and cancer. Contrary to popular belief, meta-analyses of observational studies support the positive role of dairy for weight control, particularly during energy restriction. Lactose intolerant individuals may not need to eliminate dairy products from their diet: most of them can tolerate up to 12 g of lactose (240 ml of milk), and both yogurt and hard cheese are well tolerated. Dairy products do not increase the risk of cardiovascular disease or cancer when consumed at the recommended dose of 3 serving per day as a part of a balanced diet. Overall, the proven benefits of dairy foods on bone health greatly outweigh unproven harms.

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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

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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.

ABSTRACT

Saving lives and resources by preventing osteoporotic fractures with dairy products

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Calcium and vitamin D are essential to protect bone and prevent osteoporotic fractures. Fortified dairy products have been recommended as the preferred option to adequately supplement elderly patients with calcium and vitamin D (Kanis JA et al. Osteoporos Int 2013; 24(1):23–57). In addition to clinical evidence, assessing the public health and economic impact of fortified dairy products is important to help policy makers in evaluating and making decisions about preventive programs, especially in the context of limited health care resources. The aim of this presentation is therefore to provide insights about the public health and economic impact of dairy products.

The public health impact of an intervention (e.g. dairy products) could be measured in terms of clinical outcomes such as the number of fractures prevented, in the number of life years saved, or in the number of quality-adjusted life years (QALY), an outcome measure combining quality of life and quantity of life. In a recent study (*Hiligsmann et al. Osteoporos Int 2017;28(3):833-840*), the authors estimated using a simulation model the lifetime health impacts of the recommended intake of dairy products in the general French population over 60 years for 1 year (2015 in base case). The total lifetime number of fractures decreased by 64,932 for the recommended intake of dairy products in the general population over 60 years, of which 15,087 and 4413 hip fractures could be prevented in women and men respectively. This resulted in a gain of 29,169 life years and of 32,569 years in perfect health (QALYs).

To assess the economic impact of an intervention, economic evaluations are conducted with the aim to compare the costs and outcomes of two or more health interventions. The results of an economic evaluation are expressed in terms of incremental cost-effectiveness ratio (ICER) which is defined as the difference in cost between the intervention and the comparator divided by their differences in outcomes. An ICER represents the additional cost of the intervention per QALY gained. If the ICER is lower than a certain threshold (often considered to be equal at two times the Gross Domestic Product) representing the maximum decision

makers are willing to pay, the intervention is considered cost-effective. In the French study (Hiligsmann et al. Osteoporos Int 2017;28(3):833-840), the cost per QALY gained of appropriate dairy intake in the general population aged above 60 years was estimated at the border of efficiency (€58,244) and dairy products were highly cost-effective (ICER <30,000€ per QALY gained) in women over 70 years and in men over 80 years. Another study (*Ethgen et al. Osteoporos Int (2016) 27:301–308*) suggests that dairy products are highly cost-effective in patients aged over 65 years with an increased risk of fracture.

In conclusion, the use of vitamin D-fortified dairy products could substantially reduce the burden of osteoporotic fractures and seem to be an economically beneficial strategy. Decision makers should be aware of the benefits of calcium and vitamin D and could be interested to implement programs to increase the intake of dairy products. Clinicians should also take actions to improve the consumption of fortified dairy products by their patients.