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Health Benefits of Dairy

Scientific evidence supports the importance of milk and dairy products as part of a healthy eating pattern. Dairy foods are not only excellent sources of calcium, vitamins B2 and B12, high-quality protein and carbohydrates in the form of lactose, but also rich in magnesium, potassium, various fatty acids and vitamin D (in fortified products). People are generally aware of the benefits of milk and other dairy foods for bone and dental health, but more recently a large body of evidence has linked dairy intake also to other health benefits[1,2]. This may be linked to the unique combination of nutrients in dairy – the so-called dairy matrix – as the collective metabolic effects of whole dairy seem to be stronger than that of individual nutrients[3].

A number of systematic reviews and meta-analyses have shown that increased dairy consumption may protect against **weight gain and obesity**. A meta-analysis of 14 randomised controlled trials (883 participants) showed that including dairy products in weight-loss diets reduced fat mass and waist circumference and accelerated weight reduction, while increasing lean mass significantly more than conventional weight-loss diets.[4] Kratz et al.[5] conducted a systematic literature review of 16 observational studies investigating the relationship between the intake of dairy fat or full-fat dairy foods and obesity and **cardiometabolic disease**. In 11 of the 16 studies, full-fat dairy intake was inversely associated with measures of adiposity. The authors concluded that 'observational evidence does not support the hypothesis that dairy fat or full-fat dairy foods contribute to obesity or cardiometabolic risk'. Dror[6] performed a systematic analysis of 36 cross-sectional prospective cohort and intervention studies among pre-school children, school-age children and adolescents in developed countries to determine associations between dairy intake and adiposity. In adolescents, dairy intake was inversely associated with adiposity, while the association was not significant in school-age or pre-school children. Most recently, Lu et al.[7] reviewed 10 prospective cohort studies (46 011 children and adolescents) to investigate associations between dairy consumption and the risk for childhood obesity. The authors concluded that consumption of dairy products may promote lean body mass (which may lead to an increase in body mass index) while decreasing body fat.

Dairy may significantly reduce the risk of **type 2 diabetes** [2,8] and associated **cardiovascular disease**.[9] In a meta-analysis of 17 prospective cohort and case–control studies, Aune et al.[10] reported a significant inverse association between intakes of both dairy products and cheese, and the risk of type 2 diabetes. The meta-analysis of Gao et al.[11] included 14 studies to clarify the dose–response association of dairy intake and the risk of type 2 diabetes. They found an inverse, linear association between the risk of type 2 diabetes and the consumption of all dairy products (13 studies), low-fat dairy products (8 studies), cheese (7 studies) and yoghurt (7 studies). Similarly, Gijsbers et al.[12] included 22 cohort studies in their meta-analysis to quantify associations between diabetes and dairy foods at different levels, and concluded that the intake of total dairy, low-fat dairy and yoghurt specifically was inversely associated with diabetes risk.

The benefits of a diet rich in fruit, vegetables and low-fat dairy, together with reduced total and saturated fat intake, have also been demonstrated in the Dietary Approaches to Stop Hypertension (DASH) trial,[13] with about 50% of the reduction in **blood pressure** associated with the DASH diet ascribed to dairy consumption. Soedamah-Muthu et al.[9] performed a dose–response meta-analysis of prospective cohort studies in which they evaluated dairy intake and the risk of hypertension in 57 256 subjects, of whom 15 367 were hypertensive. The subjects were followed up for between two and 15 years. The analysis showed that intakes of total dairy, low-fat dairy and milk were all linearly associated with a lower risk of hypertension. With stroke being a major implication of hypertension, De Goede et al.[14] conducted a dose–response meta-analysis of the consumption of milk and other dairy products in relation to stroke risk. They included 18 studies, each with between 8 and 26 years of follow-up, and which represented 29 943 stoke events. Their findings showed that an increase of 200 g in daily milk intake was associated with a 7% lower risk of stroke. The protective effect of dairy with regard to stroke risk has also been confirmed in other meta-analyses.[15,16]

Mechanisms

Although various components in milk have been reported to potentially be responsible for health effects, the combination of nutrients in whole food makes it difficult to determine which single component is responsible for a specific observed effect. The dairy matrix may further also establish an effect that may not be seen with single nutrients.[3]

Mainly calcium and vitamin D have been studied for their effects on body weight and fat mass. A high calcium intake may lead to the calcium-mediated formation of insoluble soaps, which prevent fat absorption by binding bile acids.[17] Other milk components that may also have a favourable effect on body weight include dairy proteins (both casein and whey protein), which have been suggested to decrease visceral fat mass and body weight.[18] Whey seems to have an important role in lipid metabolism and muscle sparing, possibly owing to the high leucine. In addition, reduced lipogenesis and increased lipolysis may explain the favourable effect of dairy on weight and fat mass.

The prebiotic function of lactose may affect body weight favourably and subsequently also the comorbidities associated with overweight and obesity.[1,2,8] Prebiotic-mediated fermentation by gut microflora enhances the production of short-chain fatty acids, which, in turn, stimulate the release of intestinal hormones that influence hypothalamic neuronal activity involved in hormone-based satiety and appetite regulation.[19] Prebiotics may further influence the bacterial composition of the gut microbiota, which affects energy homeostasis and insulin sensitivity,[19] and fat storage and metabolism.

Hirahatake et al.[2] have highlighted the role of the incretin hormones GLP-1 and gastric inhibitory polypeptide (GIP) in maintaining glucose homeostasis. The effect of both these hormones is reduced in type 2 diabetes. Dairy – and especially lactose– may have beneficial effects on the gut microbiota, which may affect GLP-1 and GIP secretion. A beneficial effect of dairy on metabolic and inflammation markers relevant to type 2 diabetes and insulin resistance has been found in animal and human studies.[2,20] Components in milk that may be beneficial in reducing risk of diabetes include calcium, vitamin D and dairy fat, with specific reference to trans-palmitoleic acid.[8,17] Trans-palmitoleic acid may improve insulin secretion, triglyceridaemia and blood pressure.[2]

White dairy products (milk and yoghurt) are rich in protein and low in sodium, although yellow dairy (butter and cheese) may be higher in sodium. Dairy is also rich in minerals (calcium, magnesium, potassium and phosphorus), vitamins (riboflavin, cobalamin, vitamin D (in fortified milk), menachinones (depending on the bacteria used for fermentation of yoghurts and cheeses) and trace elements (iodine, selenium and zinc), which may contribute to a reduction in blood pressure individually or in combination.[21,22] As the association between dairy intake and blood pressure is stronger than that between only calcium intake and blood pressure, other components in dairy products are suggested to contribute to the positive effect of dairy on blood pressure regulation.[21] Bioactive milk peptides such as lactotripeptides are hypothesised to inhibit the action of angiotensin 1-converting enzyme (ACE), which stimulates blood vessel constriction, and so may contribute to the protective effect of dairy on blood pressure.[22] Finally, the high electrolyte content of dairy also contributes to a high beverage hydration index, which is considered to be an important benefit in maintenance of fluid balance[23].

Conclusion

Including milk and milk products in the diet is associated with better dietary quality. Most individuals who avoid milk do not consume recommended levels of calcium, potassium, vitamin D, and other nutrients. As shown in this review, there is extensive evidence that, as part of a balanced diet, daily consumption of dairy is beneficial to health.

References

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