

Role of dairy foods in weight management^{1,2}

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Milk and its products have formed part of human diets for several millennia. Because milk was a highly perishable commodity, the processing of milk by fermentation to produce cheese and yogurt was one of the earliest forms of food processing in which curds (rich in casein) were separated from whey. Milk was skimmed to yield cream or churned to produce butter. Now, the term *dairy* is widely used to describe milk, cream, cheese, and yogurt, but not butter, which is usually included with the oils-and-fats food group. Dairy products such as casein and whey proteins (rich in branched-chain amino acids) are also used as ingredients in many processed foods. Globally, milk production continues to increase, and dairy products are almost universally available in economically developed parts of the world. The demand for dairy is increasing, particularly in India and in China, a country where dairy consumption was formerly low. These emerging economies are now facing an epidemic of obesity and its major consequence, type 2 diabetes (1), so it is pertinent to consider the role of dairy in this context.

Food-frequency questionnaires, which are typically used in prospective cohort studies, are probably more robust for assessing dairy intake than for many other dietary components. A recent meta-analysis of prospective cohort studies (2) conducted as part of the review for formulating the Dietary Guidelines for Americans indicated that individuals whose diets contain more dairy are at a lower, rather than greater, risk of cardiovascular disease, especially stroke, and type 2 diabetes. Whether this is a true cause-effect relation or a consequence of residual confounding by other aspects of lifestyle (health consciousness) is uncertain. In the UK Low Income Diet and Nutrition Survey, dairy intake (milk, yogurt, and cheese) was found to have inverse associations with the consumption of sugar-sweetened beverages and to be associated with better overall food choices (3).

The role of dairy in weight management has a long history, and various hypotheses have been generated to suggest that dairy foods might promote weight loss. The high calcium in cheese might decrease fat absorption by promoting the formation of insoluble calcium soaps with fatty acids (4), but this effect has been shown to be trivial (5). A large amount of attention in the past decade was focused on conjugated linoleic acid (CLA) and its purported weight-loss effects. However, the intake of CLA provided by dairy is ~0.1 g/d, much less than the amounts (2–4 g/d) tested in weight-loss trials, which showed no convincing effects (6). More recently, branched-chain amino acids (valine, leucine, isoleucine), which are enriched in the whey fraction, have been proposed to have anabolic effects acting via the insulin-like growth

factor axis and mammalian target of rapamycin complex 1 signaling pathway (7, 8).

The numerous trials that have evaluated weight-loss properties of dairy have been subject to meta-analysis, but the quality of a meta-analysis is dependent on that of primary data, the accuracy of reporting, and the rigor of the peer review process in identifying bias. A meta-analysis by Arbgoue et al (9) concluded that an energy-restricted, dairy-based diet resulted in improved weight loss, increased fat loss, and an increase in lean body mass. That meta-analysis had a number of deficiencies, and there was substantial heterogeneity between trials. In the current issue of the *Journal*, a more rigorous meta-analysis (10) reviewed the findings from intervention trials with or without energy restriction that have compared weight loss and fat loss. The addition of dairy to diets promotes neither weight gain nor weight loss. However, energy-restricted diets containing dairy promoted weight loss but were not superior compared with other forms of caloric restriction.

Where does this leave us with regard to dietary advice on dairy for weight loss? Ice cream and cream are well-known indulgence products and have no place in weight-loss management except as occasional treats. There is no evidence to indicate that dairy fat has weight-reducing properties and additions of fat to food increase energy density, so butter, like other fat spreads, should be used sparingly. Cheese is more problematic because its high nutrient density is coupled with high energy density. Furthermore, reduced-fat cheeses have not enjoyed the same consumer acceptability as low-fat milk. Consequently, it remains sensible advice to limit full-fat cheese to ≤1 ounce (30 g) per day with energy-restricted diets and to limit the amount of cheese in processed foods such as pizza. Decreasing the fat content of milk and yogurt has a marked effect on their energy content with a minimal effect on that of other nutrients. For example, exchanging full-fat milk and yogurt for their 1% fat equivalents with an intake of 400 mL/d would decrease fat and energy intake by ~12 g and 100 kcal, respectively. Because of its high nutrient density, dairy can have an important role in ensuring nutritional adequacy of energy-restricted diets without resorting to dietary supplements.

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However, dairy consumption per se has no clinically meaningful effect on energy balance to promote weight loss.

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