Symposium: Dairy Product Components and Weight Regulation

Dairy Product Components and Weight Regulation: Symposium Overview

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The area of dairy product components and weight regulation is attracting increasing interest with the rapid rise in related publications. The collection of reviews and original research in this symposium add to our understanding and potential impact of dairy products on the incidence of obesity and insulin resistance.

Barr begins the symposium with a retrospective review of a number of dairy product and calcium supplementation trials conducted for reasons other than body weight or body composition (e.g., skeletal endpoints, blood pressure endpoints) (Barr 2002). This report exemplifies potential reasons that the relationship between calcium intake and changes in weight or body fat has not been previously observed. Calcium intake or calcium supplementation alone as the independent variable is unlikely to demonstrate the effects on weight because calorie intake must also be factored into the model. This is shown in the analysis by Lin et al. (2000), in which the relationship of calcium intake to changes in body fat is obscured unless calcium corrected for calories is used as the independent variable. In addition, many of the trials analyzed by Barr were completed in normal weight individuals whose weight was stable, given that these factors are often inclusionary criteria for studies designed with bone as the endpoint. The impact of calcium or dairy products may well be greatest in individuals whose adipocyte status is changing, such as during weight loss (Zemel 2002, Gentile et al. 2002), growth (Carruth & Skinner 2001) or age-associated weight gain (Lin et al. 2000, Davies et al. 2000, Jacqmain et al. 2001, Barger-Lux et al. 2001). Moreover, data presented by Lin et al. (2000) and Zemel (2002) demonstrate that, in the absence of caloric restriction, shifts in body composition may occur unaccompanied by measurable changes in body weight when dairy intake is increased in weight-stable individuals with increased dairy intake.

Also in this symposium, Teegarden reviews the current literature on the impact of calcium intake on body weight or body composition in clinical trials (Teegarden 2002). Zemel (2002) describes mechanisms whereby dairy products modulate adipocyte metabolism and obesity risk. Notably, dairy exerts significantly greater effects on adiposity than calcium alone. Although the bioactive constituent(s) responsible for this additional bioactivity remain the subject of speculation (Zemel 2002), components that may contribute include whey peptides with angiotensin-converting enzyme inhibitory activity (Zemel 2002), conjugated linoleic acid (Belury et al. 2002) and branched-chain amino acids (Layman 2002).

Belury (2002) reviews the literature and offers new data to describe the effects of conjugated linoleic acid (CLA) on body composition. Although these effects are significant, they are not attributable to the c9t11-CLA isomer, which predominates in dairy and other foods, but instead appear to be attributable primarily to t10c12-CLA isomer found in CLA supplements. Accordingly, the additional factor or factors in dairy that augment the effects of calcium in modulating body weight and composition are unlikely to include CLA. The relatively high concentration of branched-chain amino acids in dairy products may also contribute to the effects of dairy on the partitioning of dietary energy (Layman 2002). Layman (2002) reviews the literature to demonstrate the metabolic roles of leucine independent of protein synthesis, and to provide new data demonstrating that isocaloric substitution of protein (8% leucine) for carbohydrate augments weight and fat loss while sparing lean body mass in subjects on an energy-restricted diet. He offers the intriguing suggestion that by reducing the dietary carbohydrate to protein, the ratio from > 3.5 (the value that results from following current policy recommendations for protein, fat and, by default, carbohydrate) to ~ 1.5 may have a more favorable effect on body composition and metabolic risk.

Heaney (2002) analyzed the literature that describes clinical and epidemiological studies of calcium and/or dairy products on weight regulation and risk of the insulin-resistance syndrome. He provides a population perspective on the predicted impact of optimizing dietary calcium intake on shifting the curve that describes the distribution of body mass index in the U.S. population and reducing the prevalence of obesity. The variability in body weight and body composition explained by calcium intake or dairy consumption in the published trials is in some cases relatively small (0.03), consistent with the expected predominant influence of energy intake and expenditure. However, this small level does not reflect the substantial potential biological impact of increasing the population’s calcium intakes to 1000 mg/d. The elegant analysis presented by Heaney in this symposium suggests that increasing the U.S. population intake to 1000 mg/d may have dra-
matic effects in reducing the incidence of obesity (Heaney 2002).

In summary, the impact of calcium or dairy products on weight must be carefully analyzed. Clearly, calcium intake or dairy products are not a “magic bullet,” and energy balance remains the underlying cause of obesity and the metabolic syndrome. However, data suggest that both calcium and other dairy product components may contribute to alterations in metabolic partitioning of dietary energy, resulting in modulation of body weight, body fat and the insulin-resistance syndrome. Further research is necessary to confirm the effects in larger trials designed for this purpose, to identify subgroups or conditions in which these components are most effective, define effective doses, identify active components of dairy that may further contribute to the effects, and to more clearly identify the mechanisms of each effect. It will be very exciting to follow future studies in this area.

LITERATURE CITED