



Weighing in with Milk Products

This issue of *Nutrition File™ for Health Professionals* was based on the July 2003 issue of *Spotlight*, a newsletter written by the registered dietitians at Dairy Farmer's of Ontario.

Key Messages

- There is growing evidence that milk and milk products play an important role in weight loss and weight maintenance.
- The calcium in dairy products causes fat cells to decrease lipogenesis (make less fat), and increase lipolysis (burn more fat), by suppressing the hormone calcitriol.
- New research on the potential role of protein in weight loss indicates that the branched chain amino acids, especially leucine, stimulate muscle protein synthesis during periods of caloric restriction.
- There is no magic bullet. Total calories must be considered in any weight loss regime.

This issue of Nutrition File™ for Health Professionals was reviewed by Heather Komar, BSc, RD (Chinook Regional Health Authority); Dana Wilkinson, MSc, RD (University of Alberta) and Helen Bishop MacDonald, MSc, RD, FDC (Dairy Farmers of Canada). Their contributions are greatly appreciated.

There is no doubt we are in the midst of a worldwide obesity crisis.¹ In Canada alone the obesity rate more than doubled between 1985 and 1998, from 5.6 per cent to 14.8 per cent.² The direct cost of obesity in Canada is estimated to be over \$1.8 billion.³ Given what we know about the escalating rate of obesity and its astronomical societal costs, it is critical that we adopt strategies to curb its increase now.

Obesity is an extremely complex issue with multiple causes. Any long term solutions are likely to be equally complex. Yet, in simple terms the obesity issue comes down to energy intake outweighing energy expenditure.

There are numerous diets with claims of weight loss. A recent review of over 200 studies showed weight loss due to caloric restriction was independent of diet composition.⁴ Regardless of whether the diet was low or high in carbohydrate, protein or fat, the key was taking in fewer calories. Furthermore, new evidence suggests the calcium content of the diet can augment weight loss effects regardless of the macronutrient content of the diet. This issue of *Nutrition File™ for Health Professionals* explores the potential

of milk products and two of its key components – calcium and protein – in long term weight management.

Calcium

There is growing evidence of calcium's role in weight loss and weight management in both men and women.⁵⁻¹¹ The most compelling evidence is a randomized controlled trial by Zemel et al. at the University of Tennessee.⁵ The study indicated that increasing dietary calcium significantly accelerates weight and fat loss. This effect was greater when the calcium source was milk products than when it was an equivalent amount of calcium supplement. The study was conducted over 24 weeks and divided study participants into three groups: low calcium (the control group), high calcium (primarily supplements) and high milk products (three to four servings of milk products). All groups were given 500 fewer calories than they needed. The weight loss is summarized in Table One. There were significant differences in weight loss between the groups. Both high calcium groups lost more weight than the control group, however, when the calcium came from milk products the weight loss was greater.

Clearly, there is more at work here than just calcium.

Another study conducted by Zemel et al. among obese African Americans showed total body fat loss and abdominal fat loss in the high milk product group.¹² This occurred at the same caloric level and without weight loss. What is interesting to note is while there was no change in weight, there was a positive shift in body composition.

As for other studies

- In a new study of adolescent girls in Hawaii, Novotny found each serving of dairy products consumed was associated with a 0.9 mm decrease iliac skin fold thickness and a 0.5 kg decrease in weight.¹³
- Lin et al. found that participants in a two-year exercise intervention who had higher calcium intakes, especially from milk products, also lost the most weight and body fat.⁶ This effect was seen regardless of type of activity.

Table One


	Control Group	High Calcium (supplement)	High Calcium (milk products)
Weight Loss	6.4%	8.1%	10.9%

- Summerbell and her colleagues conducted a randomized controlled trial of weight loss in overweight outpatients. Weight loss with a diet containing three to four servings of milk was significantly greater compared to the control diet.⁷
- The Coronary Artery Risk Development in Young Adults (CARDIA) study concluded that increased milk product consumption was associated with decreased insulin resistance syndrome (including obesity) among overweight adults.⁸
- Heaney and colleagues reanalyzed data from six observational studies and three controlled trials designed to measure either bone mass or blood pressure. Again, the high calcium groups had a lower body weight compared to the placebo groups.⁹
- In one of the few studies in children, Carruth and Skinner showed that preschool children who had high intakes of milk also had the least body fat.¹⁰
- The Quebec Family Study showed that women in the low calcium group had higher Body Mass Indexes (BMIs), waist circumferences and total body and abdominal fat stores. In addition, calcium intake was negatively correlated to low density

lipoprotein (LDL) cholesterol and total cholesterol in both men and women.^{11,14}

So what is the mechanism of calcium in weight management? The theory is that a high calcium diet suppresses the hormone calcitriol (1, 25-dihydroxyvitamin D). In simple terms, this causes a decrease in lipolysis and an increase in thermogenesis. That is, calcium causes fat cells to make less fat and turn on their fat burning mechanism. A more detailed explanation is low calcium diets signal calcitriol to cause higher amounts of calcium to enter fat cells. This, in turn, causes lipogenesis and inhibits lipolysis. This mechanism seems to be heightened in times of energy restriction.¹⁵⁻¹⁷ In fact, a recent study by Melanson et al. showed an increase in calcium intake was associated with an increase in 24-hour fat oxidation.¹⁸

With the exception of the randomized controlled trial by Zemel et al.,⁵ most of the evidence to date is either epidemiological or a review of clinical trials designed to measure outcomes other than weight. This explains why recent reviews acknowledged the promising role of calcium despite inconsistencies in the results.^{19, 20} It is clear that several factors including the complexity of the mechanism responsible for the effects of calcium, its heightened



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effectiveness during times of energy restriction and the importance of total calories must be considered in future studies. However, the good news is the amount of milk products needed to see changes in weight corresponds to current recommendations by Health Canada of two to four servings a day. In addition, a high intake of calcium during weight loss is positive as it has the potential to offset any loss in bone mass that may occur.²¹

Protein

Overall, the newer protein research suggests that protein's role in losing and maintaining weight may have been overlooked.

Newer research on the potential role of protein in weight loss indicates a role for the branched chain amino acids leucine, valine and isoleucine. According to Layman et al. there is evidence that these amino acids, especially leucine, stimulate muscle protein synthesis during periods of caloric restriction, thereby maintaining muscle mass and enhancing our bodies' calorie-burning power.²² Rich food sources of leucine are milk products and eggs.

Does increased protein in the diet automatically mean a high fat diet? No. The new Dietary Recommended Intakes (DRIs) for protein states an acceptable level is between 10 per cent and 35 per cent of calories from protein.²³ This translates to between 68 and 175 grams of protein per day for a 2000 kcal diet.

A generally accepted explanation for why higher protein diets trigger weight loss has been that they promote a higher rate of energy expenditure (thermogenesis). A recent study in Brazil showed that there was no alteration in resting metabolic rate and a reduced or absent thermic effect of food independent of the macronutrient composition.²⁴ Eight studies lasting longer than two weeks showed mixed results for weight loss associated with a higher protein intake.²⁵ These inconsistencies indicate that the thermogenic effect of protein alone cannot be responsible for the weight loss attributed to the protein content of high protein diets. Furthermore, the effects of branched chain amino acids may have been overlooked.

Conclusion

While food is only one part of the obesity equation, the research on the role of calcium and protein rich milk products in weight management offers some promise. Developing concrete food strategies based on new research is a pioneering step in managing a complex issue and has the potential to curb rising obesity rates. More studies from the frontiers of weight research will help shape future prevention approaches.

Q & A

Q: What role do calcium-fortified beverages play?

A: Dr. Zemel considers calcium-fortified beverages as a drink with a supplement in it.²⁶ While they may boost overall calcium intake, they do not have the added bioactive components found in milk products; therefore, weight loss will not be as effective as with diets high in milk products.

Q: What kinds of milk products are more effective for weight loss?

A: A variety of milk, cheese and yogourt were used in Zemel's studies. The key was to eat three servings of milk products.

Q: How do you translate the protein-weight loss research to concrete dietary advice?

A: According to Dr. Layman, a higher protein weight loss diet would consist of:

- four servings of grains
- two servings of meat
- one serving of egg/nuts
- three servings of milk products
- five servings of vegetables
- three servings of fruit

For weight maintenance, have a protein rich food at each meal or snack.²⁶

On the Horizon

Two clinical trials are underway to better understand why milk products have a clear advantage over non-dairy calcium sources. Possible bioactive components in milk products include proteins such as whey.²⁷

In Your Practice

Ten Real Ways to Manage Your Weight

1. Jumpstart your morning with breakfast. Eating turns the heat up on your metabolism and helps keep calories in check.

How? Eat anything from cereal and milk to last night's leftovers.

2. Eat every three to four hours. This will keep your energy levels up and prevent you from overeating.

How? Having a small snack between meals is a great way to keep going throughout the day.

3. Power up with protein rich foods at each meal. It will curb your hunger and boost your body's calorie burning power.

How? Eat fish, chicken, meat, eggs, nuts, seeds, canned beans, milk, cheese and yogourt.

4. Take advantage of milk products. New research suggests milk products can be good for your waistline.

How? Eat three servings of milk and milk products every day. Yogourt, white or chocolate milk, cheese, pudding, soup made with milk, macaroni and cheese, pizza and lasagna.

5. Soak up eight to 12 cups of fluid every day. We need fluids to make up for the water that is lost by our bodies.

How? You can get fluids from water, milk, juice, soups, fruits and vegetables. Milk and juice do double duty as they are 87 per cent water and provide valuable nutrients.

6. Focus on fibre-rich foods. Fibre curbs your hunger by filling you up.

How? Choose fruits and vegetables, nuts, whole grains (e.g. brown rice, barley, or multigrain, rye or pumpernickel bread), high fibre cereal with more than four to five grams of fiber in each serving, dried figs or prunes, kidney beans, baked beans, black beans or boiled lentils.

7. Brighten up with vegetables and fruit. Vegetables and fruit are low in calories and a great way to balance your day.

How? Choose at least five (preferably eight) servings every day. Try different colours like apples, strawberries, cantaloupe, sweet potato, leafy greens, romaine lettuce, blueberries, and eggplant. Limit juice to one half to one cup a day as it is easy to rack up the calories.

8. Keep other foods in check. Foods like chips, chocolate and pop are OK to have once in a while. If you are having these foods every day, you may be packing in extra calories and missing out on valuable nutrients.

9. Move your body 30 to 60 minutes every day.

How? Walk the dog, walk at lunch, go biking or swimming or do household chores.

10. Strengthen your muscles two to four times each week. Muscle is an excellent calorie-burning machine.

How? Do abdominal crunches, lift hand weights, carry grocery bags or laundry baskets, take the stairs or walk up slopes.

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