

The Dairy and Weight Loss Hypothesis: An Evaluation of the Evidence

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ABSTRACT

Researchers have hypothesized that dairy products and calcium may aid in weight and body fat loss. The dairy product industry has widely publicized this potential relationship. We have reviewed evidence from 18 observational studies and 40 clinical trials that directly or indirectly assessed the effect of calcium supplementation and/or dairy product intake on body weight and body fatness.

In summary, dairy products and calcium are inconsistently inversely associated with body weight or fatness in observational trials, but in clinical trials neither dairy products nor calcium supplements reliably lowered body weight (4 out of 40 trials) or adiposity (4 out of 17 trials). In observational trials, higher dairy intakes were associated with other lifestyle factors known to predict weight or fat loss such as exercise level, soda consumption, total fat and fiber intake. Further, none of the longitudinal studies reported weight or fat loss over time; rather, positive studies showed smaller weight or fat gains.

Taken together, current evidence does not support the hypothesis that dairy or calcium consumption alone, or in conjunction with caloric restriction, will result in weight or fat loss in the short or long term. This finding raises concern about the potential public health impact of health and weight loss claims made by food advertisers based on hypothetical effects of food products or nutrients these products may contain.

INTRODUCTION

Some researchers have hypothesized that dairy products and calcium may assist in the loss of excess weight and body fat.¹⁻¹² Among proposed potential mechanisms is calcium modulation of circulating calcitriol, which, in turn, has been shown to affect lipolysis.^{4, 6-8, 10, 11} However, this hypothesis is contradicted by studies showing that dairy products may have no effect or even an adverse effect on body weight.¹³⁻¹⁸ This review evaluates evidence from observational studies and clinical trials that address the effect, if any, of dairy product intake or calcium supplementation on body weight and body fatness in children and adults.

REFERENCES

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OBSERVATIONAL STUDIES

In some, but not all, observational trials, intake of dairy products or calcium is inversely associated with body weight or fatness, although these studies generally showed no relationship with weight loss. Rather, associations, when observed, were with varying BMI values at a single time point in cross-sectional studies or with a higher or lower rate of gain in prospective trials.

Observational studies looking at calcium and body weight:

Of the nine observational studies investigating the relationship between calcium or dairy intake and BMI, weight, or change in body weight or BMI in adults, one cross-sectional study reported no association,³¹ three cross-sectional studies and one prospective reported an inverse relationship in some, but not all subpopulations,^{23-25, 37} and one cross-sectional study and three prospective studies reported an inverse relationship.^{19, 28, 29, 32} Of the nine observational studies in children and adolescents investigating the same relationship, one prospective study demonstrated a positive relationship,¹⁸ one prospective and one cross-sectional study showed no relationship,^{20, 26} and four cross-sectional, one case-control, and one prospective study showed an inverse relationship.^{21-22, 27, 30, 33}

Observational studies looking at calcium and body fatness:

As with body weight, the findings relating body fatness to dairy or calcium consumption have been inconsistent across observational studies. Of ten studies relating calcium or dairy intake to body fat in adults, adolescents, and children, one observed no relationship,²⁰ three showed an inverse relationship with some subpopulations or analyses, but no relationship with others,²³⁻²⁵ and five observed an inverse relationship.^{19, 26, 34-36}

CLINICAL TRIALS

With or without concomitant energy restriction, neither dairy products nor calcium supplements reliably lowered body weight or adiposity. Of 40 randomized trials assessing the effect of dairy products or calcium supplementation on body weight, 34 showed no effect, two demonstrated weight gain, and four showed weight loss.

Weight Loss Findings: Calcium or Dairy Supplementation without Energy Restriction:

At least 31 clinical trials observing the effect of dairy products (n = 12)^{15, 16, 17, 49-55, 72-73} or calcium (n = 19)^{54, 56-71, 75} the majority of which had bone health as primary endpoints but also assessed weight, BMI and/or body composition. Of the twelve dairy trials, three showed an increase in body weight with dairy supplementation,^{15, 16, 17} nine showed no difference in body weight or composition.⁴⁹⁻⁵⁵ Of the 19 calcium supplementation trials where the treatment did not affect caloric intake, changes in body weight or body fat were similar between groups in 18 studies, while one study found greater weight loss in the supplemented group (0.76 vs 0.32 kg/yr).^{13, 66}

Weight Loss Findings: Calcium or Dairy Supplementation with Energy Restriction:

Nine clinical trials have directly assessed whether dairy products or calcium supplements facilitate weight loss in the context of a reduced-calorie diet (two used calcium supplements, while seven studied the effects of dairy products or dairy products and supplements). **Table 1.** Six found no significant effect,^{41-45, 74} while three found a significant positive association between dairy and calcium and weight loss.^{46, 47, 72}

Fat Loss Findings:

None of the thirteen clinical trials that measured body fat in the absence of caloric restriction showed any difference in body fat change between high-dairy or high-calcium treatment and controls in adults^{14, 54, 63-65, 71, 72} or children and adolescents.^{49-51, 56, 60, 73}

Eight of the trials pairing calcium or dairy augmentation with caloric restriction also reported on body composition changes; four of these reported significantly greater fat loss between the high dairy consuming groups and low dairy groups in calorie-restricted overweight or obese adults^{45-47, 72} The remaining four studies found no difference between high and low-dairy or calcium consuming groups in loss of body fat.^{41, 43-44, 74}

Caloric Restriction Studies Using Calcium from Dairy Products or Supplements

Study	Subjects	Intervention	Outcome	Comments
Harvey-Berino 2004 ⁴¹	45 obese or overweight men and women	randomized to low or high dairy with caloric restriction and behavior modification	weight loss not different between low and high dairy groups (LD: 9.3 ± 5.4 kg HD: 9.9 ± 4.9 p=0.44)	See Note 3
Jensen 2001 ⁴²	62 obese pre and post menopausal women	1 g calcium supplement or not treatment along with low calorie diet for 3 mos	weight loss not significant from control (control = 6.2 ± 2.8 vs 5.4 ± 2.5 kg)	See Note 1
Bowen 2004 ⁴³	50 obese or overweight men and pre and post menopausal women	caloric restriction with protein from dairy or mixed sources for 12 wks	weight loss not significantly different between groups (9.0 ± 0.6 vs 9.3 ± 0.7 kg)	
Shapses 2004 ⁴⁴	100 obese or overweight pre and post	1 g calcium supplement or placebo weight loss program for 25 wks	weight loss not significant from control (control = 6.2 ± 0.7 vs 7.0 ± 0.7 kg)	
Zemel 2004 ⁴⁵	68 overweight or obese men and pre menopausal women	randomized to low dairy, high dairy or 800mg supplement for 12 wks with caloric restriction	weight loss not significantly different between groups (LD = 3.03 ± 0.62 HD = 4.7 ± 0.63 Supplement = 2.32 ± 0.87 kg)	See Note 1, 2
Thompson 2005 ⁷⁴	62 obese men and pre menopausal women	randomized to moderate, high dairy with fiber all with caloric restriction and behavior modification for 48 wks	weight loss not significantly different between groups (HD = 11.8 ± 6.1 HD fiber = 10.6 ± 6.8 Moderate = 10.0 ± 6.8 kg) p = 0.45	
Zemel 2004 ⁴⁶	32 obese men and pre and post menopausal women	randomized to low dairy, high dairy or supplement for 12 wks with caloric restriction	HD significantly greater than other groups (HD = 11.07 ± 1.63 LD = 6.6 ± 2.58 Supplement = 8.58 ± 1.60 kg; p < 0.01)	See Note 1, 2, 3, 4
Zemel 2005 ⁴⁷	34 obese men and pre and peri menopausal women	randomized to high or low dairy groups for 12 wks with caloric restriction	HD significantly greater than control (HD = 6.63 ± 0.6 Control = 4.99 ± 0.5 p < 0.01)	See Note 2, 3
Zemel 2005 ⁷²	29 obese african american men and pre and post menopausal women	randomized to high or low dairy groups for 24 wks with caloric restriction	HD significantly greater than control (HD = 11.02 Control = 5.95 p < 0.01)	See Note 2 Std Dev. Not reported

HD = high dairy LD = low dairy

Note 1 Gender breakdown between and among groups not reported.

Note 3 Weight loss seen is consistent with what might be expected based on a 500 kcal energy deficit.

Note 2 Baseline caloric intake nor change in energy intake is reported, making it difficult to determine whether differences in weight loss were due to the dairy or calcium treatment or differential compliance with the calorie-restriction protocol.

Note 4 Weight loss in control groups was lower than what might be expected based on a 500 kcal energy deficit.

DISCUSSION

The results from 24 observational studies are variable and inconclusive, but many suggest an inverse association between dairy or calcium and body weight or adiposity. In prospective studies, this has meant a decreased rate of weight or fat gain, rather than an increased rate of weight or fat loss, although the largest prospective trial showed dairy intake to be associated with significant weight gain. This divergence between findings from observational studies and clinical trials may be explained by associations between higher consumption of dairy products and dietary or lifestyle habits that aid in achieving and maintaining lower weights and body fat levels such as exercise, increased fiber or fruit and vegetable intake, decreased soda intake, etc.

Accumulated evidence from randomized clinical trials indicates that neither dairy products nor calcium supplements reliably facilitate weight loss. Of 40 clinical trials, two demonstrated an increase in body weight with a dairy treatment,^{15, 16} three small trials demonstrated a differential weight loss with calcium supplements and dairy products when paired with a calorie-restricted diet.^{46, 47, 72} Of these three trials conducted by Zemel and colleagues, neither baseline caloric intake nor change in energy intake is reported making it difficult to determine whether the differences in weight loss observed were due to the dairy or calcium treatment or differential compliance with the calorie-restriction protocol. Numbers of males and females in one study were not reported in each of the treatment groups as well which is important as men and women lose weight differently and could bias results. Additionally, as Barr notes in a review on the topic of dairy and weight loss, "It would be naive to expect that subjects randomized to increase their intake of dairy products would simply add these to their customary diets, without compensating in some way for the additional energy content provided by the dairy foods".¹³ One other weight loss study showed a greater weight loss with supplemental calcium in the absence of caloric restriction.⁶⁶ The remaining 34 showed no significant effect of dairy or calcium on body weight with or without caloric restriction. Of 21 trials studying the effect of calcium on adiposity, four reported a greater fat loss with high versus low dairy or calcium treatments,^{45-47, 72} while 17 did not.

These trials demonstrate that increasing dairy product intake does not consistently result in weight or fat loss with or without caloric restriction and may have the opposite effect.