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The new power
of calcium

Jungbunzlauer

presents

an exclusive report on how calcium can fight obesity

The new power

Various studies over the last years have shown that increased calcium uptake can significantly fight overweight and obesity. **Dr Gerhard Gerstner** from Jungbunzlauer Ladenburg GmbH, a leading manufacturer of highly bioavailable organic calcium salts used in food and pharmaceuticals, looks at the facts

The recommended daily intake of calcium (1,000 mg/day) has been set to meet the requirements of bone health and the prevention of osteoporosis. Beyond it, calcium plays an essential role in numerous other vital functions such as regulation of cell membrane fluidity and permeability, nerve conduction, muscle contraction and blood clotting. Calcium has anti-hypertensive properties and the consumption of calcium in sufficient amounts may reduce the risk of colon cancer.

Anti-obesity effects of calcium

However, it is only recently that the anti-obesity effect of dietary calcium has been discovered. Although observations showing an inverse relation between calcium intake and obesity have been published since the end of the 1980s, the idea only became popular in the scientific community after the studies from Zemel¹ and co-workers had been published. This publication was based to a great extent on investigations in obese and insulin resistant mice (the so-called mutant 'agouti mouse') and led to an intensive re-examination and extended interpretation of data from several epidemiological studies².

These studies showed a significant inverse relationship between calcium consumption and body weight, the body mass index (BMI). Positive results were independent from whether calcium intake itself was estimated in the respective study or milk was taken as a measure of calcium intake. The anti-obesity effect of calcium has been demonstrated in black and white people and in both sexes, although the strongest effects occurred in white women and black men.

Further evidence came from clinical studies (six observation studies and three controlled intervention trials), of which the primary focus was the calcium effect on bone mass, from studies relating nutrient intake to body composition and from recent controlled intervention trials explicitly testing the calcium effect on body weight, fat and the efficacy of weight reduction diets.

These studies consistently revealed, that a high calcium intake in childhood and adulthood as well as supplemental calcium is asso-

ciated with a lower body weight (or BMI), less body fat due to a shift from fat to lean body mass and a slower age-dependent weight gain in midlife. Furthermore, calcium increased the efficacy of energy-reduced weight reduction diets.

And last but not least, all studies together show that calcium has its own anti-obesity effect that is independent of other components of the diet.

Only a small number of animal and human studies did not support the idea of an anti-obesity effect of dietary calcium.

In human studies for example, the administration of 1g/day 'extra calcium' increased weight and fat loss only non-significantly in 100 pre- and post-menopausal women following an energy-restricted diet over 25 weeks³.

Table 1: Effect of a 300mg (one serving) increment in regular calcium intake on body weight and body fat

GROUP	BODY WEIGHT	BODY FAT
Children		-1.0kg ³
Young women	-2.5 kg ⁴	
Adult women	-3.0 kg ¹	
African American men		-4.9 ⁵

Quantitative aspects

A quantitative re-analysis of the data from Davies and Heaney⁴ revealed, that calcium intake accounted for approx. 3% of the variation in BMI in young women and that each 100 mg increment in daily calcium intake would decrease average BMI by 0.3 kg/m². As summarised in Table 1, other studies showed even greater effects in adults.

The actual relevance of these effects becomes evident if population means for weight, BMI or body fat as prime indicators for obesity or overweight are considered.

Here are some important examples:

- In young women, an increase in calcium intake by 600 mg/d from 500 to 1,100 mg/d caused a drop in mean BMI of 1.8 kg/m² (-8%), and decreased the predicted prevalence of overweight (BMI>26 kg/m²) substantially by 78% from 17 to 4% and the prevalence of obesity (BMI>30 kg/m²) by 84% from 1 to 0.2% of that age group⁷.

- Midlife weight gain decreased by 97% from 0.4 kg/y to 0.01 kg/y comparing women at the low end of calcium intake with those at recommended calcium intake⁸.

- One additional serving of calcium per day (300 mg) leads to 3.5-4.5% less body fat in pre-school boys and girls (body fat 18% to 21%), which is equivalent to a drop of 20%⁹.

of CALCIUM

Mechanism

How does calcium work? Although the physiological or cell biological basis for the changes in body weight and body fat have not fully been elucidated fully, there are three main theories.

The most important hypothesis has been developed by Zemel and co-workers¹, which is based largely on experiments in the aforementioned obese agouti mutant mouse. According to this hypothesis, increased circulating calcium due to the consumption of relative large amounts of dietary calcium decreases serum concentrations of the hormones PTH (parathyroid hormone) and calcitriol, which in turn down-regulates the calcium influx into our bodies fat cells, the so-called adipocytes.

Decreased adipocyte intracellular calcium stimulates fat degradation and fatty acid oxidation. All these effects result in decreased adipocyte lipid accumulation, weight and body fat reduction and an overall shift of dietary energy from fatty ('adipose') tissue to lean body mass.

Another mechanism may be, that the divalent cation calcium prevents the intestinal absorption of part of the dietary fat and increases faecal lipid loss and sterol excretion forming insoluble fatty acid soaps and bile salts^{9,10}. By the same mechanism calcium may enhance the cholesterol-lowering effect of plant sterols¹¹.

A third possible mechanism, which may slightly contribute to weight reduction as well, has recently been published¹². In a randomised, blind, controlled cross-over study with 11 overweight or obese subjects (mean BMI 31 kg/m²) consumed isocaloric high and low dairy calcium breakfasts followed by a very low calcium standard lunch.

High calcium intake did not affect hunger and satiety immediately after meal, but did significantly reduce spontaneous food intake over the subsequent 24h.

Conclusion

Although the contribution of the different mechanisms to the overall anti-obesity effect of calcium is not clear, there is much evidence from animal and human studies, that a high-calcium diet and/or calcium supplementation decreases body weight and fat.

High calcium uptake can be attributed to an increased lipolysis and fatty acid oxidation and to a lower intake of digestible energy caused by increased faecal lipid loss and (possibly) a reduction in food and energy intake. These positive effects can be achieved by a diet rich in calcium and also by consuming calcium supplements and calcium fortified food, paving the way for new nutritional concepts to fight obesity.

● INFORMATION

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One in three women and one in eight men over the age of 50 are affected by an enhanced bone fragility and an increased fracture risk. Additionally, increased uptake of calcium is currently discussed as one effective mean to fight another important disease: obesity.

Dr. Gerhard Gerstner is senior technical service manager for the Swiss-based food ingredients company Jungbunzlauer. He is also the technical service contact for Jungbunzlauer's portfolio of organic, highly bioavailable calcium salts such as tricalcium citrate, calcium gluconate and calcium lactate gluconate which are produced in a dedicated facility in Ladenburg, Germany.

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power of
Calcium

We provide highly bioavailable organic calcium sources for your applications

- TRICALCIUM CITRATE
- CALCIUM GLUCONATE
- CALCIUM LACTATE GLUCONATE

* On top of promoting bone health recent studies have shown that increased calcium uptake can significantly fight overweight and obesity.

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