

CALCIUM SUPPLEMENTATION & EFFECTS

Calcium Citrate and Calcium Carbonate

At Bariatric Fusion, we use a mixture of both calcium citrate and calcium carbonate in our Complete Chewable Multivitamin. While some evidence indicates that absorption of calcium citrate may be better than calcium carbonate in the absence of food and in the presence of low stomach acid in the gastric bypass¹, a paucity of comparative studies exist for the sleeve gastrectomy or adjustable band. According to the American Society for Parenteral and Enteral Nutrition (ASPEN)², calcium carbonate is well absorbed and tolerated when taken with food. For all my bariatric patients (gastric bypass, sleeve gastrectomy, or adjustable band), I always recommend that vitamin and mineral supplements be taken with some sort of food or protein supplement to reduce adverse symptoms of GI distress sometimes associated with supplement intake after surgery. This also assists with the absorption of calcium in both forms. It has always been the philosophy of Bariatric Fusion® to influence positively patient compliance with their vitamin and mineral intake after bariatric surgery by making a product that is affordable, pleasant-tasting, and easy to take. Unfortunately, research shows poor compliance of supplement intake after surgery even when patients are well-educated about their importance.³ Since calcium carbonate contains more elemental calcium than calcium citrate (40% versus 21%), this enables Bariatric Fusion® to provide a single multivitamin/multi-mineral product that provides adequate amounts of micronutrients, thereby improving patient compliance. Vitamins and minerals, no matter which form they are in, only work if patients take them.

What is the take home message to bariatric health care providers? To really ensure patients are adequately nourished after bariatric surgery, health care providers should reinforce the importance of regular follow up visits and review of lab work.

What is the take home message to bariatric patients? Continue toward your healthful goals by following your bariatric nutrition protocol, take your vitamins and minerals every day, exercise, and go to your follow up visits with your bariatric health team.

1. Tondapu P, Provost D, Adams-Huet B et al. Comparison of the absorption of calcium carbonate and calcium citrate after Roux-en-Y gastric bypass. *Obes Surg.* 2009;19:1256-1261.
2. Straub DB. Calcium supplementation in clinical practice: A review of forms, doses, and indications. *Nutr Clin Pract.* 2007; 22:286-296.
3. Warde-Kamar J, Rogers M, Flancbaum L, Laferrere B. Calorie intake and meal patterns up to 4 years after roux-en-y gastric bypass surgery. *Obes Surg.* 2004;14:1070-1079.



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Absorbability and Cost Effectiveness in Calcium Supplementation

J Am Coll Nutr. 2001 Jun;20(3):239-46
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BACKGROUND: Cost-effectiveness of calcium supplementation depends not only on the cost of the product but on the efficiency of its absorption. Published cost-benefit analyses assume equal bioavailability for all calcium sources. Some published studies have suggested that there are differences in both the bioavailability and cost of the major calcium supplements.

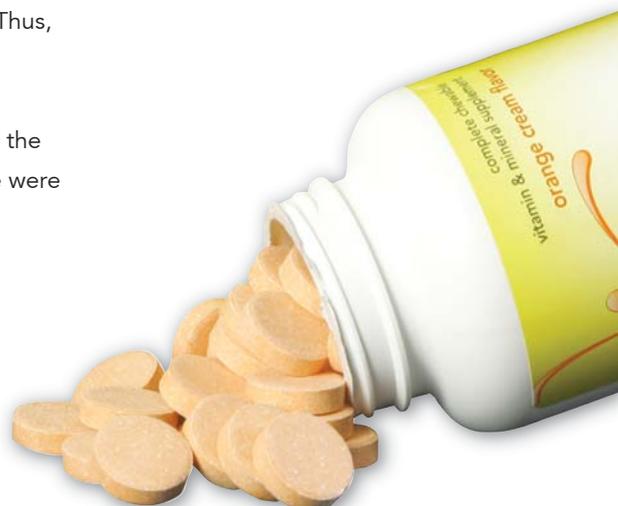
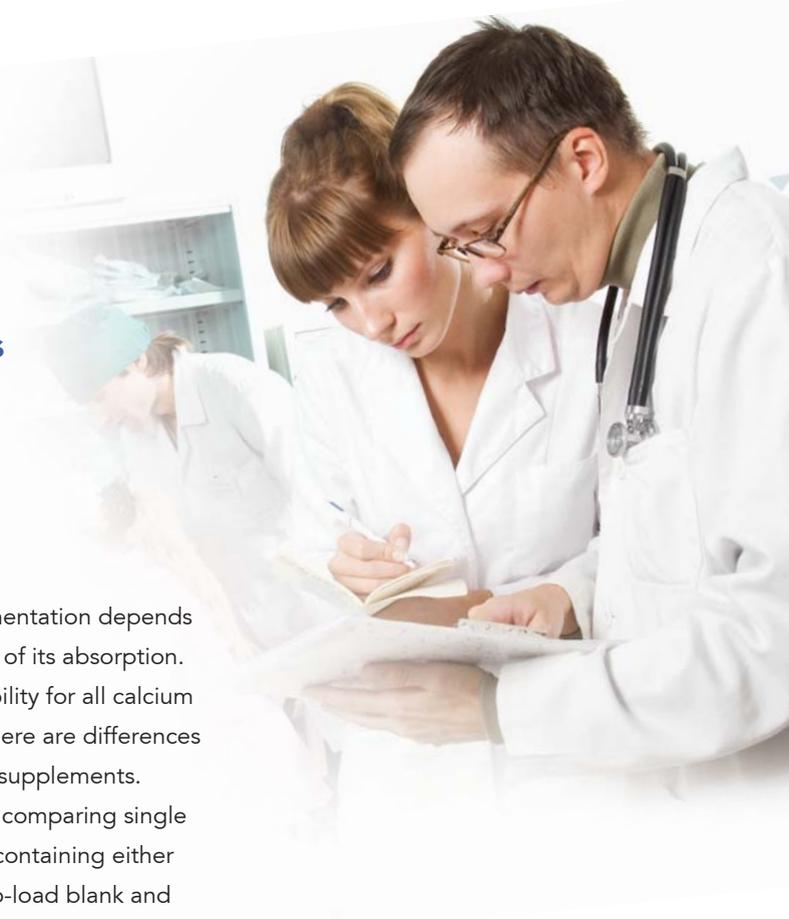
DESIGN: Randomized four period, three-way cross-over comparing single doses of off-the-shelf commercial calcium supplements containing either calcium carbonate or calcium citrate compared with a no-load blank and with encapsulated calcium carbonate devoid of other ingredients; subjects rendered fully vitamin D-replete with 10 microg/day 25(OH)D by mouth, starting one week prior to the first test.

SUBJECTS: 24 postmenopausal women

METHODS: Pharmacokinetic analysis of the increment in serum total and ionized calcium and the decrement in serum iPTH induced by an oral calcium load, based upon multiple blood samples over a 24-hour period; measurement of the rise in urine calcium excretion. Data analyzed by repeated measures ANOVA. Cost calculations based on average retail prices of marketed products used in this study from April through October, 2000.

RESULTS: All three calcium sources (marketed calcium carbonate, encapsulated calcium carbonate and marketed calcium citrate) produced identical 24-hour time courses for the increment in total serum calcium. Thus, these were equally absorbed and had equivalent bioavailability. Urine calcium rose slightly more with the citrate than with the carbonate preparations. But the difference was not significant. Serum iPTH showed the expected depression accompanying the rise in serum calcium, and there were no significant differences between products.

CONCLUSION: Given the equivalent bioavailability of the two marketed products, the cost benefit analysis favors the less expensive carbonate product.



Surgery for Obesity and Related Diseases

Official Journal of the American Society for Metabolic and Bariatric Surgery, September/October 2008

American Association of Clinical Endocrinologists, The Obesity Society, and the American Society for Metabolic & Bariatric Surgery Medical Guidelines for Clinical Practice for the Perioperative Nutritional, Metabolic, and Nonsurgical Support of the Bariatric Patient

"Minimal nutritional supplementation includes 1ñ2 adult multivitamin-mineral supplements containing iron, 1200ñ1500mg of calcium, and a vitamin B-complex preparation." pS121

The Levels of Calcium and Zinc that Are Found Naturally in Foods or in Calcium-Fortified Foods Do Not Affect Iron Absorption

Drs. Penelope Nestel and Ritu Nalubola

"Iron and Calcium's inhibition of absorption however, has not been found in long-term (6 months or longer) intervention studies. [3,4] **An adaptive response, possibly involving an up-regulation in the efficiency of iron absorption, may prevent prolonged inhibition of iron absorption or the development of inadequate iron status when supplemental doses of calcium are taken. [3,6]** The inhibitory effect of calcium on iron absorption has not been observed with calcium fortification or naturally occurring calcium in foods."

Effect of calcium supplementation on daily nonheme-iron absorption and long-term iron status

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"The long-term effect of consuming calcium supplements with meals (1200 mg Ca/d) on body iron (functional and storage iron) was investigated in 11 iron-replete adults over a 6-mo period. An unsupplemented control group (n = 13) was also monitored to correct for any seasonal changes in the biochemical measurements. **There were no changes in any of the hematologic indexes, including hemoglobin, hematocrit, zinc protoporphyrin, and plasma ferritin resulting from the calcium supplementation. The results clearly show that long-term supplementation with calcium did not reduce plasma ferritin concentrations in iron-replete adults consuming a Western-style diet containing moderate to high amounts of calcium in most meals.**"



Calcium absorption and achlorhydria (no stomach acid)

RR Recker

"Defective absorption of calcium has been thought to exist in patients with achlorhydria. I compared absorption of calcium in its carbonate form with that in a pH-adjusted citrate form in a group of 11 fasting patients with achlorhydria and in 9 fasting normal subjects. Fractional calcium absorption was measured by a modified double-isotope procedure with 0.25 g of calcium used as the carrier. Mean calcium absorption (+/- S.D.) in the patients with achlorhydria was 0.452 +/- 0.125 for citrate and 0.042 +/- 0.021 for carbonate (P less than 0.0001). Fractional calcium absorption in the normal subjects was 0.243 +/- 0.049 for citrate and 0.225 +/- 0.108 for carbonate (not significant).

Absorption of calcium from carbonate in patients with achlorhydria was significantly lower than in the normal subjects and was lower than absorption from citrate in either group; absorption from citrate in those with achlorhydria was significantly higher than in the normal subjects, as well as higher than absorption from carbonate in either group. Administration of calcium carbonate as part of a normal breakfast resulted in completely normal absorption in the achlorhydric subjects. These results indicate that calcium absorption from carbonate is impaired in achlorhydria under fasting conditions. Since achlorhydria is common in older persons, calcium carbonate may not be the ideal dietary supplement."

All research presented in this document was done by independent researchers with no input nor feedback from Bariatric Fusion.

