

## Women Who Took AlgaeCal Plus and Strontium Boost (AC) for 7 Years Showed Continually Increasing Bone Density, Plus Safety

A 7-Year Longitudinal Trial of the Safety and Efficacy of a Vitamin/Mineral Enhanced Plant-Sourced Calcium Supplement.  
*J Am Coll Nutr.* 2016. PMID: [26885697](https://pubmed.ncbi.nlm.nih.gov/26885697/).



This study showed women in their mid-60's gained 7.3% more bone over 7 years – and that it happened in a linear fashion with about 1% added per year. Safety was well established by a panel of 45 blood chemistries drawn at baseline and ending. This is significant given recent studies suggesting traditional calcium supplements may increase cardiovascular risks.

### Study Overview

#### Objectives

To examine the safety and efficacy of a vitamin–mineral enhanced plant-sourced calcium AlgaeCal calcium (AC) in female consumers who had taken the supplement from 1 to 7 years.

#### Methods

The Integrative Health Technologies, Inc. (IHTI) database was searched to identify healthy female adult women who reported:

- that they had purchased and used AlgaeCal (AC) for one to 7 years
- had completed at least one DEXA total body scan, had not been taking bisphosphonates or other bone building medications, and could verify how much of the AC supplement they purchased and consumed

Only subjects who completed at least one DEXA BMD test at any time during the past 7 years were contacted and asked if they would volunteer to complete another complimentary BMD test and allow us to use redacted data. A total of 172 baseline-ending comparisons were acquired. BMD data were obtained from 3 databases: Centers for Disease Control (CDC), GE Lunar Norms, and the IHTI longitudinal database.

In order to establish a control group, data were obtained from the same IHTI database of women who consumed a variety of dietary supplements other than AC over the same 7-year period of time. To approximate age-matching, a percentage of subjects of each age was calculated for the AC group. This same percentage of women of this age was then selected from the database and as a result a total of 2540 age-matched women were incorporated into this control group compared to 172 in the AC group.

To assess safety, 125 AC subjects who had completed at least one of the 45-measurement blood chemistry panels were contacted to complete a complimentary second blood test in return for using their data. Comparisons were made with an aged-match group of females in the IHTI database ( $N = 5070$ ) who had completed the same blood chemistry panels one to 4 years apart and had been regularly using dietary supplements, including calcium supplements, other than AC.

### Results

#### Efficacy

To calculate expected average annualized changes in BMD for women, data were obtained from the 3 different databases, as noted above:

- CDC database of 8238 women aged 30 to 80 reflects an average annual decline of  $-0.51\%/y$ .
- GE Lunar's database of 1313 women aged 30 to 79 reflects an average annual decline of  $-0.42\%/y$ .
- IHTI longitudinal database of 16,289 women aged 20 to 75 reflects an average annual decline of  $-0.35\%/y$ .

An additional comparison was also made between the AC group and the 2540 age-matched subjects taken from the IHTI database for the same 7-year time period. In contrast to the 7.3% increase found in the AC group, the age-matched non-AC group had a consistent linear decline of  $-8.5\%$ —a difference of 15.8% between the 2 study groups.

## ***Discussion***

Population-based longitudinal studies and other studies suggest:

- starting at age 40, there is minor, but significant, annual bone loss after which the decline remains about 1%
- after midlife there is an age-related yearly loss of bone of 1%, which is accelerated to 2% for up to 14 years around the age of menopause
- that women will lose 35% to 39% of bone after achieving peak bone mass at ages 30–40 years, after which the decline remains about 1%.

As with the previous short-term studies of AC, the data from this study stand in marked contrast to age-related expected changes in BMD. The data suggest that consumption of the AC supplement over the 7-year study period resulted in a significant, consistent, and generally linear increase in BMD. These findings were observed in within-group changes from baseline as well as in the expected between-group comparisons in each of the 3 individual databases as well as in the combination of all 3 databases. Additionally, the comparisons with an age-matched group of women who were regular users of dietary supplements other than AC also revealed a marked contrast with these AC data.

Calcium supplementation is often prescribed with bisphosphonates because, as the National Osteoporosis Foundation points out, osteoporosis medications do not work without calcium and vitamin D. As a result, questions have been raised as to whether or not 3- to 5-year use of calcium has similar long-term decrements in efficacy and safety. The progressive and linear increases in BMD found in each year of the 7-year study and the absence of adverse effects on blood chemistries discussed below appears to attenuate some of these concerns.

These results also stand in contrast to the adverse effects and decrements in efficacy that have been reported with the 3- to 5-year use of bisphosphonates. For example, there is evidence that 3- to 5-year use of bisphosphonate is associated with:

- atypical fractures of the femoral shaft
- risk of these fractures increasing progressively with the duration of use and that treatment with oral bisphosphonates, which may do more harm than good
- other studies that led to heightened interest in interrupting or stopping bisphosphonate therapy after several years of treatment, a recommendation for a “drug holiday”.

## ***Safety***

The primary safety measure used in the study was to assess changes from baseline in a 45-measurement blood chemistry panel to address concerns suggesting that consumption of calcium supplements may have adverse cardiovascular effects. Comparison of lipid changes from baseline between the AC group and non-AC group for 4 years showed:

- the non-AC group had a greater reduction in total cholesterol (TC) than the AC group
- the AC group had a statistically significant increase in high-density lipoprotein (HDL) compared to the non-AC group
- once HDL is removed in the non-HDL cholesterol measurement, the TC measurements for each group are virtually identical
- no statistically significant differences were found between baseline-ending changes in low-density lipoprotein or triglycerides
- additional comparisons were made between serum glucose levels and CRP with greater reductions found in the AC group

Analyses of the remaining blood chemistry measurements found:

- no changes in the test 1 ranges for 91.1% of the non-AC group and 93.1% of the AC group
- no statistically significant differences found between the 4.14% of non-AC subjects and the 4.36% of AC subjects who were normal at baseline but became abnormal on the ending test
- no significant differences between the 4.70% and 2.56% of subjects who were abnormal at baseline but became normal on the ending tests

## ***Discussion***

A concern regarding safety is the potential long-term adverse cardiovascular effects of calcium supplementation reported in some studies. These researchers concluded that calcium supplements, with or without vitamin D3, are associated with modest increases in risk factors of cardiovascular disease. Though the data that were the subject of this controversy were acquired over multiple decades, it is worth noting that no adverse effects were found in any of the lipid measurements acquired over this 7-year study period.

Future research needs to explore which of the ingredients or interactions between these ingredients, in the AC supplement contribute to the reversal of age-related declines in BMD. There are data suggesting that:

- each of the ingredients contained in the AC formula can support BMD, most notably strontium citrate

- because AC contains a plant-sourced form of calcium, plant-sourced vitamins and minerals may be more easily absorbed than non-plant-sourced forms
- whereas the body was able to absorb only 10% of synthetic minerals contained in many brands of multivitamins, over 80% of minerals derived from plant sources were typically absorbed
- other studies have also reported positive associations between fruit and vegetable consumption and BMD in 5 age- and sex-matched cohorts, during the menopausal transition in elderly adults, adolescents, and prepubertal children

### Study Strengths

- use of a pragmatic clinical trial to obtain data under real-world conditions – data were collected from consumers who had purchased and used the product during the study periods without their awareness that their data would be used in a clinical trial
- verifying consumer reports of product usage with the retailer from whom they purchased the product
- using only subjects who were not taking bisphosphonates or bone-building pharmaceutical products
- the 7-year duration of the study with data for each of the 7 years
- comparisons with a similar large ( $N = 2520$ ) age-matched control group who were regular users of dietary supplements other than AC
- comparisons with expected changes derived from a combination of 3 large independent databases ( $N = 25,885$ ), and the use of the same DEXA technology and technicians for baseline and ending measurements
- study provides previously unreported data on annual changes in bone density in a large ( $N = 16,289$ ) national sample of women between the ages of 20 and 90 over a 30-year period of time, very few of whom were taking bone health medications, which could be useful in estimating expected or normative changes

### Study Weaknesses

- the non-representativeness of the study sample notwithstanding the fact that subjects resided in multiple states throughout the United States
- the absence of a randomized controlled trial or placebo group for comparisons is another weakness, however, it should be noted that getting subjects to enroll in a 7-year study with a 50–50 chance of receiving a placebo poses a major challenge and may even raise some ethical issues

### Conclusions

This 7-year study of consumers who had taken the AC supplement was designed as a Practical Clinical Trial (PCT) in which safety and efficacy are studied under conditions as close as possible to the conditions under which consumers are likely to purchase and use the product.

The evidence suggests that:

- taking the AC supplement was associated with a significant, annual, and generally linear increase in BMD of 1.04% per year, 7.3% over the 7-year study period
- these results stand in marked contrast to normative or expected changes of  $-0.4\%/y$  from 3 different databases and a combination of all 3 databases ( $N = 16,289$ )
- AC supplement facilitated an increase, not a decrease, in age-related BMD
- no evidence was found in cardiovascular risk as measured by adverse changes in blood lipids
- no evidence found of a diminished efficacy over the 7-year study period, with data suggesting that the gains in BMD were consistent and linear over the 7-year study period
- confirms earlier short-term studies suggesting that this supplement can facilitate significant increases in total body BMD in contrast to studies suggesting that calcium supplements can only slow down age-related declines in BMD

### Denotation

AC: AlgaeCal Plus with Strontium Boost