

## The Calcium Controversy

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A recent study found that calcium supplementation in healthy postmenopausal women is associated with upward trends in cardiovascular event rates. (Bolland, Barber et al. 2008)

The same author published a meta-analysis that found calcium supplements (without co-administered vitamin D) are associated with an increased risk of myocardial infarction. (Bolland, Avenell et al. 2010)

A population-based, prospective study of Swedish men with relatively high intakes of dietary calcium and magnesium showed that intake of calcium above that recommended daily may reduce all-cause mortality. (Kaluza, Orsini et al. 2010)

### Calcium with Vitamin D

The Women's Health Initiative found that calcium/vitamin D supplementation neither increased nor decreased coronary or cerebrovascular risk in generally healthy postmenopausal women over a 7-year use period. (Hsia, Heiss et al. 2007) (LaCroix, Kotchen et al. 2009)

### Magnesium

The Atherosclerosis Risk in Communities Study found that dietary magnesium intake was marginally inversely associated with the incidence of ischemic stroke. (Ohira, Peacock et al. 2009)

A study of Finnish male smokers found that a high magnesium intake may play a role in the primary prevention of cerebral infarction. (Larsson, Virtanen et al. 2008)

A small study found that dietary magnesium deficiency induces heart rhythm changes, impairs glucose tolerance, and decreases serum cholesterol in postmenopausal women. (Nielsen, Milne et al. 2007)

A more recent study of tap water hardness, magnesium, and calcium concentration and mortality due to ischemic heart disease or stroke in The Netherlands found conflicting results. For men with the 20% lowest dietary magnesium intake, an inverse association was observed between tap water magnesium intake and stroke mortality (HR per 1 mg/L intake = 0.75; 95% CI, 0.61-0.91), whereas for women with the 20% lowest dietary magnesium intake, the opposite was observed. (Leurs, Schouten et al. 2010)

## Calcium-Magnesium Ratio

An article by Rowe in the *American Journal of Cardiology* expounds on the Calcium-magnesium-ratio intake and cardiovascular risk (Rowe 2006)

Magnesium is "nature's calcium blocker," and, in addition to a magnesium ion deficiency, ischemia, catecholamine elevations, and insulin resistance, for example, may precipitate a calcium overload of the myocardium, conducive to myocardial infarction.

Seelig has stressed that Finland, with the highest calcium/magnesium intake ratio (well above the ideal 2:1 calcium/magnesium ratio), has the world's highest cardiovascular morbidity and mortality. (Seelig 1989)

A high calcium/magnesium intake ratio interferes with magnesium absorption, increases the potential for clot formation with vasospasm, and increases oxidative stress, with the latter also more likely to occur as a result of the reduced effectiveness of magnesium as an anti-oxidant in the presence of catecholamine auto-oxidation.

An adequate total intake of calcium for adults is 1,000 to 1,200 mg/day; therefore, maintaining a favorable 2:1 ratio would require a daily total magnesium intake of 500 to 600 mg rather than "the recommended dietary allowance of 320 mg/day for adult women."

Finally, it is noteworthy, that magnesium, in addition to calcium, is necessary for bone structure, thereby reducing the likelihood of osteoporosis; a calcium/magnesium intake ratio that is excessive will offset the effectiveness of magnesium in providing this function. (Seelig 1993)

The Shanghai Women's Health Study found an inverse association between calcium and magnesium intakes and type 2 diabetes risk. (Villegas, Gao et al. 2009)

An interesting study of the calcium:magnesium ratio in local groundwater and incidence of acute myocardial infarction among males in rural Finland found a protective role of magnesium and low Ca:Mg ratio against coronary heart disease but did not support the earlier hypothesis of a protective role of calcium. (Kousa, Havulinna et al. 2006)

A recent article proposed that a high serum Ca/Mg ratio is more appropriate and alterations in this ratio could lead to increased development of new and recurrent breast cancer. (Sahmoun and Singh 2010)

Mg is essential for DNA duplication and repair and Mg deficiency favors DNA mutations leading to carcinogenesis. Dietary intake of Mg in the US is less than the recommended amount, and the deficit is more pronounced in older individuals where gastrointestinal and renal

mechanisms for Mg conservation are not as efficient. Furthermore, healthy postmenopausal women are frequently recommended to take supplemental Ca, but not Mg and vitamin D to maintain bone and overall health.

### Potassium

The Nurses' Health Study cohort found that low calcium intake, and perhaps low potassium intake, may contribute to increased risk of ischemic stroke in middle-aged American women. (Iso, Stampfer et al. 1999)

A study found that diets rich in potassium, magnesium, and cereal fiber reduce the risk of stroke, particularly among hypertensive men. (Ascherio, Rimm et al. 1998)

A Cochrane Database Review found no robust evidence that supplements of any combination of potassium, magnesium or calcium reduce mortality, morbidity or BP in adults, although no study included all three minerals. The combination of potassium & magnesium compared to control resulted in statistically non-significant reductions in both SBP (mean difference = -4.6 mmHg, 95% CI: -9.9 to 0.7) and DBP (mean difference = -3.8 mmHg, 95% CI: -9.5 to 1.8), although the results were heterogeneous ( $I^2=68\%$  and  $85\%$  for SBP and DBP respectively). (Beyer, Dickinson et al. 2006)

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