

Appendix V: Importance of Balancing Ca with Mg and

Dangers of the Rising Ca:Mg Dietary Intake Ratio

1. Magnesium balances Calcium: Importance of the Ca:Mg Ratio – see Fig. 4

Of Central importance to the Mg Hypothesis of CVD is the intracellular Calcium to Magnesium Ratio (Ca:Mg). In the 1990s, Resnick and co-workers discovered that the intracellular calcium to magnesium ratio (Ca:Mg) was totally predictive of tissue responses that, taken together, manifest as cardiovascular disease. For example, when Mg becomes low in the cell, calcium rises in the cell, raising the cell's Ca:Mg ratio which causes a firing off a cascade of reactions particular to that cell's "fight or flight" response. If it's a nerve cell, it rapidly and continuously fires. If a muscle cell, it will contract and not relax until the Ca:Mg ratio is brought to normal resting state. These various tissue manifestations of the high Ca:Mg intracellular ratio are illustrated in [Figure 4](#).

A marginal Mg status or Mg deficit state will often manifest these abnormal Ca:Mg responses as clinical symptoms so often seen in our society on the low Mg diet. Modern medicine, not yet accepting the Mg Hypothesis of CVD, treats these symptoms with medications rather than nutrient therapy that could correct the high Ca:Mg ratio causing the symptoms.

Some references of Resnick and colleagues work on Ca:Mg ratio in cells with links to pubmed abstracts:

Resnick, L. (1999). "The cellular ionic basis of hypertension and allied clinical conditions." *Prog Cardiovasc Dis* 42(1): 1-22.
<http://www.ncbi.nlm.nih.gov/pubmed/10505490>

Resnick, L. M. (1992). "Cellular calcium and magnesium metabolism in the pathophysiology and treatment of hypertension and related metabolic disorders." *Am J Med* 93(2A): 11S-20S.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=1387762

Resnick, L. M. (1992). "Cellular ions in hypertension, insulin resistance, obesity, and diabetes: a unifying theme." *J Am Soc Nephrol* 3(4 Suppl): S78-85. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=1457764

Resnick, L. M. (1993). "Ionic basis of hypertension, insulin resistance, vascular disease, and related disorders. The mechanism of "syndrome X"." *Am J Hypertens* 6(4): 123S-134S.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=8507440

2. The Ca:Mg ratio in USA diets is increasing – see [Figs. 5a, 5b & 6](#)

Since 1977 the Ca in USA diets has risen much more than the Mg in USA diets. This trend is shown in [Figures 5a and 5b](#). As a result, the food intake Ca:Mg ratio in the USA has gone from largely below 3.0 to largely above 3.0 during the last 35 years ([see Figure 6](#)). This rising ratio does not include supplements, only food sources of Ca and Mg. It has been recommended that a Ca:Mg intake ratio should not exceed 2.0 for both foods and supplements.

References on rising Ca:Mg food intake ratios in USA with links to Full Texts and to Pubmed abstracts:

[\(for highlighted abstracts of the following references, click here "Abstract" document for Appendix V\)](#)

(See Full Texts of the following papers)

[Rosanoff, A. \(2010\). "Rising Ca:Mg intake ratio from food in USA Adults: a concern?" *Magnes Res* 23\(4\): 181-193. \[http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=21233058\]\(http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=21233058\)](#)

[Rosanoff, A., et al. \(2012\). "Suboptimal magnesium status in the United States: are the health consequences underestimated?" *Nutr Rev* 70\(3\): 153-164. <http://www.ncbi.nlm.nih.gov/pubmed/22364157>](#)

3. Recent studies show Ca supplementation puts people more at risk of CVD.

For the past decade, Ca supplements have been widely recommended to prevent osteoporosis. This has widely been assumed "safe" as USA Calcium intakes from food are often below recommended levels. However, given our society's low Mg intakes, Ca from supplements may not be balanced with Mg and can exacerbate the high Ca:Mg ratio and bring on heart disease, unexpected in *a medical paradigm that does not include the Mg Hypothesis of CVD*.

References on CVD risks with Ca supplementation:

[\(For Appendix V highlighted abstracts click\)](#)

Li, K., et al. (2012). "Associations of dietary calcium intake and calcium supplementation with myocardial infarction and stroke risk and overall cardiovascular mortality in the Heidelberg cohort of the European Prospective Investigation into Cancer and Nutrition study (EPIC-Heidelberg)." *Heart* 98(12): 920-925. <http://www.ncbi.nlm.nih.gov/pubmed/22626900>

Reid, I. R., et al. (2011). "Cardiovascular effects of calcium supplementation." *Osteoporos Int* 22(6): 1649-1658. <http://www.ncbi.nlm.nih.gov/pubmed/21409434>

Reid, I. R., et al. (2011). "Calcium supplementation: balancing the cardiovascular risks." *Maturitas* 69(4): 289-295. <http://www.ncbi.nlm.nih.gov/pubmed/21621353>

Bolland, M. J., et al. (2011). "Calcium supplements with or without vitamin D and risk of cardiovascular events: reanalysis of the Women's Health Initiative limited access dataset and meta-analysis." *Bmj* 342: d2040. <http://www.ncbi.nlm.nih.gov/pubmed/21505219>

Bolland, M. J., et al. (2010). "Effect of calcium supplements on risk of myocardial infarction and cardiovascular events: meta-analysis." *Bmj* 341: c3691. <http://www.ncbi.nlm.nih.gov/pubmed/20671013>

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Gopal, A. and M. J. Budoff (2006). "Coronary calcium scanning." *Am Heart Hosp J* 4(1): 43-50. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=16470104

Early References by M.S. Seelig that predicted the adverse effect of Ca supplementation on cardiovascular health, given the Mg Hypothesis of CVD:

Seelig, M. (2006). "Value of raising magnesium to calcium intake ratio for health." *New Data in Magnesium Research, John Libbey Eurotext, In Press*: 1-16.

Seelig, M. S. (1990). "Increased need for magnesium with the use of combined oestrogen and calcium for osteoporosis treatment." *Magnes Res* 3(3): 197-215. [\(See highlighted abstract in "Abstracts" folder for Appendix V\)](#)

Seelig, M. S. (2001). Epidemiologic data on magnesium deficiency-associated cardiovascular disease and osteoporosis; consideration of risks of current recommendations for high calcium intake. *Advances in magnesium Research: Nutrition and Health*. Y. Rayssiguier, A. Mazur and J. Durlach. London, John Libby & Co.: 177-190.

What About Vitamin D?

Many recent reports show low serum vitamin D values being related to several health issues including bone health and heart health (Gotsman et al, 2012). Magnesium is required for the biological activation of Vitamin D. When Magnesium status is low, Serum Vitamin D levels remain low (Rude, 1985) as do serum Calcium and serum Potassium. It remains to be shown whether recent reports on Vitamin D and health issues are truly due to low levels of vitamin D, low levels of magnesium or both.

Gotsman, I., et al. (2012). "Vitamin D deficiency is a predictor of reduced survival in patients with heart failure; vitamin D supplementation improves outcome." Eur J Heart Fail **14**(4): 357-366.

<http://www.ncbi.nlm.nih.gov/pubmed/22308011>

Rude, R. K., J. S. Adams, et al. (1985). "Low serum concentrations of 1,25-dihydroxyvitamin D in human magnesium deficiency." J Clin Endocrinol Metab **61**(5): 933-40.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=3840173

To read on other research aspects of the calcium to magnesium ratio, see:

Dai, Q., M. J. Shrubsole, et al. (2007). "The relation of magnesium and calcium intakes and a genetic polymorphism in the magnesium transporter to colorectal neoplasia risk." Am J Clin Nutr **86**(3): 743-51.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=17823441