

## Magnesium: the key to life

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Calcium and magnesium are opposites in their effects on our body structure. As a general rule, the more rigid and inflexible our body structure is, the less calcium and the more magnesium we need.

Dr Garry Gordon wrote, "If you have compromised cell membranes or low ATP production for any reason, then the cell has trouble maintaining the normal gradient. This is because the usual gradient is 10,000 times more calcium outside of cells than inside; when this is compromised you will have increased intracellular calcium, which seems to always happen at the time of death.

Whenever intracellular calcium is elevated, you have a relative deficiency of magnesium, so whenever anyone is seriously ill, acute or chronic, part of your plan must be to restore magnesium, which is poorly absorbed through oral means." The ratio of calcium to magnesium is vital for cell membranes and the Blood/Brain Barrier.

Countries with the highest calcium to magnesium ratios (high calcium and low magnesium levels) in soil and water have the highest incidence of cardiovascular disease. At the top of the list is Australia. In contrast, in Japan with its low cardiac death rate, the daily magnesium intake was cited as high as 560 milligrams. Adequate levels of magnesium are essential for the heart muscle.

Those who die from heart attacks often have very low magnesium — but high calcium — levels in their heart muscles. Patients with coronary heart disease who have been treated with large amounts of magnesium survived better than those with other drug treatments.

Magnesium dilates the arteries of the heart and lowers cholesterol and fat levels. Magnesium taken in proper dosages can solve the problem of calcium deficiency ~ Dr. Nan Kathryn Fuchs, The Nutrition Detective

It is magnesium that controls the fate of potassium and calcium in the body. If magnesium is insufficient potassium and calcium will be lost in the urine and calcium will be deposited in the soft tissues (kidneys, arteries, joints, brain, etc.). Magnesium and calcium have competing effects on many of the body's chemical pathways. Calcium causes muscles to contract, while magnesium helps them relax.

Magnesium and calcium are paired minerals. Several studies have reported that increasing calcium in the diet significantly reduces the absorption of magnesium. Calcium intakes above 2.6 grams per day may reduce the uptake and utilization of magnesium by the body thus increasing magnesium requirements. So much stress is placed on the importance of calcium by the dairy industry that we may, in fact, be harming magnesium absorption.

Up to 30% of the energy of cells is used to pump calcium out of the cells. A healthy cell has high magnesium and low calcium levels. The higher the calcium level and the lower the magnesium level in the extra-cellular fluid, the harder is it for cells to pump the calcium out. The result is that with low magnesium levels the mitochondria gradually calcify and energy production decreases.

Our biochemical age could theoretically be determined by the ratio of magnesium to calcium within our cells.

Magnesium is the mineral of rejuvenation and prevents the calcification of our organs and tissues that is characteristic of the old-age related degeneration of our body. Without sufficient magnesium, calcium can collect in the soft tissues and cause arthritis. Not only does calcium collect in the soft tissues of arthritics, it is poorly, if at all, absorbed into their blood and bones. Some researchers estimate that the American ratio of calcium to magnesium is actually approaching 6:1, while the recommendation for healthy living is actually 2:1. But even two parts of calcium to one part of magnesium is probably too high, since current research on the Paleolithic or caveman diets show that the ratio they used to eat was 1:1. 1

“A diet high in dairy and low in whole grains can lead to excess calcium in the tissues and a magnesium deficiency.”<sup>2</sup> ~ Dr Nan Kathryn Fuch

According to Dr P Kaye, Emergency Department, Bristol Royal Infirmary, UK, “Magnesium acts as a smooth muscle relaxant by altering extracellular calcium influx and intracellular phosphorylation reactions. It may also attenuate the neutrophilic burst associated with inflammatory bronchoconstriction by attenuating mast cell degranulation. The principal trigger for this degranulation is a rise in intracellular calcium, which is antagonised by magnesium. It has been shown experimentally to augment the bronchodilatory effect of salbutamol and to inhibit histamine induced bronchospasm. Magnesium should be used as a safe, easy to administer and effective second line agent in acute severe asthma.”<sup>3</sup>

Medical authorities claim that the widespread incidence of osteoporosis and tooth decay in western countries can be prevented with a high calcium intake. However Asian and African populations with a low intake (about 300 mg) of calcium daily have very little osteoporosis.

Bantu women with an intake of 200 to 300 mg of calcium daily have the lowest incidence of osteoporosis in the world.<sup>4</sup> In western countries with a high intake of dairy products the average calcium intake is about 1000 mg.

With a low magnesium intake, calcium moves out of the bones to increase tissue levels, while a high magnesium intake causes calcium to move from the tissues into the bones. Thus high magnesium levels leads to bone mineralization.

Dr. Karen Kubena, associate professor of nutrition at Texas A & M University indicates that even if you monitor your magnesium level like a maniac, you're still at risk for migraines if your calcium level is out of whack. It seems that higher than normal blood levels of calcium cause the body to excrete the excess calcium, which in turn triggers a loss of magnesium.

“Let's say you have just enough magnesium and too much calcium in your blood. If calcium is excreted, the magnesium goes with it. All of a sudden, you could be low in magnesium,” says Dr. Kubena.<sup>5</sup>

If calcium is not taken with enough magnesium it will cause more harm than good. The unabsorbed calcium can lodge anywhere in the body and provoke practically any disease. For instances, if it lodges in your bones and joints, it leads to some forms of arthritis; if it lodges in you heart, it leads to arterial lesions; it provokes respiratory problems if it lodges in your lungs, etc.

Despite the crucial relationship between calcium and magnesium a recently published study announced that most U.S. children don't get enough calcium in their diets, and pediatricians should intervene to help remedy the problem. These guidelines were issued in Feb. 2006 by the American Academy of Pediatrics.<sup>6</sup> The proportion of children who receive the recommended amounts of calcium declines dramatically after the second year of life, reaching a nadir during adolescence, said Dr. Nancy F. Krebs, of the University of Colorado in Denver, who headed the academy committee that wrote the guidelines.

Adolescent girls are faring the worst, Dr. Krebs and colleagues reported. Only about 10% of girls ages 12 to 19 are getting the recommended amount of calcium. For boys, the figure is about 30%, according to the guidelines, which were published in the February issue of Pediatrics. Not a word is mentioned about magnesium as the committee goes on to recommend increasing calcium intake through the use of fortified foods and calcium supplements.

Is a medical crime being committed when these pediatricians fail to address the crucial relationship between magnesium and calcium?

Our affirmative answer is sustained when reviewing the materials presented below. Experts say excessive calcium intake may be unwise in light of recent studies showing that high amounts of the mineral may increase risk of prostate cancer. "There is reasonable evidence to suggest that calcium may play an important role in the development of prostate cancer," says Dr. Carmen Rodriguez, senior epidemiologist in the epidemiology and surveillance research department of the American Cancer Society (ACS). Rodriguez says that a 1998 Harvard School of Public Health study of 47,781 men found those consuming between 1,500 and 1,999 mg of calcium per day had about double the risk of being diagnosed with metastatic (cancer that has spread to other parts of the body) prostate cancer as those getting 500 mg per day or less. And those taking in 2,000 mg or more had over four times the risk of developing metastatic prostate cancer as those taking in less than 500 mg. The recommended daily allowance (RDA) of calcium is 1,000 mg per day for men, and 1,500 mg for women

Later in 1998, Harvard researchers published a study of dairy product intake among 526 men diagnosed with prostate cancer and 536 similar men not diagnosed with the disease. That study found a 50% increase in prostate cancer risk and a near doubling of risk of metastatic prostate cancer among men consuming high amounts of dairy products, likely due, say the researchers, to the high total amount of calcium in such a diet. The most recent Harvard study on the topic, published in October 2001, looked at dairy product intake among 20,885 men and found men consuming the most dairy products had about 32% higher risk of developing prostate cancer than those consuming the least.

According to the University of Florida Shands Cancer Center a high level of calcium in the blood, called hypercalcemia<sup>7</sup>, may become a medical emergency. This disorder is most commonly caused by cancer or parathyroid disease but underneath the primary etiology is probably magnesium deficiency.

Hypercalcemia is commonly attributed to either the cancer treatment or the cancer itself and may make it difficult for doctors to detect hypercalcemia when it first occurs. This disorder can be severe and difficult to manage especially because doctors have not a clue about the underlying relationship between excess calcium and low levels of magnesium. Severe hypercalcemia is a medical emergency that can be avoided if magnesium levels are brought up to normal.

Calcium competes with zinc, manganese, magnesium, copper and iron for absorption in the intestine and a high intake of one can reduce absorption of the others. Because of the totally distorted way medical science relates to magnesium the medical profession makes mistakes with calcium. It's still common to hear the assumption about calcium's ability to help prevent osteoporosis (weakening of the bones usually associated with aging). The fact is that it's the increasing of magnesium intake that increase bones density<sup>8</sup> in the elderly and reduces the risk of osteoporosis.

"Higher Magnesium intake through diet and supplements was positively associated with total-body bone mineral density (BMD) in older white men and women. For every 100 mg per day increase in Mg, there was an approximate 2 per cent increase in whole-body BMD<sup>9</sup>," said Dr. Kathryn Ryder. Magnesium is essential for proper calcium absorption and is an important mineral in the bone matrix.

"Bones average about 1 % phosphate of magnesium and. teeth about 1% per cent phosphate of magnesium. Elephant tusks contain 2 % of phosphate of magnesium and billiard balls made from these are almost indestructible. The teeth of carnivorous animals contain nearly 5 % phosphate of magnesium and thus they are able to crush and grind the bones of their prey without difficulty," wrote Otto Carque (1933) in Vital Facts About Foods.

Some people, like a spokesperson for the UK-based charity, the National Osteoporosis Society, continue to think that "magnesium deficiency is, in fact, very rare in humans." So they cannot get it through their neural circuits that magnesium deficiency, not calcium deficiency plays a key role in osteoporosis.

Thus it is no surprise when we find more studies suggesting that high Ca intake had no preventive effect on alteration of bone metabolism in magnesium deficient rats<sup>10</sup> and that not only severe but also moderate dietary restriction of magnesium results in qualitative changes in bones in rats<sup>11</sup>.

The results from some of these studies may be surprising to some. While we have no reason to question the importance of calcium in bone strength, we have plenty of reason to doubt the value of consuming large amounts of calcium that are currently being recommended for adults and young people alike.<sup>12</sup>

"One of the most important aspects of the disease osteoporosis has been almost totally overlooked. That aspect is the role played by magnesium." ~ Dr Lewis B. Barnett

While most sources understand that calcium is important in the growth and development of children, little attention is paid to the role of magnesium or magnesium deficiency or the need to maintain the intricate balances of each (and other nutrients as well). Back in the 1950's Dr. Barnett examined the bone content of healthy people and compared it with the content of people suffering from severe osteoporosis. He found there was little difference among the calcium, phosphorus, and fluoride content of the bones of the individuals.

The magnesium content in the bones of the healthy people, however, was 1.26 %. That of the osteoporosis victims was .62 %. Many years ago Dr. Barnett conducted tests on 5,000 people and found about % of them deficient in magnesium. Today we find the Massachusetts Institute of Technology (MIT) placing that number officially at

66 %. How is it that so many in the medical profession can ignore this clinical reality and go on pretending that magnesium deficiency in the general population is rare? Magnesium status is important for regulation of calcium balance through parathyroid hormone-mediated reactions.<sup>13</sup>

The current focus on increased need for calcium in a magnesium deficient population can easily push those already receiving adequate amounts of calcium in their daily diets over the edge to reaching too high levels, thus causing depletion of magnesium and other problems.

The American Diabetes Association in their 2006 guidelines for diabetes and pre diabetes, when making treatment and nutritional recommendations, join the Pediatricians and do not recommend magnesium be addressed in any significant way despite the increasing evidence over the years that magnesium is even more deficient in diabetics and dietary recommendations are not combating the issue. This medical review is important exactly because large segments of the medical establishment are choosing ignorance in relationship to magnesium and calcium thus misleading the public and leading them to the altar of iatrogenic disease, a place where billions of dollars are made.

Despite the fact that serum levels of magnesium are not the best indicator of adequate magnesium levels some studies have shown that when magnesium deficiency was induced in humans, the earliest sign was decreased serum magnesium levels (hypomagnesemia).

Over time serum calcium levels also began to decrease (hypocalcemia) despite adequate dietary calcium. Hypocalcemia persisted despite increased parathyroid hormone (PTH) secretion. Usually, increased PTH secretion quickly results in the mobilization of calcium from bone and normalization of blood calcium levels. As the magnesium depletion progressed, PTH secretion diminished to low levels. Along with hypomagnesemia, signs of severe magnesium deficiency included hypocalcemia, low serum potassium levels (hypokalemia), retention of sodium, low circulating levels of PTH, neurological and muscular symptoms (tremor, muscle spasms, tetany), loss of appetite, nausea, vomiting, and personality changes.<sup>14</sup> Hypercalcemia can cause magnesium deficiency and wasting.<sup>15</sup>

It is medical wisdom that tells us that magnesium is actually the key to the body's proper assimilation and use of calcium, as well as other important nutrients. If we consume too much calcium, without sufficient magnesium, the excess calcium is not utilized correctly and may actually become toxic, causing painful conditions in the body. Hypocalcemia is a prominent manifestation of magnesium deficiency in humans (Rude et al., 1976). Even mild degrees of magnesium depletion significantly decreases the serum calcium concentration (Fatemi et al., 1991).

\*The adverse effects of excessive calcium intake may include high blood calcium levels, kidney stone formation and kidney complications.\*<sup>16</sup>

Elevated calcium levels are also associated with arthritic/joint and vascular degeneration, calcification of soft tissue, hypertension and stroke, and increase in VLDL triglycerides, gastrointestinal disturbances, mood and depressive disorders, chronic fatigue, and general mineral imbalances including magnesium, zinc, iron and phosphorus. High calcium levels interfere with Vitamin D and subsequently inhibit the vitamin's cancer protective effect unless extra amounts of Vitamin D are supplemented.<sup>17</sup>

William R. Quesnell, author of *Minerals: The Essential Link to Health*, said “Most people have come to believe nutrition is divisible, and that a single substance will maintain vibrant health. The touting of calcium for the degenerative disease osteoporosis provides an excellent example. Every day the media, acting as proxy for the milk lobby, sells calcium as a magic bullet. Has it worked? Definitely for sales of milk; but for our health it has been a disaster. When you load up your system with excess calcium, you shut down magnesium’s ability to activate thyrocalcitonin, a hormone that under normal circumstances would send calcium to your bones.” When it comes to magnesium and calcium neither can be divided from the other. One is not divisible from the other in terms of overall effect. They are paired minerals yet it is magnesium that holds the overall key for their paired function. In truth magnesium holds the key to life. It is, as the Chinese say, the most beautiful of all metals. It is a nutritional element that can and is used as a medicine to great effect by all who know of its beauty and power.

#### References

- [1] Eades M, Eades A, *The Protein Power Lifeplan*, Warner Books, New York, 1999
- [2] The source of menstrual cramps may come from eating too much cheese, yogurt, ice cream or milk, combined with insufficient whole grains and beans. Or it could come from taking too much calcium without enough magnesium. Modifying diet and increasing magnesium supplementation may allow menstrual cramps to disappear.
- [3] Kaye, P. O’Sullivan, I. The role of magnesium in the emergency department. *Emergency Department, Bristol, Royal Infirmary, Bristol, UK, Emerg Med J* 2002; 19:288-291
- [4] <http://list.weim.net/pipermail/holisticweim/2001-July/001023.html>
- [5] <http://www.mgwater.com/prev1801.shtml>
- [6] Pediatricians Say That Most US Kids Don’t Get Enough Calcium <http://www.medpagetoday.com/Pediatrics/GeneralPediatrics/dh/2624>
- [7] Signs and symptoms of hypercalcemia may include:
  - Nausea • Fatigue • Vomiting • Lethargy • Stomach Pain • Moodiness • Constipation
  - Irritability • Anorexia • Confusion • Excessive thirst • Extreme muscle weakness • Dry mouth or throat • Irregular heart beat • Frequent Urination • Coma
- [8] Stendig-Lindberg G. Tepper R. Leichter I. Trabecular bone density in a two year controlled trial of peroral magnesium in osteoporosis. *Department of Physiology and Pharmacology, Sackler Faculty of Medicine, Tel Aviv University, Israel. Magnes Res.* 1993 Jun;6(2):155-63.
- [9] *Journal of the American Geriatric Society* (November, Vol 53, No 11, pp 1875-1880).
- [10] We examined the effects of high calcium (Ca) intake on bone metabolism in magnesium (Mg)-deficient rats. Male Wistar rats were divided into three groups, with each group having a similar mean body weight, and fed a control diet (control group), a Mg-deficient diet (Mg-deficient group) or a Mg-deficient Ca-supplemented diet (Mg-deficient Ca-supplemented group) for 14 d. Femoral Ca content was significantly lower in the Mg-deficient Ca-supplemented group than in the control group and Mg-deficient group. Femoral Mg content was significantly lower in the Mg-deficient group and Mg-deficient Ca-supplemented group than in the control group. Furthermore, femoral Mg content was significantly lower in the Mg-deficient Ca-supplemented group than in the Mg-deficient group. Serum osteocalcin levels (a biochemical marker of bone formation) were significantly lower in the two Mg-deficient groups than in the control group. As a biochemical marker of bone resorption, urinary deoxypyridinoline excretion was significantly higher in the Mg-deficient Ca-supplemented group than in the control group and Mg-deficient group. The results in the present study suggest that high Ca intake had no preventive effect on alteration of bone metabolism in Mg-deficient rats. *Effects of high calcium intake on bone metabolism in magnesium-deficient rats. Magnes Res.* 2005 Jun;18(2):97-102.

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[11] Br J Nutr. The effect of moderately and severely restricted dietary magnesium intakes on bone composition and bone metabolism in the rat. 1999 Jul;82(1):63-71.

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[12] In particular, these studies suggest that high calcium intake doesn't actually appear to lower a person's risk for osteoporosis. For example, in the large Harvard studies of male health professionals and female nurses, individuals who drank one glass of milk (or less) per week were at no greater risk of breaking a hip or forearm than were those who drank two or more glasses per week. Other studies have found similar results. Additional evidence also supports the idea that American adults may not need as much calcium as is currently recommended. For example, in countries such as India, Japan, and Peru where average daily calcium intake is as low as 300 mg/day (less than a third of the US recommendation for adults, ages 19-50), the incidence of bone fractures is quite low. Of course, these countries differ in other important bone-health factors as well – such as level of physical activity and amount of sunlight – which could account for their low fracture rates. Calcium in Milk, Harvard School of Public Health;

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[13] North Western University; Nutrition Fact Sheet:

<http://www.feinberg.northwestern.edu/nutrition/factsheets/magnesium.html>

[14] Shils ME. Magnesium. In: Shils M, Olson JA, Shike M, Ross AC, eds. Nutrition in Health and Disease. 9th ed. Baltimore: Williams & Wilkins; 1999:169-192.

[15] Other causes of renal magnesium wasting include aldosterone excess, most likely through chronic volume expansion, causing increased magnesium excretion; hypercalcemia due to increased competition for reabsorption with magnesium; Hypercalcemia inhibits magnesium reabsorption, probably through competition for passive transport through the renal system. Hypomagnesemia; Mahendra Agraharkar, MD, FACP, Updated: June 20, 2002

<http://www.emedicine.com/med/topic3382.htm>

[16] New York State Department of Health

<http://www.health.state.ny.us/diseases/conditions/osteoporosis/qanda.htm>

[17] Accu-Cell Nutrition; Calcium and Magnesium <http://www.acu-cell.com/acn.html>