

## *The Magic of Magnesium*

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### **A Story**

I was setting up a talk for a Rotary club on the topic of my book *Your Body's Sign Language*. The program chairman said, "Jim, I have a question for you even before you come and speak to our group. I have been having terrible leg cramps. I went to my doctor and he put me on a high dose of calcium, but it has made my cramping much worse." I replied, "I happen to have an acquaintance with Dr. Mildred Seelig who was one of the greatest authorities on the subject of magnesium. She warned against supplementing with calcium without also including magnesium. She recommended a two to one ratio of calcium to magnesium.

I found this interesting because GNLD came to the same conclusion in their research on calcium. Dr. Seelig warned that high dose calcium supplementation without magnesium would worsen a magnesium deficiency." I encouraged the program chairman to add some magnesium to his supplement program and to use the nutrients in a chelated form. When I was introduced at the club meeting a couple of months later the program chairman shared that his cramping had completely stopped within a couple of days after he had implemented my advice. He added an additional comment that I really knew what I was talking about. I begin with this story because it is common for physicians in the United States to put patients on high dose calcium without magnesium.

This is particularly true of women suffering with osteoporosis. I routinely talk to women who have been told by their physicians to supplement with 1,000 to 2,000 mg of calcium without any mention of the need to combine the calcium with magnesium. Deficiency of magnesium is at least as common as is calcium deficiency. The deficiency is just more difficult to detect by looking at an X-ray.

There are also suggestions in some of the medical literature that high dose calcium without magnesium may actually overwork the bone building cells resulting in their early death and creating a more severe osteoporosis than if calcium had never been supplemented. The reason for this will become obvious as I discussed the harmful role that calcium can play if magnesium is deficient.

Zinc

Phencyclidine

Magnesium

Ca<sup>++</sup>

Na<sup>+</sup>

Ca<sup>++</sup>

K<sup>+</sup>

*The calcium channel is opened by stimulation of the glutamate receptor and closed by magnesium.*

## *THE CALCIUM CHANNEL*

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### **The Role of Magnesium**

Magnesium resides almost totally within cells. Calcium usually resides outside. Much of the biological activity which makes life possible results from the movement of calcium into the cells through special channels or pores. As long as the calcium remains within the cell the activity of the cell will continue. This might be the contracting of a muscle, the firing of a nerve, or the secreting of a hormone. Magnesium plays an essential role in pumping the calcium out of the cell, allowing the cell to be restored to a state of rest. In 1926 a scientist named C.F.A. Pantin published a paper on the movement of amoeba cells. He found that the amoeba died when they were put in a nutrient solution without magnesium. If they were put into a solution with magnesium, but no calcium the cells lived just fine, but they were unable to move. When both nutrients were provided the cells could both move and be healthy. The absence of calcium on the exterior of the amoeba made it impossible for the amoeba to become active--a serious problem. Lack of magnesium caused death--even more serious.

### **Stress and Magnesium Deficiency**

Any kind of stress opens up the calcium channels of the cells in the body leaving them in a “keyed up” fight or flight mode. The glands of the body secrete adrenaline and other hormones. The blood vessels contract raising blood pressure, the heart beats faster, and the muscles become primed to contract. If a magnesium deficiency exists, the body will lose the ability to restore the cells to the relaxation state. Blood pressure and cholesterol may become permanently elevated. Muscles will tend to spasm, twitch or cramp. The heart beat may become irregular. It is interesting that magnesium is a natural blocker of the HMG CoA reductase enzyme involved with cholesterol synthesis. Low magnesium levels make cholesterol levels rise. Low magnesium and a hyper-vigilant state can also contribute to backache, anxiety and depression. A number of factors including trauma, stress, high sugar intake and MSG (monosodium glutamate) can activate the glutamate receptors in brain cells. These cells are particularly susceptible to being overexcited which can result in brain cell death. Chemicals which overexcite brain cells are sometimes thought of as “excitotoxins.” Excitement of brain cells is inevitable, but this excitement can result in brain cell death if serious magnesium deficiency exists.

### **Reference:**

Magnesium-calcium balance and stress, *Organic Connections*, September 10, 2008, 46:5-6.

### **Magnesium and Aging**

The more active cells become the more rapidly they age and deteriorate. Part of this is the increased free radical activity associated with the production of energy within the cells. It should not be surprising that a lack of magnesium has recently been shown to speed the aging of human cells. Long term deficiency is almost certainly tied to increased risk for age-related degenerative diseases. Magnesium is involved in hundreds of biochemical reactions involving virtually every cell in the human body. Bruce Ames and researchers at Children’s Hospital Oakland Research Institute studied the effects of moderate magnesium deficiency on human fibroblast cells. These are cells that provide the structural framework for many of the tissues in the human body. These

cells normally live for 3-4 months. The researchers found that when the cells grew in an environment with a moderate magnesium deficiency they survived and divided normally. It became obvious, however, that the cells aged more rapidly than cells supplied with adequate magnesium. This premature aging of the cells altered the way that the cells functioned. One of the researchers, David Killilea, said, "We are now thinking that cellular consequences of magnesium deficiency may be driving long-term chronic disease." Ames and Killilea suggested that the cells were using the magnesium to perform indispensable activities at the expense of long term function. The researchers observed that there is no long term marker for moderate magnesium deficiency and it could exist for a long time without being detected by either a physician or by a patient.

**Reference:**

*Yahoo News!* April 8, 2008.

**Syndrome X**

There is an epidemic of a disorder called Syndrome X in the United States. This disorder is characterized by high insulin levels, failure of cells to respond to insulin, high blood pressure, increased tendency to experience blood clots and heart disease, and diabetes. Dr. Lawrence Resnick, professor of medicine at Cornell University Medical College suggests that Syndrome X is a cellular imbalance between magnesium and calcium -- specifically, a low magnesium/high calcium state inside the cell.

**Reference:**

Seelig, Mildred, and Rosanoff, Andrea, *The Magnesium Factor*, New York: Penguin, 2003, 41-42.

**Drugs and Magnesium**

The movement of calcium into cells is a primary mechanism by which work is carried out by the cells of the body. Calcium moves into cells by what is called the calcium channel. Excess movement of calcium into cells sets the stage for serious health problems including high blood pressure as the tissues of the circulatory system contract. Modern medicine is not without its miracle drugs to prevent the influx of calcium into cells. The blood pressure reducing drugs called calcium-channel blockers work by this mechanism.

Magnesium is a natural calcium-channel blocker which will prevent the entrance of excess calcium into cells if adequately supplied. Magnesium reduces the risk of heart attacks, but one study found that long-term use of calcium-channel-blocking drugs increased risk of heart attacks by 60 percent. Another commonly prescribed anti-hypertensive drug is the beta-blocker. These medications are designed to inhibit the hormone adrenaline. These drugs are quite effective, but can have serious side effects if used for a prolonged period of time.

Side effects include "impaired circulation, palpitations, dizziness, nausea, and slight constriction of airways." A number of pharmaceutical drugs increase the loss of magnesium in the urine. This includes loop and thiazide diuretics like lasix, bumex, edecrin and hydrochlorthiazide. Diuretics have also been shown to lower levels of magnesium within the cell increasing the risk of the entrance of excess calcium into heart and other tissues. Anti-cancer drugs like cisplatin

and antibiotics like gentamicin and amphotericin also cause loss of magnesium. One should not discontinue medications without consulting with a physician since this can be dangerous, but it is also irresponsible on the part of physicians to ignore the magnesium status of the patient.

### **Reference:**

Seelig, Mildred, and Rosanoff, Andrea, *The Magnesium Factor*, New York: Penguin, 2003, 69-71.

### **Calcium Influx into the Cell**

The entrance of excess calcium into the cell is a serious concern as illustrated by the small amount of information I have space to share. The question arises, what causes the movement of excess calcium from the outside of the cell to the inside? The answer to that question is rather simple. Inadequate intake of magnesium or difficult utilizing it. The diet of the average American is relatively low in magnesium. Making this low intake worse is the fact that the American diet is high in sugar which causes a loss of magnesium from within the cell. (Seelig, 42) As has been discussed already, supplementation with large amounts of calcium without any magnesium can increase the severity of a magnesium deficiency. There is normally 10,000 times more magnesium within the cell than there is outside. (Seelig, 15-16)

### **References:**

Seelig, Mildred, and Rosanoff, Andrea, *The Magnesium Factor*, New York: Penguin, 2003.

Blaylock, Russell, *Excitotoxins: The Taste that Kills*, Santa Fe, New Mexico: Health Press, 1994.

### **Magnesium Deficiency**

Studies of nutrient deficiency in the United States typically find that more than half the population obtains inadequate magnesium in their diet. Foods rich in magnesium include green vegetables like spinach. The green is chlorophyll which contains a molecule of magnesium. Other foods rich in magnesium include beans, nuts, and unrefined grains.

### **GNLD Mineral Supplementation**

I once spent an afternoon with Dr. Arthur Furst who developed the [GNLD chelated mineral products](#). He had a large piece of equipment in the laboratory which looked quite impressive. I asked him what it was and how it worked. Dr. Furst explained that this piece of equipment made it possible to examine mineral products. He then went on to explain that many of the mineral products which are made fail to live up to the high quality suggested by their label claims. He pointed out that the word chelate means “claw”. This word as GNLD uses it refers to the process of grabbing onto a mineral with an amino acid.

An amino acid-mineral combination will withstand the stomach acid in intact form. This makes it much easier to absorb minerals. Combinations of minerals with other substances like carbonates, sulfates, or chlorides do not stand up to the acid in the stomach. The bonds break apart and the minerals are poorly absorbed. Minerals usually exist with a positive charge. The lining of the small intestine has a negative charge. As a result, minerals tend to be attracted to the lining of the small intestine (opposites attract), but they are poorly absorbed. Many products

claim to be chelated, but this process is rarely performed properly.

Dr. Furst explained that for proper chelation concentrations of amino acids and minerals, pH, and temperature must be varied to achieve the wrapping of the amino acid around a mineral. Many companies just mix amino acids and minerals together, dry the mixture, and call them chelated minerals. Most minerals have two ionic charges which must be neutralized for efficient absorption of the mineral.

GNLD has developed a technology which permits a double wrap of the minerals with amino acids where this is necessary and appropriate for optimal absorption of the mineral. GNLD also seeks to bind minerals with specific amino acids which will optimize absorption and utilization of the mineral in the body. This is why calcium and magnesium are combined with glycine while zinc is combined with methionine. [GNLD Chelated Cal-Mag](#) tablets have almost total dissolution within 30 minutes. The government standard is 75 percent dissolution in 30 minutes and most calcium supplements fail this test. Testing on GNLD minerals suggests that the chelated minerals are absorbed two to six times better than non-chelated minerals.

Quality of mineral supplementation is based upon two basic criteria -- dissolution and absorption and the GNLD mineral products excel in both of these areas. It should also be pointed out that there are literally dozens of minerals which are needed in very tiny quantities by the body. The best and safest way to obtain these minerals is by consumption of sea foods. Sea vegetation is a particularly valuable source of trace minerals.

[GNLD Chelated Multi-Mineral](#) and all of the [Pro Vitality Uni-Paks](#) use sea vegetation as one of the ingredients in the product to provide a rich natural source of the minerals required in only minute quantities. Sea vegetation has the advantage of not containing the high levels of aluminum found in many colloidal mineral products and it does not have the salt content of sea salt. Minerals in sea vegetation are also found in an organic matrix making them easier to use than minerals outside of a biological matrix.

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