Title: THE BENEFITS OF MAGNESIUM--THE DIABETES CONNECTION.

Date: 5/1/2000; **Publication**: Saturday Evening Post; **Author**: DeFelice, Stephen L.

In his latest book, one of the nation's leading crusaders on the benefits of natural remedies to prevent and combat disease discusses the vital role magnesium and chromium play in controlling diabetes.

No one knows which came first--he diabetes or the magnesium deficiency.

But an exciting body of research strongly suggests that supplementation with magnesium can almost certainly help prevent or maybe even treat insulin resistance and other cardiovascular problems in people with diabetes.

I've been convinced of the importance of magnesium for people with diabetes for some time. I helped coordinate a consensus group of medical experts on the role of magnesium supplementation in the treatment of diabetes with the American Diabetes Association way back in 1992. The experts concluded that the weight of experimental data suggests that magnesium deficiency may well play a role in insulin resistance, carbohydrate intolerance, and high blood pressure.

In other words, when there is magnesium deficiency in a patient with diabetes, it should be corrected. There are even more data now, and the story is becoming even more compelling.

What's the connection between magnesium and diabetes? Why are people with diabetes prone to magnesium deficiency? Though there are many theories, no one knows. What is important to note is that many people with diabetes eat various types of food but still are magnesium-deficient. This strengthens the argument for supplementation as the best way to replete the body's stores. Magnesium can help people with diabetes in a number of ways.

Magnesium can reduce insulin resistance. Clinical researchers have uncovered a correlation between insulin resistance and magnesium deficiency. The cells of practically all people with diabetes are insulin-resistant. And insulin resistance is closely connected with many of the cardiovascular problems endemic to people with diabetes. People with insulin resistance are more prone to high blood pressure, impaired blood clotting, accumulation of excess fat in the blood, and atherosclerosis.

More than one study has concluded that people with insulin resistance also have low levels of magnesium in their tissues and that magnesium supplementation can reduce insulin resistance. When Dr. Jerry Nadler, an international expert and

division chief of endocrinology and metabolism at the University of Virginia in Charlottesville, and his colleagues put 16 healthy people on magnesium-deficient diets for a mere three weeks, for instance, their cells not only became deficient in magnesium, but the insulin of every single individual became less capable of transporting sugar from the blood into the cells. He discussed these results to the attendees at my November 1997 Foundation for Innovation in Medicine (FIM) conference and made these provocative remarks: "You can induce insulin resistance even in people who do not have diabetes. Just deprive them of magnesium."

Nine small studies have tested the effect of 360 to 390 milligrams of magnesium per day for over one to five months. Although six of these studies found that the magnesium had no effect on lowering people's blood sugar, three did find that the magnesium improved their insulin sensitivity. I'm not surprised by these results. Magnesium is not likely to change blood sugar very much, but it may improve insulin sensitivity, which may improve long-term prospects of avoiding a heart attack or stroke in people with diabetes.

Magnesium can reduce blood clotting. People with diabetes are prone to excessive blood clotting, a risk factor for dangerous plaque buildup and artery blockages. Indeed, Dr. Nadler has discovered that people with Type II diabetes, in addition to being magnesium-deficient, also have double the amount of the blood-clotting factor thromboxane compared to people without diabetes. Magnesium supplementation, Dr. Nadler says, may help reduce vascular disease in patients with diabetes by reducing their thromboxane levels.

Magnesium may help some people who are diabetic manage high blood pressure. Magnesium's potential to help control blood pressure is especially important for people with diabetes. One of the country's leading experts on magnesium, Lawrence Resnick, M.D., professor of medicine and director of hypertension at Wayne State University School of Medicine in Detroit, and his colleagues measured magnesium levels in people with non-insulin-dependent diabetes and in people without diabetes. He found that those people with diabetes who had significantly lower magnesium levels also had higher blood pressure than people without the disease. He also found that all his subjects with high blood pressure, whether diabetic or nondiabetic, had lower magnesium levels than people with normal blood pressure. A follow-up study confirmed these results.

Exactly how does magnesium keep blood pressure down for people with diabetes who have low levels of intracellular magnesium? It probably reduces the sensitivity of these people to angiotensin II--the hormone produced by the kidneys that makes blood vessels clamp down. Here again, there's good clinical evidence that magnesium can help. Dr. Resnick has discovered that people with low levels of angiotensin II are high in magnesium, and those with excessive amounts of angiotensin II are low in magnesium. "I have treated people who

were hypertensive and on one or two medications with magnesium," says Dr. Resnick. "Their blood pressure is now normal."

If you have diabetes, you probably don't know if your cells are deficient in magnesium, though it's highly likely. Routine laboratory tests do not include blood and intracellular magnesium levels. Until such time, it is wise for people with diabetes, with certain exceptions such as those with kidney disease, to take daily supplementation of this mineral.

Just a brief note of caution here: don't ever replace any blood pressure medications with magnesium or any nutraceutical without discussing this possibility with your physician.

An Early Warning System for Diabetes

If you don't have diabetes, don't get complacent. There's good evidence that low levels of magnesium in your body could be an early warning sign that you may one day contract diabetes, along with its concomitant cardiovascular risks.

In the ARIC (Atherosclerosis Risk in Communities) study, we learned that low magnesium levels can be correlated to a whole host of cardiovascular disease risk factors in healthy people. The clinical researchers didn't stop there. In 1997, the ARIC researchers updated their findings with a new paper. People who had the lowest levels of magnesium in their blood at the beginning of the study were twice as likely to be diagnosed later with diabetes as those with the highest levels of magnesium, according to Frederick Brancati, M.D., an epidemiologist at the Johns Hopkins University School of Medicine in Baltimore. This twofold risk of developing diabetes was independent of every other risk factor that can cause diabetes.

The Nurses' Health Study has been following the diets and health of 85,000 nurses since 1976, and the Prospective Health Professional Study, also known as the Health Professional Follow-Up Study, has likewise been done for tens of thousands of male health professionals since 1986. Both studies revealed a significant connection between magnesium intake and the risk of developing diabetes in healthy people. The Nurses' Health Study found that women who consumed about 220 milligrams of magnesium daily were about one-third more likely to develop diabetes over the next six years than those who consumed about 340 milligrams daily. The more magnesium these women took in, the lower their risk of getting diabetes. The Prospective Health Professionals Study showed similar results.

Clearly, it could be in your interest to keep your magnesium levels up, particularly if you have a family history of diabetes.

Why It's Important to Supplement

You may be thinking that you'd better head off to your doctor and see whether you're magnesium-deficient. Certainly, the consensus group held by the American Diabetes Association has recommended that doctors measure the magnesium levels of high-risk patients, such as alcoholics, pregnant women, those taking drugs that could lead to magnesium deficiency, or those who had had heart failure or a recent heart attack. Their position was and is that if these tests uncover a magnesium deficiency, doctors should advise their patients to correct it through diet or supplements.

The trouble is that most hospitals do not routinely measure your magnesium levels. Even among those who do, the standard test for magnesium may not reveal the whole truth. Most tests measure the amount of magnesium that's in your blood serum (the fluid, excluding the blood cells). But this serum only contains about one percent of the magnesium in your body. The other 99 percent of your body's magnesium is inside your cells. You can have so-called normal amounts of magnesium in your blood serum and still be magnesium-deficient inside your cells, which is where it really matters. Unless your doctor specifically orders tests on your intracellular level of magnesium, you'll never know the truth.

People with diabetes are particularly vulnerable to this type of misdiagnosis. In one study, for instance, Dr. Resnick compared the magnesium levels in about 30 people without diabetes and that of people with Type II diabetes. He found little differences in total serum magnesium between the two groups. It was only when he used rather sophisticated techniques to compare the level of magnesium inside their cells that he could see a difference. "Most diabetics have intracellular magnesium deficiency," he said in an interview. "But if you look for it in their blood, you'll find that 70 to 80 percent have normal serum levels."

Dr. Nadler agrees. In his studies conducted at the University of Southern California (USC) in Los Angeles, the total magnesium wasn't substantially different between people with and without diabetes. But about 80 to 90 percent of the patients had low intracellular free magnesium. A dose of oral magnesium for six weeks reversed this.

"Along with many other studies, we confirmed that Type II diabetics have low intracellular free magnesium," Dr. Nadler says. "We also demonstrated that you can replete or correct this by supplementation."

Diet Is Not Enough

Theoretically, you can get magnesium from eating dairy products, whole-grain products, unprocessed vegetables, legumes, nuts, and soy products. Drinking water can also contribute somewhat to your total magnesium intake if you live in an area where the water is hard.

In practice, though, most people can't get enough magnesium from their food. How many people do you know who live primarily on unprocessed, whole-grain products? In the early 1900s, when people did eat more natural food products, they ingested 475 to 500 milligrams of magnesium in their food daily. Today, it's an average of 143 to 266 milligrams per day--well below what you need for cardiac health strategy.

To compound the difficulty of getting enough magnesium in your diet, magnesium isn't usually listed on food packaging labels, so you can't monitor your magnesium intake on your own, even if you wanted to.

How Much Should You Take?

Robert Rude, M.D., of USC--the doctor who served as the magnesium expert for the National Academy of Sciences (NAS) panel in 1997--strongly recommends that we increase our official minimum requirements for magnesium intake. Largely because of this input, the NAS today suggests that women over age 30 consume 320 milligrams of magnesium daily, while men should consume at least 420 milligrams daily.

To be on the conservative side, I recommend that you take 400 to 450 milligrams of magnesium daily. That will ensure that you're getting enough.

You can find magnesium in a variety of forms, including magnesium oxide, magnesium chloride, magnesium gluconate, magnesium amino acids chelate (chelated magnesium), and magnesium carbonate. Ask your pharmacist or physician which forms are absorbed best.

RELATED ARTICLE: Magnesium Profile

* What it is:

A mineral found in the blood and in almost every cell of your body

* What it does:

Activates more than 300 different enzyme reactions to maintain cells' mineral balance

* Mechanism of protection:

In your heart, it helps keep the cells contracting regularly and stabilizes energy production; in your circulatory system, it can keep your arteries from constricting too much and prevent blood clots. Magnesium also can help reduce insulin resistance and helps your body metabolize sugar, both of which can reduce cardiovascular risks for people with diabetes.

* Where you can buy it:

Pharmacies, health-food stores, and supermarkets

* What to look for on the label:

Magnesium chloride, magnesium oxide, magnesium gluconate, magnesium animo acids, chelate (chelated magnesium), or magnesium carbonate. Some pills contain only one form, others may include two different types in the same pill.

* Who it's for:

Adults over age 35; people who have coronary artery disease and cardiomyopathy; people with high blood pressure; people with diabetes.

* Who it's not for:

Anyone with kidney failure; too much magnesium is dangerous in people with renal disease.

* How much to take:

400 to 450 mg daily

RELATED ARTICLE: A Chromium Profile

What it is:

A trace mineral found in most of your cells

What it does:

It can help reduce insulin resistance, which is an important cardiovascular risk factor; it may lower blood sugar.

Mechanism of protection:

By reducing insulin resistance, it may have a beneficial effect on myocardial ischemia and myocardial infarctions or heart attacks.

Where you can buy it:

Pharmacies, health-food stores, and supermarkets

What to look for on the label:

Chromium picolinate

Who it's for:

People with diabetes

How much to take:

500 to 1,000 micrograms, or one-half to one milligram