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New Research Finds that High Magnesium Intake May Protect Against Diabetes

Two new studies have found that diets high in magnesium may protect against type 2 (adult-onset) diabetes. The mineral plays key roles in several enzymes involved in breaking down glucose, or blood sugar.

In one study, Ruy Lopez-Ridaura, MD, of the Harvard University School of Public Health, tracked the health of 85,000 women participating in the Nurses' Health Study and almost 43,000 men in the Health Professionals' Follow-up Study. Magnesium intake was assessed with dietary questionnaires every two to four years.

Early in the study, the researchers noted that people with higher intakes of magnesium tended to be thinner, more physically active, and more likely to take multivitamins and magnesium supplements.

Lopez-Ridaura and colleagues tracked the risk of diabetes for 18 years in the women and 12 years in the men. After accounting for age, body fat, physical activity, smoking, and other known risk factors for diabetes, the researchers found that people eating diets rich in magnesium were 33 to 34 percent less likely to develop diabetes.

"In humans, some but not all experimental studies have shown benefits of magnesium supplements on glucose metabolism and/or insulin sensitivity," wrote Lopez-Ridaura.

"In the other study, Simin Liu, MD, ScD, of the Harvard Medical School, reported the results of a similar analysis of women in the Women's Health Study, which included 39,000 women 45 years of age and older.

Over a six-year period, women with the highest dietary intakes of magnesium had an 11 to 19 percent lower risk of developing diabetes.

But inexplicably, women who were overweight, a risk factor for diabetes, benefited the most from high-magnesium diets. These women had a 22 to 24 percent lower risk of diabetes if they ate a high-magnesium diet, compared with overweight women who consumed a low-magnesium diet. In addition, overweight women with high-magnesium intake had relatively low levels of fasting insulin.

According to the two reports, whole grains, nuts, and green leafy vegetables are rich sources of magnesium.

References: Lopez-Ridaura R, Willett WC, Rimm EB, et al. Magnesium intake and risk of type 2 diabetes in men and women. *Diabetes Care*, 2004;27:134-140. Song Y, Manson JE, Buring JE, et al. Dietary magnesium intake in relation to plasma insulin levels and risk of type 2 diabetes in women. *Diabetes Care*, 2004;27:59-65. □

Researchers Report that Apple Cider Vinegar Improves Glucose Tolerance

For years, apple cider vinegar has been promoted as a weight-loss aid, despite a virtual absence of scientific support. But now, a respected university researcher has found that apple cider vinegar can reduce glucose intolerance and insulin resistance, conditions often intertwined with overweight and obesity.

Carol S. Johnston, PhD, of Arizona State University, Mesa, and her colleagues asked three groups of subjects to drink 20 grams (a little less than an ounce) of apple cider vinegar, followed by a high-carbohydrate breakfast. The subjects consisted of 11 people with insulin resistance, 10 with type 2 diabetes, and eight healthy controls. A week later, they were given a placebo drink followed by the same high-carbohydrate breakfast, which provided 87 carbohydrate grams from a white bagel, butter, and orange juice.

Consumption of apple cider vinegar improved post-meal insulin function by 34 percent in subjects with insulin-resistance and 19 percent in those with diabetes.

Overall, all three groups – including the healthy subjects – experienced smaller elevations in glucose and insulin after drinking apple cider vinegar.

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Johnston wrote that "vinegar may possess physiological effects similar to acarbose or metformin," drugs commonly used to treat diabetes. She added, "Further investigations to examine the efficacy of vinegar as an antidiabetic therapy are warranted."

Reference: Johnston CS, Kim CM, Buller AJ. Vinegar improves insulin sensitivity to a high-carbohydrate meal in subjects with insulin resistance or type 2 diabetes. *Diabetes Care*, 2004;27:281-282. ▯

Omega-3 Fish Oils Protect Against Gene that Predisposes for Heart Disease

Considerable research has shown that the omega-3 fats, found in fish oils, can reduce inflammation, decrease blood pressure, prevent arrhythmias, and lower the risk of heart attack. Now, researchers have reported that diets high in omega-3 fish oils can also protect against a particular genetic predisposition for heart disease.

James H. Dwyer, PhD, of the University of Southern California, Los Angeles, and his colleagues investigated variations in the ALOX5 gene. This gene programs the construction of 5-lipoxygenase, an enzyme involved in making inflammation-promoting molecules.

Dwyer identified ALOX5 genetic variations in 6 percent of a group of 479 healthy middle-age men and women living in the Los Angeles area. Having a variation in the ALOX5 gene increased the risk of blood vessel narrowing, a sign of heart disease. The ALOX5 was also associated with substantially higher levels of C-reactive protein, a marker of inflammation and a risk factor for heart disease.

But much of the risk of heart disease posed by the ALOX5 variations was either amplified or mitigated by diet. People who ate diets rich in omega-6 fats, specifically linoleic acid and arachidonic acid (found in corn, safflower, soy, and other cooking oils), were far more likely to have narrowed arteries and higher levels of inflammation.

However, people who consumed large amounts of omega-3 fish oils, specifically eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), had no increased risk of heart disease or inflammation.

Dwyer and his colleagues explained that omega-6 and omega-3 fats compete with each other to use the 5-lipoxygenase enzyme. Increasing consumption of omega-3 fats reduces the production of pro-inflammatory omega-6 molecules, which are involved in heart disease.

Reference: Dwyer JH, Allayee H, Dwyer KM, et al. Arachidonate 5-lipoxygenase promoter genotype, dietary arachidonic acid, and atherosclerosis. *New England Journal of Medicine*, 2004;350:29-37. ▯

Omega-3 Fats During Pregnancy Reduces Allergies in Infants

Women with allergies or asthma have a high risk of giving birth to infants with allergies. But if they take omega-3 fish oils capsules during pregnancy, they will be less likely to deliver allergy-prone infants.

The reason, according to researchers, may be that the fish oils program developing immune cells for an attenuated response to potential allergens.

Susan L. Prescott, MBBS, PhD, of the University of Western Australia, Perth, and her colleagues studied 83 pregnant women who had allergies and were at high risk of having children with allergies or asthma. Forty of the women took four 1-gram fish oil capsules daily from the 20th week of gestation until delivery. Forty-three women took placebos during the same time.

Fish oil supplements led to a higher proportion of omega-3 fats and lower levels of omega-6 fats in blood cells of the infants.

At birth, babies in the fish-oil group had slightly weaker immune responses to allergens, such as dust mites and cat dander.

At one year of age, the differences became clearer. Infants in the fish oil group were three times less likely to be sensitive to egg allergen. And while allergic dermatitis was more common in the fish-oil group, it was 10 times less severe than in the placebo group.

"In general, children in the fish oil group were consistently less likely to develop clinical features, including recurrent wheeze, persistent cough, diagnosed asthma, [and] food allergy…" wrote Prescott.

She noted that the reduced immune responses of infants in the fish oil group were consistent with research documenting the anti-inflammatory properties of omega-3 fish oils.

"The dramatic increase in the expression of asthma and allergic disease over the last 20 to 30 years has highlighted the urgent need to identify associated factors that might be logical targets for disease prevention," Prescott wrote. "One significant change during this period has been a progressive decline in the intake of dietary anti-inflammatory 'n-3' polyunsatured fats (omega-3 PUFAs) in Western diets, with a corresponding increase in omega-6 PUFAs."

Reference: Dunstan JA, Mori TA, Barden A, et al. Fish oil supplementation in pregnancy modifies neonatal allergen-specific immune responses and clinical outcomes in infants at high risk of atopy: a randomized, controlled trial. *Journal of Allergy and Clinical Immunology*, 2003;112:1178-1184. ▯

Combined Supplements of Vitamins E and C Lower Risk of Alzheimer's Disease

Taking moderately high dosages of vitamins E and C appears to lower the risk of developing Alzheimer's disease. That's the finding of a study of elderly residents in Cache County, Utah.

From 1995 to 1997, Peter P. Zandi, Ph.D., of Johns Hopkins University, Baltimore, and his colleagues collected information about the use of vitamin supplements from 4,740 men and women, age 65 or older. The researchers also examined the subjects and diagnosed 200 of them with Alzheimer's disease. During follow-up exams, from 1998 to 2000, they identified 104 new cases of Alzheimer's disese.

Men and women who had been taking a combination of at least 400 IU of vitamin E and 500 mg of vitamin C daily were 78 percent less likely to have Alzheimer's disease during the initial investigation. On follow-up, these vitamin users were 64 percent less likely to develop Alzheimer's disease.

In addition, people taking vitamin E plus a multivitamin with small amounts of vitamin C benefited from a slight reduction in Alzheimer's disease risk. However, subjects taking vitamin E alone, vitamin C alone, B vitamins, or a multivitamin (with only small amounts of vitamins E and C) did not have reduced risk of Alzheimer's disease.

"Use of vitamin E and vitamin C supplements in combination is associated with reduced prevalence and incidence of Alzheimer's disease," wrote Zandi and his colleagues.

Other studies have found that dietary or supplemental vitamin E reduce the risk of Alzheimer's disease. One clinical trial reported that high-dose vitamin E slowed the progression of late-stage Alzheimer's disease.

Reference: Zandi PP, Anthony HJC, Khachaturian AS, et al. Reduced risk of Alzheimer disease in users of antioxidant vitamin supplements. The Cache County Study. *Archives of Neurology*, 2004;61:82-88. ▯

Homocysteine, Low B Vitamins Linked to Risk of Abdominal Aneurysms

Elevated blood levels of homocysteine and low levels of B vitamins are well-known risk factors for coronary artery disease and stroke. A new study has found that the same pattern is common in people with abdominal aortic aneurysms.

An abdominal aortic aneurysm is essentially a bubble in a blood vessel located in the mid-section. This type of aneurysm can leak blood, put pressure on the backbone, or become large enough to cause pain.

A team of researchers from the Royal Glamorgan Hospital, Wales, analyzed homocysteine and B vitamin levels in 38 patients with abdominal aortic aneurysms and 36 healthy controls.

The researchers found that slightly more than two-thirds – 68 percent – of the patients with abdominal aortic aneurysms had significantly elevated homocysteine levels, compared with only 6 percent of the control subjects. On average, patients with aneurysms had homocysteine levels of 19.4 micromoles per liter of blood, compared with 10.9 in the control group.

In addition, patients with aneurysms had 20 percent lower vitamin B12 and 18 percent lower folic acid levels than the control subjects.

The study did not clearly indicate whether elevated homocysteine contributes to aneurysms, as it does in heart disease or stroke, or whether B vitamins would be protective. The researchers concluded by writing that "long-term population studies will be required to establish whether patients at high risk of abdominal aortic aneurysms can be prevented from developing aneurysm by selected vitamin supplements."

Reference: Warsi AA, Davies B, Morris-Stiff G. Abdominal aortic aneurysm and its correlation to plasma homocysteine and vitamins. *European Journal of Vascular and Endovascular Surgery*, 2004;27:75-79. ▯

Stroke Triggers Strong Inflammatory Response, Depletes Vitamin C Levels

After suffering a stroke, patients typically experience a sharp increase in inflammation and a rapid drop in vitamin C levels, changes that may diminish their chances of recovery. About one-fourth of patients develop dementia within three months of a stroke. Lesser forms of cognitive impairment affect about half of stroke patients under age 65 and three-fourths of stroke patients over age 75.

Antonio Martin, MD, PhD, and his colleagues at Tufts University, Boston, evaluated 15 patients within two to five days of suffering a stroke and compared them with 24 healthy control subjects. They measured levels of vitamins C and E, as well as various markers of inflammation, including C-reactive protein (CRP), intercellular adhesion molecule-1, and 8-isoprostane in both patients and control subjects.

Martin and his colleagues determined, based on dietary assessments, that stroke patients originally had intakes of vitamin C comparable to those of the control subjects. However, the patients' vitamin C levels dropped significantly after a stroke. As vitamin C levels dropped, their levels of CRP and 8-isoprostane increased.

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Quick Reviews of Recent Research

• Echinacea has anti-fungal activity

Although echinacea is a popular herbal remedy for increasing resistance to colds and flus, it may have other health benefits. In a series of laboratory experiments, researchers found that echinacea had anti-fungal activity, including against *Candida albicans* (the cause of yeast infections). The herb also inhibited the activity of the enzyme 5-lipoxygenase, showing that it also had anti-inflammatory effects.

Merali S, et al. *Pharmaceutical Biology*, 2003; 41:412-420.

• Selenium may prevent preeclampsia

Preeclampsia complicates 2-8 percent of pregnancies and is characterized by hypertension, headaches, and water retention. Researchers studied 53 patients with preeclampsia and 53 healthy controls. Women with low levels of selenium were 4.4 times more likely to develop preeclampsia. Selenium is part of glutathione peroxidase, one of the most potent antioxidant enzymes made by the body. Other research has found that low levels of vitamins E and C and magnesium also increase the risk of preeclampsia. The researchers wrote that their finding "raises the question of whether a small increase in selenium intake might help prevent preeclampsia in susceptible women."

Rayman MP, et al. *American Journal of Obstetrics and Gynecology*, 2003;189:1343-1349.

• Vitamins help children with hypercholesterolemia

Researchers treated 15 patients, ages nine to 20 with familial hypercholesterolemia, an inherited disorder that raises cholesterol levels and increases the risk of premature heart disease. The patients were give 400 IU of natural vitamin E and 500 mg of vitamin C for six weeks. After supplementation, their blood vessel tone and flexibility improved, signs of improved cardiovascular health.

Engler MM, et al. *Circulation*, 2003;108: 1059-1063.

• High-dose vitamin C helps in pancreatitis

Researchers administered 10 grams of intravenous (IV) vitamin C daily for five days to 84 patients with acute pancreatitis, an inflammation of the pancreas. The vitamin C IV reduced symptoms and improved a variety of blood markers of immune activity. However, administration of only 1 gram of vitamin C daily for five days did not benefit a separate group of patients with pancreatitis.

Du WD, et al. *World Journal of Gastroenterology*, 2003;9:2565-2569.

• Carotenoids may reduce risk of colorectal cancer

Population studies have reported that high intake of lycopene-rich tomatoes are associated with a low risk of colorectal cancers. Researchers investigated the relationship between colorectal adenomas, precursors for most colorectal cancers, and carotenoids levels in 73 subjects with adenomas, 63 without polyps, and 29 with hyperplastic polyps. On average, lycopene levels were 35 percent lower and beta-carotene levels were 25 percent lower in patients with polyps, compared with the other two groups.

Erhardt JG, et al. *American Journal of Clinical Nutrition*, 2003;78:1219-1224.

Vitamin C, Inflammation, and Stroke...

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CPR, a marker of inflammation and cardiovascular disease risk, also predicts the degree of recovery for stroke patients. Higher CRP levels are associated with poor recovery. Similarly, 8-isoprostane constricts blood vessels and reduces blood flow.

Other key markers of inflammation also increased after stroke, reflecting a strong inflammatory response by the body.

Many researchers believe that a strong inflammatory response increases tissue injury, in this case damage to brain cells. In contrast, vitamin C may temper brain cell damage after a stroke by quenching free radicals or moderating the inflammatory response.

"When these findings are put together, our study strongly suggests that early vitamin C depletion may play a critical role in brain injury," wrote Martin. "Thus, evaluating the effects of vitamin C supplementation for stroke patients has promise in the treatment of stroke."

Reference: Sanchez-Moreno C, Dashe JF, Scott T, et al. Decreased levels of plasma vitamin C and increased concentrations of inflammatory and oxidative stress markers after stroke." *Stroke*, 2004;35:163-168. □

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