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High Fasting Glucose Levels Boost Diabetes Risk, But Improving Diet Leads to Protection

Impaired glucose tolerance – identified by a significant jump in blood sugar levels after a glucose tolerance test – is a well-known risk factor for adult-onset diabetes. Now, research has confirmed that simply having an elevated *fasting* blood sugar, measured as part of a routine blood chemistry at a physician's office, also increases the likelihood of diabetes. A combination of both risk factors is a clear danger sign of looming diabetes.

However, people who improve their diets through a variety of means and engage in moderate physical activity, such as walking, can reverse these risk factors and greatly reduce their chances of developing diabetes.

Jacqueline M. Dekker, PhD, of Vrije University, the Netherlands, tracked the health of 1,342 men and women over 10 years. She found that subjects who entered the study with impaired fasting glucose (fasting blood sugar levels between 110-126 mg/dL) were one-third more likely to develop full-blown diabetes over the following six years, compared with people who had normal fasting glucose levels.

Having a combination of impaired fasting glucose and impaired glucose tolerance was the most accurate predictor of diabetes. Sixty-four percent of people with both risk factors developed diabetes during the six-year period, compared with only 4.5 percent of those with normal blood sugar.

Yet changing the diet can greatly alter a person's risk of diabetes. Jaakko Tuomilehto, MD, of Finland's National Public Health Institute, asked 522 middle-age subjects, all overweight and with impaired glucose tolerance, to follow a weight-loss dietary regimen built around an increase in vegetables and fiber, moderate fat intake, and light exercise. Half of the subjects were given individualized nutritional and lifestyle counseling, while the other half (the "control" group) was given only general guidelines for improvement.

After an average of three years' follow up, subjects who were individually counseled about dietary and lifestyle changes lowered their risk of diabetes by 58 percent, compared with the control group. Tuomilehto noted that this percentage was "conservative" and that the degree of improvement may have been even greater, because the control group had received some dietary advice.

In a separate report, Alden D. Hilton, MD, and Timothy A. Hursh, MD, physicians at Ellsworth Air Force Base, South Dakota, described the case history of a 54-year-old helicopter pilot diagnosed with diabetes. Such a diagnosis typically disqualifies a pilot from further flying.

The pilot was overweight and had elevated blood pressure (controlled by medication), as well as high cholesterol, triglyceride, blood sugar, and glycosylated hemoglobin (an indicator of poor blood sugar control). Because of previous failures with traditional low-fat diets, and after being tested for normal kidney function, the pilot opted for a high-protein, low-carbohydrate diet (containing fewer than 30 grams of carbohydrates daily). He also began walking two miles three to four times weekly.

After three months, the pilot lost 35 pounds, his cholesterol declined from 240 to 204 mg/dL, triglyceride dropped from 500 to 238, fasting glucose from 116 to 100, and two-hour postprandial blood sugar from 283 mg/dL to 122 mg/dL. He was also able to maintain normal blood pressure without medication. After one year on this diet, his glycosylated hemoglobin returned to normal.

References: de Vegt F, Dekker JM, Jager A, et al. Relation of impaired fasting and postload glucose with incident type 2 diabetes in a Dutch population. *JAMA*, 2001;285:2109-2113. Tuomilehto J, Lindstrom J, Eriksson JG, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *New England Journal of Medicine*, 2001;344:1342-1350. Hilton AD, Hursh TA. Type 2 diabetes in an aviator, protein diet vs traditional diet: case report. *Aviation, Space, and Environmental Medicine*, 2001;72:219-220. □

Low Levels of Vitamin B6 Linked to Lung Cancer in Men Who Smoke

Men who smoke tobacco and also have low blood levels of vitamin B6 have a high risk of developing lung cancer, according to the results of a recent study.

Demetrius Albanes, MD, of the National Cancer Institute, Bethesda, Md, and his colleagues studied a subgroup of male smokers in the Alpha-Tocopherol, Beta-Carotene Cancer Prevention Study. Specifically, they examined blood levels of several B vitamins and lung cancer risk in 300 men who were diagnosed with the disease and 300 other men who remained free of cancer.

Only low levels of vitamin B6 were associated with an increased risk of lung cancer, and just over half of the men with lung cancer were deficient in vitamin B6. Men with the lowest blood levels of vitamin B6 were about 50 percent more likely to develop lung cancer, compared with men who had the highest levels of the vitamin.

Albanes and his colleagues suggested several reasons why vitamin B6 might reduce the risk of lung cancer. First, the active form of the vitamin, pyridoxal 5'-phosphate, is a precursor to the coenzymes involved in the synthesis of deoxyribonucleic acid (DNA), the building block of genes. Second, vitamin B6 is needed for normal homocysteine metabolism, which generates the key precursor for glutathione, an antioxidant involved in detoxifying cancer-causing compounds. Third, a lack of vitamin B6 could disrupt normal gene activity and detoxification processes, increasing the risk of cancer.

Reference: Hartman TJ, Woodson K, Stolzenberg-Solomon R, et al. Association of the B-vitamins pyridoxal 5'-phosphate (B6), B12, and folate with lung cancer risk in older men. *American Journal of Epidemiology*, 2001;153:688-694. □

Intravenous Vitamin C Helpful in Treating Chronic Heart Failure

Vitamin C can improve the health of patients with chronic heart failure, in part by boosting levels of nitric oxide.

Nitric oxide is a versatile compound that, depending on its biochemical context, can function either as a free radical or an antioxidant. It plays important roles in blood vessel constriction and relaxation, as well as in preventing blood clots.

Gethin R. Ellis, MD, of the University of Wales College of Medicine, Cardiff, and his colleagues gave 2 grams of intravenous vitamin C to 10 patients with chronic heart failure. The vitamin normalized blood vessel function and improved blood circulation in the forearm, increased the body's response to nitric oxide, and reduced levels of free radicals.

In a separate set of experiments, using blood drawn from the patients, vitamin C reduced platelet blood cell aggregation (clotting) and enhanced the effect of two compounds known to increase nitric oxide levels.

Reference: Ellis GR, Anderson RA, Chirkov YY, et al. Acute effects of vitamin C on platelet responsiveness to nitric oxide donors and endothelial function in patients with chronic heart failure. *Journal of Cardiovascular Pharmacology*, 2001;37:564-570. □

A Diet Rich in Soy Foods Might Help Prevent Hot Flashes

A high intake of soy foods may reduce a woman's frequency of hot flashes, according to a study of Japanese women.

Chisato Nagata, MD, and her colleages at the Gifu University School of Medicine, Japan, tracked the health and dietary habits of 1,106 women who were between the ages of 35-54 years old and were premenopausal at the start of the study.

Nagata focused specifically on the women's consumption of soy through such foods as miso soup, tofu, bean curd, soy milk, and boiled soybeans. Soy is particularly high in isoflavones, a family of antioxidants that have mild estrogenic properties.

Nagata found that women consuming a large quantity of soy foods were 53 percent less likely to experience hot flashes. Women consuming the greatest amount of isoflavones were 58 percent less likely to have hot flashes.

"Although traditional hormone replacement therapy is effective in controlling hot flashes, compliance with this therapy is not great, and there is a desire for a more natural approach to the management of menopausal symptoms," Nagata wrote. "Our findings suggest that consumption of soy products is a practical strategy for preventing hot flashes."

Reference: Nagata C, Takatsuka N, Kawakami N, et al. Soy product intake and hot flashes in Japanese women: results from a community-based prospective study. *American Journal of Epidemiology*, 2001;153:790-793. □

Vitamin E and Other Antioxidants Associated with Healthy Lungs

High levels of antioxidants – especially vitamin E and the carotenoid beta-cryptoxanthin – may help maintain healthy lungs, according to a study completed at the University of Buffalo School of Medicine, New York.

Holger J. Schünemann, MD, PhD, and his colleagues studied blood levels of various antioxidant

nutrients and lung function in 1,616 men and women ages 35 to 79 years. They measured lung function with two standard tests: FEV_1 (forced expiratory volume in one second, or the amount of air exhaled in one second), and FVC (forced vital capacity, or the amount of air they could exhale in one breath).

Schünemann found that people with the highest blood levels of total antioxidants had far greater lung capacity and function, compared with those who had the lowest levels of antioxidants. Specifically, high blood levels of vitamin E and beta-cryptoxanthin were most strongly related to *both* FEV1 and FVC.

Vitamins C, E, and A, beta-cryptoxanthin, lutein/zeaxanthin, and beta-carotene were associated with FEV1, whereas beta-cryptxanthin, lutein/zeaxanthin, and beta-carotene were most closely related to FVC.

Beta-cryptoxanthin is found in papaya, peaches, tangerines, and oranges.

Schünemann and his colleagues wrote that "the association of antioxidant vitamins and pulmonary function is important because reduced pulmonary function is a risk factor for chronic disease mortality and antioxidant vitamins could help reduce the risk."

Reference: Schünemann HJ, Grant BJB, Freudenheim JL, et al. The relation of serum levels of antioxidant vitamins C and E, retinol and carotenoids with pulmonary function in the general population. *American Journal of Respiratory and Critical Care Medicine*, 2001;163:1246-1255.

Sickle-Cell Anemia May Be Complicated By Low Levels of Folic Acid

Sickle-cell anemia, a genetic disease affecting one in 400 Blacks, may also predispose people toward deficiencies of folic acid, a B-vitamin needed for cardiovascular health and DNA synthesis and repair.

The disease causes severe pain because deformed blood cells create blockages in blood vessels. In addition, these blood cells have an average life span of only two weeks (compared with 17 weeks for normal cells) leading to chronic anemia.

Tay S. Kennedy, PhD, of the Children's Hospital of Philadelphia, Pennsylvania, measured levels of folic acid and vitamin B12 in 70 sickle-cell patients, ages 1 to 19 years. More than half of them had inadequate intake of folic acid from food and, despite daily supplementation, 15 percent had low red blood cell (RBC) levels of folic acid.

Most of the children had normal vitamin B12 levels, but levels of both vitamins did decrease with age – despite apparent supplementation.

"Low RBC folate levels indicate depleted folate tissue stores," Kennedy wrote. "It is remarkable that 15 percent of the sample had low RBC folate levels, considering that the 1,000-mcg daily supplement of folate routinely prescribed by our sickle-cell disease care center...Even a sporadic adherence to the supplement prescription would be expected to provide adequate folate to maintain tissue levels."

Low folic acid levels are strongly associated with higher blood levels of homocysteine and, therefore, an increased risk of coronary artery disease and stroke.

Reference: Kennedy TS, Fung EB, Kawchak DA, et al. Red blood cell folate and serum vitamin B12 status in children with sickle cell disease. *Journal of Pediatric Hematology/Oncology*, 2001;23:165-169.

Vitamins E and C Supplements Reduce Side Effects of Radiation Therapy

Researchers have reported that vitamin E and C supplements can rapidly and significantly reduce the symptoms of chronic radiation proctitis.

The condition, an inflammation of the rectum and anus, is a common consequence of radiation therapy for cancers of the pelvic region, including prostate cancer in men and cervical cancer in women. Radiation therapy generates large numbers of free radicals, which can kill cancer cells but often injure nearby normal cells.

The study's subjects were 10 men and 10 women with radiation proctitis for at least six months. Their symptoms included bleeding, diarrhea, incontinence, and rectal pain. Eighteen of the patients had to limit their regular lifestyle activities because of the symptoms.

Marc Kennedy, MD, of the Loyola University Medical Center, Maywood, Ill., and his colleagues asked the subjects to take 400 IU of vitamin E and 500 mg of vitamin C three times daily for eight weeks.

During this time, all of the patients' symptoms were greatly reduced, except for rectal pain. Diarrhea ceased in eight patients and decreased in eight others – all of those who had originally reported it as a symptom. Incontinence also decreased and was completely resolved in three of 16 patients who had the symptom.

After taking vitamin E and C supplements, 13 of the 18 patients were able to resume some of their routine activities, and seven were able to fully resume their lifestyle activities.

Kennedy and his colleagues tracked 10 of the patients who continued to take the vitamin supplements for one year. All of them reported continued improvement.

Reference: Kennedy M, Bruninga K, Mutlu EA, et al. Successful and sustained treatment of chronic radiation proctitis with antioxidant vitamin E and C. *American Journal of Gastroenterology*, 2001;96:1080-1084.

Quick Reviews of Recent Research

• Vitamin E adopted as key Alzheimer's therapy

Free radicals promote the growth of beta-amyloid protein, which strangles brain cells in Alzheimer's disease. Considerable laboratory research and one major clinical trial support the use of vitamin E in Alzheimer's. Based on a comprehensive review of medical journal articles, a team of U.S. researchers recommended the use of vitamin E, 1,000 IU twice daily, to slow the progression of Alzheimer's disease. The recommendation was approved by the American Academy of Neurology and the Alzheimer's Association.

Doody RS, et al. *Neurology*, 2001;56:1154-1166.

• Scurvy may masquerade as multiple organ failure

French researchers recently reported the case of a 75-year old man hospitalized for multiple organ failure. The patient, who had a history of diabetes and ischemic heart disease, was admitted to intensive care with acute respiratory failure and edema of the legs. He had bruises on his legs and abdomen and signs of anemia, which were not related to low folic acid, vitamin B12, or iron. His heart was enlarged, blood pressure low, and pulse rapid. Laboratory tests showed him to have a severe deficiency of vitamin C, most likely because he had stopped eating fresh fruits and vegetables. He began receiving infusions of vitamin C and was released from the hospital after two weeks. One year later, on a normal diet, he remained symptom free.

Kieffer P, et al. *Intensive Care Medicine*, 2001;27:448.

• Pycnogenol® supplements protect skin

Twenty fair-skinned men and women took supplements of Pycnogenol® in a trial to determine whether the herbal antioxidant complex could reduce sensitivity to ultraviolet light-induced sunburn. For four weeks they took 1.10 mg of Pycnogenol® per kg of body weight and 1.66 mg per kg of body weight for another four weeks. After four weeks, the subjects' resistance to UV sunburn increased by 40 percent, and after eight weeks it increased by 84 percent. Consumption of supplemental antioxidants appears to increase antioxidant reserves in the skin and the body's resistance to UV-induced free radicals.

Saliou C, et al. *Free Radical Biology and Medicine*, 2001;30;154-160.

• Good bacteria fight bad bacteria in stomach

Lactobacilli are a family of bacteria that inhabit the gastrointestinal tract. Many studies have found that these and other beneficial bacteria can improve resistance to infection, by enhancing immune function and also by competing with disease-causing bacteria. A strain of *Lactobacilli* has been found to suppress the growth of *Helicobacter pylori*, a bacterium that causes gastritis, ulcers, and gastric cancer. The researcher wrote that "approaches based on simple dietary changes are likely to meet public acceptance and may prove safer and cheaper than complex drug regimens."

Michetti P. *Nutrition*, 2001;17:268-269.

• Flavonoids suppress prostate cancer

In a cell-culture experiment, researchers found that three flavonoids, quercetin, kaempferol, and luteolin, completely stopped the growth of nonhormone-dependent prostate cancers. Three other flavonoids, genistein, apigenin, and myricetin, suppressed the cancer cell growth by 59-73 percent. Genistein is found in legumes, and the other flavonoids are commonly found in fruits.

Knowles LM, et al. *Nutrition and Cancer*, 2000;38:116-122.

• Vitamin E helpful in tonsillitis

Indian physicians treated 24 patients, with a combination of tonsillitis and middle-ear infections, who had elevated levels of free radicals in their red blood cells. Vitamin E supplements were effective in reducing the patients' oxidative stress.

Shukla GK, et a. *Asia Pacific Journal of Pharmacology*, 2000;14:143-145.

Antioxidants may help in hereditary pancreatitis

Three young patients with hereditary pancreatitis, a serious inflammation of the pancreas characterized by disabling pain, were treated with 180 mg of vitamin C, 30 mg of vitamin E, 2400 micrograms of vitamin A, 75 micrograms of selenium, and 800 mg of sulphadenosyl-methionine (SAMe) daily. After taking the supplements, they benefited from a significant decrease in the number of days with abdominal pain.

Yomo G, et al. *Digestive and Liver Disease*, 2001;33:58-62.

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