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Organically Grown Foods Yield Higher Levels of Vitamin C and Other Antioxidants

Several small studies have found – though not always consistently – that organically grown fruits and vegetables contain higher levels of many vitamins and minerals, compared with conventionally grown foods. Now comes a well-controlled study showing that several fruits and vegetables yield substantially higher levels of vitamin C and antioxidant phenolics when grown organically or with sustainable agriculture methods.

Phenolics, which include flavonoids such as quercetin, may not be household terms. However, these little-known nutrients provide the lion's share of antioxidants in fruits, vegetables, and herbs.

In the study, Alyson E. Mitchell, Ph.D., and her colleagues at the University of California, Davis, compared levels of vitamin C and "total phenolics" in strawberries, marionberries (a type of blackberry), and corn. Samples of the foods were grown organically, through sustainable agriculture methods, or by conventional farming practices. All of the food samples were frozen, freeze dried, or air dried.

Organic foods are grown on farmland that has not been treated with synthetic pesticides or herbicides for at least three years. Sustainable agriculture may include organic methods, but it is intended to naturally maintain soil quality. In contrast, conventional farming is geared toward high yield crops and uses chemical fertilizers and pesticides.

In the sustainably grown strawberries, vitamin C levels were 20 percent higher than in those grown conventionally. Although corn is not a major source of vitamin C, levels of the nutrient in organic and sustainably grown corn were 52 and 67 percent higher, respectively, compared with conventionally grown corn. And in marionberries, only those grown with sustainable methods yielded enough vitamin C to be measured.

Mitchell found that organic and sustainably grown strawberries, marionberries, and corn also had consistently higher levels of antioxidant phenolics, compared with those grown conventionally. "The

levels of total phenolics in frozen, freeze-dried, and air-dried corn grown by sustainable methods were 58.5, 40.7, and 58.4% higher [respectively] than levels measured in conventionally grown samples," Mitchell wrote. Overall, levels of phenolics in organic foods were almost as high as those grown with sustainable methods.

In addition, freezing the foods maintained higher levels of these nutrients compared with freeze drying or air drying. Conventionally grown, air-dried foods yielded the lowest amounts of antioxidants.

In plants, antioxidant phenolics protect plants against bacteria and insects, and environmental stresses often boost production of these compounds. Mitchell wrote that pesticides may reduce a plants' requirement for making its own protective phenolics, resulting in lower levels.

Reference: Asami DK, Hong YJ, Barrett DM, et al. Comparison of the total phenolic and ascorbic acid content of freeze-dried and air-dried marionberry, strawberry, and corn grown using conventional, organic, and sustainable agriculture practices. *Journal of Agricultural and Food Chemistry*, 2003;51:1237-1241.□

Have Japanese Researchers Discovered a New B Vitamin?

It often seems as though all of the vitamins were discovered ages ago – the last, vitamin B12, was discovered in 1948 – leaving the impression that there is little left to learn. But in a recent study, Japanese researchers presented evidence supporting their discovery of a new B vitamin.

Takaoki Kasahara, PhD, and Tadafumi Kato, PhD, of the Brain Science Institute, part of the Riken research center in Saitama, investigated pyrrolo-quinoline quinone (PQQ), a compound first discovered in bacteria in 1979.

Based on experiments with laboratory mice, the researchers found that PQQ was essential for the breakdown of lysine, an essential amino acid.

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When Kasahara and Kato fed mice a diet lacking PQQ, the animals stopped converting lysine to a key metabolic compound that works with vitamins B2 and B3 in breaking down food for energy.

Previous research found that a lack of PQQ led to poor growth, fragile skin, a lower immune response, and poor reproduction in mice.

According to the researchers, PQQ is found in a variety of foods, including vegetables and meat. Because PQQ is found in the diet, not made in the bodies of mammals, Kasahara and Kato wrote that it should be classified as a new B vitamin.

Reference: Kasahara T, Kato T. A new redox-cofactor vitamin for mammals. *Nature*, 2003;422:832. □

Fish Oils Lower Triglyceride Levels, But Alpha-Linolenic Acid Does Not

The omega-3 fats found in fish oils – eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) – are known to lower blood levels of triglyceride, a cholesterol-like risk factor for heart disease. But many people take flaxseed oil in the hopes of achieving the same heart-healthy benefits. That's because flaxseed is rich in alpha-linolenic acid, which the body must convert to EPA and DHA.

However, it may be better to stick with fish oils: researchers have found that alpha-linolenic acid does not have the same benefits of the actual EPA and DHA in fish oils.

Christine M. Williams, PhD, of the University of Reading, England, and her colleagues asked 150 subjects to follow one of five supplement regimens for six months: 0.8 or 1.7 grams of EPA/DHA daily, 4.5 or 9.5 grams of plant-source alpha-linolenic acid, or an omega-6 "control." The subjects ranged in age from 25 to 72 years, and all had moderately elevated levels of blood fats.

Williams found that subjects taking the higher dose of EPA/DHA had an average decline of almost 8 percent in their triglyceride levels. Alpha-linolenic acid had the opposite effect – 9.5 grams daily increased triglyceride levels by almost 11 percent.

However, EPA/DHA supplements did increase signs of free-radical oxidation in the subjects' cholesterol. Vitamin E is frequently recommended with EPA/DHA supplements to prevent such oxidation.

Reference: Finnegan YE, Minihane AM, Leigh-Firbank EC, et al. Plant- and marine-derived n-3 polyunsaturated fatty acids have differential effects on fasting and postprandial blood lipid concentrations and on the susceptibility of LDL to oxidative modification in moderately hyperlipidemic subjects. *American Journal of Clinical Nutrition*, 2003;77:783-795. □

Vitamin A Supplements May Play Role in Reducing Risk of SIDS

Giving infants a multivitamin supplement, including vitamin A, during the first year of life, may greatly reduce the risk of sudden infant death syndrome (SIDS). That's according to a study by researchers in Sweden, Norway, and Denmark.

Bernt Alm, MD, PhD, of Queen Silvia Children's Hospital, Goteborg, Sweden, and his colleagues compared 244 cases of SIDS with 869 healthy infants, who were matched for age, gender, and maternity ward.

About 24 percent of the SIDS cases involved infants who did not receive any vitamins, compared with less than 11 percent of healthy infants.

Overall, Scandinavian infants who did not receive vitamins were almost three times more likely to die of SIDS. However, in a further analysis of only infants from Sweden, infants who did not get vitamins were 28 times more likely to die of SIDS.

Alm and his colleagues reported that vitamin supplements, often in the form of a vitamin A and D supplement, are commonly given to infants after the first six weeks of life. But based on the findings of the study, the researchers believed that a lack of vitamin A was most critical.

"Vitamin A is important for maintaining a normal immunoresponse... Since infection is regarded as an important risk factor in SIDS, it can be hypothesized that an otherwise non-symptomatic deficiency of vitamin A can lead to an increased number of infections, and thereby an increased risk of SIDS," Alm wrote.

Reference: Alm B, Wennergren G, Norvenius SG, et al. Vitamin A and sudden infant death syndrome in Scandinavia 1992-1995. *Acta Paediatrica*, 2003;92:162-164. □

Low Folic Acid, Genetic Anomaly in Women Raise Risk of Cleft Lip and Palate

Pregnant women who do not consume enough of the B-vitamin folic acid are more likely to give birth to an infant with cleft lip, cleft palate, or both. And pregnant women who carry a common genetic variation, called a polymorphism, in a key folic acid-processing gene are particularly at risk.

Regine P. M. Steegers-Theunissen, PhD, of the University Medical Center, Nijmegen, Netherlands, and her colleagues studied the families of 179 children born with a cleft lip, cleft palate, or both, and compared them with children in 204 families who did not have the birth defect.

A cleft lip is a split in the middle of the upper lip, whereas a cleft palate is characterized by a hole in

the roof of the mouth. Together, they are among the most common of all birth defects.

Steegers-Theunissen and her colleagues found that women with one of two particular polymorphisms in the folic acid-processing gene were either six or seven times more likely to be born with a cleft lip or palate if they did not consume enough dietary folic acid or take folic acid supplements.

Folic acid is essential for the body's production and repair of DNA (deoxyribonucleic acid), the molecule that forms genes. In a rapidly growing fetus, DNA production is accelerated and adequate folic acid is essential for normal development.

The body's use of the vitamin depends on the activity of an enzyme, methylenetetrahydrofolate reductase. But the gene responsible for making this enzyme has two common variations, which reduce the enzyme's activity. One variation, known as C677TT, lowers folic acid levels in the blood and raises homocysteine levels. The other variation, A1298CC, reduces the enzyme's activity without affecting folic acid or homocysteine levels.

A genetic analysis of mothers in the study found that those with the C677TT variation were six times more likely to give birth to an infant with cleft lip or palate, but only if they did not take folic acid supplements or if they had low dietary levels of the vitamin.

Similarly, mothers with the A1298CC variation, were almost seven times more likely to give birth to an infant with cleft lip or palate, if they did not take folic acid supplements or if they had low dietary intake of the vitamin.

Most multivitamin supplements contain folic acid. It appears to be especially crucial before conception and in the first few weeks of pregnancy.

Reference: van Rooij IALM, Vermeij-Keers C, Kluijtmans LAJ, et al. Does the interaction between maternal folate intake and the methylenetetrahydrofolate reductase polymorphisms affect the risk of cleft lip with or without cleft palate? *American Journal of Epidemiology*, 2003;157:583-591. □

Vitamins E and C Supplements Help Keep Elderly Minds Sharper

Research indicates that the age-associated decline in memory and other aspects of cognitive function results partly from free-radical damage to brain cells. Several studies have found that antioxidants – particularly vitamin E – can protect brain cells and help people maintain their cognitive function as they age.

In the latest study, Francine Grodstein, ScD, of the Harvard Medical School, analyzed data from the ongoing Nurses' Health Study. She focused on almost 20,000 women, ages 70-79 years. The subjects were

given a variety of cognitive tests, including those for memory, recall, and verbal fluency. As an example, one of the tests asked women to name as many animals as they could in one minute. Responses to this particular test ranged from two to 38.

Grodstein found that women who scored the highest on cognitive tests were more likely to have been taking a combination of supplemental vitamin E (more than 300 mg) and vitamin C (more than 400 mg) daily for at least 10 years. The benefits were especially strong among women who had a low intake of vitamin E from foods.

Women who took vitamin E alone seemed to benefit, but not consistently. No cognitive benefits were found among women who took only vitamin C or among women who had never taken vitamin E.

Reference: Grodstein F, Chen J, Willett WC. High-dose antioxidant supplements and cognitive function in community-dwelling women. *American Journal of Clinical Nutrition*, 2003;77:975-984. □

Devil's Claw As Good as Cox-2 Inhibitor Drug for Easing Low-Back Pain

The herb devil's claw (*Harpagophytum procumbens*) – so named because of its unusual shape – is a southern African folk remedy for pain. With documented anti-inflammatory properties, it has been used in Europe to reduce pain from osteoarthritis for more than a half-century.

Now, German researchers have reported that the herb works as well as one of the popular Cox-2 inhibitor drugs in relieving low-back pain.

Sigrun Chrubasik, MD, of the University of Freiburg, and colleagues asked 79 patients with low-back pain to take either 60 mg of a proprietary devil's claw product or 12.5 mg of rofecoxib (Vioxx) for six weeks. The patients were allowed to take an analgesic (tramadol) if further pain relief was needed during the study.

By the end of the study, 18 (43 percent) of the 43 patients taking devil's claw had more than a 50 percent reduction in pain, compared with only 12 (33 percent) of the 36 patients taking the drug.

However, more of the patients taking devil's claw had to take the analgesic to reduce their pain. Both groups of patients had about the same number of side effects, mostly gastrointestinal complaints that which were more severe in the rofecoxib group.

The authors noted that the herb had the potential of making 20 percent of patients pain free, compared with only 10 percent in the drug group.

Reference: Chrubasik S, Model A, Black A, et al. A randomized double-blind pilot study comparing Dolotefin and Vioxx in the treatment of low back pain. *Rheumatology*, 2003;42:141-148. □

Quick Reviews of Recent Research

• L-theanine tea extract boosts immunity

L-theanine, one of the many bioactive compounds in tea, may enhance the activity of some types of immune cells. In a laboratory experiment, researchers found that L-theanine increased the activity of gamma-delta T cells, which play a central role in orchestrating the immune system's response to infection. In a small clinical trial, 11 subjects were asked to drink five to six daily cups of black tea, which contains L-theanine. Ten other subjects were asked to drink instant coffee, which does not contain L-theanine. Blood was drawn from the subjects, and the gamma-delta T cells of tea drinkers responded five times faster to bacterial challenge. Coffee drinkers gained no benefits.

Kamath AB, et al. *Proceedings of the National Academy of Sciences*, April 21, 2003. Electronic publication ahead of print.

• Surgery may boost vitamin C needs

Vitamin C is needed for the synthesis of collagen protein, the "tissue cement" of the body. After surgery, vitamin C requirements likely increase to promote healing. Physicians gave 12 subjects undergoing surgical hip replacement 1,000 mg of intravenous vitamin C three times daily, starting two days before and continuing for six days after surgery. After surgery, the ratio of oxidized to nonoxidized vitamin C increased by two and one-half times. The researchers concluded that surgery increases the oxidation of vitamin C as a result of increased free-radical production.

Kubin A, et al. *Annals of Nutrition and Metabolism*, 2003;47:1-5.

• Homocysteine linked to congestive heart failure

Increased blood levels of homocysteine, the consequence of low B-vitamin intake, are a risk factor for coronary heart disease. In an analysis of data from the Framingham Heart Study, researchers compared blood levels of homocysteine in almost 2,500 participants, 156 of whom eventually developed congestive heart failure, a weakening of the heart muscle. Men and women with elevated homocysteine levels had nearly double the risk of congestive heart failure. The risk was somewhat more consistent in women than in men.

Vasan RS, et al. *JAMA*, 2003;289:1251-1257.

• Carotenoids may protect against colorectal cancer

Some research indicates that carotenoids may activate genes that reduce the risk of colorectal cancer. In a study of seven patients with and five patients without colon polyps, researchers found that polyp biopsy samples had relatively low levels of

several carotenoids, compared with healthier nearby tissues. In addition, tissues of healthier patients had higher levels of carotenoids, compared with patients who had polyps. The measured carotenoids included alpha-carotene, beta-carotene, lutein, lycopene, zeaxanthin, and cryptoxanthin.

Muhlhofer A, et al. *Clinical Nutrition*, 2003;22:65-70.

• Black cohosh source of protective antioxidants

The herb black cohosh (*Cimicifuga racemosa*) is often used to reduce menopausal hot flashes. The herb also appears to be a rich source of antioxidants. In an experiment, researchers exposed breast cancer cells to menadione, a chemical that causes free-radical damage. The cells were then bathed in an extract of black cohosh, as well as in 10 individual chemical extracts of the herb. Whole black cohosh reduced menadione-induced DNA damage, as did six of the herb's individual chemical constituents.

Burdette JE, et al. *Journal of Agricultural and Food Chemistry*, 2002;50:7022-7028.

• Lutein better absorbed than zeaxanthin

In a series of experiments, researchers asked healthy men and women to take supplements of lutein esters, one of the forms of the antioxidant carotenoid found in supplements. Dosages varied between 2.4 and 30 mg of lutein esters daily, with supplementation ranging from 60 days to six months. All subjects responded with increased blood levels of lutein. Higher eye levels of lutein appears more consistently among subjects taking the higher dosage. Two subjects took 30 mg of zeaxanthin, which was found to be absorbed less efficiently than lutein. Both nutrients are needed to form the macular pigment, which improves visual acuity and likely reduces the risk of age-related macular degeneration. The body can convert some lutein to zeaxanthin.

Bone RA, et al. *Journal of Nutrition*, 2003;133:992-998.

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