

# The NUTRITION REPORTER™

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## Selenium's Role in Health Expands to Critical Care, Liver Disease, Fertility

Years ago, the mineral selenium was considered toxic. Today, it's regarded as an essential dietary mineral. Three recent studies demonstrate its diverse roles in health.

These findings come of the heels of a renaissance for selenium. In recent years, the mineral has been found to prevent dangerous mutations in at least one virus and to slow the progression of the AIDS virus and possibly the Ebola virus as well. Selenium supplements have been shown to reduce the risk of developing prostate, colorectal, and lung cancer.

Most nutrition researchers recognize that selenium forms an integral part of a key antioxidant enzyme, glutathione peroxidase. Without sufficient dietary selenium, the body cannot make adequate amounts of glutathione peroxidase. Studies have found that seriously ill people consistently have low levels of glutathione peroxidase.

In one study, Roland Gaetner, MD, and his colleagues at the University of Munich, Germany, studied the effect of selenium on patients with systemic inflammatory response syndrome (SIRS). SIRS is a common cause of death in critically ill patients. Often in response to sepsis (an infection of the blood), SIRS promotes production of large numbers of free radicals, some of which kill infecting organisms but which can also damage organs.

Gaetner treated 21 SIRS patients with high doses of intravenous selenium selenite, beginning with 535 mcg daily and decreasing over more than two weeks. Another 21 patients received only 35 mcg of selenium daily.

Both groups were tracked for a variety of clinical symptoms, including kidney failure, the need for breathing assistance, and death. Both groups entered the study with low levels of glutathione peroxidase.

Patients receiving high-dose selenium regained normal glutathione peroxidase levels within three days, but the other patients continued to have low levels of the antioxidant. Other clinical symptoms improved in the high-selenium group as well. Overall, only one-third of the SIRS patients receiving high-dose selenium died, compared with half of those receiving low-dose selenium.

Meanwhile, researchers at the National Taiwan University, Taipei, studied more than 7,000 men who were carriers of hepatitis B and C viruses. An estimated 15-20 percent of people in Taiwan are carriers of hepatitis

B, and about 80 percent of liver cancer cases are attributed to chronic hepatitis B and C infections. Ming-Whei Yu, PhD, analyzed 69 cases of liver cancer in the group and compared them with infected subjects without cancer, as well as 139 healthy subjects.

The researchers found that high blood levels of selenium were associated with significant reductions in risk of liver cancer, ranging from a 48 to 81 percent reduction.

Finally, a team of German and Italian researchers reported a new role for selenium in the development of sperm. Animal and human research has shown that selenium deficiency can be a cause of male infertility. Leopold Flohe, PhD, and his colleagues studied a selenium-containing protein, phospholipid hydroperoxide glutathione peroxidase (PHGPx). They found that PHGPx is produced in large quantities in developing sperm, where it appears to protect against free radical damage to DNA.

However, as sperm mature, the function of PHGPx changes, and it plays a key role in maintaining the physical structure of sperm. In other words, selenium does more than carry out a chemical reaction. It actually forms a key building block of sperm. If sperm were selenium deficient, they would lack this building block and break apart, leading to male infertility.

References: Angswurm MWA, Schottdorf J, Schopoh J, et al. Selenium replacement in patients with severe system inflammatory response syndrome improves clinical outcome. *Critical Care Medicine*, 1999;27:1807-1813. Yu M-W, Horng I-S, Hsu K-H, et al. Plasma selenium levels and risk of hepatocellular carcinoma among men with chronic hepatitis virus infection. *American Journal of Epidemiology*, 1999;150:367-374. Ursini F, Heim S, Kiess, et al. Dual function of the selenoprotein PHGPx during sperm maturation. *Science*, 1999;285:1393-1396. □

### Vitamin E Lowers Lung Cancer Risk

Maintaining high blood levels of vitamin E may reduce the risk of lung cancer by almost one-fifth, according to researchers.

Karen Woodson, PhD, of the National Institutes of Health, Bethesda, Md., and her colleagues analyzed data from the Alpha-Tocopherol, Beta-Carotene Cancer

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Prevention Study (ATBC). The study group included 29,133 male smokers.

Overall, Woodson found that men with the highest blood levels of vitamin E had a 19 percent reduced risk of developing lung cancer, compared with those who had the lowest vitamin E levels. However, men with high blood levels of vitamin E and who were also light smokers had a 50 percent reduced risk of lung cancer.

Men taking 50 mg of vitamin E daily had a slightly reduced risk of lung cancer, but this lower risk did not become statistically noticeable until after eight years of supplementation.

Reference: Woodson K, Tangrea JA, Barrett MJ, et al. Serum a-tocopherol and subsequent risk of lung cancer among male smokers. *Journal of the National Cancer Institute*, 1999;91:1738-1743. □

## High-Lutein Diets Associated With a Lower Risk of Cataracts

Two new studies support the argument that diets high in the carotenoids lutein and zeaxanthin reduce the risk of developing cataracts. Previous research has all but proven that these nutrients significantly lower the likelihood of developing another eye disease, macular degeneration.

Lisa Chasan-Taber, PhD, of the University of Massachusetts, Amherst, and her colleagues analyzed the diets and health of more than 77,000 female nurses over a 12-year period. Women with the highest dietary intake of lutein and zeaxanthin had a 22 percent reduced risk of cataract surgery, compared with women eating the least amount of these nutrients.

In a related study, Lisa Brown, DSc, of the Harvard School of Public Health, and her colleagues, studied the diets and health of more than 36,000 male physicians over eight years. Men consuming foods rich in lutein and zeaxanthin were 19 percent less likely to develop cataracts, compared with men who consumed few of these foods.

Diets high in broccoli, spinach, and kale – each high in lutein and zeaxanthin – were associated with a lower risk of cataract surgery. The researchers suggested that diets high in these carotenoids reduce the risk of cataracts and, particularly, the development of cataracts severe enough to warrant surgery.

References: Chasan-Taber L, Willett WC, Seddon JM, et al. A prospective study of carotenoid and vitamin A intakes and risk of cataract extraction in US women. *American Journal of Clinical Nutrition*, 1999; 70:509-516. Brown L, Rimm EB, Seddon JM, et al. A prospective study of carotenoid intake and risk of cataract extraction in US men. *American Journal of Clinical Nutrition*, 1999;70:517-524. □

## High Vitamin E Levels May Prevent Macular Degeneration

French researchers, using an innovative diagnostic technique, have found a strong association between vitamin E and a low risk of developing age-related macular degeneration (AMD).

Cécile Delcourt, PhD, of the National Institute of Health and Medical Research, Paris, and her colleagues investigated the relationship between blood levels of antioxidants and AMD as part of the ongoing Pathologies Oculaires Liées à l'Age (POLA) survey. The study group consisted of 2,584 inhabitants of Sète, a town located on the French Mediterranean.

At first, Delcourt found only a weak statistical relationship between blood levels of vitamin E and both the early and late symptoms of AMD. However, after analyzing "lipid-standardized" blood levels of vitamin E, she determined that people with the highest levels of vitamin E were 82 percent less likely to develop AMD, compared with people who had the lowest levels of the vitamin.

Lipid-standardized vitamin E levels measure the concentration, or relative ratio, of the vitamin within blood fats or lipoproteins. "Indeed," Delcourt wrote, "the metabolism of vitamin E is closely related to lipids, since it is transported by lipoproteins."

Other research has shown that high levels of vitamin E reduce free radical oxidation of lipoproteins, which carry cholesterol through the blood.

Reference: Delcourt C, Cristol J-P, Tessier F, et al. Age-related macular degeneration and antioxidant status in the POLA study. *Archives of Ophthalmology*, 1999;117:1384-1390. □

## Vitamin C Lotion Reduces Wrinkles, Improves Overall Skin Quality

Topical applications of a vitamin C-containing lotion can reduce tiny wrinkles and improve overall skin condition.

"Chronic insults to the skin such as those caused by UV light, ozone, cigarette smoke, pollutants...lead to cumulative damage and can result in photoaging," wrote Steven S. Traikovich, DO, a clinician in Phoenix, Ariz., in *Archives of Otolaryngology, Head and Neck Surgery*. Skin damage results in part from the generation of free radicals as well as the depression of antioxidants in skin.

Traikovich studied 19 patients who applied a proprietary skin lotion, containing vitamin C, zinc, and tyrosine, to parts of the face for three months. The same patients also applied a lotion without these nutrients to other parts of the face. Assessments were made with objective clinical techniques, clinical evaluations, and patient questionnaires.

In general, the patients had significant improvements in fine wrinkles, skin roughness, sickly yellow complexion, and skin tone. The improvements ranged from almost 60 percent in before-and-after photographs to 84 percent in patient questionnaires.

The study “provided significant objective and subjective improvement in photodamaged facial skin,” wrote Traikovich. “These changes were gradual and became progressively more evident as treatment continued.”

Vitamin C is needed for the creation of stable collagen molecules and for cross-linking collagen molecules, which creates strong skin. Zinc aids collagen turnover and the production of new collagen. Tyrosine is an amino acid involved in protein synthesis and may help transport vitamin C into the skin.

Reference: Traikovich SS. Use of topical ascorbic acid and its effects on photodamaged skin topography. *Archives of Otolaryngology, Head and Neck Surgery*, 1999;125:1091-1098. □

## Low Folic Acid, Whatever the Cause, May Set the Stage for Leukemia

Not every genetic mutation is bad.

A recent study found that people with specific mutations in the genes controlling folic acid metabolism are less likely to develop a form of leukemia. Diets rich in folic acid can benefit people who aren't lucky enough to carry this beneficial mutation.

Martyn T. Smith, PhD, of the University of California, Berkeley, analyzed some of the genes responsible for folic acid metabolism in 71 patients with acute lymphocytic leukemia (ALL) and 114 healthy subjects. ALL accounts for about 10-15 percent of all adult cases of leukemia, but is a common form of leukemia in children.

Smith found that one genetic mutation resulted in a three-fold reduction of ALL risk. Another mutation resulted in a 14-fold reduction of developing ALL.

The mutations protect against ALL by increasing the body's reserves of a form of folic acid known to prevent major breaks in DNA. DNA damage is the principal cause of cancer.

However, these mutations offered no protection against acute myeloid leukemia, the more common type of leukemia in adults.

Smith's findings suggest that, in people without these mutations, a lack of folic acid may increase the risk of this form of leukemia. The “results provide evidence that folic acid deficiency may be a risk factor for adult acute lymphocytic leukemia,” wrote Bruce N. Ames, PhD, in a related commentary.

Ames added that genetic damage “to the sperm or egg is a likely cause of the cancers of childhood, such

as ALL in children. Poor diet in the father, or mother, or even in the grandmother when she was pregnant with the mother...may be a contributor to ALL in children, one of the more common types of childhood cancer.”

Reference: Skibola CF, Smith MT, Kane E, et al. Polymorphisms in the methylenetetrahydrofolate reductase gene are associated with susceptibility to acute leukemia in adults. *Proceedings of the National Academy of Sciences*, 1999;96:12810-12815. □

## Fiber Controls Insulin Levels, Weight, Heart Risk Factors

A diet rich in fiber can help keep weight and blood pressure under control, as well as reduce the risk of coronary heart disease, according to a study in the *Journal of the American Medical Association*.

Fiber consists largely of undigestible material found in vegetables, fruits, and grains. It functions in part by slowing the absorption of food, which prevents the over-secretion of the hormone insulin.

Insulin is needed to transport blood sugar (created during the break down of food) into cells. However, high levels of the hormone promote the storage of fat and can lead to obesity. Insulin can also increase blood pressure, and high insulin levels are well established as a risk factor for coronary artery disease, according to David S. Ludwig, MD, PhD, of Children's Hospital, Boston.

In his study, Ludwig studied more than 2,900 apparently healthy men and women between 18 and 30 years old. He found that men consuming large amounts of dietary fiber were more likely to maintain normal blood insulin levels. In addition, the higher a person's fiber intake, the less likely he was to be obese, to have hypertension, or to have abnormal blood fats.

Over a 10-year period, people eating the most fiber gained the least amount of weight. The 20 percent of the study group eating the most fiber weighed about eight pounds less than did the 20 percent eating the least fiber. Fiber even protected against high-fat diets. “At all levels of fat intake, individuals eating the most fiber gained less weight than those eating the least fiber,” Ludwig wrote.

He concluded by writing, “Fiber consumption predicted insulin levels, weight gain, and other cardiovascular disease risk factors more strongly than did total or saturated fat consumption. High-fiber diets may protect against obesity and cardiovascular disease by lowering insulin levels.”

Reference: Ludwig DS, Pereira MA, Kroenke CH, et al. Dietary fiber, weight gain, and cardiovascular disease risk factors in young adults. *JAMA*, 1999;282:1539-1546. □

## Quick Reviews of Recent Research

### • Zinc may protect against prostate cancer

Healthy prostate tissue contains the highest zinc levels of any soft tissue in the body, suggesting that the mineral plays an important biological role. In a cell culture study, researchers found that zinc inhibited the growth of prostate cancer cells by prompting their self-destruction. The researchers wrote that there is "now strong evidence that the loss of a unique capability to retain a high level of zinc is an important factor in the growth of malignant cells."

Feng P, et al. *FASEB Journal*, 1999;13 (5 Pt, 2 Suppl):A686, Abstr 504.4.

### • Garlic and green tea lower stomach cancer risk

Gastric cancer is the second most common form of cancer worldwide. Chronic atrophic gastritis increases the risk of gastric cancer, and the leading cause of atrophic gastritis is infection with *H. pylori* bacteria. Recent Chinese studies cited by the researchers suggest that garlic and green tea protect against gastric cancer. People who drink large amounts of green tea have a 25 percent lower risk of developing gastric cancer.

Puspok A, et al. *Chirurgische Gastroenterologie*, 1999;15:211-214.

### • Heartburn drug affects vitamin B12

The drug omeprazole is used to treat reflux disease, or heartburn. However, use of the drug has been linked to an increased incidence of atrophic gastritis and decreased absorption of vitamin B12. In a study of 19 patients treated with omeprazole, 15 patients (33 percent) eventually developed atrophic gastritis. As a group these patients suffered an average 16 percent decrease in vitamin B12 levels.

Schenk BE, et al. *Alimentary Pharmacology & Therapeutics*, 1999;13:1343-1346.

### • Vitamin C may reduce diabetes risk

Researchers measured blood plasma vitamin C and glycated hemoglobin (blood cells damaged by free radicals) in almost 6,500 men and women. They found that low vitamin C levels were strongly associated with glycated hemoglobin and a greater risk of developing diabetes.

Sargeant LA, et al. *Diabetologia*, 1999;42 (Suppl): A5, Abstr 9.

### • Pycnogenol® reduces blood stickiness

Smoking tobacco increases adrenaline production, which in turn increases platelet aggregation. In a study, researchers gave smokers various dosages of Pycnogenol®, a complex of antioxidants extracted from French maritime pine bark. Pycnogenol® reduced platelet aggregation, most effectively at the highest dose (200 mg). One 200 mg dose reduced platelet aggregation for six days. Compared with aspirin,

Pycnogenol® did not increase bleeding time.

Putter M, et al. *Thrombosis Research*, 1999;95:155-161.

### • N-acetylcysteine (NAC) has antiaging effects

Deterioration of energy-producing mitochondria in cells contributes to the aging process. After being fed supplemental NAC, laboratory rats maintained more youthful mitochondrial function.

Chakraborti S, et al. *Medical Science Research*, 1999;27:39-40.

### • Coenzyme Q10 (CoQ10) beneficial in heart disease

In a review article, researchers explained that a deficiency of coenzyme Q10 has been noted in patients with congestive heart failure, angina, hypertension, and mitral valve prolapse. CoQ10 boosts cellular production of energy, which improves myocardial function. CoQ10 also inhibits oxidation of the low-density lipoprotein form of cholesterol.

Singh RB, et al. *Journal of Clinical Biochemistry and Nutrition*, 1999;26:109-118.

### • Flavonoids protect against free radicals

In a cell-culture study, researchers documented that hydrogen peroxide, a potent generator of free radicals, damaged DNA. However, incubating the cells with three flavonoids (rutin, quercetin, and myricetin) significantly protected the cells from DNA damage.

Aherne, et al. *Nutrition and Cancer*, 1999;34:160-166.

### • Licorice root has antiinflammatory properties

Licorice root has been used in folk medicine as an antiinflammatory. Recent research has confirmed this effect. In this study, researchers isolated several chemical constituents of licorice root and found them to inhibit platelet-activating factor, which promotes inflammatory responses. Licoridicin was a particularly potent antiinflammatory compound.

Nagumo S, et al. *Biological & Pharmaceutical Bulletin*, 1999;22:1144-1146.

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