

The Nutrition Reporter™

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The independent newsletter that reports vitamin, mineral, and food therapies

New Report: Vitamin Therapies May Help Treat Many Genetic Defects, Fifty Diseases

Nutritionally oriented physicians have sometimes described their use of vitamin supplements as "precursor therapy." The rationale has been to provide large amounts of the biochemical building blocks of enzymes to increase their biological activity, which in turn promotes normal health.

In a new article, Bruce N. Ames, PhD, of the University of California, Berkeley, and one of the world's most respected cell biologists, has taken the concept of precursor therapy a step further. In the *American Journal of Clinical Nutrition*, Ames described the use of high-potency vitamins and other supplements in the treatment of more than 50 diseases – including heart disease, cancer, Alzheimer's, migraines, and alcohol intolerance – caused by genetic defects.

Ames optimistically forecast a new medical era in which physicians will evaluate their patients' individual genetic weaknesses, then prescribe specific vitamin supplements to compensate for those weaknesses. "Feeding high doses of the vitamin raises the tissue [enzyme] cofactor concentrations and thereby increases the activity of the defective enzyme," he wrote.

According to Ames, one-third of genetic mutations, or sites of damage in genes, reduce the "binding affinity" of enzymes to vitamin-dependent coenzymes or substrates. This means that a mutation runs a high risk of preventing an enzyme from linking up with a needed vitamin or vitamin-like nutrient. As a consequence, the enzyme's activity becomes sluggish, essential biochemical reactions fail to take place, and the risk of disease increases.

Some of the genetic defects, known as polymorphisms, may be inborn, or they may be caused by age-related free-radical damage to genes.

In his article, Ames focused on eight B-complex vitamins, vitamin D, vitamin E, vitamin K, alpha-lipoic acid, carnitine, and other nutrients.

For example, a defect in how the body processes vitamin B2 and folic acid affects 10-20 percent of the

population, which can increase the risk of migraine headaches, birth defects, and coronary heart disease. Large doses of supplements, such as those sold in health food stores, can increase the amount of enzyme cofactors and prevent or reverse the disorder.

Similarly, large amounts of vitamin B6 have been shown helpful in the treatment of anxiety, hostility, and depression, noted Ames. The vitamin is required for the body's production of many neurotransmitters – brain communication chemicals – and supplements can increase production of serotonin, one neurotransmitter that is often low in people with depression and other psychiatric disorders.

"Health food and drug stores sell a variety of high-dose B vitamin pills called B50, B100, and similar formulations...Until now, there has been little general support for high-dose B vitamin intake, so the presence of these pills on the market is puzzling," wrote Ames. "This review suggests that for some persons there might be a benefit from high-dose B-vitamin treatment..."

In his conclusion, Ames also wrote, "High-dose vitamin therapies have been efficacious in ameliorating about 50 genetic diseases...The examples discussed...are likely to represent only a small fraction of the total number of defective enzymes that would be responsive to therapeutic vitamins."

Reference: Ames BN, Elson Schwab H, Silver EA. High-dose vitamin therapy stimulates variant enzymes with decreased coenzyme binding affinity (increased K_m): relevance to genetic disease and polymorphisms. *American Journal of Clinical Nutrition*, 2002;75:616-658. □

Animal Study Finds that Supplements Reverse Age-Related Decline in Memory

Giving old laboratory rats a combination of alpha-lipoic acid and acetyl-L-carnitine enhances their memory and reduces age-related damage to brain cells. The study, by Bruce N. Ames, PhD, is

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related to research described in the May issue of *The Nutrition Reporter*.

According to Ames, old laboratory rats do not perform as well as young rats on memory tests. He and his colleagues gave the animals alpha-lipoic acid and acetyl-L-carnitine for seven weeks, then compared their performance on two memory tasks to untreated old rats.

They found that the combination of supplements was far superior to either one by itself. For example, rats taking the supplements were able to find an underwater platform considerably faster than those not taking the supplements.

Tests on the brains of rats found that poorer memory was related to a greater amount of free radical damage in mitochondria, tiny cell structures that break down carbohydrates and fats for energy. Both alpha-lipoic acid and acetyl-L-carnitine are considered "mitochondrial metabolites" that enhance the production of energy, and rats taking the supplements has less brain damage.

"The results suggest that feeding a combination of mitochondrial metabolites to old animals may prevent mitochondrial decay in neurons and restore cognitive function," Ames and his colleagues wrote. "These results also suggest that consumption of high levels of mitochondrial metabolites may be an efficient intervention in humans for delaying brain aging and age-associated neurodegenerative diseases."

Reference: Liu J, Head E, Gharib AM, et al. Memory loss in old rats is associated with brain mitochondrial decay and RNA/DNA oxidation: partial reversal by feeding acetyl-L-carnitine and/or R-a-lipoic acid. *Proceedings of the National Academy of Sciences*, 2002;99:2356-2361. □

Vitamin C Supplements Can Prevent Excessive Bleeding in Surgical Patients

Although some physicians have raised concerns that blood-thinning supplements, such as vitamin E and *Ginkgo biloba*, might cause excessive bleeding among surgical patients, the opposite situation also occurs. Patients with low vitamin C levels may experience excessive post-surgical bleeding.

That's the finding of Thomas H. Cogbill, MD, and some of his colleagues at the Gunderson Lutheran Medical Center in La Crosse, Wisconsin. In the journal *Surgery*, Cogbill described 12 patients who had normal coagulation parameters – that is, normal platelet counts and fibrinogen levels – but experienced abnormal bleeding. Some of the patients required blood transfusions to make up for lost blood.

Blood tests indicated that these patients were deficient in vitamin C, and each patient quickly responded to a dosage of oral vitamin C, 250-1,000 mg daily. "Within 24 hours of vitamin C administration, there was no further evidence of clinical bleeding nor need for subsequent blood transfusions in any patient," Cogbill wrote.

He noted that many people with borderline vitamin C levels can become deficient while hospitalized, particularly if they have a serious illness. Excessive bleeding results from poor blood vessel integrity, which vitamin C can correct and prevent.

"Vitamin C deficiency should be included in the differential diagnosis of nonspecific bleeding in surgical patients," Cogbill wrote. "Prolonged hospitalization, severe illness, and poor diet create vitamin C deficiency with significant clinical consequences. Oral vitamin C replacement rapidly reverses the effects of this disorder."

Reference: Blee TH, Cogbill TH, Lambert PJ. Hemorrhage associated with vitamin C deficiency in surgical patients. *Surgery*, 2000;131:408-412. □

Creatine Supplements Increase Brief Bursts of Energy Among Elite Athletes

In muscle cells, creatine helps restore the chemical reservoir of energy, known as adenosine triphosphate, or ATP. Body builders commonly use creatine supplements to increase their muscle mass, endurance, and strength, but a new study shows that creatine can also increase short bursts of energy.

Tim N. Ziegenfuss, PhD, of Kent State University, Ohio, and colleagues tested the effects of creatine supplements or placebos on 10 male and 10 female elite college athletes, all of whom had relatively little body fat. The male athletes were wrestlers or hockey players, whereas the female athletes were involved in gymnastics, basketball, field hockey, softball, or track.

The subjects engaged in brief bursts of high-intensity exercise, performing six 10-second cycling sprints on a specially designed exercise bicycle. After consuming a creatine-containing beverage or placebo for three days, the subjects were retested. The creatine dosage was tailored to the subjects' individual weights, with the amount equivalent to 5 grams daily for a 150-pound person.

Athletes consuming creatine had significant increases in body mass, measured through magnetic resonance imaging of the thigh, and significant increases in performance while sprint cycling. No significant improvements occurred among athletes taking the placebos.

In addition, the relative increases in performance among the men were greater than those

among the women during the first sprint. However, the women's performance increased more than did the men's during the last three sprints.

In addition, the researchers were surprised to find that the athletes consuming creatine were less fatigued after the brief but intense exercise.

Reference: Ziegenfuss TN, Rogers M, Lowery L, et al. Effect of creatine loading on anaerobic performance and skeletal muscle volume in NCAA division 1 athletes. *Nutrition*, 2002;18:397-402. □

Evidence Suggests Silicon May Be Essential for Normal Bone Formation

Researchers have long suspected that silicon, or its silica (silicon dioxide) form, might be an essential dietary mineral. About a century ago, evidence emerged that it played a role in the formation of bone and connective tissue and that it might help maintain the health of blood vessels.

In the 1970s, studies found that animals fed silicon-deficient diets developed defects in bone and connective tissue and did not grow normally. More recent research has found that silicon increases the formation of type 1 collagen, a key component of bone. Indeed, normal silicon levels in the human body are more than twice as high as those of iron and zinc.

But before silicon can be officially recognized as an essential nutrient, researchers must identify high-silicon foods and how well the mineral is absorbed. With that in mind, Ravin Jugdaohsingh, PhD, of St. Thomas' Hospital, London, and his colleagues conducted several related studies.

In one study, Jugdaohsingh analyzed silicon intake among 5,200 men and women who had participated in the original Framingham (Massachusetts) Heart Study and the Framingham Offspring Study.

In the study, silicon intakes were consistently 20-33 percent higher in men than in women, and intakes decreased with age among both sexes. Silicon intake among men averaged 30-33 mg daily and 24-25 mg daily among women, and the major food sources of silicon were bananas, string beans, and beer.

In two new absorption/excretion studies, one conducted over two days and the other over 25 days, Jugdaohsingh found that men and women absorbed about 7 percent of the total silicon consumed.

The foods highest in silicon in these studies were high-bran cereal, carrots, green beans, bananas, and California seedless raisins.

"Asians and Indians have much higher silicon intakes than do Western populations, as a result of their higher intakes of plant-based foods,"

Jugdaohsingh observed, "and it is interesting that in these communities there is a lower incidence of hip fracture than in the West."

Reference: Jugdaohsingh R, Anderson SHC, Tucker KL, et al. Dietary silicon intake and absorption. *American Journal of Clinical Nutrition*, 2002;75:887-893. □

New Research Finds that Drinking Tea May Be Good for the Heart

Drinking three or more cups of black tea daily may reduce your risk of heart attack, according to a study by Dutch researchers.

Jacqueline C.M. Witteman, PhD, of the Erasmus Medical Center, Netherlands, assessed the eating habits and health of 4,800 Dutch men and women, then followed up on their health for about five and one-half years.

Witteman found that those who consumed three or more cups of tea daily were 43 percent less likely to experience any type of heart attack and 70 percent less likely to suffer a fatal heart attack.

Tea is a major source of antioxidant flavonoids, particularly quercetin, kaempferol, and myricetin, as well as antioxidant catechins and polyphenols.

Noteworthy, women and smokers appeared to gain more benefits from tea, compared with men and nonsmokers. The mild phytoestrogen effect of flavonoids might enhance their effect in women, and smokers might have a greater need for antioxidants because of tobacco-related vascular damage.

Reference: Geleijnse JM, Launer LJ, van der Kuip DAM, et al. Inverse association of tea and flavonoid intakes with incidence myocardial infarction: the Rotterdam study. *American Journal of Clinical Nutrition*, 2002;75:880-886. □

Fish, Omega-3 Intake Reduces Risk of Heart Attacks in Women

Eating more fish can lower a woman's risk of heart attack, and the protective effect of fish is directly related to the amount consumed.

That's the finding of a study by researchers at the Harvard and Duke university medical schools. Previous research has shown that diets high in fish reduce the risk of heart attack in men.

In the current study, Frank B. Hu, MD, of Harvard, and his colleagues analyzed the diets and health of women participating in the Nurses' Health Study since 1980.

Women consuming fish one to three times per month were 21 percent less likely to have a heart attack compared with women who never ate fish. But

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Quick Reviews of Recent Research

• Ginkgo eases mountain sickness

Acute mountain sickness often develops after rapidly moving to a very high altitude. Twenty-six men and women were asked to take either 60 mg of ginkgo biloba or a placebo three times on one day. On the following day, they were transported from sea level to almost 14,000 feet on a Hawaiian mountain over a three-hour period. Two subjects (17 percent) taking ginkgo and nine subjects (64 percent) taking placebo developed severe acute mountain sickness. One day of pretreatment significantly reduced the severity of acute mountain sickness.

Gertsch JH, et al. *High Altitude Medicine & Biology*, 2002;3:29-37.

• Hawthorn reduces blood pressure and anxiety

The herb hawthorn is a traditional heart tonic, and some studies have found it beneficial for people with heart failure. Researchers gave 500 mg of hawthorn extract, magnesium, or a combination to 36 subjects with mild hypertension. Ten of the 19 people taking hawthorn had modest but "promising" reductions in diastolic blood pressure. They also has a trend toward reduced anxiety. No benefits were noted in subjects taking magnesium or a combination of supplements.

Walker AF, et al. *Phytotherapy Research*, 2002; 16:48-54.

• Beta-carotene may protect against colon cancer

In cell-culture studies, researchers tested different amounts of beta-carotene on four types of colon

cancer cells. Beta-carotene inhibited the growth of the colon cancer cells, and the highest dose had the greatest effect. Beta-carotene interrupted the growth cycle of the cancer cells and prompted their self-destruction. The researchers wrote, "The present study provides evidence that beta-carotene may act as a potent growth inhibitory compound in human colon adenocarcinoma cells and supports the possibility of a chemopreventive or chemotherapeutic potential for this carotenoid in colon cancer."

Palozza P, et al. *Carcinogenesis*, 2002;23:11-18.

• Vitamin E benefits people with diabetes

Diabetics who use an insulin pump maintain near-normal blood sugar levels but still experience high levels of oxidative stress, resulting from large numbers of damaging molecules known as free radicals. Researchers asked 98 men and women using an insulin pump to take 300 IU of natural vitamin E or placebos daily for two months. People taking vitamin E had lower levels of free radicals and oxidative stress. In addition, tests showed that the vitamin E supplements boosted the subjects' vitamin C levels.

Park S, et al. *American Journal of Clinical Nutrition*, 2002;75:728-733.

• Antioxidants linked to healthy lungs

Previous research has shown that high intake of antioxidants is related to enhanced lung function. Researchers analyzed the lung function and diets of 1,616 middle-age and elderly men and women. High intake of vitamin E was associated with greater FEV1 (forced expiratory volume in one second, or the amount of air exhaled in one second). Two carotenoids, lutein and zeaxanthin, were associated with increased FVC (forced vital capacity, or the amount of air exhaled in one breath). Both FEV1 and FVC are standard tests of lung function.

Schunemann HJ, *American Journal of Epidemiology*, 2002;155:463-471.

Fish, Heart Attacks...

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women who consumed fish far more often – five or more times weekly – were 34 percent less likely to experience a heart attack. In addition, women eating a lot of fish were 45 percent less likely to have a fatal heart attack.

In various breakdowns of data, Hu and his colleagues found that the risk of heart attack consistently declined as fish consumption increased. The benefits of eating fish were independent of other established dietary factors influencing the risk of heart disease.

When the researchers calculated the amount of omega-3 fatty acids in the diet, the risk of heart attack was also inversely related to intake: more omega-3s translated into lower risk.

Hu FB, Bronner L, Willett WC, et al. Fish and omega-3 fatty acid intake and risk of coronary heart disease in women. *Journal of the American Medical Association*, 2002;287:1815-1821. □

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