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THE NEWSLETTER THAT REPORTS VITAMIN AND MINERAL THERAPIES

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The Amino Acid Carnitine Works with Antioxidants to Slow the Aging Process

Researchers increasingly believe that the aging process ultimately begins in the mitochondria, thread-like "organs" found in each cell of the body. Mitochondria are the cell's energy factories, where much of the cell's work is actually performed and 85 percent of all oxygen is consumed.

Of course, wherever there's oxygen, there are also free radicals stripping away electrons from healthy molecules—and aging cells.

In a provocative paper in the *Proceedings of the National Academy of Sciences of the USA* (Nov. 8, 1994;91:10771-8), respected biochemist and molecular biologist Bruce Ames, PhD, of the University of California, Berkeley, explored some of the causes of aging—and how the amino acid carnitine and antioxidant nutrients likely slow down or turn back the aging process.

Free radicals, or oxidants, are produced as a consequence of normal energy-producing reactions, infection-fighting, and detoxification reactions in the body, as well as by air pollution and cigarette smoke.

"Accumulation of such damage may contribute to aging and age-associated degenerative diseases," Ames wrote. "The continuous threat of oxidant damage to the cell, tissue, and organism as a whole is underscored by the existence of an impressive array of cellular defenses that have evolved to battle these reactive oxidants. However, these defenses are not perfect..."

One of the key mitochondrial defenses is cardiolipin, essential for membrane permeability. By maintaining the flexibility of membranes, cardiolipin allows smaller

molecules to pass through to the mitochondria. One of these small molecules is coenzyme Q10, a nutrient that stimulates the mitochondria's production of adenosine triphosphate (ATP) and energy.

However, cardiolipin levels in heart, liver, and brain cells decrease as a result of oxidation and aging.

As it turns out, carnitine promotes cardiolipin synthesis. "Acetyl-L-carnitine (ALCAR) fed to old rats increases the amount of cardiolipin to levels similar to

that of young rats, suggesting that ALCAR administration may improve cellular bioenergetics in the aged rat," Ames explained.

Numerous studies have supported the thesis that low levels of carnitine in the mitochondria contribute to aging. "A rapidly growing body of evidence suggests that the apparent age-related deficits in mitochondrial function can be slowed or reversed by ALCAR, a normal component of the inner

Continued on page 2

Fish Oil Improves Heart Wall Flexibility

The cardiovascular benefits of omega-3 fatty acids (fish oils) have been well documented. However, many of the benefits have been attributed to the anti-coagulant or cholesterol-lowering properties fish oils confer on blood platelet cells.

Now, a study has found that fish oils improve "arterial compliance"—the flexibility of the heart wall—among diabetics. Negative changes in arterial compliance may be indicative of the early stages of heart disease.

Gary McVeigh, MD, of the University of Minnesota, investigated the effects of fish oil capsules on heart function. Twenty diabetic subjects took fish oil capsules daily for six weeks. The fish oil contained 1.8 grams of eicosapentaenoic acid and 1.2 grams of docosahexaenoic acid. Either before or after receiving the fish oil, subjects were given an olive oil placebo for six weeks.

"Diets rich in fish oils appear to be associated with a low incidence of atherosclerosis and acute thrombotic complications due to atherosclerosis," McVeigh wrote in *Arteriosclerosis and Thrombosis* (Sept. 1994;14:1425-9). "Be-

cause fish oils favorably influence many of the mechanisms involved in atherogenesis, they are attractive candidates for therapy in diabetic subjects."

To measure changes in cardiac output, a catheter was inserted under local anesthesia into the left brachial artery of the subjects. Arterial compliance improved in response to the fish oil supplements, but not to the olive oil.

Blood analyses indicated that the eicosapentaenoic acid and docosahexaenoic acid displaced arachidonic acid. Fasting glucose levels increased about 10 percent, cholesterol remained unchanged, and triglyceride levels dropped by about 20 percent among those taking fish oil capsules.

McVeigh wrote that "short-term dietary supplementation with fish oils improved the compliance characteristics of the arterial circulation in patients with NIDDM (non-insulin-dependent diabetes mellitus). Improving arterial wall characteristics may represent an additional mechanism whereby fish oils exert their cardioprotective action in humans." □

Magnesium Reduces the Risk of Restenosis Among Balloon Angioplasty Patients

The use of intravenous magnesium during coronary balloon angioplasty increases the likelihood that the procedure will succeed, according to a study conducted at the Tel-Aviv Medical Center, Israel.

Balloon angioplasty is a quasi-surgical procedure in which a spaghetti-thin catheter is inserted into a coronary artery. A balloon at the tip of the catheter is inflated, dilating the artery and increasing blood flow. The procedure is often recommended because it costs about one-fifth that of coronary artery bypass surgery.

However, 30-40 percent of patients undergoing a balloon angioplasty suffer from restenosis—the re-narrowing of the blood vessel—within six months. Drug treatment has failed to reduce the incidence of restenosis, and patients who develop restenosis must undergo another angioplasty or bypass surgery.

Cardiologist Arie Roth, MD, compared three groups of patients undergoing balloon angioplasty: 45 patients who received magnesium before, during, and after the procedure; 48 who also received supplemental magnesium for six months after the procedure; and 46 patients who served as a control group by not receiving magnesium.

Numerous studies have delineated the cardiovascular benefits of magnesium, including the mineral's ability to reduce arrhythmias, platelet aggregation, and blood pressure. "Since magnesium has vasodilator and antithrombotic effects, this study was designed to evaluate its potential to decrease the rate of restenosis," Roth wrote in the *European Heart Journal* (Sept. 1994;15:1164-73).

The rate of restenosis was 34 percent lower among patients receiving magnesium. Only 25 to 26 percent of

the magnesium patients developed restenosis compared with 38 percent of those who did not get magnesium. Roth defined restenosis as more than a 50-percent reduction in blood vessel diameter at the site of the procedure. Supplemental magnesium for six months after the procedure provided no additional benefits.

How did magnesium help? Most likely by reducing coronary spasm and elastic recoil and increasing vasodilation, according to Roth.

He concluded that "intravenous administration of magnesium in patients undergoing coronary angioplasty is feasible and safe and that the beneficial trend of magnesium to prevent acute recoil and...restenosis is encouraging and should promote further investigation in a larger patient population." □

Vitamin C Not a Factor in Kidney Stones

Doctors have long wondered whether high intake of vitamin C increases the risk of kidney stones. A recent study shows that it does not.

Theodore Wandzilak, MD, of the University of California Davis, noted in the *Journal of Urology* (April 1994;151:834-7) that most kidney stones are composed of calcium oxalate and that urinary oxalate is a marker of kidney stone risk. Oxalate comes from either the metabolism of glyoxylate and vitamin C or from the diet.

"Controversy exists as to whether an increased or megadose ingestion of vitamin C can significantly increase the urinary excretion of oxalate and, therefore, lead to an increase in the potential for calcium oxalate stone formation," wrote Wandzilak.

Many methods have been used over the years to measure urinary oxalate, and some studies have shown that intake of more than 4 grams of vitamin C daily increases urinary

oxalate levels. The studies have been complicated by the fact that vitamin C interferes with accurate measurements of urinary oxalate. "Ascorbic acid has been shown to interfere in some manner with the measurement of oxalate in most of the assays used to measure urinary oxalate," Wandzilak wrote.

Wandzilak, however, decided to use his own ion chromatography method, which minimizes interference from vitamin C, to determine urinary oxalate levels in 15 subjects given 10 grams daily of the vitamin. Increases in urinary oxalate were minimal.

In conclusion, Wandzilak wrote that the "data show that the ingestion...of increasingly large quantities of vitamin C...did not cause...an increase in the urinary excretion of oxalate. Therefore, the safety concerns raised about increased ascorbate ingestion causing an increased urinary oxalate level and, as

Carnitine, Aging...

Continued from page 1

mitochondrial membrane that serves as a precursor for acetyl-CoA (needed to synthesize fatty acids) as well as the neurotransmitter acetylcholine." ALCAR is converted to L-carnitine, which is stored in the mitochondrial membrane and can be converted back to ALCAR.

In addition, Ames pointed out that "excitatory" amino acids, such as glutamate, are often toxic to neurons and have been implicated in a large number of neurological diseases, including Parkinson's and Alzheimer's diseases.

However, he added, several nutrients—mostly antioxidants—protect against neural toxicity. Among them are ALCAR, glutathione and oxidized glutathione, vitamin B3, and CoQ10. These substances prevent the depletion of ATP, a situation that makes neurons susceptible to the damaging effects of

Continued on page 4

Continued on page 3

Vegetarian Diets, Fiber Reduce Risk of Disease

A study of German vegetarians has found that they are far less likely than nonvegetarians to die of heart disease and cancer.

Rainer Frentzel-Beyme, PhD, of the Bremen Institute for Prevention Research and Social Medicine, followed 1,904 strict and moderate vegetarians for 11 years and compared their incidence of disease and death to what was expected in a more general population. The findings were dramatic.

Two hundred twenty-five deaths among the vegetarians occurred between 1978 and 1989—half of what was expected in the general population.

"This was attributable mainly to the reduction in cardiovascular disease (CVD) as the major cause of death," Frentzel-Beyme noted in the *American Journal of Clinical Nutrition*; (May 1994;59S:1143S-52S). "There were less than half the number of expected deaths from CVD in both sexes, and the mortality from ischemic heart diseases as a part of CVD was only one-third of the expected number."

Other key findings:

- both male and female vegetarians had less than half the expected deaths from respiratory system diseases;
- male vegetarians had half the expected deaths from cancer;
- female vegetarians had one-fourth the expected deaths from cancer; and
- vegetarians had a lower incidence of death from colon cancer and no deaths from rectal cancer.
- On the negative side, vegetarian men and women had a greater risk of dying from aplastic anemia.

Frentzel-Beyme noted that vegetarians tend to be more health conscious overall and that other lifestyle factors, such as exercise, may also protect them against disease.

In the same issue of the *American Journal of Clinical Nutrition* (May 1994

59S:1242S-7S), James Anderson, PhD, of the University of Kentucky College of Medicine, Lexington, addressed the practicalities of adding more fiber to the diet.

"Over the past 20 years dietary fiber has emerged as a leading dietary factor in the prevention and treatment of chronic diseases. High fiber intakes are associated with lower serum cholesterol concentrations, lower risk of coronary heart disease, reduced blood pressure, enhanced weight control, better glycemic control, reduced risk of certain forms of cancer, and improved gastrointestinal function," he wrote.

However, the average American consumes only 10 to 23 grams of fiber daily, roughly half of the recommended intake of 20 to 35 grams.

"Almost all individuals can increase their intake of fiber-rich foods if they do so gradually," explained Anderson. "The major side effect of high fiber intake is increased intestinal gas production, which subsides as individuals adapt to the diet."

He noted that a report by the National Academy of Sciences (*Diet and Health*, National Academy Press, 1989) recommended that Americans eat at least five servings of fruit and vegetables and at least six servings of breads, cereals, and legumes each day. A serving of white bread, rice, or pasta provides about 1 gram of fiber, whereas a serving of whole-grain bread provides 2 to 5 grams of fiber.

"As individuals increase their fiber intake, they should also increase fluid intake," Anderson advised. "Medications for hyperlipidemia, hypertension, or diabetes may need to be reduced or discontinued under a physician's direction. Individuals should also be encouraged to engage in regular aerobic activity such as walking, because exercise augments the health benefits of high fiber intake."

In conclusion, he noted that considering "the mounting evidence

of the overall health benefits of fiber, aggressive efforts should be made to incorporate fiber intake goals in nutrition therapy for metabolic conditions as well as in nutrition guidelines for health promotion. A high-fiber diet that is generous in fruits, vegetables, beans, and whole grains is a practical nutrition plan to adopt for a lifetime." □

Carnitine...

Continued from page 2
excitatory amino acids.

"Clinical studies in elderly humans indicate that various dietary antioxidants such as glutathione, beta-carotene, and alpha-tocopherol (vitamin E) improve cell-mediated immunity," concluded Ames. "Increasing the intracellular antioxidant levels...improving mitochondrial function, and decreasing oxidant-induced membrane rigidity could all be mechanisms by which dietary antioxidants serve to boost cell-mediated immunity." □

Vitamin E Helps Transplant Patients

Increased platelet aggregation is one of the many post-surgical risks a person faces after a heart transplant. But according to a recent study, vitamin E reduces the clotting tendency of blood platelet cells—and also lowers the risk of organ rejection.

A team of researchers gave 20 heart-transplant patients either 500 IU of vitamin E or a placebo daily for two months. Platelet aggregation "significantly decreased" in patients given the vitamin E, according to an article in *Transplantation* (de Lorgeril, M., et al., July 27, 1994;58:193-5).

The vitamin E "tended to improve immunosuppression," most likely by reducing white blood cell count. It also reduced cyclosporine toxicity to the kidneys, according to the authors. □

Substituting Almonds or Walnuts for Other Dietary Fats Reduces Cholesterol Levels

Replacing dietary fats with almonds or walnuts can reduce total blood cholesterol levels and, perhaps more importantly, the low-density lipoprotein (LDL) form of cholesterol.

Mavis Abbey, MD, of the Division of Human Nutrition, Commonwealth Scientific and Industrial Research Organization, Australia, investigated the effects of different dietary fats on 16 men with normal cholesterol levels.

"Dietary studies have usually used dietary oils as the source of polyunsaturated and monounsaturated fatty acids. Very little work has been done in which specific foods have been examined for their effect on plasma lipids and coronary heart disease outcomes," Abbey wrote in the *American Journal of Clinical Nutrition* (May 1994;59:995-9). One study has shown that individuals consuming nuts four times per week were substantially protected from fatal and nonfatal coronary heart disease events compared with those consuming nuts less than once a week. It is suggested that the favorable fatty acid composition of nuts, that is a relatively high percentage of polyunsaturated and monounsaturated fatty acids, may explain their protective effect."

Abbey placed the subjects on a "reference" diet comparable to the typical Australian diet, which contains 36 percent fat. For three weeks, meat, dairy products, vegetable oils, and fat spreads provided 18 percent of the fat. The other 18 percent was provided initially by raw peanuts, coconut cubes, and a coconut confectionary bar.

For the second three-week period, subjects received 18 percent dietary fat from almonds instead of from peanuts

and coconut. And for the third three-week period, they received 18 percent dietary fat from walnuts.

"Compared with the reference diet, there were significant reductions in total and LDL cholesterol, 7% and 10% respectively, after supplementation with almonds, and 5% and 9%, respectively, after supplementation with walnuts," Abbey wrote.

Of particular importance, the reduction in total cholesterol levels was

a result of lowered LDL, not of the beneficial high-density lipoprotein (HDL) form of cholesterol.

Added Abbey: "The reduction in cholesterol, although only of the order of 7-10% in this study, is significant in relation to reduction in coronary heart disease risk because a 7% decrease in total cholesterol leads to a theoretical 14% decrease in incidence of coronary heart disease." □

Fish Oils Protect Smokers' Lungs

The best way to control the health effects of smoking is to stop smoking. But a recent study has shown that a high intake of omega-3 fatty acids (fish oils) might confer some protection against smoking-related chronic obstructive pulmonary disease (COPD), including chronic bronchitis, emphysema, or reduced lung function.

Numerous studies have shown that the omega-3 fatty acids, principally eicosapentaenoic acid and docosahexaenoic acid, have an anti-inflammatory effect and benefit people with rheumatoid arthritis and ulcerative colitis.

Chronic bronchitis and emphysema are common consequences of lifelong smoking. "The pathogenic mechanisms linking cigarette smoke to these diseases are not entirely understood, but inflammatory mediators are likely to be involved, including those that may be influenced by omega-3 fatty acids," observed Eyal Shahar, MD, MPH, in the *New England Journal of Medicine* (July 28, 1994;331:228-33).

Shahar, of the University of Minnesota School of Public Health, looked at the dietary habits and diseases of approximately 4,000 smokers and 5,000 former smokers.

He found that those who ate a

lot of fish had half the incidence of COPD compared with those who ate little or no fish. The more people consumed fish oils, the less their risk of disease.

"Although this study does not establish that the dietary intake of omega-3 fatty acids or fish protects against smoking-related COPD, that hypothesis is biologically plausible....The findings reported here suggest a role for dietary intake of omega-3 fatty acids against COPD and deterioration of lung function among cigarette smokers," Shahar wrote. □

Kidney Stones...

Continued from page 2

a consequence, an increase in kidney stone formation in healthy subjects are not supported by our findings." □

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