Dynamic Chiropractic

NUTRITION / DETOXIFICATION

Carnitine

Robert Anderson, DC,MD,PhD

Carnitine is a peptide made in the liver and kidneys from L-lysine and methionine, vitamin B6, vitamin C, niacin, and iron. Carnitine must be present for long chain fatty acids to be oxidized. It is part of four different enzymes that allow fatty acids to be transported through the mitochondrial membranes so beta oxidation can occur. Carnitine is best known for improving cardiac function in patients with ischemic heart disease, cardiomegaly, and angina. A carnitine deficiency may result in the accumulation of triacylglycerol in the liver, which can lead to intrahepatic lipid infiltration. New studies indicate that carnitine supplementation can help in peripheral vascular disease and intermittent claudication. Carnitine also removes metabolic byproducts from the inside of the mitochondria. This frees coenzyme A to metabolize fats. A lack of carnitine may result in an increase in blood triglyceride levels.

Our focus today is how carnitine can be of benefit to the athlete. Carnitine's ability to transport fatty acid into the mitochondria aids aerobic and endurance athletes. In long-term submaximal activity, the body uses fatty acids and fat reserves for the bulk of its energy. Efficient intramitochondrial delivery of fatty acids insures proper nutrient breakdown, spares glycogen, and may increase VO2 max.

New, exciting research indicates that carnitine supplementation can help the anaerobic athlete as well. Its ablity to enhance pyruvate's buffering capacity leads to reduced amounts of intramuscular lactate accumulation. Thus, strength athletes, such as football players, bodybuilders, and powerlifters may find that adding carnitine to their supplemental programs will enhance their performance.

Only the L form of carnitine should be used. The D-isomer and DL forms have been shown in numerous studies to block the beneficial effects of the L form. Carnitine is a very safe substance, with the only side effects being possible diarrhea at higher doses. Effective doses of carnitine range from 250-2,000 mg per day. Although opinions on maximal time of ingestion vary, it is my experience that carnitine is best absorbed when taken before meals in divided doses. For example, for the athlete who is taking 1,000 mg per day, I would recommend that he ingest 500 mg before breakfast, and 500 mg before dinner. Athletes should generally begin to feel carnitine's effect after three to five days of supplementation. Normally, I would start an athlete on no more than 500 mg per day for the first two to four weeks. If they do not feel that it is having a positive effect, I would then increase the dose by 500 mg every two weeks. I do not recommend exceeding 2,000 mg per day. Most athletes will respond quite favorably to 1,000 mg per day.

As mentioned above, carnitine is synthesized in the body from a variety of nutrients. Various studies have shown that should any one of these nutrients be severely restricted, a marginal carnitine deficiency may be present. The amino acid lysine is the most important ingredient for carnitine. Therefore, patients on a vegetarian diet may have an increased risk for borderline carnitine deficiencies. Lysine is also heat sensitive and, thus, it is possible for it to be destroyed or denatured by prolonged high temperature cooking.

Other people who may need carnitine supplements include patients on high fat diets or vigorous

exercise programs, both of which stimulate carnitine use. In the case of the high fat diet, urinary excretion of carnitine is also increased, thus increasing the importance of this accessory nutrient for patients in this category.

As is the case with so many ergogenic aids, there are conflicting studies on what carnitine can do. In particular, carnitine's ability to increase VO2 max (thus, enhancing aerobic capacity) has been questioned in those who are free from cardiac and/or vascular disorders. Also, there have been no studies to reproduce the initial research that indicated anaerobic athletes may benefit as well. Although further studies are needed, there are many athletes in both aerobic and anaerobic sports who are reporting enhanced muscular efficiency with the use of carnitine.

For references pertaining to this article please contact:

Douglas Andersen, D.C.
916 E. Imperial Hwy.
Brea, California 92621

MARCH 1991