COENZYME Q_{10}

A Natural Nutrient for Heart Disease

Although acceptance of nutritional supplements has been very high among the general public in the United States, their use as treatments for common disease states has not been widespread in the medical community. A lack of data on the effectiveness of these treatments as well as concerns for patient safety has limited the use of such supplements by health care professionals.

Coenzyme Q_{10} (CoQ_{10}) is a naturally occurring nutrient that exemplifies this controversy. CoQ_{10}, also known as ubiquinone, is a fat soluble vitamin-like substance that occurs naturally in organs such as the heart, liver, and kidneys.[1] It plays a role in cellular energy release, serving as an electron carrier in mitochondrial ATP synthesis. It also serves as an antioxidant by reducing free radicals thereby preventing damage to structural lipids and proteins.[2] Coenzyme Q_{10} has been studied for a variety of uses, including heart disease, cancer, HIV, and periodontal disease. However, because of its status as a natural product, is not presently FDA approved as a treatment for any of these indications and is exempt from FDA regulation.

The most convincing efficacy data for coenzyme Q_{10} is in patients with heart disease. Clinical trials performed worldwide have proven the safety and efficacy of this supplement for heart failure, but it remains to be a relatively unknown therapeutic option. In fact, the American Heart Association has not established a stance on the use of coenzyme Q_{10}.

Interest in the use of coenzyme Q_{10} for heart disease stemmed from the observation that CoQ_{10} blood and tissue levels are reduced in subjects with heart failure. This observation holds true regardless of the specific type of heart disease that may be present. Levels of coenzyme Q_{10} have been shown to be reduced in dilated cardiomyopathy, restrictive cardiomyopathy, and alcoholic heart disease.[3]

Deficiencies of coenzyme Q_{10} can occur because of decreased intake, decreased endogenous production, or both. Coenzyme Q_{10} is found in a wide variety of meats, fish, and vegetables. Within the body, it is synthesized through a complex pathway dependent on niacin, folate, vitamins B_6, B_{12}, and C and the enzyme HMG-CoA reductase.[1,4] Vitamin deficiencies or the use of HMG-CoA reductase inhibitors for hypercholesterolemia can result in reduced CoQ_{10} levels.

Studies on the use of coenzyme Q_{10} for heart disease have analyzed its use as an adjunct to standard drug therapy. In a 12-month multicenter, placebo-controlled trial, Morisco and colleagues exhibited the remarkable effectiveness of supplemental coenzyme Q_{10} treatment in advanced congestive heart failure.[5] This study followed 282 patients randomized to receive coenzyme Q_{10} 2 mg/kg/day (mean age: 66 yrs; range: 26-89) and 281 patients randomized to receive placebo (mean age 67 yrs; range 30-88). All subjects had congestive heart failure with NYHA class III or IV severity and

were using digitalis, diuretics, and/or ACE inhibitors as their main treatment. Patients with myocardial infarction within the previous three months, significant angina, valvular disease, and renal failure were excluded from the trial. The study showed that the incidence of major cardiovascular events requiring hospitalization, including acute pulmonary edema, cardiac asthma, and arrythmias, were all significantly reduced in the coenzyme Q_{10} group. This trial was unable to show a benefit in mortality in the coenzyme Q_{10} group due to the exclusion of patients with comorbidities. However, the reduction of CHF complications along with the lack of adverse reactions associated with the CoQ_{10} treatment makes this an excellent addition to standard therapy for congestive heart failure.

The effective clinical outcomes from CoQ_{10} treatment may be due to measurable effects this agent exhibits on cardiac function. Langsjoen and colleagues conducted a study on 115 patients with isolated diastolic dysfunction which measured echocardiographic changes before and after CoQ_{10} supplementation.[6] Diastolic dysfunction, an early sign of heart failure, is characterized by the stiffening and hypertrophy of the heart muscle. In addition to having over 90% of patients show an improvement of at least one NHYA class, CoQ_{10} supplementation resulted in echocardiographic improvement. In a 29 patient subset who had a six-month echocardiograph follow-up, 65% showed a reduction in myocardial wall thickness. These changes suggest that myocardial wall relaxation is dependent, in part on coenzyme Q10. Other research showed the considerable effect that CoQ_{10} has on left ventricular ejection fraction.[3]

The use of anthracyclines (doxorubicin, daunorubicin) for neoplastic conditions is often hampered due to dose-limiting cardiotoxicity. Coenzyme Q_{10} has been studied as a preventative measure for patients on anthracycline therapy. Iarussi and colleagues studied the effect of CoQ_{10} therapy on a group of 20 young patients (age 1-15) being treated with daunorubicin or doxorubicin for acute lymphoblastic leukemia (ALL).[7] Ten patients were randomized to a CoQ_{10} treated group (100 mg orally twice daily) and the remaining ten patients were without CoQ_{10} treatment. Echocardiography studies were performed at baseline, at a cumulative anthracycline dose of 180 mg/m^2, and at the end of therapy. Septal wall thickening, an adaptive response indicative of progressing heart disease, was present in the subjects completing therapy with anthracyclines without CoQ_{10} supplementation. The subjects being supplemented with CoQ_{10} appeared to be protected from the morphological changes of heart disease. These findings suggest that coenzyme Q_{10} can reduce cardiovascular morbidity related to antineoplastic therapy.

Coenzyme Q_{10} is available as an oral tablet and as a soft-gel capsule. The soft-gel is preferred due to its superior bioavailability. Doses for treatment of heart disease range from 50-150 mg/d. Mild nausea has been reported as a side effect of CoQ10 therapy. No drug-drug interactions have been documented. The cost of monthly therapy is about $60 for a 70-kg person taking the recommended dose.[8] The favorable efficacy, toxicity, and economic profiles make adjunctive coenzyme Q_{10} therapy a viable option for all heart failure patients. However, it is important to keep in mind that no

studies have shown a decrease in mortality or an improved survival with coenzyme Q_{10} supplementation.

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