



Coenzyme Q10

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Summary

Coenzyme Q10 is a fat-soluble compound primarily synthesized by the body and also consumed in the diet. Coenzyme Q10 is required for mitochondrial ATP synthesis and functions as an antioxidant in cell membranes and lipoproteins.

Endogenous synthesis and dietary intake appear to provide sufficient coenzyme Q10 to prevent deficiency in healthy people, although tissue levels of coenzyme Q10 decline with age.

Oral supplementation of coenzyme Q10 increases plasma, lipoprotein, and blood vessel levels, but it is unclear whether tissue coenzyme Q10 levels are increased, especially in healthy individuals. Coenzyme Q10 supplementation has resulted in clinical and metabolic improvement in some patients with hereditary mitochondrial disorders.

Although coenzyme Q10 supplementation may be a useful adjunct to conventional medical therapy for congestive heart failure, additional research is needed.

Roles for coenzyme Q10 supplementation in cardiovascular diseases, neurodegenerative diseases, cancer, and diabetes require further research.

Coenzyme Q10 supplementation does not appear to improve athletic performance.

Although coenzyme Q10 supplements are relatively safe, they may decrease the anticoagulant efficacy of warfarin.

Although the use of cholesterol-lowering medications known as HMG-CoA reductase inhibitors (statins) decreases circulating levels of coenzyme Q10, it is unclear whether coenzyme Q10 supplementation provides any health benefit to patients taking these drugs.

Introduction

Coenzyme Q10 is a member of the ubiquinone family of compounds. All animals, including humans, can synthesize ubiquinones, hence, coenzyme Q10 cannot be considered a vitamin (1). The name ubiquinone refers to the ubiquitous presence of these compounds in living organisms and their chemical structure, which contains a functional group known as a benzoquinone. Ubiquinones are fat-soluble molecules with anywhere from one to 12 isoprene (5-carbon) units. The ubiquinone found in humans, ubiquinone or coenzyme Q10, has a "tail" of ten isoprene units (a total of 50 carbon atoms) attached to its benzoquinone "head" (diagram) (2).

Diabetes mellitus

Diabetes mellitus is a condition of increased oxidative stress and impaired energy metabolism. Plasma levels of reduced coenzyme Q10 (CoQ10H₂) have been found to be lower in diabetic patients than healthy controls when normalized to plasma cholesterol levels (51, 52). However, supplementation with 100 mg/day of coenzyme Q10 for three months neither improved glycemic (blood glucose) control nor decreased insulin requirements in type 1 (insulin-dependent) diabetics compared to placebo (53). Similarly, 200 mg/day of coenzyme Q10 supplementation for 12 weeks or six months did not improve glycemic control or serum lipid profiles in type 2 (non-insulin dependent) diabetics (45, 54). Because coenzyme Q10 supplementation did not influence glycemic control in either study, the authors of both studies concluded that coenzyme Q10 supplements could be used safely in diabetic patients as adjunct therapy for cardiovascular diseases.

Maternally inherited diabetes mellitus and deafness (MIDD) is the result of a mutation in mitochondrial DNA, which is inherited exclusively from one's mother. Although mitochondrial diabetes accounts for less than 1% of all diabetes, there is some evidence that long-term coenzyme Q10 supplementation (150 mg/day) may improve insulin secretion and prevent progressive hearing loss in these patients (55, 56).