

The Longwood Herbal Task Force
(<http://www.mcp.edu/herbal/default.htm>) and
The Center for Holistic Pediatric Education and Research
Co-Enzyme Q10 (CoQ10 or Ubiquinone)
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<p>Principal Proposed Use: Heart disease: chronic heart failure, ischemic heart disease, toxin-induced cardiomyopathy; ischemia associated with cardiac surgery, mitral valve prolapse; hypertension</p> <p>Other Proposed Uses: Adjunctive therapy for cancer, diabetes, and muscular dystrophy; enhancement of athletic performance</p>

Overview

The major American use for CoQ10 is the prevention and treatment of cardiovascular diseases including chronic heart failure, atherosclerotic and ischemic heart disease, ischemia associated with cardiac surgery, toxin-induced cardiomyopathies and hypertension. Other popular uses include adjunctive therapy for periodontal disease, cancer and diabetes and to enhance athletic performance. CoQ10 is a natural human ubiquinone, but it can be chemically synthesized. It has an important role in mitochondrial metabolism, and it functions as an antioxidant. Data from animal studies, case series, open-label trials and comparison studies support its use in treating ischemic heart disease, ischemia associated with cardiac surgery, chronic heart failure, hypertension, and ventricular arrhythmias. Additional studies are needed to define its precise role in the treatment of these conditions and to evaluate its use as an adjunctive therapy for cancer and periodontal disease. Data do not support its use as a therapy for diabetes or as an aid to athletic performance. CoQ10 is very safe, though its use in pregnancy, lactation and childhood has not been evaluated.

Historical and Popular Uses

Coenzyme Q-10 (CoQ-10 or Ubiquinone) is a naturally occurring quinone that is found in most aerobic organisms from bacteria to mammals. It was first identified in 1940 and isolated from the mitochondria of beef heart in 1957. Its clinical use to treat cardiovascular disease began in Japan in the mid-1960's. By the 1970's, basic scientists and clinical researchers were beginning to unravel the biological pathways, deficiency states and effectiveness of CoQ10 in treating cardiovascular and other diseases.

Nowadays over 12 million Japanese adults rely on CoQ10 as the medication of choice in treating chronic cardiovascular disease; more than 250 commercial products containing ubiquinone are available in Japan¹. Diverse cardiovascular conditions including congestive heart failure, ischemic heart disease, toxin-induced cardiomyopathy, mitral valve prolapse, and ischemia associated with cardiac surgery have all been treated with CoQ10. Because certain widely used chemotherapeutic agents (e.g. adriamycin) have well known toxic effects on the heart (which may limit their long-term use), CoQ10 has become a popular adjunctive therapy for many oncology patients as well. Other uses for this enzyme include periodontal disease, diabetes, weight loss, muscular dystrophy and various immune deficiency disorders. Some athletes use CoQ10 to enhance their performance.

Botany

Not applicable. CoQ10 is not an herbal product. It occurs naturally in the mitochondria of most aerobic organisms and can be commercially synthesized.

Common Names

Coenzyme Q10 is also known as Coenzyme Q, CoQ, CoQ10, Ubiquinone, Ubiquinone-Q10, Ubidecarenone, and Vitamin Q10.

Biochemistry

CoQ10 is another name for 2,3-dimethoxy-5-methylbenzoquinone to which a terpenoid side chain (consisting of ten monounsaturated trans-isoprenoid units) is attached¹. It is a fat soluble quinone, structurally similar to vitamin K². Quinones with six to 10 side chains (CoQ6 – CoQ10) are found in mammals; all have been synthesized in the lab. Human cells synthesize CoQ10 in an eight-step cascade starting from the amino acid, tyrosine. The synthetic chain requires adequate levels of folic acid, niacin, and vitamins B2, B6, and C³.

Normal blood levels of CoQ10 are 0.7 – 1 mcg/ml⁴. Therapeutic levels for angina are 2.0 – 2.5 mcg/ml^{5,6,7}.

CoQ10 is slowly absorbed after oral administration. It is taken up by chylomicrons, distributed to the liver and incorporated into very low density lipoproteins². It is found in high concentrations in the heart, liver, kidney and pancreas; intracellularly, 40% - 50% is found in the mitochondrial membrane. Peak blood levels occur 5 – 10 hours after ingestion; the elimination half life is 34 hours, and it is primarily excreted through the biliary tract. Typical adult daily doses of 100 – 150 milligrams double normal serum levels².

Physiologically, CoQ10 plays four major roles. It has an essential role in mitochondrial energy (ATP) production through redox activity in the respiratory chain, transporting electrons between enzymes. Second, it plays a role in extramitochondrial redox activity in the cell membrane and endomembranes. CoQ10 also functions as an antioxidant, inhibiting lipid peroxidation and scavenging free radicals. Finally, it plays an important role in membrane stabilization and fluidity^{2,8}.

Experimental Studies

CoQ10 has undergone extensive research in Europe, Russia and Japan. There were over 12,000 citations in a 1999 MedLine search.

CoQ10: Potential Clinical Benefits

1. Cardiovascular: Atherosclerotic and ischemic heart disease; chronic heart failure; toxin-induced cardiomyopathy; hypertension; arrhythmias; cardiac surgery
2. Pulmonary: none
3. Renal and electrolyte balance: none
4. Gastrointestinal/hepatic: none
5. Neuropsychiatric: none
6. Endocrine: Diabetes mellitus
7. Hematologic: Anemia
8. Rheumatologic: none
9. Reproductive: none
10. Immune modulation: none
11. Antimicrobial: none
12. Antineoplastic: Adjunctive cancer therapy
13. Antioxidant: Antioxidant
14. Skin and mucus membranes: none
15. Other/miscellaneous: Enhanced athletic performance; muscular dystrophy; periodontal disease

1. **Cardiovascular:** Atherosclerotic and ischemic heart disease; chronic heart failure; toxin-induced cardiomyopathy; hypertension; arrhythmias; cardiac surgery. CoQ10 is beneficial in many cardiovascular conditions. Research has documented CoQ10 deficiencies in a variety of human heart diseases⁹. It is thought to exert its benefits principally through its antioxidant, free radical scavenging and membrane stabilizing effects².
 - a. Atherosclerotic and ischemic heart disease. In ischemic myocardium, there are several sources of oxygen free radicals, whose pernicious effects may be minimized by an antioxidant such as CoQ10.

- i. *In vitro data:* Studies in isolated rats hearts demonstrated a protective effect of CoQ10 against ischemia and reperfusion injuries, enhancing functional recovery from these injuries^{10,11,12}.
- ii. *Animal data:* Numerous animal studies support the use of CoQ10 in treating ischemic heart disease.

Pretreatment with CoQ10 protects against ischemic damage¹³. For example, pretreatment with CoQ10 prior to experimentally induced ischemia-reperfusion improved recovery of cardiac function, aerobic efficiency and enzyme levels significantly in young healthy rats, compared with untreated controls¹⁴. CoQ10 combined with carnitine was more effective than either agent alone in preventing ischemic injury in rats¹⁵.

Compared to younger counterparts, older animals have a reduced capacity to tolerate ischemic or aerobic stress and recover pre-stress contractile performance; this reduction is attenuated by CoQ10 pretreatment^{16,17}.

Giving CoQ10 parenterally to rats while they are undergoing ischemia is also protective¹⁸.

- iii. *Human data:* CoQ10's ability to protect ischemic myocardium is supported by several small double-blind studies in patients with stable angina pectoris and in those with acute ischemic conditions.

For example, in a double-blind, randomized cross-over trial of 12 adults with chronic, stable angina, four weeks of daily treatment with CoQ10 (150 milligrams daily) was associated with significantly improved exercise tolerance and exercise-induced ECG changes^{5,19}. Additional studies with larger sample sizes are needed to replicate these results.

In a comparison trial of 144 patients with acute myocardial infarction, the 73 patients assigned to oral treatment with CoQ10 (120 mg/d) for four weeks had significantly fewer episodes of angina pectoris (9.5 vs. 28.1) and total arrhythmias (9.5% vs. 25.3%); they also had significantly fewer cardiac deaths and nonfatal infarctions (15.0% vs. 30.9%) than the placebo-treated group²⁰.

In a randomized controlled trial of 61 patients with acute myocardial infarction, none of those assigned to immediate antioxidant treatment (500 mcg of selenium) and ongoing treatment with CoQ10 (100 mg daily) and selenium (100 mcg daily) for one year showed prolongation of the frequency-corrected QT interval by more than 440 msec. This was significantly less than the 40% of the control group who had such prolongation. No other differences between treatment and control groups were statistically significant²¹.

b. Chronic heart failure (CHF)

- i. *In vitro data*: CoQ10 enhanced myocardial contractility.
- ii. *Animal data*: In rats, CoQ10 produced higher ATP levels and improved mechanical function of the myocardium when compared to controls¹⁰.
- iii. *Human data*: Numerous human trials have evaluated CoQ10 as an adjunctive therapy in the treatment of chronic or congestive heart failure.

Open-label trials have consistently demonstrated that patients treated with CoQ10 have improved subjective symptoms, such as dyspnea and fatigue, as well as improvements in objective measures such as cardiac ejection fraction^{22,23,24,25,26,7,27}. For example, in an open label trial, CoQ10 (100 mg daily) was given to 34 patients with New York Heart Association (NYHA) Class IV congestive cardiomyopathy; more than 80% of patients had increased stroke volumes and cardiac index, and mean ejection fractions increased from an average of 25% at baseline to 40% after treatment. Survival rate was also increased⁶. In another series of 40 patients with severe heart failure (Classes III and IV) treated with CoQ10 (100 mg daily), over 50% showed significant clinical improvements²⁸.

In a prospective, multi-center study of 1715 patients with chronic heart failure (NYHA Classes II and III) who were stabilized on standard medical therapy for three months, and then treated in addition with CoQ10 (50 mg daily for four weeks), there was an improvement in dyspnea at rest, palpitations, cyanosis, hepatomegaly, pulmonary rales, peripheral edema, and blood pressure²⁹. Similarly, in a large Italian open label trial of 2664 patients with NYHA Classes II and II chronic heart failure, subjects were given 50 – 150 mg daily of CoQ10; after 3 months of treatment,

improvements were noted in cyanosis (78%), edema (79%), pulmonary rales (78%), hepatic enlargement (49%), jugular reflux (72%), dyspnea (53%), palpitations (75%), sweating (80%), subjective arrhythmia (63%), insomnia (63%), vertigo (73%) and nocturia (54%)³⁰.

In a double-blind, placebo controlled cross over trial of patients with Class III or IV NYHA heart failure, treatment with CoQ10 for 12 weeks resulted in increased blood levels of CoQ10 and remarkable clinical improvements³¹.

In a randomized, controlled trial of 22 patients in NYHA Class II – III heart failure with a mean left ventricular (LV) ejection fraction of 26%, those assigned to coenzyme Q10 (200 mg daily) for 12 weeks had significant improvement in stroke index, pulmonary artery pressure and pulmonary capillary wedge pressure, suggesting improved left ventricular performance.³² In another placebo controlled trial of 641 patients with CHF, those randomized to CoQ10 (2 mg/kg daily) had a decreased number of hospitalizations and complications over the year of treatment compared with the placebo treated group³³.

c. Toxin-induced cardiomyopathy

- i. *In vitro data:* Anthracyclines, such as adriamycin, are known cardiotoxins. Treating rat myocardial cells with CoQ10 prior to adriamycin exposure mitigated its toxic effects on mitochondrial respiration^{34,35,36,37}.
- ii. *Animal data:* In mice pretreated with CoQ10 for 4 days prior to toxic doses of adriamycin, survival rates were significantly higher (80%) than in mice who did not receive the supplements (40%)³⁸; these findings were replicated in other studies in mice and rats^{39,40,41,42,43,44}.
- iii. *Human data:* In a pilot study of 14 cancer patients, the seven patients pretreated with CoQ10 (100 mg daily) prior to adriamycin administration demonstrated less cardiotoxicity than unsupplemented patients³⁶. These data were supported in another open label pilot study of adult oncology patients⁴⁵ and a comparison study in 20 pediatric oncology patients⁴⁶. Randomized, controlled clinical trials are needed to further evaluate the effectiveness of CoQ10 in adult and pediatric oncology patients undergoing adriamycin therapy.

Chronic alcohol abuse is also associated with cardiomyopathy. The level of CoQ10 was significantly decreased in various groups of patients with alcoholic heart disease as compared to normal myocardium. The deficiency of CoQ10 was more pronounced with increasing symptoms: patients with dilated cardiomyopathy in NYHA Classes III and IV had lower tissue CoQ10 content than those of Classes I and II²⁸. There are no studies evaluating CoQ10 as a supplemental therapy for patients with alcoholic cardiomyopathy.

d. Hypertension

- i. *In vitro data*: none
- ii. *Animal data*: Hypertensive animals have lower concentrations of CoQ10 than normotensive animals^{47,48}. In rats with steroid-induced hypertension, CoQ10 administration normalized blood pressure⁴⁹.
- iii. *Human data*: Hypertensive adults also have lower concentrations of CoQ10 than normotensive individuals⁴⁸. Several open label studies and controlled clinical trials support the use of CoQ10 in reducing hypertension.

In one open-label study, 17 hypertensive adults were given 30 – 45 mg of CoQ10 daily for 2 –16 weeks; 23% of these patients had a significant decrease in systolic and diastolic blood pressure⁵⁰. In another open label study of 115 patients with fatigue, atypical precordial pain, and cardiac arrhythmia, 60 had hypertensive cardiovascular disease, 27 had mitral valve prolapse syndrome, and 28 had chronic fatigue syndrome. At baseline, 63 patients were functional NYHA Class III and 54 Class II; all showed diastolic dysfunction. CoQ10 administration resulted in reduction of high blood pressure in 80% and improvement in diastolic function in all patients with follow-up echocardiograms; treatment was also associated with a reduction in myocardial thickness in 53% of hypertensives⁵¹. In an open label study of 109 patients with who presented to a private cardiology practice with symptomatic essential hypertension and were treated with CoQ10, a definite and gradual improvement in functional status was observed; 51% of eliminated between one and three antihypertensive drugs at an average of 4.4 months after starting CoQ10. Only 3% of patients required the addition of one antihypertensive drug. In the 9.4% of

patients with echocardiograms both before and during treatment, there was a highly significant improvement in left ventricular wall thickness and diastolic function⁵².

In a randomized, double-blind trial of 59 patients with essential hypertension and coronary artery disease who were receiving antihypertensive medication, the effects of oral treatment with coenzyme Q10 (120 mg daily) were evaluated. After 8 weeks of follow-up, the following indices were significantly reduced in the coenzyme Q10 group: systolic and diastolic blood pressure, fasting and 2-h plasma insulin, glucose, triglycerides, lipid peroxides, malondialdehyde and diene conjugates⁵³.

In a double-blind, placebo-controlled trial in 20 hypertensive adults who were deficient in CoQ10, those randomized to supplements (100 mg daily) for 12 weeks had a significant decline in both systolic and diastolic blood pressure compared with the placebo treated group⁵⁰.

e. Mitral valve prolapse

i. *In vitro data*: none

ii. *Animal data*: none

iii. *Human data*: In two placebo-controlled trials among pediatric patients with mitral valve prolapse, those assigned to CoQ10 (2 mg/kg daily) had significant normalization of cardiac function on echocardiography; relapse was common among those who discontinued the supplements^{54,55}.

f. Arrhythmias

i. *In vitro data*: none

ii. *Animal data*: In animals, CoQ10 prolonged the action potential and decreased the ventricular rate under ischemic conditions.

iii. *Human data*: Case reports in humans suggest that CoQ10 can reduce ventricular ectopy².

In a randomized controlled trial of 40 patients undergoing cardiac surgery, those assigned to seven days of pretreatment with CoQ10 had significantly fewer episodes of arrhythmia post-operatively than untreated patients⁵⁶.

g. Cardiac surgery. Based on studies suggesting CoQ10's benefits in ischemic myocardium, some clinicians have begun using it as a cardioprotective agent for patients undergoing

surgery that renders the myocardium ischemic and then reperfused such as coronary artery bypass surgery (CABG) or heart transplantation^{57,58}.

- i. *In vitro data*: See atherosclerotic and ischemic heart disease.
- ii. *Animal data*: See atherosclerotic and ischemic heart disease.
- iii. *Human data*: In a comparison study, patients undergoing CABG surgery who were given CoQ10 supplements (150 mg daily) for seven days prior to surgery had lower post-operative cardiac enzyme levels (e.g. CPK-MB), a significantly lower incidence of arrhythmias, and significantly higher stroke volumes than patients who did not receive the supplements⁵⁶.

In a comparison trial of 20 patients undergoing open heart surgery, those pretreated with CoQ10 (100 mg daily) for 14 days prior to surgery had significantly better measures of cardiac pumping and left ventricular ejection fraction and a shorter and less complicated recovery⁶.

In a randomized controlled trial of 24 patients scheduled for cardiac valve replacement surgery, the 12 who received CoQ10 pre-operatively had significantly lower levels of cardiac enzymes and higher levels of hydroxyl radical scavenging activity postoperatively⁵⁹.

2. **Pulmonary**: none
3. **Renal and electrolyte balance**: none
4. **Gastrointestinal/hepatic**: none
5. **Neuropsychiatric**: none
6. **Endocrine**: Diabetes mellitus
 - i. *In vitro data*: none
 - ii. *Animal data*: none
 - iii. *Human data*: Diabetics tend to have lower CoQ10 levels than non-diabetics; those with more severe disease (requiring oral hypoglycemic medications rather than control by diet alone) have the lowest CoQ10 levels^{60,61}.

In a randomized, placebo-controlled trial of 23 patients with Type 2 diabetes, those treated with CoQ10 (200 mg daily) had a significant increase in serum CoQ10 concentrations, but no change in glycemic control; no significant side effects were

noted⁶². Similarly, in another randomized double-blind, placebo-controlled study of 34 patients with Type 1 diabetes, enrollees received either 100 mg CoQ10 or placebo daily; after 3 months, there were no significant differences between the CoQ10 and the placebo groups in HbA1c, mean daily blood glucose concentrations, mean insulin dose, number of hypoglycemic episodes or cholesterol concentrations⁶³.

7. **Hematologic:** Anemia

- i. *In vitro data:* none
- ii. *Animal data:* Earlier studies in anemic animals given CoQ4 (a compound closely related to CoQ10) noted improved hemoglobin levels^{64,65}.
- iii. *Human data:* In an open label trial, giving CoQ4 (75 – 325 mg daily) to anemic children was associated with reticulocytosis and increased hematocrit within a week of starting treatment⁶⁶. In three nutritionally deficient children who were given CoQ10 supplements, reticulocytosis was noted between 7 and 10 days after starting therapy⁶⁶.

8. **Rheumatologic:** none

9. **Reproductive:** none

10. **Immune modulation:** Immunostimulant

- i. *In vitro data:* none
- ii. *Animal data:* In rats, CoQ10 administration increased phagocytic activity^{37,67,68}. In rabbits, CoQ10 administration enhanced production and maturation of myeloid cell lines in the bone marrow⁶⁹.
- iii. *Human data:* In a case series of eight adult patients (four with heart disease, three with cancer and one with diabetes), treatment with CoQ10 (60 mg daily) significantly increased serum IgG levels over one to four months⁷⁰. In a pilot study of 14 healthy adults treated with CoQ10, there were significant increases in T4/T8 ratios⁷¹. This has led to speculation that CoQ10 may be helpful in treating HIV disease⁷².

There are no controlled trials evaluating the effectiveness of CoQ10 in treating any immune deficiency disease.

11. **Antimicrobial:** none

12. **Antineoplastic:** Adjunctive cancer therapy. See also

<http://www.sph.uth.tmc.edu:8052/utcam/agents/coq10.htm>

- i. *In vitro data:* CoQ10 is presumed to be protective against free radical damage induced by chemotherapy or radiation therapy (See Antioxidant section and Cardiac section above). It may also be helpful in preventing cardiotoxicity (see Cardiac section above) and in stimulating the immune system (See Immune modulation).
- ii. *Animal data:* Mice with lower endogenous levels of CoQ10 appeared to be more susceptible to developing experimentally induced tumors and to suffering from the advanced stages of those tumors⁷³.

Mice with chemically induced tumors who were treated with CoQ10 had prolonged survival and decreased tumor size compared with untreated mice⁶⁸.

- iii. *Human data:* CoQ10 levels tend to be significantly lower than normal in patients suffering from a variety of cancers^{4,68,74}. For example, among 200 women hospitalized for biopsy and/or ablation of a breast tumor, a coenzyme Q10 deficiency was noted in those with both in carcinomas (80 patients) and non-malignant lesions (120 patients) with a correlation between the intensity of the deficiency and a worse prognosis based on high TNM and SBR values or the lack of estrogen receptors⁷⁵.

Based on these observations, some clinicians have recommended CoQ10 to cancer patients. Several case studies and open label studies report symptomatic improvement and actual tumor regression in patients treated orally with CoQ10 as an adjunctive therapy along with chemotherapy and/or radiation. Most patients in these reports had metastatic breast cancer and were treated with doses of 100 – 390 mg CoQ10 daily as well as other nutritional supplements such as vitamin C, vitamin E and selenium^{69,4,76,77}.

There are no controlled trials evaluating the effectiveness of CoQ10 as a sole therapy or adjunctive therapy for cancer, nor any trial comparing it to standard medical and surgical treatments.

13. **Antioxidant:** Antioxidant

- i. *In vitro data:* CoQ10 is a known antioxidant^{78,79,80,81,8,82}. It prevents free radical oxidation of low density lipoprotein (LDL) and very low density lipoprotein (VLDL)^{83,84}. In isolated, perfused rat hearts subjected to ischemia and reperfusion,

pretreatment with CoQ10 provided significant protection against oxidant-induced endothelial cell injury⁸⁵.

- ii. *Animal data:* Keratinocytes from older animals have diminished epidermal resistance against oxidative stressors. Topical application of CoQ10 helps restores this resistance to normal levels, perhaps suggesting that CoQ10 and other antioxidants might be useful in treating wrinkles and other signs of aging in the skin⁸⁶.
- iii. *Human data:* Based on its antioxidant effects, CoQ10 has been investigated as a cutaneous antioxidant to prevent signs of skin aging, which are thought to be mediated primarily by photo-mediated oxidation⁷⁸.

Two studies have evaluated its antioxidant protective effects during experimentally induced oxidative stress. Among 22 who were given fish oil supplementation to produce oxidative stress, CoQ10 co-therapy was associated with decreased lipid peroxidation⁸⁷. These results were replicated in a second similar study⁸⁸.

Oxidant stress is also a hazard in certain occupations. Among 24 paint and lacquer industry workers (exposed to organic solvents) who received CoQ10, there were significant decreases in products of lipid peroxidation⁸⁹.

14) **Skin and mucus membranes:** none

15) **Other/miscellaneous:** Enhanced athletic performance; muscular dystrophy; periodontal disease

a. Enhanced athletic performance

- i. *In vitro data:* none
- ii. *Animal data:* none
- iii. *Human data:* In two separate randomized controlled trials of highly trained athletes (triathletes and bicycle racers), CoQ10 supplements had no measurable effect on oxygen uptake or exercise-induced fatigue^{90,91}.

b. Muscular dystrophy

- i. *In vitro data:* none
- ii. *Animal data:* Among mice with hereditary muscular dystrophies, low levels of CoQ9 have been reported⁹². In severely dystrophic mice, treatment with CoQ6 improved walking and enhanced survival⁹³.

iii. *Human data:* Defects in mitochondrial function have been observed in several kinds of human myotonic dystrophic conditions⁹⁴.

In a double-blind, placebo-controlled trial in patients with muscular dystrophy or neurogenic atrophic disease, treatment with CoQ10 (100 mg daily) was associated with a significantly improved sense of well being in 50%, improved stroke volume and cardiac output and improved physical performance compared with placebo treatment⁹⁵.

c. Periodontal disease

i. *In vitro data:* none

ii. *Animal data:* none

iii. *Human data:* Patients with periodontal disease have low concentrations of CoQ10 in gingival tissue and blood^{96,97,98}. This has led some clinical investigators and dentists to recommend CoQ10 supplementation, particularly for diabetic patients and others at risk for periodontal disease⁹⁹.

A case report of one patient with severe periodontal disease who had a dramatic improvement with CoQ10 therapy prompted several open label trials^{100,101}.

In one case series, eight patients with periodontal disease were treated with CoQ10 (50 mg daily); symptoms were significantly reduced over 21 days of treatment^{102,103}. In an open label study of ten adult patients with periodontal disease, topical therapy with CoQ10 was associated with significant improvement in disease¹⁰⁴.

There are no randomized, controlled clinical trials comparing CoQ10 with standard therapy for periodontal disease¹⁰⁵.

Toxicity and Contraindications

Allergic reactions can occur to any natural product in sensitive persons

Allergic reactions to CoQ10 have not been reported.

Potentially toxic compounds in ubiquinone: None

Acute toxicity: Side effects have been reported in fewer than 2% of subjects receiving CoQ10 supplements; they include irritability, upset stomach, nausea, anorexia, abdominal pain, diarrhea and skin rash^{103,29,30,5,26,23}. Thrombocytopenia was reported in one patient in a study of 16 patients treated with CoQ10 for mitochondrial disorders¹⁰⁶.

Chronic toxicity: None reported.

Limitations during other illnesses or in patients with specific organ dysfunction: Unknown; none reported. Presumably, doses would need to be reduced for patients with impaired hepatic excretion such as biliary obstruction.

Interactions with other herbs or pharmaceuticals: Unknown; none reported. Caution is suggested for patients taking hypolipidemic agents and hypoglycemic agents².

Safety during pregnancy, lactation and/or childhood: Unknown; it has not been systematically evaluated in these conditions. It has no reported teratogenic effects.

Typical dosages

Provision of dosage information does not constitute a recommendation or endorsement, but rather indicates the range of doses commonly used in practice.

Doses are given for single supplement use and must be adjusted when using supplements in combinations.

Doses may also vary according to the type and severity of the condition treated and individual patient conditions.

Typical adult doses: Scientific studies have used a range of doses:

For chronic heart failure or hypertension: 50 – 300 mg daily (typically 100 mg daily) of CoQ10 divided into two or three doses. It typically takes 2 weeks to 1 month to observe beneficial effects^{29,2,26}.

For periodontal disease: 25 milligrams twice daily.

Given CoQ10's long half life, administration once daily is probably sufficient.

Pediatric dosages: Unknown; studies have used doses of 2 mg/kg.

Availability of standardized preparations: Yes

Proprietary Names: Adelir, Caomet, Cardioton, CoQ10, Coedieci, Decafar, Decorenone, Heartcin, Iuvecar, Miodene, Miotyn, Mitocor, Neuquinone, Taidecanone, Ubidex, Ubifactor, Udekinon, Ubiquinone, Ubivis

Multi-ingredient preparations containing CoQ10: Agedin Plus, Efamol Plus Coenzyme Q10, Ener-E

Dosages used in combinations: Variable

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