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# COENZYME Q-10

## Also Known As:

Coenzima Q-10, Coenzyme Q10, CoQ10, Ubidécarénone, Ubiquinone-10.
CAUTION: See separate listing for Pantethine.

## Scientific Name:

Ubiquinol; Ubiquinone; Ubidecarenone; Mitoquinone.

## People Use This For:

Orally, coenzyme Q-10 is used for congestive heart failure (CHF), angina, dilated cardiomyopathy, hypertrophic cardiomyopathy, diabetes, hypertension, periodontal disease, cardiotoxicity associated with doxorubicin (Adriamycin) chemotherapy, and breast cancer. It is also used orally for Huntington's disease, Parkinson's disease, muscular dystrophy, increasing exercise tolerance, chronic fatigue syndrome (CFS), Lyme disease, pre-eclampsia, and warfarin-induced alopecia. Coenzyme Q-10 is also used orally for stimulating the immune systems of people with HIV/AIDS, life extension, male infertility, idiopathic asthenozoospermia, migraine headache, quinone-responsive mitochondrial encephalomyelopathy, aging skin, and for preventing "statin"-induced myopathy.
Topically, coenzyme Q-10 is used for treating periodontal disease.

## Safety:

**LIKELY SAFE** ...when used orally and appropriately. Coenzyme Q-10 has been safely used in studies lasting up to 30 months (2134, 6037, 6038, 6407, 8163, 8938, 8939, 8940, 15395, 17413, 17716). ...when used topically on the gums (2107).
**CHILDREN**: POSSIBLY SAFE ...when used orally and appropriately. Coenzyme Q-10 in doses of 1-3 mg/kg/day or 10 mg/kg/day have been safely used for up to 9 months under medical supervision (12199, 13223, 15256).
**PREGNANCY**: POSSIBLY SAFE ... when used orally and appropriately. Coenzyme Q-10 100 mg twice daily has been safely used during pregnancy, starting at 20 weeks gestation until term (17201).
**LACTATION**: Insufficient reliable information available; avoid using.

## Effectiveness:

### LIKELY EFFECTIVE

**Coenzyme Q-10 deficiency**. Taking coenzyme Q-10 orally seems to improve symptoms of coenzyme Q-10 deficiency (8160, 8161). Rare cases of documented coenzyme Q-10 deficiency with symptoms of weakness, fatigue, and seizures have been reported.
**Mitochondrial encephalomyopathies**. Taking coenzyme Q-10 orally seems to

reduce symptoms in some patients with genetic and acquired disorders of mitochondrial dysfunction (8159, 8162, 8163, 8912, 11050). The onset of effect is slow, with maximal effect at six months (8163). A specific coenzyme Q-10 formulation (UbiQGel) has FDA Orphan Drug Status for mitochondrial encephalomyopathies, including MELAS (myoclonic epilepsy with lactic acidosis and stroke-like episodes) syndrome, Kearns-Sayre syndrome, and MERRF (myoclonus epilepsy with ragged red fibers).

**POSSIBLY EFFECTIVE**

**Congestive heart failure (CHF)**. Adding oral coenzyme Q-10 to conventional treatments seems to improve quality of life, improve New York Heart Association classification, decrease hospitalization rates, and decrease symptoms of heart failure such as dyspnea, peripheral edema, enlarged liver, and insomnia in patients with mild to severe (New York Heart Association Class II-IV) CHF (6407, 6408, 6409, 8909, 12170). However, the effectiveness of coenzyme Q-10 for heart failure is controversial (8910). Some research suggests that coenzyme Q-10 does not improve objective measures of CHF including ejection fraction or exercise tolerance (5090, 6037, 6038). Tell patients there's no evidence that coenzyme Q-10 can help heart failure when taken alone, but it might be helpful when taken with other heart failure drugs.

**HIV/AIDS**. Taking coenzyme Q-10 orally seems to improve immune function in people with HIV/AIDS (2123, 2124).

**Huntington's disease**. Ubiquinol, a reduced form of coenzyme Q-10, has FDA Orphan Drug Status for Huntington's disease (11873). However, taking coenzyme Q-10 orally in doses of 600 mg per day or less doesn't seem to be effective for slowing the progression or functional decline in patients with Huntington's disease (1357, 8940).

**Hypertension**. Several preliminary clinical trials show that taking coenzyme Q-10 orally, alone or along with other antihypertensives, significantly lowers blood pressure. In some cases, it might allow dosage reduction or discontinuation of conventional antihypertensive medications (2122, 3365, 9890, 17702, 17650, 17651). An analysis of these studies shows that taking coenzyme Q-10 100-120 mg daily lowers systolic blood pressure by 11 mmHg and diastolic blood pressure by 7 mmHg compared to placebo (17702).

**Ischemic reperfusion injury**. Taking coenzyme Q-10 orally for a week before cardiac bypass or vascular surgery might lessen hypoxic damage during surgery (11902, 11903). But other research suggests no effect (11904).

**Isolated systolic hypertension**. Taking coenzyme Q-10 orally appears to lower systolic blood pressure by about 26% in some people with isolated systolic hypertension after 12 weeks of therapy (8907).

**Migraine headache**. Taking coenzyme Q-10 orally seems to help prevent migraine headaches. Coenzyme Q-10 decreases the frequency of headaches by about 30% and the number of days with headache-related nausea by about 45% in adults (8135, 11872). Taking coenzyme Q-10 also appears to reduce migraine frequency in children who have low levels of coenzyme Q-10 (15256). For reducing migraine frequency in adults, the number needed to treat (NNT) using coenzyme Q-10 100 mg TID for 3 months is three (11872). It can take up to 3 months for significant benefit. Taking coenzyme Q-10 prophylactically does not seem to reduce the duration or severity of migraine headaches when they develop in adults (11872).

**Muscular dystrophy**. Taking coenzyme Q-10 orally seems to improve physical performance in some patients with muscular dystrophies (2127).

**Myocardial infarction (MI)**. Taking coenzyme Q-10 orally seems to decrease the risk of cardiac events in patients with recent MI who are at risk of atherothrombosis. When started in patients within 72 hours of MI and administered for 1 year, coenzyme

Q-10 appears to significantly lower the risk of cardiac events including non-fatal MI and cardiac death (10152).

**Parkinson's disease**. Some evidence shows that taking high doses of coenzyme Q-10, 300-2400 mg/day slows functional decline in people with early Parkinson's disease (8938, 15255). This effect appears to be dose dependent (8938). However, mid-stage Parkinson's disease patients who take a specific nanoparticular coenzyme Q-10 supplement (Nanoquinon, MSE Pharmazeutilka) 100 mg three times daily do not have significantly reduced symptoms compared to placebo (15395).

**POSSIBLY INEFFECTIVE**

**Hyperlipidemia**. One clinical study in obese patients shows that taking coenzyme Q-10 200 mg daily for 12 weeks does not significantly reduce total cholesterol, triglycerides, or oxidized low density lipoprotein (LDL); or increase high density lipoprotein (HDL) compared to placebo (17704).

**LIKELY INEFFECTIVE**

**Athletic performance**. Taking coenzyme Q-10 orally doesn't improve aerobic power in athletes (2109, 2110, 8911). Some evidence suggests coenzyme Q-10 might slightly improve tolerance to higher workloads, but more research is needed to tell if coenzyme Q-10 is effective for this purpose (8911).

**Periodontal disease**. Coenzyme Q-10 applied topically isn't effective for treating periodontal disease (2107, 2108). However, preliminary research suggests that taking coenzyme Q-10 orally might be helpful for periodontal disease (8916, 8917, 8918); more evidence is needed.

**INSUFFICIENT RELIABLE EVIDENCE to RATE**

**Angina**. Some preliminary clinical research suggests that taking coenzyme Q-10 orally might improve exercise tolerance in patients with angina (2121).

**Breast cancer**. There is preliminary evidence that taking coenzyme Q-10 orally might be helpful in advanced breast cancer, along with surgery and conventional therapy plus other antioxidants and omega-3 and omega-6 fatty acids (3993, 3995).

**Cyclic vomiting syndrome (CVS)**. Preliminary clinical research suggests that taking coenzyme Q-10 10 mg/kg orally twice daily is comparable to amitriptyline 0.5-1 mg/kg/day for reducing the number of CVS episodes in both children and adults (17703).

**Diabetes**. There is conflicting evidence about the effectiveness of coenzyme Q-10 for diabetes. Some research suggests that taking 200 mg coenzyme Q-10 per day reduces hemoglobin A1C in people with type 2 diabetes (9890, 11877). However, other research in type 2 diabetes using the same dose shows no effect on hemoglobin A1C (492). Some research in people with type 1 diabetes also shows no effect (456, 2126). A clinical study in obese patients (BMI > 25 kg/m2) found that taking coenzyme Q-10 200 mg daily for 12 weeks had no effect on fasting plasma glucose and insulin levels compared to placebo (17704).

However, in patients with hypertension and coronary artery disease, there is some evidence that coenzyme Q-10 might reduce insulin resistance (3365).

**Dilated cardiomyopathy**. Preliminary evidence suggests that taking coenzyme Q-10 3 mg/kg/day or 10 mg/kg/day divided into 2-3 doses for up to 9 months improves ejection fraction (12199) and New York Heart Association (NYHA) classification in children with dilated cardiomyopathy (12199, 13223).

**Fibromyalgia**. Preliminary clinical research suggests that taking coenzyme Q-10 (BioQuinone Q10, Pharma Nord) 200 mg in conjunction with ginkgo (Bio-Biloba, Pharma Nord) 200 mg orally daily for 84 days improves patient's quality of life such

as physical fitness levels, emotional feelings, social activities, overall health, and pain (17716).

**Hypertrophic cardiomyopathy**. Preliminary evidence suggests that coenzyme Q-10 (CoQ10, Vitaline) might improve symptoms of hypertrophic cardiomyopathy. Taking coenzyme Q-10 orally in doses titrated to achieve a coenzyme level above 2 mcg/mL seems to decrease cardiac wall thickness, and decrease symptoms of dyspnea and fatigue (11031).

**Infertility**. Preliminary research shows that infertile men with idiopathic asthenozoospermia who take coenzyme Q-10 200 mg/day have increased sperm motility after 6 months of treatment (12169). Another preliminary clinical study shows that infertile men with idiopathic oligoasthenoteratospermia who take coenzyme Q-10 300 mg daily have significantly improved sperm density and motility after 26 weeks of treatment compared with placebo; however, this did not seem to significantly improve pregnancy rate (17413).

**Maternally inherited diabetes mellitus and deafness (MIDD)**. There is some preliminary evidence that taking coenzyme Q-10 orally might prevent progressive insulin secretory defect, exercise intolerance, and hearing loss in people with a rare form of diabetes called maternally inherited diabetes mellitus and deafness (MIDD) (2125).

**Pre-eclampsia**. Preliminary clinical research shows that taking coenzyme Q-10 100 mg orally twice daily during pregnancy, starting at 20 weeks gestation until term, reduces the rate of pre-eclampsia in women at risk of developing this condition (17201).

**Statin-induced myopathy**. There is preliminary clinical research that coenzyme Q-10 might decrease muscular adverse effects caused by HMG-CoA reductase inhibitors ("statins"); however, not all studies have shown benefit. In a preliminary clinical trial, patients with statin-induced myopathy who took coenzyme Q-10 100 mg daily had significantly reduced pain intensity compared to baseline and compared to a vitamin E control after 30 days of treatment (16008). In people taking high-dose lovastatin investigationally as a treatment for cancer, taking coenzyme Q-10 decreases the dose-limiting statin toxicity of myopathy (11899, 11900). However, in another preliminary trial of typical statin doses in patients with a history of myopathy, taking coenzyme Q-10 200 mg daily did not significantly affect myopathy or overall statin tolerability compared to placebo (16009).

**Warfarin-induced hair loss**. There is some preliminary evidence that coenzyme Q-10 might be helpful for preventing warfarin-induced hair loss (455).

More evidence is needed to rate coenzyme Q-10 for these uses.

## Mechanism of Action:

Coenzyme Q-10 is a vitamin-like compound present in virtually all cells and in especially high concentrations in the heart, liver, kidney, and pancreas. Within the cell, 25% to 30% of total coenzyme Q-10 is found in the nucleus, 40% to 50% in the mitochondria, 15% to 20% in the microsomes, and 5% to 10% in the cytosol. Coenzyme Q-10 is fat soluble and acts similar to a vitamin (2134, 11892). Its primary functions include activity as an antioxidant, a membrane stabilizer, and as a cofactor in many metabolic pathways, particularly in the production of adenosine triphosphate (ATP) in oxidative respiration (2134, 6037, 6048, 6410, 11892).

The body produces adequate amounts of coenzyme Q-10, so it's not considered a vitamin (11893). It's also ingested in small amounts from dietary sources, including meats and seafood. However, the amounts ingested in foods do not approach therapeutic doses. Coenzyme Q-10 formulated in soy bean oil appears to have superior bioavailability compared to other formulations (457). Peak levels of coenzyme

Q-10 after oral administration occur in 5-10 hours, and the half-life is approximately 34 hours (2134, 8907).

Many of the therapeutic benefits of coenzyme Q-10 are primarily attributed to its antioxidant effects and its role in the generation of ATP. Genetic or acquired disorders of mitochondrial function cause increases in serum lactate and the lactate/pyruvate ratio, due to impaired oxidative metabolism. Supplementation with coenzyme Q-10 seems to reduce these levels and improve exercise tolerance and function in people with these disorders (8159, 8162, 8163). In addition, coenzyme Q-10 may be helpful for people with diseases for which coenzyme Q-10 levels are often lower, including congestive heart failure (CHF), hypertension, periodontal disease, certain muscular diseases, and AIDS (2134, 6410).

In the treatment of CHF, the mechanism is thought to involve prevention of oxidative damage. The greatest benefit seems to occur in people with the largest deficiency of coenzyme Q-10 (2134). The effect in the treatment of angina may be due to increased ATP synthesis, reduction of free radicals, or membrane protection (2134). Preliminary evidence suggests that coenzyme Q-10 might enhance endothelium-independent arterial relaxation and improve endothelium-dependent vasodilation, which can lower total peripheral resistance and systolic blood pressure. This effect seems to be caused by increased endothelial production of prostacyclin (PGI2) or increased sensitivity of arterial smooth muscle to PGI2, or both (8908).

Coenzyme Q-10 increases plasma levels of high density lipoprotein (HDL) cholesterol, vitamin E, and vitamin C; and decreases levels of total cholesterol, low density lipoprotein (LDL) cholesterol, and products of lipid peroxidation such as thiobarbituric acid reactive substances (TBARS), malondialdehyde, and diene conjugates. In patients at risk for future coronary events, coenzyme Q-10 may prevent thrombosis and have protective effects on vascular and myocardial remodeling and endothelial function (10152).

Coenzyme Q-10 levels are highest during the first 20 years of life and decline with age. At age 80, coenzyme Q-10 levels may be lower than at birth. In some kinds of bacteria, coenzyme Q-10 supplements seem to prolong life (11895). However, life-long administration of coenzyme Q-10 to rodents doesn't affect lifespan (11896).

Coenzyme Q-10 can undergo oxidation/reduction reactions in various cell membranes such as lysosomes, Golgi, or plasma membranes. The proton gradient caused by the redox ability of coenzyme Q-10 provides a basis for antioxidant action either directly or by regeneration of vitamin E (tocopherol) and ascorbate (8913). Preliminary research suggests that decreased redox status of coenzyme Q-10 might indicate a higher risk for coronary heart disease in people with familial hyperlipidemia (8914). Fenofibrate (Tricor) and coenzyme Q-10 seem to improve endothelial and non-endothelial forearm vasodilator function in dyslipidemic type 2 diabetic patients (11877).

Coenzyme Q-10 appears to be a factor in Parkinson's disease. Parkinson's disease might be caused by impaired function of the mitochondrial electron transport chain, and particularly the mitochondrial enzymes, complex I and complex II. Coenzyme Q-10 is the electron acceptor for these complexes. People with Parkinson's disease seem to have lower levels of coenzyme Q-10 in platelet mitochondria. Preclinical research suggests that supplementation increases cerebral concentrations of coenzyme Q-10 and reduces the loss of dopamine and dopaminergic axons in experimental models of Parkinson's disease (8938, 8939).

Coenzyme Q-10 may be a biomarker to determine if patients have fibromyalgia. Fibromyalgia may cause an altered distribution of coenzyme Q-10 in the body, with higher levels of coenzyme Q-10 in the plasma; as well as reduced cell uptake and metabolism of coenzyme Q-10 into mononuclear cells. The reduction in coenzyme Q-

10 within the mononuclear cells may lead to higher levels of reactive oxygen species causing oxidative stress in patients with fibromyalgia (17705).

There is also interest in using coenzyme Q-10 for Huntington's disease, which is also thought to be a mitochondrial disorder. In animal models of Huntington's disease, orally administered coenzyme Q-10 extends survival and delays development of motor deficits, weight loss, cerebral atrophy, and neuronal changes (8941). Usefulness in humans hasn't been demonstrated at doses of 600 mg per day or less (8940). Some researchers suggest that L-carnitine and coenzyme Q-10 might have an additive or synergistic effect. Both coenzyme Q-10 and L-carnitine are involved with maintaining mitochondrial energy production in cells and may help protect against oxidative and toxin-induced damage (3653, 9603), but it isn't known whether this has any clinical significance.

For migraine headaches, coenzyme Q-10 might work by improving mitochondrial oxidative phosphorylation, which appears to be impaired in some patients with migraines (8135, 11897). Some people with migraine headache might have low levels of coenzyme Q-10. The reference range for serum total coenzyme Q-10 levels is 0.5-1.5 mcg/mL. As many as 32.9% of pediatric and adolescent migraine patients have serum coenzyme Q-10 levels below the reference range (15256).

HMG-CoA reductase inhibitors ("statins") reduce serum coenzyme Q-10 levels (4404, 4405, 4406, 4407, 4408, 4409, 4410, 15115). But intramuscular levels don't appear to be affected (3367). Some researchers think statin-induced myopathy may be related to mitochondrial dysfunction caused by reduce coenzyme Q-10 levels. Coenzyme Q-10 and cholesterol share common synthetic pathways. Statins block the synthesis of both. Coenzyme Q-10 does not affect the cholesterol-lowering effect of statins (11898). Coenzyme Q-10 is transported with low-density lipoprotein (LDL) cholesterol. Some evidence indicates that the statin-related decrease in coenzyme Q-10 levels is due to the statin's reduction of cholesterol levels. Increasing cholesterol reduction is correlated with increased reduction in coenzyme Q-10 plasma levels (15115).

The cholesterol absorption inhibitor ezetimibe (Zetia) does not appear to significantly affect coenzyme Q-10 plasma levels (15115).

Some drugs inhibit coenzyme Q-10 activity. Preliminary evidence suggests that the negative inotropic effect of some beta-blockers, particularly propranolol (Inderal), and to a lesser extent metoprolol (Lopressor, Toprol), is caused by inhibition of coenzyme Q-10 dependent enzymes in the myocardium (3368, 3369, 8958). Preliminary in-vitro evidence suggests coenzyme Q-10 might prevent cardiotoxicity caused by phenothiazines and tricyclic antidepressants. It seems to block mitochondrial dysfunction induced by these drugs (8959).

Anthracycline chemotherapeutic agents such as doxorubicin (Adriamycin) are thought to inhibit coenzyme Q-10 mitochondrial enzymes and synthesis of coenzyme Q-10 in the heart. Although anthracyclines seem to decrease coenzyme Q-10 synthesis, in some cases coenzyme Q-10 plasma levels might rise immediately after treatment with doxorubicin (Adriamycin). This might be due to myocardial tissue damage resulting in release of coenzyme Q-10 into plasma (14412). Preliminary research suggests that coenzyme Q-10 might protect against doxorubicin (Adriamycin) cardiotoxicity, possibly through correction of coenzyme Q-10 deficiencies and scavenging of free radicals (2134).

Researchers are also interested in coenzyme Q-10's possible anticancer effects related to its antioxidant properties. Coenzyme Q-10 might also have immunostimulatory activity (3993). There is also some evidence that coenzyme Q-10 concentrations are lower in cancerous breast tissue than healthy tissue (4846, 5158). Some researchers speculate that very low levels of coenzyme Q-10 might be an indicator of a poor

prognosis (4846).
Coenzyme Q-10 is a large molecule that is poorly absorbed when taken orally (11031). Effervescent, fast-melting, and gel capsule formulations all appear to have the same oral bioavailability (11049).

## Adverse Reactions:

Orally, coenzyme Q-10 is generally well-tolerated. In clinical studies, there have been no reports of significant adverse effects (2134, 6037, 6038, 6047, 8135, 8938, 8939, 8940, 17201, 17413). Coenzyme Q-10 can cause gastrointestinal side effects such as nausea, vomiting, diarrhea, appetite suppression, heartburn, and epigastric discomfort in less than 1% of patients (2134, 3370, 8135, 8938, 8939, 8940, 10152). Some of these adverse effects can be minimized if total daily doses exceeding 100 mg are divided and administered two to three times per day (3370). Allergic rash has also been reported (11872).

## Interactions with Herbs & Supplements:

**HERBS AND SUPPLEMENTS WITH HYPOTENSIVE EFFECTS**: Coenzyme Q-10 is thought to have hypotensive effects. Theoretically, combining coenzyme Q-10 with other herbs or supplements with hypotensive effects might increase the risk of hypotension. Some of these herbs and supplements include andrographis, casein peptides, cat's claw, coenzyme Q-10, fish oil, L-arginine, lycium, stinging nettle, theanine, and others.
**RED YEAST**: Theoretically, since red yeast has HMG-CoA reductase inhibitor ("statin") constituents (512), it might reduce coenzyme Q-10 levels.
**VITAMIN K**: Coenzyme Q-10 is chemically similar to vitamin K2 (menaquinone) and can have vitamin K-like effects, including antagonism of warfarin (2128, 6048). Concomitant use of coenzyme Q-10 and vitamin K might cause additive effects and increase the risk of clotting in people taking anticoagulants.

## Interactions with Drugs:

**ANTIHYPERTENSIVE DRUGS**
Interaction Rating = **Moderate** Be cautious with this combination.
Severity = Mild • Occurrence = Probable • Level of Evidence = B

Coenzyme Q-10 can decrease blood pressure and might have additive blood pressure lowering effects when used with antihypertensive drugs (2122, 9890); use with caution.

**CHEMOTHERAPY**
Interaction Rating = **Moderate** Be cautious with this combination.
Severity = High • Occurrence = Possible • Level of Evidence = B

Preliminary evidence suggests that inhibition of coenzyme Q-10 dependent enzymes and decreased coenzyme Q-10 synthesis in the heart might contribute to the cardiotoxicity caused by doxorubicin (Adriamycin) (3368, 14412). Theoretically, taking Coenzyme Q-10 supplements might prevent this toxicity. But there is also concern that coenzyme Q-10 might lower effectiveness of doxorubicin (3368). Coenzyme Q-10 does not seem to significantly alter the pharmacokinetics of doxorubicin (14413). However, there is concern that antioxidants such as coenzyme Q-10 might protect tumor cells from chemotherapeutic agents that work by inducing oxidative stress, such as the alkylating agents (e.g., cyclophosphamide, Cytoxan) and radiation therapy (5158, 5159).

**WARFARIN (Coumadin)**
Interaction Rating = **Moderate** Be cautious with this combination.
Severity = High • Occurrence = Possible • Level of Evidence = D

Concomitant use might reduce the anticoagulation effects of warfarin (2128, 6048, 6199). Coenzyme Q-10 is chemically similar to menaquinone and might have vitamin K-like procoagulant effects. Four cases of decreased warfarin efficacy thought to be due to

coenzyme Q-10 have been reported (2128, 6048, 11048). However, there is some preliminary clinical research that suggests coenzyme Q-10 might not significantly decrease the effects of warfarin in patients that have a stable INR (11905). Closely monitor patients taking warfarin and coenzyme Q-10. Dose adjustment may be necessary.

## Drug Influences on Nutrient Levels and Depletion:

**HMG CoA REDUCTASE INHIBITORS (Statins)**: HMG CoA reductase inhibitors can reduce serum coenzyme Q-10 levels (4404, 4405, 4406, 4407, 4408, 4409, 4410, 15115). They block the synthesis of mevalonic acid, which is a precursor of coenzyme Q-10 (3370). Statins' effect on coenzyme Q-10 appears to be dose-related. Taking atorvastatin (Lipitor) 10 mg/day or pravastatin (Pravachol) 20 mg/day does not significantly decrease levels of circulating coenzyme Q-10 in healthy people (8915). But taking atorvastatin 80 mg/day for 30 days reduces coenzyme Q-10 levels by 52% (12099). The clinical significance of statins' effect on coenzyme Q-10 levels is unclear. For example, taking simvastatin 20 mg/day for 4 weeks reduces serum coenzyme Q-10 levels about 32%, but levels in muscle may actually increase, up to 47% according to one study (3367). Coenzyme Q-10 is transported with low-density lipoprotein (LDL) cholesterol. Some evidence indicates that the statin-related decrease in coenzyme Q-10 levels is due to the statin's reduction of cholesterol levels (15115). Some researchers suspect that depletion of coenzyme Q-10 levels might result in statin-related side effects such as myopathy. But so far there is no reliable evidence that coenzyme Q-10 depletion is the cause of statin side effects. There is also no proof that taking coenzyme Q-10 supplements reduces statin side effects. Other "statin" drugs include lovastatin (Mevacor), simvastatin (Zocor), and fluvastatin (Lescol).

## Interactions with Foods:

None known.

## Interactions with Lab Tests:

**GLYCOSYLATED HEMOGLOBIN (Hemoglobin A1C, Hg A1C)**: Some clinical research suggests that coenzyme Q-10 can reduce glycosylated hemoglobin in people with type 2 diabetes (9890, 11877). However, other research suggests no effect (456, 492). Coenzyme Q-10 doesn't seem to affect fasting blood glucose (9890, 11877).
**HYPERCHOLESTEROLEMIA**: Elevated cholesterol levels are associated with artificially increased levels of serum coenzyme Q-10 (15256).
**LIVER ENZYMES**: Coenzyme Q-10 does not seem to adversely affect liver function. Despite earlier concern that doses greater than 300 mg per day might cause increases in SGOT (Serum Glutamic-Oxaloacetic Transaminase) and LDH (Lactic Dehydrogenase) (2134), doses greater than 600 mg per day given for 30 months have not caused changes in liver function (8938, 8939, 8940).
**T4/T8 RATIO**: Coenzyme Q-10 can increase the T4/T8 ratio in normal patients and some HIV-positive patients (2123).

## Interactions with Diseases or Conditions:

**HYPOTENSION, HYPERTENSION**: Coenzyme Q-10 might lower blood pressure. It can have additive effects with medications used for hypertension (2122, 3365, 9890); use with caution.
**SMOKING**: Cigarette smoking depletes body stores of coenzyme Q-10 (7722).
**SURGERY**: Coenzyme Q-10 might affect blood pressure. Theoretically, coenzyme Q-10 might interfere with blood pressure control during and after surgical procedures. Tell patients to discontinue coenzyme Q-10 at least 2 weeks before elective surgical procedures.

## Dosage/Administration:

**ORAL**: For mitochondrial encephalomyopathies, 150-160 mg, or 2 mg/kg/day has

been used (8159, 8162, 8163). In some cases, doses have been gradually increased to 3000 mg per day (8912).
For heart failure in adults, most studies have used 100 mg per day divided into 2 or 3 doses (6037, 6038, 6047, 8909). Benefits have also been found with 60 mg/day (12170).
For dilated cardiomyopathy in children, doses of 3 mg/kg/day and 10 mg/kg/day in 2-3 divided doses have been used (13223).
For hypertrophic cardiomyopathy, 120-240 mg/day of a specific coenzyme Q-10 formulation (CoQ10, Vitaline) has been used to achieve a coenzyme Q-10 level above 2 mcg/mL (11031).
For angina, 50 mg three times per day has been used (2121).
For reducing the risk of future cardiac events in patients with recent myocardial infarction, 120 mg daily in 2 divided doses has been used (10152).
For isolated systolic hypertension, 60 mg twice daily has been used (8907).
For HIV/AIDS, 200 mg per day has been used (2123, 2124).
For diabetes, 100 mg once or twice daily has been used (456, 492, 9890).
For Parkinson's disease, 300 mg, 600 mg, 1200 mg, and 2400 mg per day in 3-4 divided doses have been used (8938, 15255, 15395).
For preventing migraine headache, 100 mg three times daily has been used (11872). A dose of 1-3 mg/kg has also been used in pediatric and adolescent patients (15256).
For statin-induced myopathy, 100-200 mg daily has been used (16008).
For muscular dystrophy, 100 mg per day has been used (2127).
For hypertension, 120-200 mg per day divided into 2-3 doses has been used (2122, 3365, 9890, 17702, 17650, 17651).
For quinone-responsive mitochondrial encephalomyopathy, 5 mg/kg/day has been used (3366).
For documented coenzyme Q-10 deficiency, 150 mg daily has been used (8160).
For male infertility, coenzyme Q-10 200-300 mg/day has been used (12169, 17413).
For cyclic vomiting syndrome (CVS), 10 mg/kg orally twice daily has been used (17703).
For pre-eclampsia, 100 mg twice daily starting at 20 weeks gestation until term has been used (17201).
For fibromyalgia, coenzyme Q-10 (BioQuinone Q10, Pharma Nord) 200 mg in conjunction with ginkgo (Bio-Biloba, Pharma Nord) 200 mg daily for 84 days has been used (17716).
To minimize adverse effects, divided daily doses of coenzyme Q-10 are generally recommended when doses exceed 100 mg/day (3370).

## Editor's Comments:

Coenzyme Q-10 was first identified in 1957. The "Q-10" refers to the five-carbon isoprenoid units that are attached to the quinone ring. In humans, coenzyme Q-10 is most prevalent; in other species, coenzymes Q-6, Q-7, Q-8, and Q-9 dominate (11892, 11894).
Coenzyme Q-10 is widely used in Japan. Millions of Japanese patients receive coenzyme Q-10 as part of their treatment for cardiovascular disease. The Japanese government approved coenzyme Q-10 for the treatment of congestive heart failure in 1974. Coenzyme Q-10 is also used extensively in Europe and Russia. Most of the coenzyme Q-10 used in the US and Canada is supplied by Japanese companies. Coenzyme Q-10 is manufactured by fermenting beets and sugar cane with special strains of yeast.

This monograph was last reviewed on 07/11/2012 and last updated on 10/21/2011. Monographs are reviewed and/or updated multiple times per month and at least once per year. If you have comments or suggestions on something that should be reviewed or included, please tell the editors. For details about our evidence-based approach, see our Editorial Principles and Process.






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