PQ10 SAP

Science-based pea-emulsified coenzyme Q_{10} for optimal absorption

Coenzyme Q_{10} is produced by the human body, and is necessary for the basic functioning of healthy living cells. It has two main physiological roles: energy production and antioxidant protection. Without CoQ_{10}, the chain of cellular energy is broken and without energy, cellular life ceases. CoQ_{10} levels decrease with age, and are even lower in patients with chronic diseases. Prescription drugs, including statins, may also lower CoQ_{10} levels, yet they can be increased by supplementing with CoQ_{10}. PQ_{10} has the ability to be absorbed 2.5–4.25 times more efficiently than the standard ubiquinone form of CoQ_{10}.

ACTIVE INGREDIENTS

Each non-GMO vegetable capsule contains:

Coenzyme Q_{10} (ubiquinone-10) (bacterial fermentation) . . . . . 100 mg

Other ingredients: Non-GMO pea protein.

This product is non-GMO.

Contains no: Gluten, soy, wheat, corn, eggs, dairy, citrus, preservatives, artificial flavour or colour, starch, or sugar.

PQ10 SAP contains pea.

PQ10 SAP contains 60 vegetable capsules per bottle.

DIRECTIONS FOR USE

Adults: Take 1 capsule two to three times daily or as directed by your healthcare practitioner.

INDICATIONS

PQ10 SAP:

- Provides protection against cardiovascular disease.
- Has the ability to transfer electrons, and therefore acts as an antioxidant.
- Can help prevent deficiency from statin medications.
- Can help treat idiopathic asthenozoospermia, which can contribute to infertility.
- May be helpful in slowing decline in Parkinson's patients.
- May help lower blood pressure and improve glycemic control in patients with type 2 diabetes.

HIGH-BIOAVAILABILITY FORM OF UBIQUINONE

NFH's **PQ10 SAP** is manufactured by blending a unique emulsifier — a specific pea protein — with CoQ_{10}. The protein is ideal for blending with CoQ_{10}, as it has both hydrophobic and hydrophilic components. The water-insoluble components are dispersed with the emulsifier in water, and are then absorbed well in the small intestine. PQ_{10} has the ability to be absorbed 2.5–4.25 times more efficiently than the standard ubiquinone form of CoQ_{10}.

PURITY AND STABILITY

All ingredients listed for all **PQ10 SAP** lot numbers have been validated by a third-party laboratory for identity, potency, and purity.

Scientific Advisory Panel (SAP): adding nutraceutical research to achieve optimum health

NFH®

351, Rue Joseph-Carrier, Vaudreuil-Dorion, Quebec, J7V 5V5
T 1 866 510 3123 • F 1 866 510 3130 • nfh.ca

For healthcare professional use only.

Research Monograph

WHAT IS COENZYME Q_{10}?

Coenzyme Q_{10} (CoQ_{10}) is a quinone compound synthesized in the human body and has properties similar to those of vitamins.[1, 2] Coenzyme Q_{10} occurs widely in living organisms and, because of its ubiquitous distribution in nature, it is also known as ubiquinone.

Structurally, CoQ_{10} ($C_{59}H_{90}O_4$) is a benzoquinone ring compound, has 10 isoprenoid units in its tail, and occurs naturally in the *trans* configuration. CoQ_{10} is present in all human tissues, highly concentrated in the mitochondria as an endogenous cofactor in the mitochondrial energy production.[2, 3] Another important function of CoQ_{10} is as an antioxidant.[1]

Many chronic diseases are associated with dysfunctional energy metabolism, and CoQ_{10} supplementation has been widely tested and used in the treatment of cardiac, neurologic, oncologic, as well as other disorders.[3] Used in most countries, CoQ_{10} supplementation targets improving cellular bioenergies, counteracting oxidative stress and slowing down some age-related pathologies.[2, 4]

ENERGY PRODUCTION AND ANTIOXIDANT PROPERTIES

Present in all human tissues, ~50% of CoQ_{10} is localized in the mitochondrial membrane.[5] CoQ_{10}, a cofactor in the mitochondrial electron transport chain (ETC), is essential for ATP production and therefore plays a fundamental role in cellular bioenergies. CoQ_{10} mainly functions in the ETC as a mobile redox agent shuttling electrons and protons; however, the redox functions of CoQ_{10} exist outside of the mitochondria.

CoQ_{10} in its reduced form, ubiquinol, is a powerful antioxidant. As an antioxidant, CoQ_{10} prevents lipid peroxidation[3] and can recycle and regenerate other antioxidants such as tocopherol and ascorbate.[5]

ABSORPTION AND TRANSPORT

CoQ_{10} is a lipophilic substance (or fat-soluble nutrient) and is therefore absorbed in the gastrointestinal tract by the same method as lipids, such as vitamin E.[2] Being hydrophobic and of large molecular weight, the absorption of dietary CoQ_{10} is enhanced in the presence of lipids or fatty meals. Secretions from the pancreas and bile acid facilitate emulsification and micelle formation that is necessary for the absorption of CoQ_{10} in the small intestine.

In a study examining the absorption rates of CoQ_{10}, 60 subjects were divided into 4 groups and administered 100 mg of CoQ_{10} daily. Group 1 took CoQ10 in a soft capsule, Group 2 CoQ10 in a hard capsule, Group 3 CoQ_{10} (ubiquinone) in a soft capsule and Group 4 CoQ_{10} (ubiquinone) in a hard capsule. After 3 weeks, the highest absorption rate was seen in group 1 (1624 ng/ml), followed by group 2 (985 ng/ml), then group 3 (1066 ng/ml) and then group 4 (737 ng/ml).[6]

In an animal study, researchers divided rats in to 6 groups and administered 100 mg/kg of regular ubiquinone with one of four emulsifiers (sorbitan stearate, polysorbate 80, glycerin esters or fatty acid, or propylene glycol state), ubiquinol or CoQ10. Three hours later, the plasma concentration was measured. In the four groups who received the emulsified ubiquinone, levels ranged between 0.75–1.25 g/ml; the ubiquinol group was 3.0 g/ml, and the CoQ10 group measured at 3.2 g/ml. This demonstrates that the absorption of the CoQ10 was comparable to ubiquinol and between 2.5–4.25 times that of the emulsified ubiquinone.[7]

CoQ_{10} is packaged into chylomicrons and transported via the lymphatics to the circulation. Being mostly carried by VLDL/LDL particles, plasma CoQ_{10} concentrations are highly dependent on plasma lipoproteins. In the human circulatory system, about 95% of CoQ_{10} in circulation exists in its reduced form as ubiquinol. CoQ_{10} is most concentrated in tissues with high energy requirements such as the heart, brain, liver, muscles and kidney. Studies show that with chronic dosing, there appears to be a dose-dependent relationship between supplementation and CoQ_{10} tissue levels for oil-based, powder-based and solubilized formulations of CoQ_{10}.[2]

UBIQUINONE V. UBIQUINOL

CoQ_{10} is found in the body in two forms: ubiquinone and ubiquinol. Ubiquinone is an oxidized form of CoQ_{10} that is used to create energy. Ubiquinol is the reduced form of CoQ_{10} that is used to provide antioxidant protection. Both of these forms are needed and used by the body, and it is the location in the body which will determine which form CoQ_{10} will take. For energy production inside cells, ubiquinone is used and outside cells for antioxidant function, ubiquinol is the form the body uses. Ubiquinone and ubiquinol form a redox pair, which means the body can easily convert from one form to the other. Ubiquinol taken in supplement form is unstable and is converted back to ubiquinone before it is absorbed. Oil-based ubiquinol does, however, have improved bioavailability over powdered ubiquinone with absorption.[6]

SAFETY AND CONTRAINDICATIONS

CoQ_{10} has an excellent safety record. The observed safe level risk assessment method reveals strong evidence of safety at intakes up to 1200 mg/d.[1] Adverse effects with CoQ_{10} supplementation are rare, with <1% of the patient population reporting GI discomfort.[3]

There may be potential interactions with warfarin (Coumadin), and due to CoQ_{10}'s potential hypoglycemic and hypotensive effects, it may be prudent to discuss adjunctive use of CoQ_{10} with other medications with a healthcare practitioner.[3] There is not enough scientific evidence to support the safe use of CoQ_{10} during pregnancy or breast-feeding.[3]

Statins, which are potent inhibitors of cholesterol biosynthesis, also inhibit CoQ_{10} synthesis and thus lower its endogenous levels in the body.[8] Even brief exposure to statin therapy causes a marked decrease in blood CoQ_{10} concentration leading to exercise intolerance, myalgia (heart pain), and myoglobinuria. However, these conditions are reversed with CoQ_{10} supplementation.[8]

CARDIOVASCULAR INDICATIONS

Numerous clinical trials supplementing with 100–300 mg/d of CoQ_{10} have found improvements in several clinical parameters related to chronic heart failure (CHF), including frequency of hospitalization, dyspnea, fatigue, and edema.[3, 4, 9] A clinical trial of 23 patients with CHF supplementing oral CoQ_{10} (100 mg t.i.d.) resulted in improved functional capacity, endothelial function, and left ventricular contractility without any side effects.[10] Similarly, CoQ_{10} supplementation may offer myocardial protection during cardiac surgery and improve postoperative cardiac function as well as reduce myocardial structural damage.[11]

A review of clinical trials using CoQ_{10} at various doses for hypertension, typically as adjuvant therapy, found a mean decrease in systolic and diastolic blood pressure of 16 and 10 mmHg, respectively.[12] Additionally, preliminary human studies of patients given CoQ_{10} orally within three days after a heart attack reported reductions in deaths, abnormal heart rhythms, and second heart attacks.[9] CoQ_{10} supplementation may also benefit cardiomyopathy (dilated, hypertrophic), angina from clogged heart arteries, and atherosclerosis.[9]

NEUROLOGIC AND METABOLIC INDICATIONS

In Parkinson's disease, CoQ_{10} may be used for slowing of functional decline. A clinical trial of 80 patients supplementing 1200 mg/d of CoQ_{10} showed that subjects experienced 44% less functional decline.[13] Furthermore, CoQ_{10} also has demonstrated positive trends in improving metabolism and physical endurance, and in reducing symptoms associated with selected mitochondrial diseases.[3, 9]

In early Alzheimer's disease, evidence from human research suggests that CoQ_{10} supplementation may slow down, but not cure, dementia in patients.[9]

In migraine studies, patients taking 150–300 mg/d of CoQ_{10} experienced a significant decrease in frequency (≥50%) of migraine attacks.[3]

Preliminary studies also show potential benefits of CoQ_{10} supplementation with Friedreich's ataxia as well as with Huntington's disease.[3, 9]

OTHER DISORDERS

Due to CoQ_{10}'s hypoglycemic and hypotensive effects, CoQ_{10} supplementation has been studied in patients with type 2 diabetes.[14] A recent study supplementing 200 mg/d of CoQ_{10} for 12 weeks observed improved blood pressure and glycemic control in type 2 diabetes patients. However, these results were not associated with a reduction in oxidative stress.

Since CoQ_{10} is vital in energy production, the effects of CoQ_{10} supplementation on exercise performance in athletes and normal healthy adults have been studied; however, results are variable.[9]

Preliminary studies in periodontitis (gum disease) have also observed improvements in bleeding, swelling and pain with oral or topical application of CoQ_{10}.[9]

CoQ_{10} can also have an impact on fertility. A study performed on human seminal fluid found that seminal CoQ_{10} concentrations have a direct correlation with seminal parameters including count and motility. Changes in CoQ_{10} levels were associated with conditions involved in male infertility, including asthenozoospermia and varicocele. In two separate studies looking at idiopathic asthenozoospermia, researchers found that CoQ_{10} in the ubiquinol and ubiquinone forms were significantly increased in both sperm cells and seminal plasma after treatment. Researchers concluded that patients with lower baseline levels of motility and CoQ_{10} levels had the highest probability to be responders to treatment and that exogenous supplementation of CoQ_{10} can be effective for improving idiopathic asthenozoospermia.[15]

REFERENCES

1. Hathcock J.N. and A. Shao. "Risk assessment for coenzyme Q_{10} (Ubiquinone)." *Regulatory Toxicology and Pharmacology* Vol. 45, No. 3 (2006): 282–88.
2. Bhagavan, H.N. and R.K. Chopra. "Coenzyme Q_{10}: absorption, tissue uptake, metabolism and pharmacokinetics." *Free Radical Research* Vol. 40, No. 5 (2006): 445–453.
3. Bonakdar, R.A. and E. Guarneri. "Coenzyme Q_{10}." *American Family Physician* Vol. 72, No. 6 (2005): 1065–1070.
4. Littarru, G.P. and L. TiaNo. "Clinical aspects of coenzyme Q_{10}: an update." *Current Opinion in Clinical Nutrition and Metabolic Care* Vol. 8, No. 6 (2005): 641–646.
5. Ernster, L. and G. Dallner. "Biochemical, physiological and medical aspects of ubiquinone function." *Biochimica et Biophysica Acta* Vol. 127, No. 1 (1995): 195–204.
6. *An absorbability study on CoQ_{10}-containing products.* Mitsubishi Gas Chemical Company, Inc. *Unpublished paper.*
7. *An availability study of BioQ10SA in rate,* 2010. Mitsubishi Gas and Chemical Company, Inc. *Unpublished paper.*
8. Rundek, T., et al. "Atorvastatin decreases the coenzyme Q_{10} level in the blood of patients at risk for cardiovascular disease and stroke." *Archives of Neurology* Vol. 61, No. 6 (2004): 889–892.
9. Medline Plus. *Coenzyme Q-10*. Updated 12 March 2014 · http://www.nlm.nih.gov/medlineplus/druginfo/natural/patient-coenzymeq10.html
10. Belardinelli, R., et al. "Coenzyme Q_{10} and exercise training in chronic heart failure." *European Heart Journal* Vol. 27, No. 22 (2006): 2675–2681.
11. Rosenfeldt, F., et al. "Coenzyme Q_{10} therapy before cardiac surgery improves mitochondrial function and in vitro contractility of myocardial tissue." *The Journal of Thoracic and Cardiovascular Surgery* Vol. 129, No. 1 (2005): 25–32.
12. Rosenfeldt, F., et al. "Systematic review of effect of coenzyme Q_{10} in physical exercise, hypertension and heart failure." *Biofactors* Vol. 18, No. 1–4 (2003): 91–100.
13. Shults, C.W., et al. "Effects of coenzyme Q_{10} in early Parkinson disease: evidence of slowing of the functional decline." *Archives of Neurology* Vol. 59, No. 10 (2002): 1541–1550.
14. Hodgson, J.M., et al. "Coenzyme Q_{10} improves blood pressure and glycaemic control: a controlled trial in subjects with type 2 diabetes." *European Journal of Clinical Nutrition* Vol. 56, No. 11 (2002): 1137–1142.
15. Balercia, G., et al. "Coenzyme Q_{10} and male infertility." *Journal of Endocrinological Investigations* Vol. 32, No. 7 (2009): 626–32.

For healthcare professional use only.