



ORIGINAL RESEARCH PAPER

Pharmacology

COENZYME Q10 – ITS ROLE AND UTILITY IN CLINICAL CONDITIONS

KEY WORDS:

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ABSTRACT

Coenzyme Q10 (CoQ10) is an important component of oxidative phosphorylation occurring in mitochondria for generation of adenosine triphosphate. CoQ10 is a substance that helps convert food into energy. CoQ10 is found in almost every cell in the body. Its antioxidant action can be used to reduce oxidative stress involved in various conditions like aging, heart failure, various inflammatory conditions caused by free radicals. The amount of CoQ10 in dietary sources is not sufficient to significantly increase CoQ10 levels in our body. Correction of deficiency requires supplementation with higher levels of coenzyme Q than are available in the diet.

Introduction

Coenzyme Q10 (CoQ10) is a fat-soluble, vitamin-like naturally occurring quinone synthesized by our body, it is stored in the mitochondria [1]. Alternative names are Ubidecarenone and ubiquinone. Various pathology involving diabetes, CHF, essential hypertension, stable angina, doxorubicin cardiotoxicity, ventricular arrhythmias, cardiomyopathy, breast cancer, acquired immunodeficiency syndrome, muscular dystrophy, periodontal disease and brain disorders have been linked to low levels of CoQ10 [2].

CoQ10 is found in Organ meats (Heart, kidney, liver), Pork, beef and chicken, Fatty fish (Trout, herring, mackerel and sardine), Spinach, cauliflower and broccoli, Oranges, strawberries, Soybeans, lentils and peanuts, Sesame seeds and pistachios, Soybean and canola oil. [3] The amount found in dietary sources isn't enough to significantly increase CoQ10 levels in your body. It comes in two forms: ubiquinol and ubiquinone. Ubiquinol is the active form.

Functions of CoQ10

Various health benefits of CoQ10's has been revealed by many research's. The primarily it acts as a cofactor in the electron-transport chain for generation of adenosine triphosphate. It also acts as an antioxidant. [2,4,5,6] They provide protection to cells from oxidative damage and viral or bacterial infections [4].

CoQ10 production decreases with age, older people have low levels of this compound. Conditions which causes leads to CoQ10 deficiency are Nutritional deficiencies (vitamin B6 deficiency), Mitochondrial diseases, Genetic defects in synthesis or utilization of CoQ10, Oxidative stress due to aging, Side effects of statin treatments, as a result of disease increased demands of CoQ10 by tissues [2,7]

CoQ10 is present in every cell of your body. However, the highest concentrations are found in organs with the greatest energy demands, such as the heart, kidneys, lungs and liver [8].

Clinical condition involving of CoQ10.

Improving heart function by increasing ATP production and limiting oxidative damage useful in treating heart failure. As reported in the literature CoQ10 supplementation given adjunct to CHF standard therapy produced positive outcomes. Low endogenous CoQ10 levels associated with Heart failure which is an energy depletion status. [9]

Its increase of ATP synthesis and increases myocardial contractility. Its antioxidant effects contribute to prevention of lipid peroxidation, which alleviates the oxidative stress inherent in heart failure. [8,10]

The antioxidant properties help improve sperm and egg quality

and reduce the decline in the number. It restores oocyte mitochondrial function and fertility during reproductive aging. [11]

Processes of aging is associated with increased cellular oxidation. This may be due to decline in the levels of endogenous CoQ10. Helps to decrease the risk of skin cancer by reducing sun damage and increase antioxidant protection. [12,13]

In a study on Parkinson patients by Clifford W et al shown that CoQ10 at the dosages up to 1200 mg/d was well tolerated and safe. Patients on CoQ10 developed less disability than those who were on placebo. CoQ10 appears to slow the progression of Parkinson disease and dementia in 'Alzheimer's patients. [14]

Helps in prevention and treatment of migraines. CoQ10 reduces inflammation and impaired oxygen metabolism due to mitochondrial dysfunction play important role in the pathogenesis of migraine. [15]

CoQ10 improves exercise performance and decreases fatigue by lowering oxidative stress and improving mitochondrial function. [16]

CoQ10 helps increase insulin sensitivity and improve blood sugar levels. In a study by Zahedi H et al showed CoQ10 improve glycemic control in patients type 2 diabetes. [17,18]

In a study by Wada H shown that percentage of plasma CoQ-10 levels in Chronic obstructive pulmonary disease patients is increased and oxygen supplementation decreases this increasing effect by Chronic obstructive pulmonary disease. This implies that %CoQ-10 might be used practically to assess the COPD patients systemically. [19,20]

CoQ10 protect cell DNA and prolong cell survival, both of which are strongly linked to cancer prevention and recurrence. [21]

CoQ10 helps to transport proteins across membranes within the cell and separate certain digestive enzymes from the rest of the cell, which helps maintain optimal pH. It's believed that acidic environments provide protection from various diseases.

CoQ10 can help improve overall immune function and might even lower risk for cancer. It has been seen that people with certain types of cancers (myeloma, lymphoma, breast, lung, prostate, pancreas and colon) had reduced levels of CoQ10 in their blood.

Correction of deficiency requires supplementation with higher levels of CoQ10 than are available in the diet. CoQ10 supplements are well tolerated by humans and have low toxicity. Most absorbable form is Ubiquinol, approximately 90% of the CoQ10 in the blood. [22].

There is no established ideal dose of CoQ10. Studies have used doses of CoQ10 ranging from 50 milligrams to 1,200 milligrams in adults, sometimes split into several doses over the course of a day. Daily dose is 90 milligrams to 200 milligrams. Doses up to 500 mg seem well tolerated, and several studies has been shown no serious side effects when used high doses [23] Do not give CoQ10 to a child under 18-year-old.

There are no specific dietary intake recommendations for CoQ10 that has been established. CoQ10 supplements includes soft gel capsules, oral spray, hard shell capsules, and tablets. CoQ10 is also added to various cosmetics.

Deficiency symptoms have not been widely reported or studied in much detail in the general population. It's estimated that the average person's diet contributes around 25 percent of total CoQ10. The best way to obtain enough is to eat a varied, nutrient-dense diet, and to consider supplementing if you're at risk for a heart-related or inflammatory condition.

Since CoQ10 is fat-soluble, it is recommended to take it with food or use products that combine it with oils to improve its absorption. Supplementing with CoQ10 appears to be well tolerated by individuals and has low toxicity. [1]

CoQ10 supplements are safe. Mild side effects can occur which includes upper abdominal pain, loss of appetite, nausea, diarrhea, headaches, insomnia, rashes, fatigue, dizziness, light sensitivity, irritability. The safety of use of CoQ10 during pregnancy and breast-feeding hasn't been established.

CoQ10 when given with warfarin (Coumadin) or clopidigrel (Plavix) makes it less effective. This could increase the risk of a blood clot. [22]

CoQ10 when given with hydroxy-methylglutaryl-coenzyme A reductase (HMG-CoA) reductase inhibitors like atorvastatin (Lipitor), fluvastatin (Lescol, Lescol XL), lovastatin (Mevacor, Altoprev), pravastatin (Pravachol), rosuvastatin (Crestor), simvastatin (Zocor), and pitavastatin (Livalo) etc, may cause muscle pain, nausea, diarrhea, liver and kidney damage, may increase blood sugar level and precipitate type 2 diabetes mellitus

CoQ10 when given with Daunorubicin (Cerubidin) and doxorubicin (Adriamycin) may help reduce the toxic effects on the heart caused by these drugs, two chemotherapy medications that are used to treat acute leukemia and AIDS related Kaposi sarcoma.

CoQ10 when given with antihypertensive medications to lower blood pressure. Addition of CoQ10 supplements allowed to reduce the doses of these medications. However more research need to prove the effectiveness of this combination.

CoQ10 when given with Betaxolol (Betoptic) reduces heart-related side effects of betaxolol without making the drug less effective for the treatment of glaucoma.

Various medication which lower the CoQ10 level when given along with CoQ10 are fibric acid derivatives for cholesterol, including gemfibrozil (Lopid), beta-blockers for high blood pressure, such as atenolol (Tenormin), labetalol (Normodyne), metoprolol (Lopressor or Toprol), and propranolol (Inderal), tricyclic antidepressant medications, including amitriptyline (Elavil), doxepin (Sinequan), and imipramine (Tofranil).

Conclusion

CoQ10 is being used in research for improving the immune function of people with HIV/AIDS, cancers and various health conditions. More research is needed, but Coenzyme Q10 seems to improve muscular dystrophy patients' exercise capacity, heart function, and overall quality of life.

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