

Ubidecarenone (Coenzyme Q 10)



Chemical name: 2-[(all-E)-3,7,11,15,19,23,27,31,35,39-decamethyl-tetraconta-2,6,10,14,18,22,26,30,34,38-decaenyl]-5,6-dimethoxy-3-methylbenzene-1,4-dione
CAS-No.: 303-98-0
EINECS No.: 206-147-9
INCI-name: Ubiquinone
CN-Code: 2914 6990 900 (2500)
Synonyms: ubichinone, ubiquinone

Produced by: ZHEJIANG MEDICINE CO. Ltd., China



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General functions

The group of ubiquinones can be found nearly everywhere in the living nature. The length of the side chain may vary according to different species. In humans an ubiquinone with the side chain length of 10 units is found predominantly, which is also called Coenzyme Q10 (Co Q10). Coenzyme Q10 is a vitamin-like substance. Its structure is similar to vitamin E and vitamin K, but it has different and unique functions.

Coenzyme Q10 is an essential mitochondrial component where it plays a key role in the respiratory chain. From Coenzyme Q10 electrons flow over cytochromes to molecular oxygen an activity that is vital for the production of ATP. With the electron transport system of this chain the human body generates the energy necessary for life. Thus, the highest levels are found in organs with high rates of metabolism like liver, heart, and kidney. Furthermore, Coenzyme Q10 acts as a potent antioxidant in the lipid phase of cells. Coenzyme Q10 itself has a lipophilic character and thus is concentrated in the lipophilic sub cellular structures such as membranes. There, it is thought to have membrane-stabilizing properties as a free radical scavenger.



Deficiency

The healthy human organism can synthesize sufficient amounts of coenzyme Q10, however, under certain conditions and with various diseases Q10 deficiencies have been described. Co Q 10 is synthesized using tyrosine, methionine and Acetyl-co-enzyme A as starting materials. Various vitamins of the B-group function as catalysts during the synthesis.

Deficiency in any of these nutrients may cause deficiency of Co Q10. The acetyl co-enzyme A pathway proceeds not only to Co Q10 but also to the synthesis of cholesterol, so both share to some extent the same biosynthetic pathway. It has been shown that the ability to synthesize Co Q10 decreases with ageing. Why this occurs is not known but may be due to decreased synthesis and/or increased lipid peroxidation, which occur with ageing. Furthermore, blood levels are reduced when HMG-CoA reductase inhibitors are used to treat elevated cholesterol levels. This low Co Q10 status may be particularly hazardous for patients with heart failure, suggesting a possible indication for Co Q10 in many, if not all, individuals using these cholesterol-lowering drugs.

Possible uses

Co Q10 has been used in functional foods and supplements since many years for various reasons. Results from preliminary studies suggest that it may help to improve symptoms of congestive heart failure, and may also help to protect against myocardial infarction. It is likely that Co Q10 is beneficial mainly in people who are deficient. Of course, Co Q10 should not be used to treat cardiovascular disorders without medical supervision.

Another important function of Co Q10 is its antioxidant activity in mitochondria and cellular membranes, which are protected against peroxidation. Co Q10 also inhibits the oxidation of LDL-cholesterol. LDL-cholesterol oxidation is believed to play a significant role in the pathogenesis of arteriosclerosis. Co Q10 is claimed to have a protective effect against cancer and Alzheimer, but data are limited.

Absorption

Co Q10 is absorbed from the small intestine into the lymphatics, from where it enters the blood. The absorption of Co Q10 supplements is poor. Over 60% of an oral dose is excreted in the feces. Furthermore, absorption of Co Q10 depends on food intake and also on the amount of lipids present in the food. Absorption of Co Q10 supplements is lower on an empty stomach and greater when taken with food of high lipid content.

Dose

Daily dosages range from 5 to 300 milligrams, though effectiveness is thought to be obtained with doses of 50 to 200 milligrams daily. The body accumulates Co Q10 slowly, it takes about three weeks of daily dosing to reach maximal serum concentrations, which then plateau with continuous dosing.

Literature:

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Bayer W., Schmidt K.: Coenzym Q10- Aktueller Erkenntnisstand. Ernährung & Medizin, 17, 138- 140, 2002

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