

Ubidecarenone (Coenzyme Q10)



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

Producer: ZHEJIANG MEDICINE CO. Ltd., China



Kyowa Hakko Europe GmbH
Daiichi Fine Chemical Division

Stability

Gradually decomposes and darkens on exposure to light.

Essentially photostable (5xMED dose: 10 % degradation), 60% at 10xMED.

Stable at presence of oxygen under pressure for up to 30 min at 75°C

Safety

Cytotoxicity (keratinocytes): no cytotoxicity was observed

Irritancy: in vivo occlusive patch tests: 0.3% not different from vehicle

Sensitive skin tolerance: tolerated by people with sensitive skin

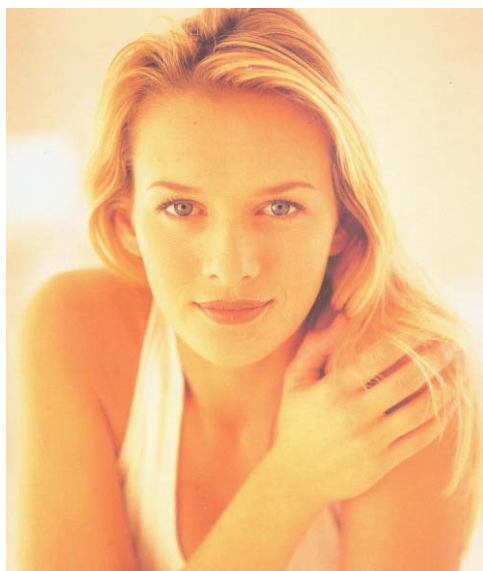
General functions

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.

Coenzyme Q10 is a vitamin-like substance. Its structure is similar to vitamin E and vitamin K, but it has different and unique functions. In every cell 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. 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 the liver, the heart, and the kidney.

The healthy human organism can synthesize sufficient amounts of coenzyme Q10, however, under certain conditions and with various diseases Q10 deficiencies have been described. Therefore it is used as a pharmaceutical substance in cardiology for various heart diseases.

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 sub cellular structures.



Cosmetics *source please see bottom of next page

Our skin is attacked by various oxidative stresses from outside such as UV radiation and from inside by molecules generated during cell metabolism. To cope with them the body disposes of different enzymatic and non-enzymatic (antioxidant) mechanisms.

Coenzyme Q 10 is an important antioxidant acting in the lipid parts of the cells together with vitamin E and vitamin C. The coenzyme Q10 levels of the epidermis is ten times higher than in the dermis. It declines with aging, calculated with reference to cholesterol. Modern cosmetics aim to reduce the signs of ageing in the skin, where oxidative stress is thought to play a major role. Apart from normal, chronological aging which is thought to create shallow small wrinkles especially the signs of photoaging, such as deep wrinkles are targeted by cosmetic formulators.

By virtue of its unique functions Coenzyme Q 10 is an attractive active ingredient for such cosmetic formulations. It penetrates into living cell layers of the epidermis. In porcine skin 20% penetrated to the epidermis and 2% to the dermis. In the dermis it is reduced from ubiquinone to ubiquinol, the active antioxidant.

Prevents oxidative effects in human skin cells

Prevents oxidative stress with hydrogen peroxide increases the activity of phosphotyrosine kinase and decreases the levels of glutathione in cultured keratinocytes. The severity of the reaction could be significantly alleviated by pre-treatment with Coenzyme Q10. Furthermore, oxidative stress by UVA irradiation, measured by an reduced mitochondrial membrane potential was suppressed by a pre-treatment with 0.3 % Coenzyme Q10.

Protects from chronological and photoaging of dermal fibroblasts

The decreased content of hyaluronic acid in chronologically aged skin was significantly increased by treatment of human keratinocytes with Coenzyme Q10. Furthermore the proliferation of these artificially aged cells increased by 20%. The ageing sign of degraded collagen fibres by high levels of collagenase under UVA irradiation was reduced by 50% due to a pre-treatment with Coenzyme Q10.

Reduces the effects of photoaging

The depth of deep wrinkles around the eyes could be significantly reduced by 26% with a product containing 0.3% Coenzyme Q10 after 6 month compared to the basic product without the active. Casts for quantitative microtopography were evaluated. Furthermore, the corneocyte size, which normally increases with age was reduced on the forearm skin.



Literature:

Bässler K.-H., et al.: Vitamin Lexikon, 2.ed, Gustav Fischer: Frankfurt. 1997.
Hoppe U. Et al.: Coenzyme Q10, a cutaneous antioxidant and energizer.
BioFactors 9, 371-378. 1999

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