

TECHNICAL DATA SHEET

Coenzyme Q10 (Lipo-soluble)

Product Name: Coenzyme Q10 powder

INCI name: Ubiquinone

CAS: 307-95-0

Synonyms: Coenzyme Q10, CoQ10, Ubidecarenone, Coenzyme Q10, Ubiquinone

Chemical classification: Quinone (benzoquinone), Ethers

Functional category: Antioxidant, skin conditioning agent ~ other

IUPAC name: 2,3-dimethoxy-5-methyl-6-decaprenyl-1,4-benzoquinone

Description: Coenzyme Q10 (Ubiquinone) is a lipophilic cosmetic ingredient naturally present in human skin. It plays a key role in cellular energy metabolism and protection against oxidative stress. In cosmetic formulations, it is used in the form of a powder or oil-dispersible systems. It is insoluble in water and requires the presence of a lipid phase or appropriate carriers to remain stable and effective. Its action is based on a strong antioxidant capacity. Ubiquinone neutralizes free radicals generated by UV radiation, pollution, and metabolic processes, thereby protecting the skin's lipid structures and reducing oxidative damage. Indirectly, it contributes to the preservation of collagen and elastin, slows down the appearance of signs of aging, and improves skin firmness and elasticity. Due to its role in mitochondrial energy production, Coenzyme Q10 supports cellular vitality and contributes to skin regeneration. Regular application improves skin tone uniformity and provides a visually healthier appearance. It is particularly valued in anti-age formulations and is most commonly used in serums, emulsions, creams, and oil preparations. It is intended for mature, tired, and photo-aged skin. It blends well with plant oils and ester emollients, is compatible with skin-like lipids, and does not clog pores when used at typical concentrations. It is also suitable for sensitive areas, such as the eye contour. Proper dosing and a stable system are essential. The stability of Coenzyme Q10 depends on protection from light, oxygen, and elevated temperatures; therefore, it is often combined with other antioxidants and packaged in appropriate containers. When properly formulated, it represents a highly valuable cosmetic active.

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Mechanism of action: Coenzyme Q10 (Ubiquinone) acts primarily as a lipophilic antioxidant in the epidermis and the skin's lipid barrier. Its main function is the neutralization of free radicals and the prevention of lipid peroxidation in cell membranes, thereby protecting the skin's structural lipids and reducing oxidative stress caused by UV radiation and external factors. Concurrently, it participates in the mitochondrial electron transport chain, supporting the cellular energy metabolism of keratinocytes. This effect contributes to better cellular vitality and slower functional degradation of the skin, acting locally in the layers where Q10 is physiologically present. Doubts raised by some authors regarding the efficacy of Coenzyme Q10 mainly relate to limited penetration due to its large molecular weight. These criticisms are methodologically justified but often misinterpretation-prone. Coenzyme Q10 is not designed for deep action in the dermis; its value lies in epidermal protection and long-term antioxidant support rather than rapid skin remodeling. When used in appropriate lipid carriers and realistic concentrations, it demonstrates measurable biological effects. Today's expert consensus views it not as a "key anti-age active," but as a stable, safe, and functional auxiliary active that makes sense in a well-formulated antioxidant system, though not as a standalone solution for pronounced signs of aging.

Benefits:

- Acts as a powerful lipophilic antioxidant that protects the skin from free radicals.
- Reduces oxidative damage caused by UV radiation and external stressors.
- Protects the skin's lipid barrier from peroxidation and degradation.
- Indirectly contributes to the preservation of collagen and elastin in the skin.
- Slows down the appearance of fine lines and signs of premature aging.
- Supports mitochondrial energy production in epidermal cells.
- Improves cellular vitality and the functional capacity of the skin.
- Contributes to a more even skin tone and a healthier visual appearance.

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- Increases the skin's resistance to daily oxidative stress.
- Suitable for long-term use in anti-aging and protective formulations.

Method of use: Coenzyme Q10 is used in cosmetic formulations as a component of the oil phase or in the form of a pre-prepared solution in a suitable emollient carrier. Due to its pronounced lipophilicity, it is completely dissolved in ester emollients or their carefully selected combinations prior to incorporation, using gentle and controlled heating to achieve complete homogeneity and system stability. Its solubility is significantly better in light ester emollients than in classical plant oils, where it is limited and technologically less reliable. *Dicaprylyl carbonate* stands out in practice as the most favorable solvent, offering optimal polarity and low viscosity for fast and complete dissolution of Coenzyme Q10 with minimal heating, yielding a clear and stable solution without a tendency toward recrystallization. *Caprylic/capric triglyceride* represents a reliable and frequently used alternative, though it requires longer heating and more intensive mixing for complete solubilization. Other esters, such as isopropyl myristate, isopropyl palmitate, and C12-15 alkyl benzoate, provide satisfactory dissolution but are mostly applied in practice in combination with other esters for better stability and control of the sensory profile. To obtain a stable and clear lipid solution of Coenzyme Q10, a mixture of dicaprylyl carbonate and caprylic/capric triglyceride in a ratio of approximately 60–70 : 30–40 is often recommended, at an active substance concentration of 0.10 to 0.50%. Ester mixtures including C12-15 alkyl benzoate can be used in formulations with a pronounced "dry" sensory profile, while for formulations with a more pronounced "natural" character, Coenzyme Q10 is introduced into a combination of CCT, squalane, and a smaller proportion of jojoba oil at lower concentrations to avoid cloudiness. Such prepared solutions are easily incorporated into emulsions, serums, or anhydrous systems without disrupting formulation stability. In classical creams and emulsions, Coenzyme Q10 is applied in moderate concentrations, most commonly ranging from 0.05 to 0.30%, allowing for reliable antioxidant action alongside good formulation stability. In serums and products with a pronounced anti-age focus, the concentration can be increased up to 0.50%, requiring careful control of carrier selection and oxidation protection. In oil preparations, balms, and anhydrous formulations, the typical application range is 0.10 to 0.50%, provided the carrier ensures a clear and stable solution without cloudiness or recrystallization tendencies. Higher concentrations are rarely used, as they do not provide proportionally stronger effects and may adversely affect system stability and the sensory properties of the finished product.

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Safety of application: Safety assessment of Coenzyme Q10 (Ubiquinone) was conducted under the Cosmetic Ingredient Review (CIR) program. The initial report was published in 2005, and conclusions were later reaffirmed without changes, meaning no new safety risks have been identified in the interim. CIR concluded that ubiquinone is safe for use in cosmetic products at concentrations commonly used in formulations. Toxicological tests showed no systemic toxicity; acute oral and dermal toxicity were rated as very low. Skin irritation tests showed that ubiquinone is not an irritant upon topical application, and sensitization tests indicated no potential for causing allergic reactions. Phototoxicity and photoirritation were not observed, which is particularly significant given its application in daytime preparations. Genotoxic and mutagenic tests gave negative results, and no carcinogenic effects were observed. CIR emphasized that safety is also supported by the fact that ubiquinone is an endogenous substance naturally present in the human body and skin, meaning topical application does not lead to systemic absorption in a clinically significant degree, with action remaining local and restricted to epidermal layers. In practical cosmetic application, recommended concentrations align with these findings: in creams and emulsions, a safe and effective range is 0.05–0.30%; in serums and targeted anti-age products, concentration can be increased up to 0.50%; and in oil preparations and anhydrous systems, 0.10–0.50% is commonly used with a stable lipid carrier and antioxidant addition. Concentrations above 0.50% are not recommended as they do not increase efficacy and may negatively impact formulation stability.

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Animal testing: In accordance with applicable European regulation (Regulation (EC) No 1223/2009 on cosmetic products), the substance has not been tested on animals. The safety assessment of the raw material is based on available toxicological data, scientific literature, and validated alternative testing methods (*in vitro* and *in silico*). *In silico* is a term used for testing and evaluation methods performed using computer models and simulations rather than in the laboratory on living organisms (*in vivo*) or cell cultures (*in vitro*). This note confirms compliance with the ban on animal testing and serves solely for informational purposes for the further use of the raw material in cosmetic formulations.

GMO: Non-GMO

Vegan: Does not contain animal-derived components