

Preparation and Properties of Coenzyme Q10 Nanoemulsions

Authors: Fred Züllig*, Esther Belser, Daniel Schmid, Christina Liechti and Franz Suter, Mibelle AG Biochemistry, CH

Abstract

Coenzyme Q10 (CoQ10), also known as ubiquinone, is used for energy production within cells and acts as an anti-oxidant. Due to this dual function CoQ10 finds its application in different commercial branches such as drugs, food supplements, or cosmetics.

Since CoQ10 is highly lipophilic, the topical and oral bioavailability is very low. Several attempts have been made to improve absorption. Latest technical developments reveal that encapsulation of CoQ10 in nanoemulsions results in a significantly enhanced bioavailability. In addition, multiple nanoemulsions prepared according to a patented process even allow the administration of several incompatible substances at the same time.

This article gives an overview of current key developments of the encapsulation of CoQ10 in nanoemulsions. It highlights how encapsulation upgrades the bioavailability of CoQ10 and with this the efficacy of CoQ10. In addition, this article presents latest in vitro tests demonstrating the influence of CoQ10 on the synthesis of collagen I and on the activity of mitochondria and their resistance against stress of dermal fibroblasts and keratinocytes, respectively.

Introduction

Everyone requires energy to live. This energy is produced by combustion of carbohydrates or fats with oxygen. However, the use of oxygen will always also generate reactive oxygen species (ROS) which will damage the cells and therefore reduce the activity of cells. This will cause a general ageing process of cells and the whole body. Thanks to a compound named coenzyme Q10 (CoQ10) the human body possesses a pivotal player in energy synthesis. In mitochondria CoQ10 helps to build up adenosine triphosphate (ATP), the body's major form of stored energy. A second task of CoQ10 is the activity as an essential regenerating antioxidant scavenging free radicals such as ROS.

Since every cell consumes energy and needs antioxidant protection, CoQ10 is present in all cellular membranes of every single cell of the body. Caused by this ubiquitous presence in the body, as well as in the rest of nature, CoQ10 is also known as ubiquinone. However, deficiencies of CoQ10 in the human body have been reported to occur frequently. In addition, CoQ10 levels decline rapidly under stress or with advancing age. In case of deficiency CoQ10 has to be supplemented to guarantee the body's energy production and its essential antioxidant protection. (1,2)

Use of CoQ10 as a drug, food supplement and cosmetic ingredient

Although CoQ10 can be synthesized in the human body, it can happen that the body's synthetic capacity is not sufficient to meet the required amount of CoQ10. Cases of deficiencies of CoQ10 are reported in a variety of diseases, e.g. cardiovascular disorders. A randomized, double-blind clinical trial assessing 49 patients who experienced cardiac arrest (heart attack or accident), revealed that after an immediate treatment with a CoQ10 nanoemulsion such as described in this paper the survival rate increased more than 100 % versus placebo after 90 days. (3) Beside these life saving properties, CoQ10 also shows positive effects in migraine and Parkinson treatments. Latest clinical research resulted in an excellent positive effect on attack frequencies, headache days and days with nausea in migraine patients. (4) In different research programs for Parkinson's disease the efficacy of CoQ10 is now under investigation. Further interest in CoQ10 application was reported for gastric ulcer, muscle dystrophy, allergy and even cancer or AIDS. (1)

CoQ10 found its uses not only as a remedy but also as a food supplement and a cosmetic. Since the synthesis of CoQ10 in the body weakens in correlation with advancing age, daily dietary supplementation provides the required compensation for energy

