

## Restorative Effects of Supercritical Guggul Extract in Cosmetic Applications

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Keywords: guggul, coenzyme Q10, type I collagen, matrix metalloproteinase, elastase, anti-wrinkle

### Abstract

Coenzyme Q10 (CoQ10) is a major ingredient in skin care products because of its anti-wrinkle properties; however, it does have some side effects at higher amounts. In this study we compare the anti-wrinkle properties of CoQ10 on the one hand and a proprietary *Commiphora mukul* gum resin (guggul) and triheptanoin preparation (GU-TC7) on the other hand. Treatment of human skin fibroblasts with GU-TC7 demonstrates a mild proliferative effect compared to CoQ10 and increased type I collagen synthesis. Additionally, GU-TC7 inhibited matrix metalloproteinase-1 (MMP-1) expression in a dose-dependent manner at 20 – 100  $\mu\text{g mL}^{-1}$  concentrations and inhibited human elastase expression by more than 50%, in contrast to the absence of any elastase inhibition with CoQ10 treatment. These results suggest that GU-TC7 is promising for treating degenerative skin conditions and wrinkle formation.

### Introduction

In many cases, active ingredients from natural sources are used both internally in functional foods and dietary supplements and topically in caring cosmetics. Another emerging trend is the nutricosmetics field for beauty from within. Well known examples of such ingredients are omega-3 fatty acids, seabuckthorn oils, vitamins C and E, CoQ10 and guggul extracts.

When used internally, the last two actives have been shown to address similar physiological pathways. Both prevent free radical damage, fuel mitochondria, the power plants in cells and reduce LDL cholesterol levels. In this study we test a special supercritical guggul extract for its protective and restorative effects on skin in comparison to CoQ10 which is already well established in anti-ageing cosmetics.

### Principles of Skin Ageing

The skin consists of two distinct layers, the epidermis or top layer and the dermis consisting of connective tissue and adnexal structures. The dermis is composed of different cell types, mainly fibroblasts and of fibrillar matrix proteins providing structural support, such as collagen bundles for strength and

elastin network for elasticity. The extracellular matrix (ECM) is segregated from fibroblasts and plays a crucial role in the visual nature of the skin. Also located in the dermis are other structures referred to as adnexa: eccrine glands (sweat glands), hair follicles and sebaceous glands and sensory receptors.

Loss of dermal collagen and elastin and consequently wrinkle formation is the result of natural ageing. It can be accelerated by excessive exposure to sun and UV-irradiation. Elastase is the major enzyme responsible for elastin degradation. It exerts pro-oxidative and pro-inflammatory damage on connective tissue and is involved in the activation of matrix metalloproteinases (MMPs), a type of collagenases leading to proteolytic collagen degradation. Therefore reducing elastase activity can improve and prolong the elasticity and youthful appearance of the skin. Type I collagen is the main component of the extracellular matrix performing a pivotal function for the structure of the dermis. Accordingly, MMP-1 and elastase are common biomarkers associated with skin ageing and wrinkle formation. They consequently represent potential targets for the evaluation of compounds included in cosmeceuticals for treating wrinkles, inhibiting MMP-1 and elastase activity or inducing collagen synthesis.

In ancient Ayurvedic literature, guggul, the gum resin from the bark of *Commiphora mukul*, is reported to possess anti-wrinkle effects. In the present study, we describe the effect of GU-TC7 on wrinkle-associated biomarkers in CCL-110 skin fibroblasts. GU-TC7 is a proprietary guggul formulation prepared by supercritical CO<sub>2</sub>-cosolvent extraction and standardised with triheptanoin, a triglyceride composed of three 7-carbon fatty acids that has also been linked to several mechanisms supporting lipid metabolism, glucose metabolism and cellular energy. GU-TC7, a light-brownish oily liquid, is compared to CoQ10 a common ingredient in anti-wrinkle preparations.

### Materials and Methods

Supercritical guggul extract was obtained by CO<sub>2</sub>-cosolvent extraction with ethanol as entrainer. The purified genuine