Tocomin - A novel vitamin E with unique benefits to skin and hair health

INTRODUCTION

The antioxidant, anti-aging and moisturizing properties of vitamin E have made it a popular ingredient in cosmetic and personal care products. Vitamin E can be divided into two groups, the tocopherols and tocotrienols. Most of the Vitamin E used in cosmetic is mainly of the tocopherol form (synthetic and natural forms). Fueled by the many recent scientific publications on the benefits of tocotrienols in cosmetic application and women's health, the use of tocotrienol as a more potent form of vitamin E — 40-60 times more potent than the normal alpha-tocopherol vitamin E — has been gaining tremendous attention in the oral and topical cosmetic and personal care industry. New studies are being conducted on tocotrienol for its superior skin protection effects such as protect against UV-radiation, anti-aging, anti-wrinkle, scar healing and prevention, moisturizing and whitening effects.

VITAMIN E

The vitamin E family is comprised of eight chemically distinct compounds: four tocopherols and four tocotrienols — alpha, beta, gamma and delta. Tocotrienols differ from tocopherols by having an unsaturated side tail that results in significantly different biological activities (Figure 1).

In nature, most plants, fruits and vegetables contain a mixture of tocopherols and tocotrienols. Single isomer of vitamin E rarely ever occurs in isolation naturally. Whilst tocopherols occur naturally in common vegetable oils; tocotrienols are concentrated in cereal grains — e.g. oat, barley, rice bran — and virgin crude palm oil (Figure 2), which is the richest source in nature.

Most of the earlier scientific research was focused on alpha-tocopherol. Only in recent years has tocotrienols received increasing attention as new studies revealed various health benefits that are unique to tocotrienols. Tocotrienols have shown promising properties including lowering blood cholesterol, reversing atherosclerosis, lowering blood pressure, preventing stroke-induced brain damages, anticancer and anti-angiogenesis properties, prevention of UV-induced skin aging and hair loss prevention.

TOCOCOM: UNIQUE BENEFITS TO SKIN AND HAIR HEALTH

Tocomin® is a natural tocotrienol complex concentrated from virgin crude palm oil through a patented mild extraction process which ensures maximum preservation of phytonutrients. It contains predominantly full spectrum tocotrienols and other phytonutrients such as tocopherols, plant squalene, phytosterols, co-enzyme Q10 and mixed carotenoids that are naturally extracted together with tocotrienols.

FOR MORE INFORMATION ABOUT COCOSCIENCE ANH-VCO 'SUPER VITAMIN E - TOCOTRIENOLS' PRODUCTS, CONTACT US AS AT -

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Figure 1 – a. Molecular structure of Tocotrienol — note the three double bonds in the side chain
b. Molecular structure of Tocopherol
Research on tocotrienols in skin protection has been fairly recent. Many more research is currently being conducted to understand and evaluate the efficacy of tocotrienols in skin protection and skin nourishment. Scientists believe that tocotrienol plays a major and important role in maintaining healthy skin especially in the prevention of oxidative stress, protection against UV-radiation, skin whitening effects, treatment of scar healing and prevents hair loss.

**Tocotrienol Is a More Potent Antioxidant**

Free radicals are highly reactive molecules that can damage biological molecules via oxidative stress. They have been implicated in many diseases and aging process including the visible signs of aging on skin such as pigmentation, wrinkle formation, and inflammation. Alpha-Tocotrienol is 40-60 times more potent than alpha-tocopherol as an antioxidant (1). The higher antioxidant potency of α-tocotrienol is due to higher recycling efficiency from chromanoxyl radicals, more uniform distribution in cell membrane and better interaction with lipid radicals. The net result is that tocotrienols are more efficient than tocopherols in scavenging and quenching the free radicals.

**Anti-Aging**

Researchers at the School of Medicine, Tokai University, Japan found that administration of palm tocotrienol complex resulted in a reduction of oxidative stress risks and hence may be a possible compound for anti-aging (2). Oxidative damage due to free radicals or reactive oxygen species has been implicated in the process of aging – “Free Radical Theory of Aging”. It was found that palm tocotrienol complex significantly prevented protein oxidation and reduced the accumulation of protein carbonyl – a good indicator of oxidative stress during aging. In this study, the researchers used C. elegans, a fascinating long worm whose entire collection of genes has literary been read, making it probably the most completely understood organism. Thus, it provides scientists with an ideal model in learning crucial lessons about many diseases such as aging, cancer, muscular dystrophies, etc. Palm tocotrienol complex recovered the mean life span of the UVB irradiated group compared to the non-irradiated group, whereas alpha-tocopherol administration did not give a significant recovery. This further illustrates the efficacy of tocotrienols in vivo (in real life) and suggests potential anti-aging properties.

**Better Inhibition of Oxidative Stress**

Ozone on the ground is primarily formed by reactions between two major classes of air pollutants generated from industrial activities and engine emissions – volatile organic compounds and nitrogen oxides. Exposure to ozone leads to oxidative damage in the lipids in our skin, as ozone is a strong oxidant (3). Topical application of alpha- and gamma-tocotrienols from palm tocotrienol complex prevented the lipid peroxidation caused by ozone exposure.

Tocotrienols either through diet or topical, could reduce lipid peroxidation due to the higher antioxidant activity, more uniform distribution and preferential accumulation at the top layer of the skin (1,4).

**Tocotrienol Defends Our Skin Against UV-Induced Damages**

Solar Ultraviolet radiation penetrates deeply into the skin and causes radical changes to skin tissues and fats. It causes lipid peroxidation, increases production of free radicals and compromises antioxidant defences which are accountable for skin damage including premature skin aging and skin cancer. Study showed that low doses of UV light is sufficient to damage many components of the skin antioxidant network and at high doses, almost all of the components are destroyed (5), resulting in decreased protection and cell damage.

Prolonged exposure to UVB causes sunburn and DNA damage, resulting in skin cancer. Vitamin E has been studied extensively for its effects in reducing UV-induced damages (6-9). Tocotrienols exhibited stronger protection on the skin against UVB induced damage in these studies, as compared to alpha-tocopherol. This could probably be explained by the fact that dietary tocotrienols were selectively taken up into the skin but not alpha-tocopherol (10).

**Better Distribution and Preferential Accumulation on the Skin**

Tocotrienol has been shown to preferentially accumulate in the uppermost layer of the skin and is distributed uniformly on the skin surface (11). Applied topically, tocotrienol is absorbed and penetrates rapidly through the skin. The polyunsaturated side chain of tocotrienols allows them to move more efficiently across the cell membranes as compared to tocopherols.

In a study to evaluate the tissue-specific distribution of lipophilic antioxidants, it was found that nearly 15% of tocotrienols (compared to 1% of tocopherol) were distributed to the skin (4). This unique distribution of tocotrienols in skin may confer superior protection against oxidative stress caused by the environment.

In the same study, it was found that concentrations of all vitamin E homologues decreased significantly after UV-irradiation, but skin tissues being treated with palm tocotrienol-rich fraction contained vitamin E at concentrations 7-30 folds higher than control values. This finding suggests the protective effects of topically applied tocotrienol complex to the skin.

**Tocotrienol May Be an Effective Skin Whitening Agent**

When exposed to sunlight, more
accurately, UV irradiation, melanin pigments in the melanocytes prevent immediate UV-induced skin damage by absorbing the harmful UV rays and dissipate the energy as harmless heat. The side effects of which turn the skin brown (sun tan) in order to protect the deeper layers of the skin. Overexposure to UV radiation will turn melanocytes into melanoma – skin cancer.

Researchers from the Fukuyama University have recently published data that shows delta-tocotrienol is able to inhibit tyrosinase protein production, which leads to reduce synthesis of melanin in mouse melanoma cells (12).

Melanin content in melanoma cells were significantly decreased after treatment with delta-tocotrienol that corresponded to a decrease in activity and amount of tyrosinase protein effected by delta-tocotrienol. Based on the result and proposed mechanisms deduced from this study, the researchers concluded that delta-tocotrienol might be useful as therapeutic or preventive agent for treating hyperpigmentation and as an effective component in skin lightening cosmetics.

**Tocotrienol in Scar Healing**

**Treatment of Surgical Scar**

The researchers at The Ohio State University are conducting an on-going clinical trial looking at the “Efficacy of natural vitamin E tocotrienol on the treatment of surgical scars”. Tocotrienol may be an effective tool to prevent or reduce normal, hypertrophic, or keloid scars by mediating the inflammatory response. Tocomin® (Carotech Inc.) is given orally and topically. The details and protocol of this clinical trial can be found at the ClinicalTrials.gov website (13).

**Burn wound healing**

Researchers at The Ohio State University are conducting an on-going study to evaluate the efficacy of topical application of tocotrienol (Tocomin®, Carotech Inc.) enriched cream in decreasing scar formation following burn injury. Rete Ridges anchor the epidermis to the underlying dermis and protect skin from shearing forces. This study used increased Rete Ridges formation as an indicator of better scar outcome. Initial results showed increased Rete Ridges formation as a response to topical Tocomin® treatment and the results should be published soon.

**Tocotrienol Showed Anti-Wrinkle Effects**

Carotech is collaborating with researchers from University Science Malaysia in an on-going in vitro study using human skin fibroblast. Type I collagen is important in maintenance of skin dermis. During aging, Type I collagen production decreases while matrix metalloproteinases increases (MMP, enzymes that degrade collagens) – wrinkle formation. In this study, the effect of Tocomin® and individual tocotrienols isomers (Carotech Inc.) on the expression of procollagen type 1-C peptide (PICP) is studied using normal human dermal fibroblast. Initial results showed Tocomin® and individual tocotrienols isomers at concentration as low as 10 ng/ml increase PICP production.

**Synergistic Effect of Tocotrienol with Astaxanthin**

A double blind, placebo controlled study showed the supplemented (combination of 2 mg astaxanthin and 40 mg Tocomin® – natural palm mixed tocotrienols) subjects with dry skin characteristics had an increased moisture level, consistent natural oils, reduction of fine wrinkles and pimple. As a result, the treated subjects reported improved elasticity, reduced swelling under the eyes and better skin feeling after the test period. On the contrary, the skin condition of subjects receiving placebo did not improve and generally worsened during the test period (14).

**Tocotrienol Prevents Hair Loss**

A double blind placebo-controlled clinical study was performed on volunteers with androgenetic alopecia (male pattern baldness). The volunteers were randomized to receive Tocomin® SupraBio™ (Carotech Inc.) or placebo. Hair counts and weight of hair in pre-selected evaluation area were measured before and every month after initiation of the study. An average of 41.8% increase in the number of hair was observed after 8-month tocotrienol supplementation. In view of the proven efficacy of Tocomin® SupraBio™ in promoting hair growth in men and women suffering from androgenetic alopecia, the United States Patent and Trademark Office has granted a patent for Tocomin® SupraBio™ as a hair growth formulation (15).

Tocomin® SupraBio™ is an advanced formulation of Tocomin®, It leverages the benefits of tocotrienols and overcome the poor absorption of fats soluble vitamins via a patented formula which ensures 200-300% increase in oral absorption of tocotrienols (16).

**CONCLUSION**

Tocotrienols, either administered orally (Tocomin® SupraBio™) or topically have shown many important and unique beneficial effects to skin and hair health. Apart from the established benefits of potent antioxidant, anti-aging, inhibition of oxidative stress, defence against UV-induced damages, on going studies on wound healing shows further promising results. Tocotrienols may become the most important form of vitamin E in skin and hair care products.

For more information, please contact: Carotech Ltd. Europe Sales & Marketing Office, info@carotech.net www.carotech.net www.tocotrienol.org

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