International Journal of Farmacia

Journal Home page: www.ijfjournal.com

Astashine capsules: an excellent choice for skin aging defence

Govind Shukla, Nagalakshmi Yaparthy, Jyothika Vanamali, G.Santosh Kumar, C.J. Sampath Kumar

Lactonova Nutripharm (P) Ltd, Makers of ASTASHINE capsules, 81/3, IDA Mallapur, Hyderabad, Telangana, India-500 076.

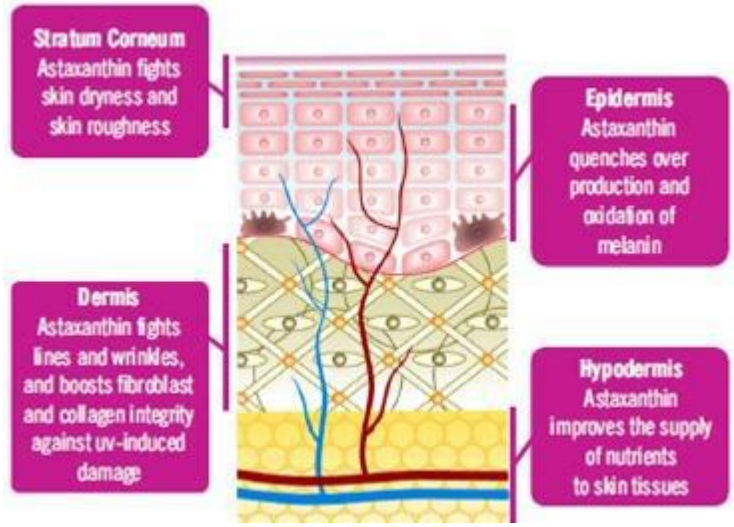
***Corresponding author: Govind Shukla**

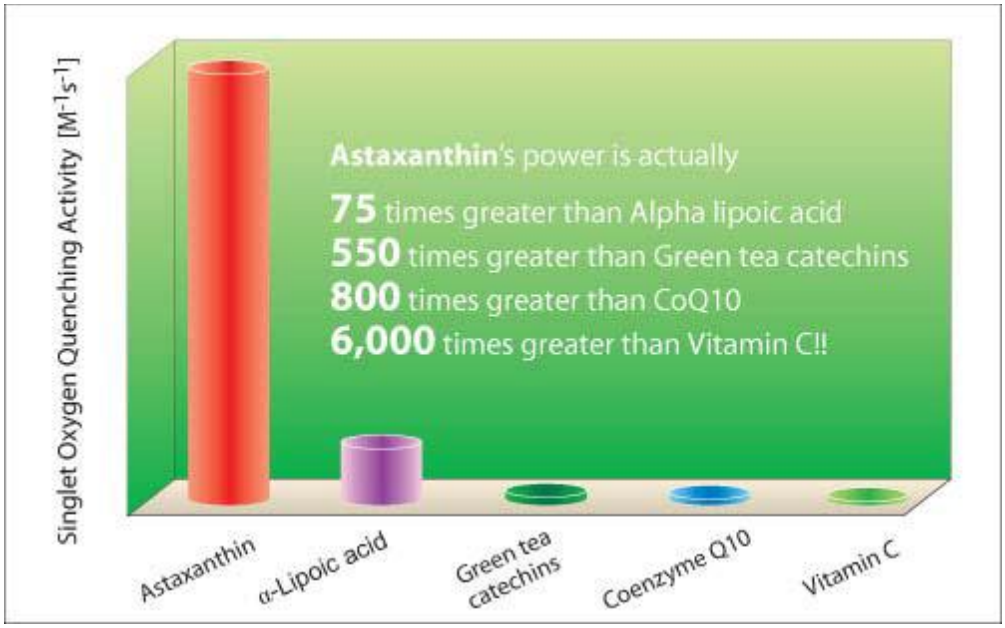
ABSTRACT

Excessive exposure of unprotected skin to sunlight results in sunburn and can also lead to photo-induced oxidation, inflammation, immunosuppression, aging and even carcinogenesis of skin cells. Pre-clinical studies shows that typical dietary antioxidant, could reduce such damages. Astaxanthin is believed to protect the skin against UV-light photo-oxidation and the in vitro protective effect of astaxanthin against UV-induced photooxidation was stronger when compared with β-carotene and lutein. These findings suggest that astaxanthin has an excellent potential as an oral sun-protectant. Although diet supplementation with β-carotene or astaxanthin has demonstrated benefits in other types of cancer, the animal or clinical studies with these two compounds are inconclusive when it comes to skin cancer. More studies are needed to better understand the possible interactions between various antioxidants and their potential prooxidative role, to determine under which conditions supplementation with carotenoids such as astaxanthin can help reduce skin carcinogenesis.

INTRODUCTION

Research has demonstrated that the antioxidant activity of astaxanthin is approximately 10 times stronger than other carotenoids tested (e.g., zeaxanthin, lutein, tunaxanthin, canthaxanthin, beta-carotene) and 100 times greater than those of vitamin E (alpha-tocopherol). This resulted in one researcher stating "astaxanthin has the properties of a 'super vitamin E.





Other research has also demonstrated superior antioxidant activity of astaxanthin over carotenoids and vitamin E. It is astaxanthin's marked antioxidant activity that seems to be the primary source of its health promoting properties.These properties include improvements in cardiovascular health, diabetic nephropathy, muscle endurance, eye fatigue, H. pylori/dyspepsia, skin, fat metabolism, stress and immune function. The cosmetic effects on human skin by 4 mg per day astaxanthin supplementation were demonstrated in a singleblind, placebo-controlled study30 using 49 healthy, middle-aged American women. Based upon dermatologist's assessment and instrumental assessment at week six compares to baseline initial values, the results were more than a 50 percent reduction in fine lines and wrinkles, about a 50 percent improvement in the moisture content of skin and more than a 50 percent improvement in skin elasticity. In addition, selfassessment of patients indicated a reduction of skin roughness by morethan 40 percent.

Composition

Astaxanthin - 2mg (Naturally derived from Haematococcus pulvialis algae extract, which is microencapsulated)

ASTASHINE capsules & Skin Health

Human clinical trials established the use of astaxanthin to improve visible signs of premature aging and general skin health. , a double-blind placebo controlled study [6], showed that astaxanthin in combination with tocotrienol, (a superior form of vitamin E), improved several aspects of overall skin condition. Eight female subjects with dry skin conditions (mean age 40 yrs) received daily doses containing 2 mg astaxanthin and 40 mg natural tocotrienols. Several types of data were collected at 2 and 4 weeks and compared to the initial baseline readings. Measurable differences were observed starting just 2 weeks after supplementation. By the 4th week, the treated subjects with dry skin characteristics exhibited the following: increased moisture levels ($p<0.05$), (Figure 1); consistent natural oils; reduction of fine wrinkles, (Figure 2);

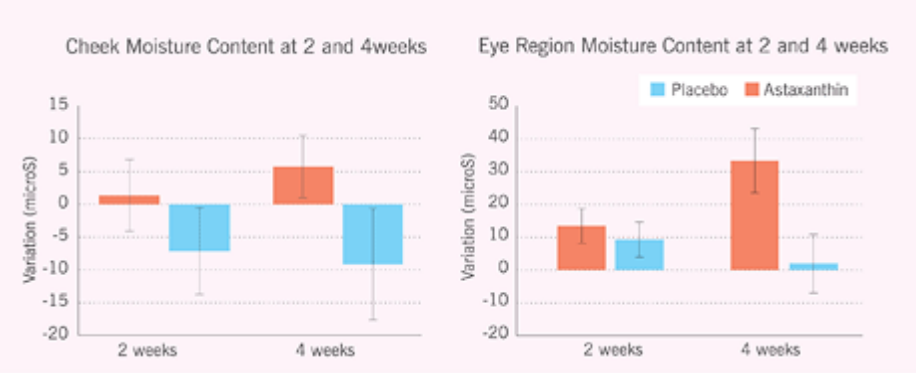


Figure 1

Figure 2

In the second study by [1], female subjects with a variety of skin types (n=49, mean age 47 yrs) were given either 4 mg (2 x 2 mg) astaxanthin or placebo in a single-blind, randomized, controlled study. After six weeks of consuming 4mg astaxanthin per day, the results of a standard questionnaire showed that the treated group of women all felt that their skin condition had improved significantly (Figure 3).

Skin improvements seen in all categories after astaxanthin supplementation.

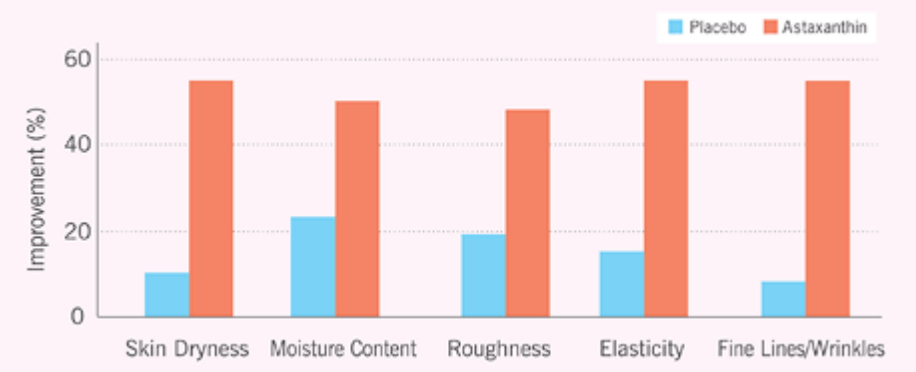


Figure 3. Subject response after 6 weeks astaxanthin supplementation

Instrument analysis proved that the treated group had indeed achieved positive results in hydration ($p<0.05$) and elasticity ($p<0.05$). Furthermore, a dermatologist's inspection showed wrinkle reduction ($p<0.05$) and improved elasticity ($p<0.05$) in the treated group especially between weeks 3 and 6 (Figure 4). The results were significant since skin regeneration usually takes between 4-5 weeks. The greatest improvement seen at week 6 supports the theory that astaxanthin protects and allows skin to regenerate.

Figure 4

Astashine capsules Protects the Skin's Natural Antioxidant Network and DNA

Oxygen radicals formed from UV radiation attack skin cells in a variety of ways. As demonstrated by [9], UVA light is capable of producing oxidative stress in living cells in-vitro. By monitoring catalase (CAT), superoxide dismutase (SOD) levels and thiobarbituric acid reactive substances (TBARS), Astaxanthin is capable of reducing oxidative stress ($p<0.01$, $n=6$) after UVA light irradiation at very low concentrations (5-10 nM). Astaxanthin has shown to be approximately 100-200 times more effective than other carotenoids, including lutein and beta-carotene (1.0µM).

Similar reports by [5] demonstrate that UVA irradiated skin cells pre-treated with astaxanthin (10µM) suffered significantly less DNA damage. Furthermore, astaxanthin protected the skin's endogenous antioxidants SOD and glutathione (GSH) from oxygen radical attack.

Astaxanthin and Skin Cancer

The risk of skin cancer is increased in skin which is frequently damaged by the sun. Although skin cancer is almost 99% curable if detected early, 1 out of 90 people in the USA or 1 out of 150 people in the UK will develop melanomas. Those in the highest risk category are people exposed to frequent short bursts of strong sunlight. Sun screens can block the UV rays, but dietary carotenoids such as astaxanthin can be vital for skin protection as well.

In another study on hairless mice, Black [8] demonstrates that astaxanthin significantly delays the UV ray formation of skin lesions and tumours ($p<0.05$). A possible explanation is that astaxanthin is preferentially accumulated over beta-carotene and lycopene. Epidermal analysis determined that the quantity of astaxanthin was 133 times that of lycopene and 28 times that of beta-carotene.

Further support comes from [10] which shows that hairless mice (SKH1) deficient in vitamin A, fed 10 mg/kg/feed astaxanthin alone or in combination with retinol, show enhanced skin protection after UVA and UVB irradiation. Astaxanthin significantly inhibited accumulation of putrescine ($p<0.05$) more than retinol and lowered spermidine and spermine.

Astashine Capsules reduces wrinkles & increase elasticity

The UVR that affects the skin is composed of two types of waves: UVA and UVB. UVB rays are shorter than UVA rays, and are the main cause behind inflammation and melanin production. However, it is the UVA rays, with their longer wavelength, that are responsible for much of the damage associated with photoaging. UVA rays penetrate deep into the dermis, where they damage collagen fibers, leading to wrinkle formation

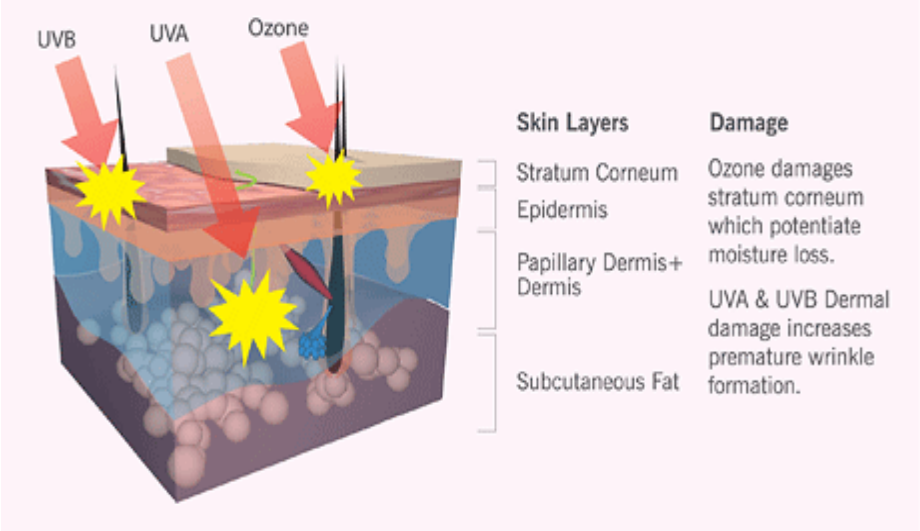


Figure 5

UV rays induce the production of in situ radical oxygen species (ROS) and matrix metalloproteinases (MMP). These factors are the root of wrinkle formation because they destroy the collagen matrix in the dermis. Fortunately, the skin's repair mechanism will rebuild the damage collagen. However, the hindrance of skin renewal by repeated exposure to uncontrolled levels of ROS and MMP leads to the formation of wrinkles. The presence of astaxanthin attenuates the effects of reactive oxygen and MMP and therefore, it allows the skin to regenerate properly there by astaxanthin supports skin renewal by attenuating factors which contribute to wrinkle formation**.**

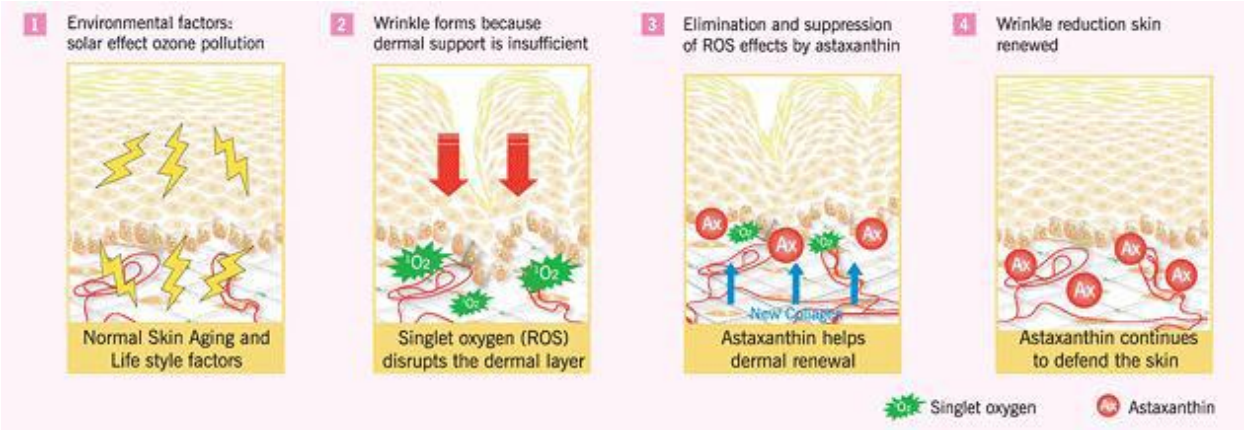


Figure 6

Astashine capsules defends against Reactive Oxygen Species

Oxygen present in our cells can form harmful radicals known as ROS or active oxygen when sufficient energy from UV rays is applied. ROS include singlet oxygen, superoxides and hydroxyl radicals (leading to peroxyl radicals) and they attempt to steal electrons from neighbouring molecules such as DNA, phospholipids, enzymes and protein in order to stabilize. Fortunately, astaxanthin is able to quench singlet oxygen reactions and supress lipid peroxidation much more effectively than other well-known antioxidants and thus control the presence of ROS. In vitro singlet oxygen quenching activity of Astaxanthin was found to be superior when compared to Catechin, Vitamin C, Alpha Lipoic Acid, Coenzyme Q10, Tocopherol, Lutein and Beta Carotene [16].

Astashine capsules Vs other Antioxidants

Singlet oxygen depletes the antioxidant defence system of fibroblasts, especially CAT and SOD.

Fibroblasts secrete collagen, a main component of extracellular matrix which provides structural support to the cells. Exposing fibroblasts to singlet oxygen is a widely used technique to model ageing and UV oxidative stress. Furthermore, viability of the fibroblasts remains vital to the maintenance of healthy skin appearance. [14] showed evidence on the ability of Astaxanthin to protect human dermal fibroblasts through in-vitro study. Human dermal fibroblasts were pre-incubated with Astaxanthin and other antioxidants and then exposed to singlet oxygen (Figure7). Cell viability was restored to more than 80% when the cells were treated with Astaxanthin.

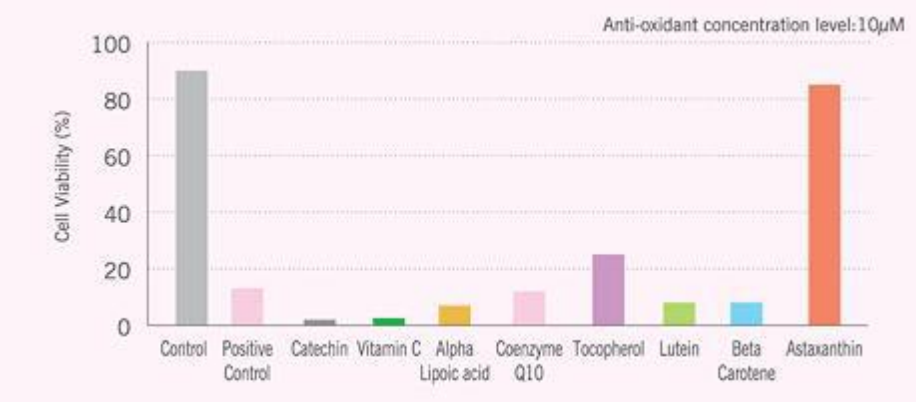


Figure 7: Study showed that astaxanthin had the highest ability to protect cells in comparison with other antioxidants.

In another study, [13] compared the photoprotective properties of astaxanthin to other antioxidants on human dermal fibroblasts. After a physiological dose of UVA was applied, roughly equal to a UV dose accumulated within 1-2 hours on a sunny day. Astaxanthin was considerably superior at preventing cell death (reduction of caspase-3 activity at protein level) compared to Canthaxanthin and Beta Carotene (Figure 8).

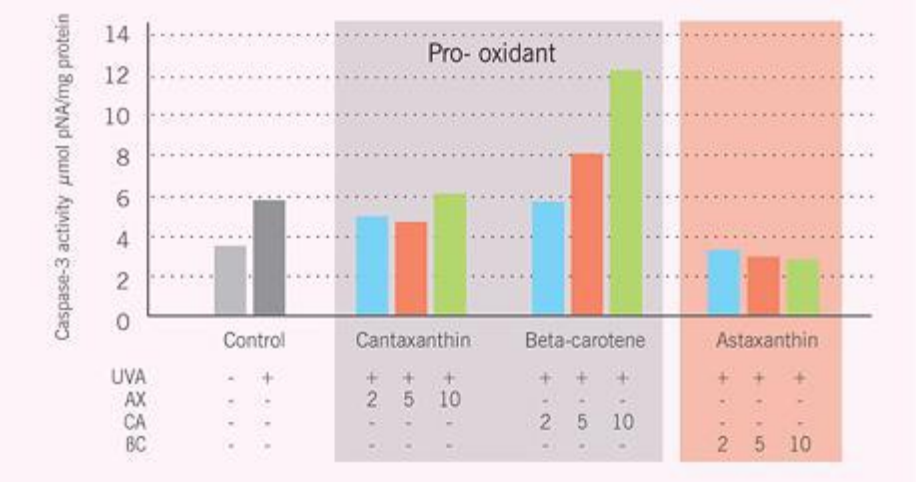


Figure 8

Astaxanthin Inner and Outer Treatment

Complementing astaxanthin oral administration with astaxanthin treatment can have enhanced synergistic effects against premature skin aging since astaxanthin is effective at all layers of skin, the skin surface, epidermis and dermis. According to studies conducted by [15], astaxanthin treatment was found

to be effective in all layers of skin. In a study with 28 subjects aged 20-55 years, astaxanthin effectively reduced wrinkles as well as improved skin elasticity. Replica analysis after 6 mg of astaxanthin supplementation combined with topical application for 8 weeks showed a reduction in the overall average wrinkle depth.

Furthermore, a reduction in wrinkle width by 9% ($p<0.05$) and depth by 14% ($p<0.01$) of the largest wrinkle were also observed. Astaxanthin treatment also showed significant improvement in skin elasticity ($p<0.01$) (Figure 9). These results were substantiated through in vitro studies. In vitro studies with fibroblasts pre treated with astaxanthin (10 μM) before singlet oxygen exposure showed collagen production restored up to 80%. This evidence suggests that astaxanthin protect fibroblasts and support collagen production thereby exerting wrinkle reduction and enhancing skin elasticity.

Astaxanthin was effective in reducing skin roughness. The study showed that after 4 weeks of treatment, the mean depth of roughness significantly improved ($p<0.05$). Before and after the clinical trials, cells from the stratum corneum from the cheek area were collected by tape stripping. The cells were stained and cell area was measured and quantified by image analysis. The size of cells in the stratum corneum was found to be significantly increased ($p<0.05$). At the start of the clinical trials, signs of desquamation were extensively observed. At the end of the 8-week clinical trial, many of these cornified layer cells were healthier or showed a better arrangement.

Astaxanthin was also found effective in reducing age spot ($p<0.05$). An objective evaluation rated improvement in condition of age spot and freckles for 59% of the subjects. In vitro studies using human epidermis models, showed that astaxanthin at very low concentration (0.0006 mg/ml) inhibited melanogenesis. This inhibitory effect is superior to that induced by vitamin C (5 mg/ml) and comparable to that induced by tranexamic acid (5mg/ml) or L-cysteine (0.1 mg/ml) which are agents commonly used in dermatological therapy.

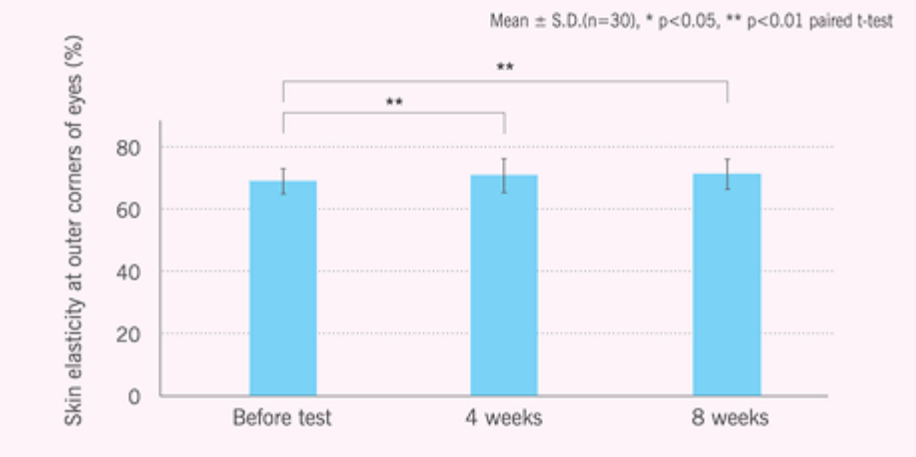


Figure 9. Effects of Astaxanthin on skin elasticity

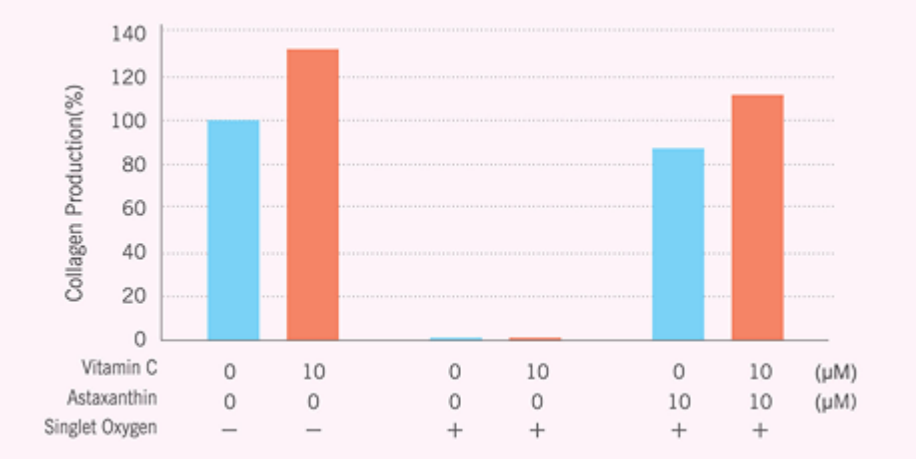


Figure 10. Stimulatory effects of Astaxanthin on collagen production and maintenance

Anti-inflammatory Action of Astashine capsules

Inflammation that normally follows sun exposure can be modulated by a powerful antioxidant. [11] shows in healthy male subjects (n=7), that topical natural astaxanthin significantly reduces burn level (erythema) by 60% at 98 hours after UVB exposure that astaxanthin works by suppressing the proinflammatory mediators and cytokines via the IκB kinase dependant NF-κB activation pathway [3].

SAFETY OF ASTASHINE CAPSULES

Astaxanthin has demonstrated safety in numerous human clinical trials. In one open-label clinical study on subjects with metabolic syndrome (n=17). astaxanthin (16 mg/day, for three months) significantly raised blood bilirubin($p \leq 0.05$), potassium ($p \leq 0.05$), and creatine kinase ($p \leq 0.01$), although all three values remained within normal range. Also, astaxanthin significantly lowered the liver enzyme gamma-glutamyl transpeptidase (GGTP; $p \leq 0.05$). Since the researchers noted this enzyme was abnormally elevated in 11 of the 17 subjects at baseline, this astaxanthin effect may have been beneficial. Animal experiments have investigated astaxanthin at levels well over 120 mg/day in human equivalents, without causing apparent harm. Hoffman-La Roche confirmed its safety with extensive tests, including acute toxicity, mutagenicity, teratogenicity, embryotoxicity, and reproductive toxicity.

Suggested Dosage

The doses of astaxanthin used in clinical trials have ranged from 1 mg/day to 40 mg/day (with the majority in the 6-12 mg range); single-dose pharmacokinetic studies used up to 100 mg per dose. As a dietary supplement, astaxanthin should be taken along with fats, with or immediately prior to meals, to ensure its optimal absorption.

CONCLUSION

Astaxanthin, a xanthophyll carotenoid, is a nutrient with unique cell membrane actions and diverse clinical benefits. This molecule neutralizes free radicals or other oxidants by either accepting or donating electrons, and without being destroyed or becoming a pro-oxidant in the process. Its linear, polar-nonpolar-polar molecular layout equips it to precisely insert into the membrane and span its entire width. In this position, astaxanthin can intercept reactive molecular species within the membrane's hydrophobic interior and along its hydrophilic boundaries. Clinically, astaxanthin has shown diverse benefits, with excellent safety and tolerability. In cultured cells, astaxanthin protected the mitochondria against endogenous oxygen radicals, conserved their redox (antioxidant) capacity, and enhanced their energy production efficiency. The concentrations used in these cells would be attainable in humans by modest dietary intakes. Astaxanthin's clinical success extends beyond protection against oxidative stress and inflammation, to demonstrable promise for slowing age-related functional decline.

REFERENCES

[1]. Yamashita, The Effects of a Dietary Supplement Containing Astaxanthin on Skin Condition. Carotenoid Science, 10, 2006, 91-95.
[2]. Koura, Skin sensitization study of Astaxanthin in Guinea Pigs. Study No. 05035. New Drug Research Center Inc., Hokkaido Japan, 2005.
[3]. Lee et al., Astaxanthin Inhibits Nitric Oxide Production and Inflammatory Gene Expression by Suppressing I?B Kinase-dependent NF-?B Activation. Molecules and Cells, 16(1), 2003, 97-105.
[4]. Arakane Superior Skin Protection via Astaxanthin. Carotenoid Sci., 5, 2002, 21-24.
[5]. Lyons & O'Brien et al., Modulatory effects of an algal extract containing astaxanthin on UVA-irradiated cells in culture. Journal of Derma. Sci., 30(1), 2002, 73-84.
[6]. Yamashita Cosmetic benefit of the supplement health food combined astaxanthin and tocotrienol on human skin. Food Style 21, 6(6), 2002, 112-117.
[7]. Seki et al., Effects of astaxanthin from haematococcus pluvialis on human skin. Fragrance J., 12, 2001, 98-103.
[8]. Black Radical Interception by carotenoids and effects on UV carcinogenesis. Nutrition Cancer, 31(3), 1998, 212-217.
[9]. O'Connor & O'Brien Modulation of UVA light induced oxidative stress by beta-carotene, lutein and astaxanthin in cultured fibroblasts. J. Derma. Sci., 16(3), 1998, 226-230.
[10]. Savoure et al., Vitamin A status and metabolism of cutaneous polyamines in the hairless mouse after UV irradiation: action of beta-carotene and astaxanthin. International J Vit. and Nutr. Res., 65(2), 1995, 79-86.
[11]. Yamashita Suppression of post UVB hyperpigmentation by topical astaxanthin from krill. Fragrance J., 14, 1995, 180-185.
[12]. Miki Biological functions and activities of animal carotenoids. Pure & Appl. Chem., 63(1), 1991, 141-146.
[13]. Camera et al., Astaxanthin, canthaxanthin and beta carotene differently affect UVA-induced oxidative damage and expression of oxidative stress-responsive enzymes. Experimental Dermatology. 18(3), 2009, 222–231.
[14]. Tominaga et al., Protective effects of astaxanthin against single oxgyen induced damage in human dermal fibroblasts in-vitro Food Style 21, 13(1), 2009, 84-86.
[15]. Tominaga et al., Cosmetic effects of astaxanthin for all layers of skin. Food Style 21, 13(10), 2009, 25-29.
[16]. Nishida et al. Carotenoid Science. 11, 2007, 16-20.