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The Effects of a Dietary Supplement Containing Astaxanthin on Skin Condition

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The cosmetic effects on human skin by 4mg per day astaxanthin supplementation were demonstrated in a single blind placebo controlled study using forty-nine US healthy middle-aged women. There were significant improvements in fine lines/wrinkles and elasticity by dermatologist's assessment and in the moisture content by instrumental assessment at week 6 compares to base-line initial values.

1. Introduction

Astaxanthin, widely and naturally distributed in marine organisms, including Crustacea such as shrimps and crabs and such fish as salmon and sea bream exhibits a strong anti-oxidative effect, and its action is reported to 1,000 times stronger than α -tocopherol [1] and approximately 40 times stronger than β -carotene [2]. It has also been reported that astaxanthin doesn't have any pro-oxidative nature like β -carotene and lycopene [3] and its potent anti-oxidative property is exhibited at the cell membrane[4]. Although used only as a coloring in the past (either as a food additive or a dye-up agent for cultured fish), astaxanthin has become one of the major materials eagerly anticipated by industries for dietary supplements and personal care products.

Furthermore its other various important benefits to date have suggested for human health such as anti-inflammation [5-8], LDL cholesterol oxidation suppression [9], immunomodulation [10], anti-stress [11], limiting diabetic nephropathy [12], improved semen quality [13], attenuating eye fatigue [14-18], sport performance and endurance [19], limiting exercised induced muscle damage [20] and improving hypertension [21, 22].

In terms of dermatological actions, suppression of hyper-pigmentation [23], inhibitions of melanin synthesis and photo-aging [24] have been reported. We have also reported visual wrinkle reduction by topical astaxanthin [25]. However, only one study for internal use about cosmetic benefit of a dietary supplement including astaxanthin and tcotrienol on human skin has been reported [26].

Here we report the effects of a dietary supplement containing astaxanthin on skin condition performed in United States of America.

2. Method

2.1 Materials

The dietary supplement containing astaxanthin (Trade Name: Astavita® Astaxanthin) was comprised of *Haematococcus plubialis* microalgae extract and canola oil as soft gel capsules. Each capsule contained 2 mg of astaxanthin.

Placebo capsules for control were prepared with only canola oil in soft capsules.

2.2 Subjects

Forty-nine (49) healthy women in Rockland, ME, age about forty seven years old, were used for the study, after obtaining their consent for participation. Taking all subjects' properties into consideration, such as age, physical build, skin-type, and constitution, the subjects were divided into a test group and a placebo control group by homogeneity of such properties after measuring skin-parameters

before beginning the study. Table 1 shows the subjects' skin types.

Table 1 Skin types of the subjects

	Dry	Oily	Normal	Combo	Total
Supplemented	7	0	5	16	28
Placebo	2	1	4	14	21

2.3 Duration and method of study

From January 18, 2005, one capsule of the dietary supplement including astaxanthin or placebo was administered to each subject every breakfast and dinner respectively. Test duration was six weeks. Measurements of each test item were performed at three points, at the beginning of the study, after three weeks and after six weeks. All tests were performed using a single-blind procedure.

2.4 Conditions of measurement

The measurements were performed 15 minutes after to the subjects, who were kept resting in a seated position after washing their faces in an environmental test room conditioned to 20℃-RT and 65%-RH.

2.5 Measurement parameters

***Questionnaire*:** Skin dryness, moisture content, roughness, elasticity and fine lines/wrinkles were recorded using a Yes/No questionnaire at week 6.

***Inspection/Palpation by dermatologist*:** Skin dryness, fine lines/wrinkles and elasticity were performed by dermatologist.

***Skin moisture content*:** Corneous moisture content (electrical conduction MS) of the left cheek was measured using the Dermal Phase Meter 9003 (NOVA meter).

***Elasticity*:** Elasticity levels of the left side outer corner of the eye were measured using the Dermalab (Cortex Technology, Denmark).

***Observation of skin surface*:** Skin surface photographs were recorded using the Fuji Fine Pix S1 Pro (supplemented group only at week 6).

3. Results

3.1 Skin condition evaluated by subjects' self-assessment

Fig. 1 shows % improvements of skin dryness, moisture content, roughness, elasticity and fine lines/wrinkles evaluated by the subjects' self-assessments after six weeks. Over fifty percent of the subjects in the treated group had a subjective improvement of all items.

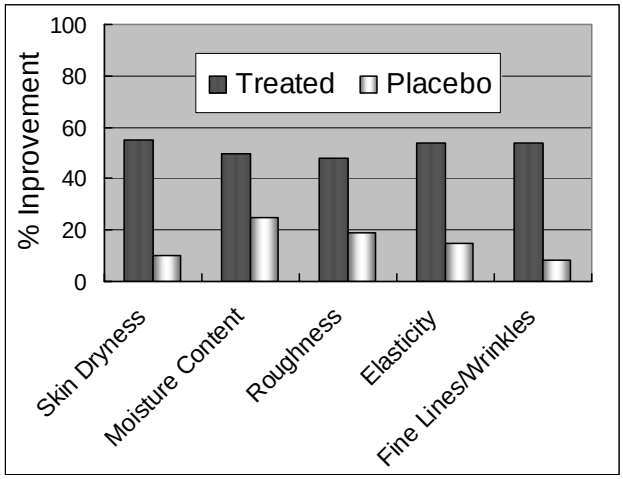


Fig. 1 Individual assessment at week 6

3.2 Inspection/Palpation by dermatologist

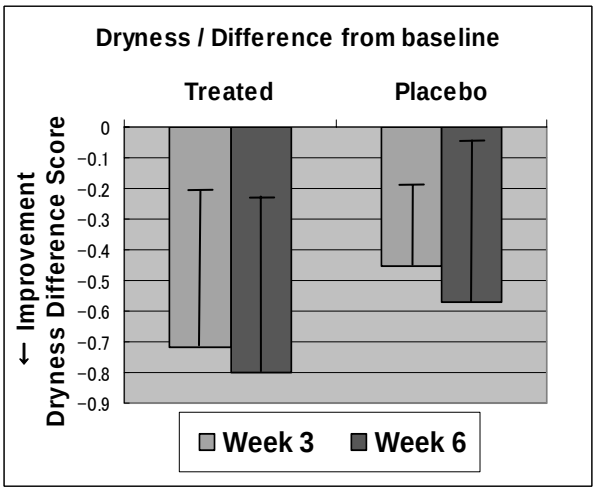
Fig. 2 shows changes of skin dryness, fine lines/wrinkles and elasticity evaluated by the dermatologist's inspection/palpation at Week 3 and Week 6 compared to the base-line initial values.

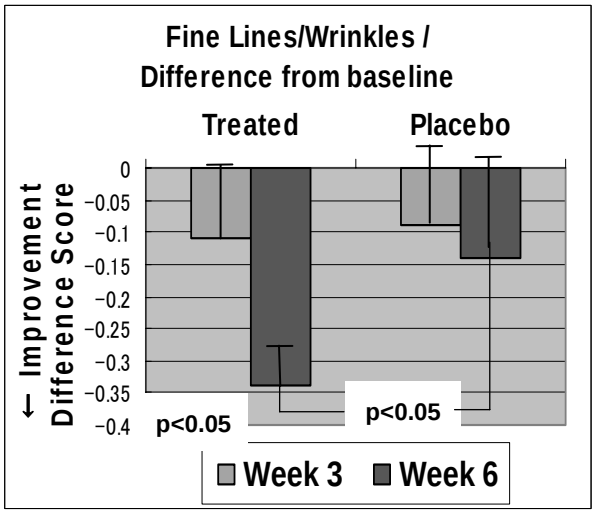
Regarding dryness, the mean scores in the treated group were lower at week 3 and 6 compared to baseline, while the mean score in the placebo were also lower at week 3 and 6. However reduction effect in the treated group was better than that in the placebo without any significant effect.

A significant improvement of fine lines/wrinkles at week 6 was found in the treated group. Comparatively, treated group was significantly

different than the placebo at week 6.

Elasticity in treated group was significantly improved at week 6, although the scores at week 3 and 6 were worse in the placebo. Comparatively, treated group was significantly different than the placebo at week 6.





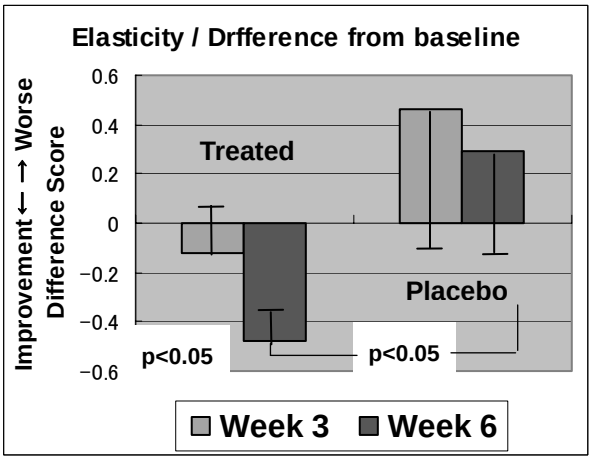


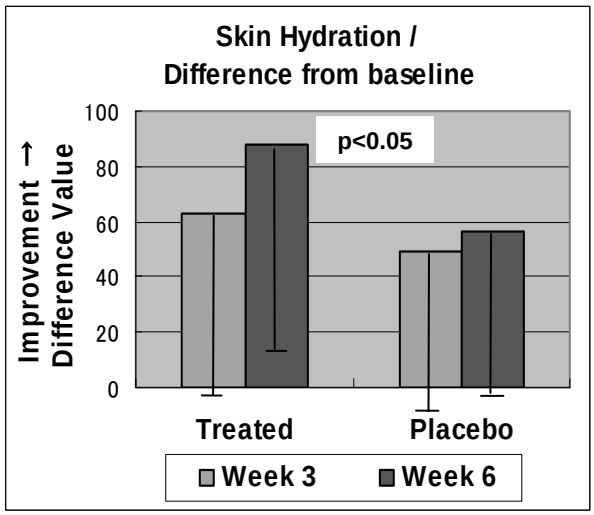
Fig. 2 Visual assessment by dermatologist

3.3 Instrumental assessment

Fig. 3 shows changes of moisture content and elasticity measured at Week 3 and Week 6 compared to the base-line initial values.

The value of moisture content in treated group was significantly higher at week 6 compared to baseline. Comparatively, there was no significantly difference between treated and placebo group.

The elasticity in the treated group was improved both at week 3 and 6, while the elasticity in the placebo was worse at week 3 and 6. Comparatively, there were significantly differences between the treated and placebo group both at week 3 and 6. The same tendency of the results of elasticity between visual assessment by dermatologist and instrumental assessment by Dermalab was observed.



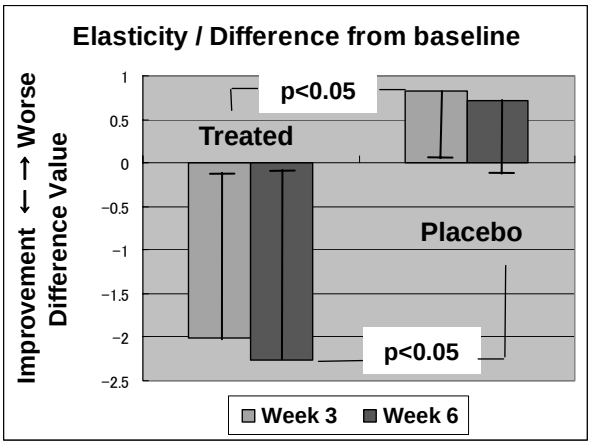


Fig. 3 Instrumental assessment

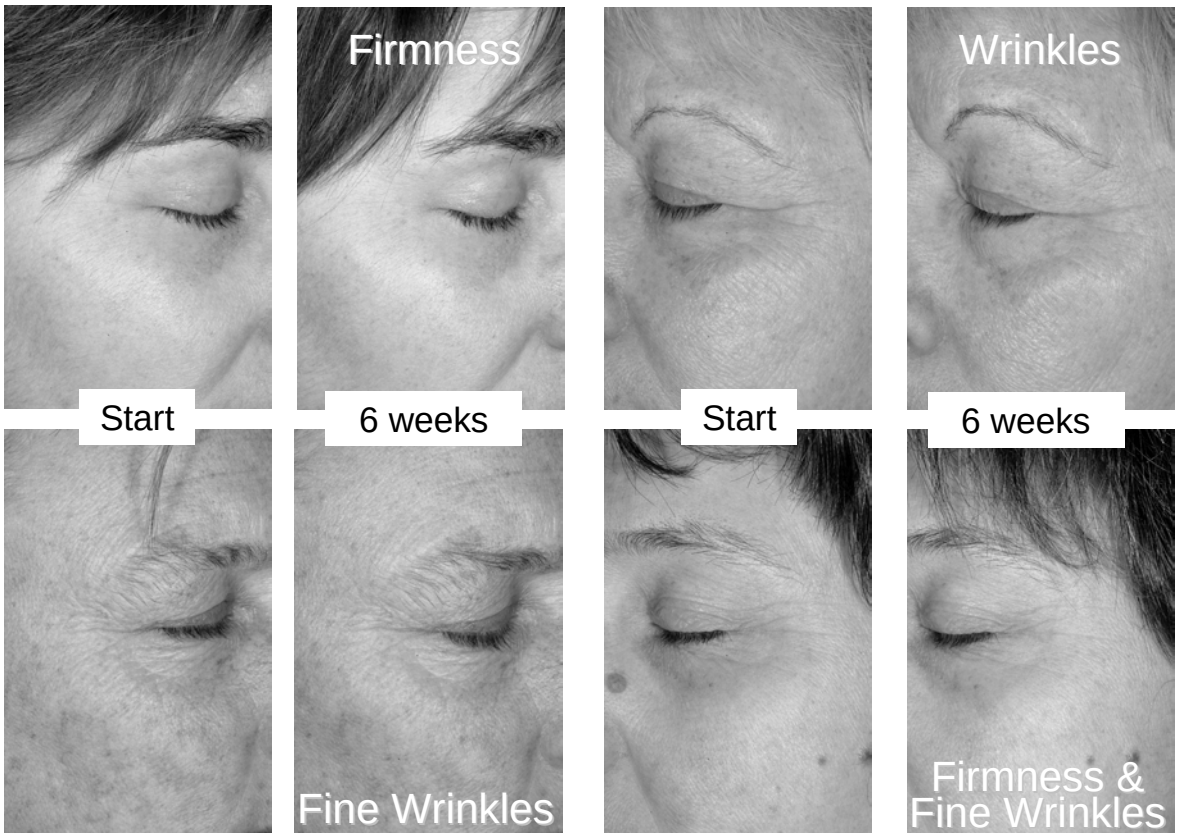


Fig. 4 Skin surface photographs

3.4 Observation of skin surface

Fig. 4 shows skin surface photographs of four subjects in the treated group at week 6. Improvements of elasticity, wrinkles, fine lines and elasticity and fine lines were observed respectively.

4. Discussion

We studied the effect on the human skin of astaxanthin, which possess a strong anti-oxidative property, by oral administration in a single blind placebo controlled clinical test. Consequently, significant improvements by astaxanthin supplementation were observed in fine lines/wrinkles and elasticity by dermatologist's visual assessment and in the moisture content by instrumental assessment at week 6. It seems that astaxanthin may protect the fresh collagen from oxidative stress such as singlet oxygen induced by UV. Placebo-effect or canola oil may improve moisture content in the placebo group.

We note, however, that the study was performed during winter and in Rockland, which is a harsh season and place that create a particularly dry human skin condition, and also that it is usually very difficult to observe any significant difference to skin condition resulting from the oral administration of dietary supplements. Consequently, it is significant to note that there was achieved a noticeable improvement to skin condition with the oral administration of a dietary supplement containing astaxanthin, despite the harsh environmental condition of winter and the administration limited to oral dietary supplements.

As a result of the above, the excellent cosmetic effects on human skin were observed from astaxanthin administration.

Considering both the cosmetic effect on the skin observed from oral use of astaxanthin in this study and the cosmetic effect of topical use of astaxanthin observed in the studies already reported [25], further cosmetic effects on the skin can be anticipated through both oral and topical

use.

This study was conducted jointly with International Research Services, Inc. (Port Chester, NY).

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