

# Development of the Dietary Supplements, “Astalift supplement” and “Astalift drink”

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## Abstract

We have developed two dietary supplements “Astalift Supplement” and “Astalift Drink”, which contain astaxanthin and other ingredients for beauty. We conducted a human trial of the two dietary supplements and the “Astalift” series of cosmetics to confirm their effect on skin health. The result suggests that the ingestion of the dietary supplements prevents the formation of dark spots, blotches and wrinkles, and maintains the moisture content of skin. Furthermore, it is indicated that the parallel use of the dietary supplements and the cosmetics synergically reduces wrinkles and improves the moisture level of skin.

## 1. Introduction

With the background of the cutting-edge technologies adequately applicable to health-care products (supplements, cosmetics) such as antioxidation technology, nano dispersion/stabilization technology, physical properties controlling technology for collagen peptide, and layer constitution technology for optimizing reactivity, reaction speed, substance diffusion and material interaction and others, which we have cultivated in the field of photo imaging, we, FUJIFILM went into the field of supplements and cosmetics in September 2006.

Afterwards, in September 2007, we started skin-care cosmetic series “ASTALIFT” directed to antiaging care, and release three products, lotion, essence and cream.



Further in March 2008, we added two supplements of beauty supplement “Astalift Supplement” and beauty drink “Astalift Drink” to the Astalift series, in addition to three cosmetics of day protector, cleansing gel and liquid soap, thereby releasing the out-body and in-body skin-care lineup.

This report is to introduce the product planning of “Astalift Supplement” and “Astalift Drink”, and the human trial result in parallel use thereof with cosmetics.

## 2. Product Planning

It is known that, in living bodies, singlet oxygen, a type of active oxygen having high reactivity is formed inside the skin exposed to UV rays from sunlight<sup>1)</sup>. The singlet oxygen stimulates melanin-producing cells to enhance melanin production thereby causing increase in skin blackening, pigmented spots and skin dullness. It is said that the singlet oxygen induces production of cytokines and proteases in the skin thereby causing skin roughness and skin elasticity reduction, and further wrinkles after long<sup>2)</sup>. As one method of reducing the injury by the singlet oxygen, it is considered to react an antioxidant ingredient having the ability of singlet oxygen removal, with the singlet oxygen in skin.

The Astalift series cosmetics contain astaxanthin, a type of carotenoids. Astaxanthin is a type of carotenoids existing in the nature, and it is considered that astaxanthin is synthesized mainly in marine algae and is taken by fishes and shellfishes by the food chain. Among various antioxidant components existing in the nature, in particular, astaxanthin is remarkably

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excellent in the singlet oxygen removal potency, and has a singlet oxygen removing speed of about 1000 times that of coenzyme Q10<sup>3</sup>). It is reported that, in a trial with mice, direct application of an astaxanthin-containing external drug to the skin inhibited formation of wrinkles by UV rays<sup>4</sup>), and application of astaxanthin to skin is expected to be effective against damage by UV rays.

On the other hand, for the effect to skin by internal use, the ingredient must be distributed in the skin after absorbed by the digestive tract. In this respect, it is reported that astaxanthin was detected in the skin tissue of a rat to which astaxanthin had been orally administered<sup>5</sup>). Further in humans, it has been confirmed noninvasively that dietary intake of carotenoids (e.g.,  $\beta$ -carotene) results in distribution thereof in skin<sup>6</sup>). Accordingly, we incorporated astaxanthin in the dietary supplements “Astalift Supplement” and “Astalift Drink” like in cosmetics, aiming to send astaxanthin to skin to thereby protect the skin from the injury by singlet oxygen not only from the outside of the skin but also from the inside thereof.

In order that the orally taken astaxanthin could transfer inside the body and to reach the skin, it must be absorbed by the intestines. Previous investigations confirmed that a nanoemulsion of astaxanthin that is an oil-soluble substance enhances the in-body absorbability of astaxanthin<sup>7</sup>). “Astalift Drink” was planned to contain an astaxanthin nanoemulsion to thereby send astaxanthin to skin more efficiently.

“Astalift Supplement” was planned to contain, in addition to astaxanthin, other carotenoids (lycopene,  $\beta$ -carotene) and red wine polyphenol to thereby reinforce the antioxidant ingredients therein; and taken in the morning, this can reduce the injury by the singlet oxygen generated by daytime UV rays. “Astalift Drink” contains, in addition to astaxanthin, vitamin C and citrus polyphenol (hesperidin) to thereby reinforce the antioxidant ingredients therein. In addition to these “skin-protecting” ingredients, collagen which is a skin constitutive ingredient, and N-acetylglucosamine, which is reported to promote production of vitamin C and hyaluronic acid necessary for collagen synthesis<sup>8</sup>), were further added to these for their planning for “skin regeneration” during sleep.

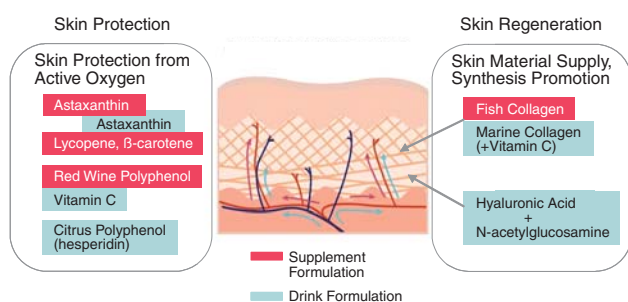


Fig. 1 Efficacy of the ingredients of “Astalift Supplement” and “Astalift Drink” on skin.

Table 1 The Active Ingredients of “Astalift Supplement” in dairy intake (2 tablets)

Astaxanthin (as free form)	6 mg
$\beta$ -Carotene	1,400 $\mu$ g
Lycopene	1.8 mg
Fish Collagen	4 mg
Red Wine Polyphenol	2.9 mg

Table 2 The Active Ingredients of “Astalift Drink” in dairy intake (one 50-ml bottle)

Astaxanthin (as free form)	4 mg
Vitamin C	270 mg
Marine Collagen	1,000 mg
Hyaluronic Acid	8 mg
Sugar Transfer Hesperidin (citrus polyphenol)	100 mg
N-acetylglucosamine	100 mg

### 3. Human Trial Results

The effect by intake of the present developed dietary supplements was confirmed in a human trial.

As in Fig. 1, the present developed dietary supplements are intended to attain the effect of the antioxidant ingredients such as typically astaxanthin for “skin protection” from active oxygen and the effect of collagen for “skin regeneration”; and this time the subjects actually took the dietary supplements and evaluated them as to whether they could “actually feel” the change in the skin, and as to whether the results could be supported by objective evaluation. These two are the key points in the human trial.

It is said that active oxygen is widely involved in various diseases and lifestyle-related diseases, and the other effects of the supplements than the cosmetic effect thereof was investigated in this trial.

The test method is described. From 35- to 59-year-old 39 women subjects were selected. The subjects were divided into three groups (13 subjects in each group) as in Table 3, and they took 2 tablets of the supplement in the morning and one bottle of the drink in the evening, for 6 weeks. For comparison with the two test supplements, placebos (that could not be differentiated from the test supplements in the appearance, the taste and the odor) were prepared. The comparison test with the group A and the group B was a double blind test (in which all the subjects and the panelists were made not to know which were the test supplements or the placebos - this test is popular for evaluation of the efficacy of medicines). On the other hand, the present trial included the group C for investigating the effect of cosmetics in addition to the present developed dietary supplements. For this, commercial products were used in comparison, and therefore, this was not a double blind test.

Table 3 Group Division of 39 Subjects for Evaluating the Effect of Ingesting the Dietary Supplements and Applying the Cosmetics.

	Supplements	Cosmetics
Group A	Astalift	Commercial Products
Group B	Placebos	Commercial Products
Group C	Astalift	Astalift

Regarding the cosmetic effect, the skin condition was checked with a machine and through replica analysis, skin photographing and cosmetic experts' evaluation as the objective evaluation, and checked through questionnaire investigation with the subjects as the subjective evaluation. In the questionnaire investigation, the questionnaire items included life-related matters in addition to cosmetic-related matters. The details of the evaluation items are shown in Table 4.

Table 4 Evaluation Items of the Human Trial.

Evaluation Method	Evaluation Items
Machine Measurement	Moisture content of skin, water evaporation, skin elasticity
Replica Evaluation	Wrinkles, skin texture
Skin Photographing	Wrinkles, stains, pores
Questionnaire Investigation	Subjects scored the improvement level of the following items. "Moistness", "freshness", "stickiness", "tightness", "softness", "transparency", "elasticity", "plumpness", "texture", "tension", "sagging", "pores", "wrinkles", "stains", "foundation spreadability", "makeup coming off", "skin condition", "moisturization", "whiteness", "crow's feet", "pimples", "shadow, somberness", "body condition", "fatigue", "life", "health", "appetite", "blood circulation", "sleep", "bowel movement", "eye fatigue".
Cosmetic Experts' Evaluation	Cosmetic experts scored the improvement level of the following items. "Skin color", "stains, freckles", "somberness", "shadow", "fattiness", "glossiness", "spots, pimples", "reddishness", "crow's feet", "forehead and glabellar wrinkles", "texture", "sagging below eyes", "smoothness", "moistness", "freshness", "tension", "toughness".

The results are mentioned below. First, as the effect by the intake of the present developed dietary supplements, wrinkles and stains were removed in skin photographing and replica analysis (Figs. 2, 3, 4). As a result of machine measurement, the moisture content of the skin was prevented from lowering (Fig. 5).

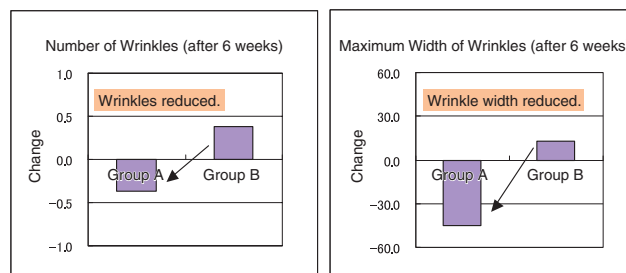


Fig. 2 Wrinkle reduction effect of ingesting the dietary supplements. Left : The number of wrinkles Right : The maximum length of wrinkles

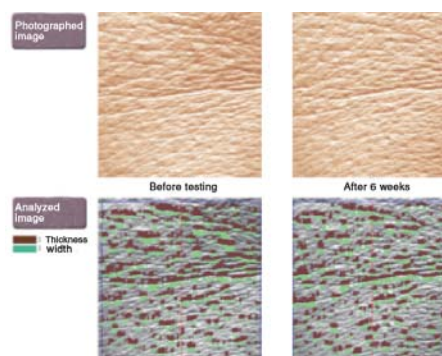


Fig. 3 Face skin photographs of the subject in group A. Left : Before testing Right : After testing Wrinkle reduction is apparent.

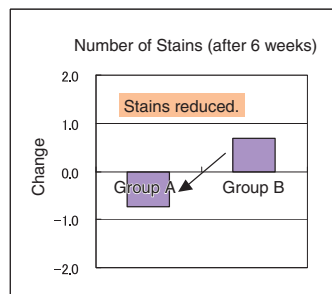


Fig. 4 Face skin stain reduction effect of ingesting the dietary supplements.

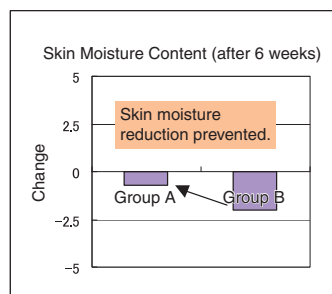


Fig. 5 Preservation of moisture content of arm skin. The reduction of moisture is restricted by ingesting the dietary supplements.

Further, the subjects' questionnaire confirmed good results in many test items of skin texture, tension, sagging, wrinkles, stains (Fig. 6). In addition, the questionnaire showed good results not only in the cosmetic effects but also in the other items of fatigue, appetite, blood circulation, sleep, eye fatigue (Fig. 7).

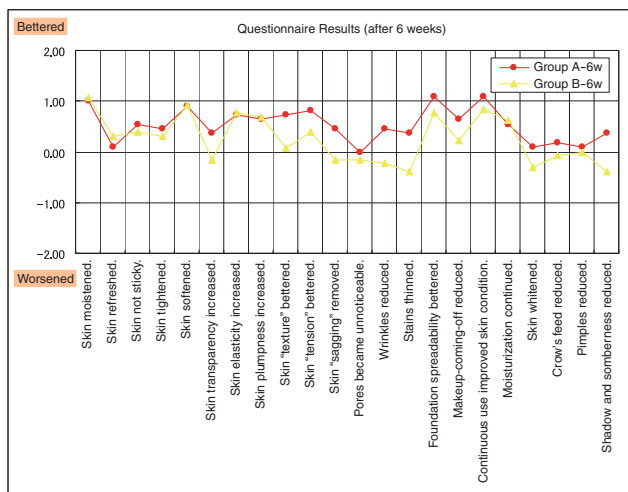


Fig. 6 The results of questionnaire data about skin condition. Group A and group B.

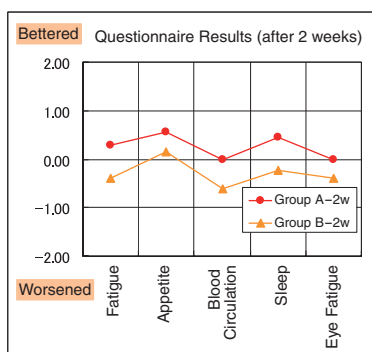


Fig. 7 The results of questionnaire data except skin condition. Group A and group B.

For the synergistic effect of the present developed dietary supplement and the cosmetic, the trial this time was not a double blind test, and any strict comments could not be given on the questionnaire results. From the machine measurement, the skin wrinkles reduced and the skin moisture content increased (Fig. 8).

In the trial made this time, the continuous intake of the present developed dietary supplements presented many results in point of many cosmetic-related indices. In particular, regarding wrinkles, both the objective evaluation and the subjective evaluation presented best results, from which it may be said that the intended "skin protection" effect and "skin regeneration" effect could be attained by prevention of wrinkle formation. The questionnaire results indicate the effect for the items of sleep and eye fatigue

except the cosmetic items, from which it is known that the present developed dietary supplements could be of some help for our healthy life in addition to the cosmetic effects thereof.

The series of trial results obtained this time confirmed the effectiveness of the present developed dietary supplements; however, in fact, many points are still unclear as to the mechanism and the behavior of astaxanthin and collagen after intake by living bodies, that is as to how the ingredient could act to present their effects and efficacies. In future, we will further analyze astaxanthin and collagen for the cell-level action thereof, and will clarify the mechanism of these ingredients.

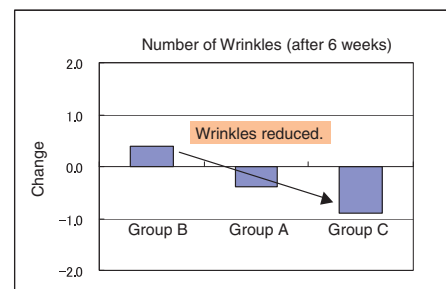
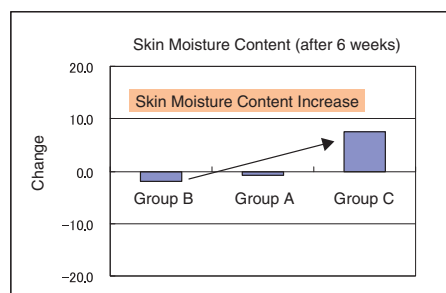


Fig. 8 The effect of both ingesting the dietary supplements and applying the cosmetics.

Upper: Moisture content of arm skin  
Lower: The number of wrinkles

#### 4. Conclusion

We developed "Astalift Supplement" and "Astalift Drink" containing astaxanthin and other cosmetic ingredients. The human trials with these dietary supplements confirmed their effects for skin, and further, combination use thereof with cosmetics confirmed enhanced effects.

We will further make an effort for contributing toward enhancement of human QOL (quality of life) and will widely contribute to society through development of dietary supplements.

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(In this report, "Astalift" is a registered trademark of FUJIFILM Corporation.)