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File: ■ Aloe Vera (*Aloe vera*, Xanthorrhoeaceae)

■ **Skin Fibroblasts**

■ **Skin Moisture**

■ **Collagen**

■ **Hyaluronic Acid**

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RE: Aloe Vera Sterols Increase Collagen and Hyaluronic Acid Production in Human Dermal Fibroblasts

Tanaka M, Misawa E, Yamauchi K, Abe F, Ishizaki C. Effects of plant sterols derived from *Aloe vera* gel on human dermal fibroblasts in vitro and on skin condition in Japanese women. *Clin Cosmet Investig Dermatol*. February 2015;8:95-104.

Wrinkles and dry skin are common dermal conditions, and their occurrence increases with age. Fibroblasts are one of the main components of maintaining skin health. They are responsible for the production of collagen, hyaluronic acid (HA), and elastin. *Aloe vera* (*Aloe vera*, Xanthorrhoeaceae) is a popular treatment for many skin ailments. Some research supports the hypothesis that aloe vera improves skin healing. In rats, the recovery period of raised skin was shortened with the application of aloe vera gel. Aloe vera gel may also induce healing in skin with radiation-induced dermatitis. Aloe vera sterols, including the lophenols and cycloartanols, are one class of the compounds thought to be responsible for the healing properties of aloe vera. The goal of this 2-part study was to measure the effect of lophenols and cycloartanols on collagen and HA production in fibroblasts and the effect of oral ingestion of aloe vera on skin moisture and wrinkles in women with dry skin.

Primary adult dermal fibroblasts (HDFa #2320; DS Pharma Biomedical; Tokyo, Japan) were grown in 3 concentrations of either lophenols and cycloartanols or blank media for 48 hours. mRNA was collected from each cell culture, amplified with real-time polymerase chain reaction, and measured for the expression of 2 collagen (COL1A1 and COL3A1) and 2 HA (HAS2 and HAS3) genes. The cells and supernatant were also measured for collagen and HA concentrations.

In the randomized, double-blind, controlled clinical trial, women with dry skin between the ages of 20 and 50 years old were recruited from the Ceravi Shinbashi Clinic (Tokyo, Japan) from September to December 2012. Subjects had skin moisture measurements that were ≤ 60 arbitrary units (AU). Subjects were divided into a treatment group and control group. Each group took 5 tablets of either the treatment or placebo per day for 8

weeks. Each treatment tablet contained 0.1 g gel powder from the mesophyll of aloe vera leaves (Morinaga Milk Industry Co., Ltd.; Tokyo, Japan), and approximately 40 µg of lophenols and cycloartanols per daily dose. The placebo contained dextrin. Skin moisture was measured on the cheek and inside of the upper arm. Depth and width of the largest wrinkle in the crow's foot near the eye was measured. A silicone skin replica was made of the crow's foot area. Percentage body fat was also measured. Each of these parameters was measured at baseline and at 4 and 8 weeks. Data were analyzed with analysis of covariance.

Fibroblast viability was unchanged when cells were grown with lophenols or cycloartanols. There was a dose-dependent increase in each of the collagen and HA mRNAs after 48 hours of cell culture with both lophenols and cycloartanols ($P < 0.05$ for all). The concentrations of collagen and HA also increased significantly when fibroblasts were cultured with lophenols or cycloartanols ($P < 0.05$ for all).

In the human trial, each group contained 28 subjects. One subject in each group dropped out after baseline measurements were taken. Facial skin hydration increased in both the control and treatment groups after 8 weeks, and the change in hydration was significant in both groups ($P < 0.05$). Skin hydration of the upper arm increased in the treatment group and decreased in the control group after 8 weeks of supplementation. These changes were not significant. Wrinkle width and depth decreased in both the treatment and placebo groups, but these changes were not significant. When the data were analyzed for subjects over the age of 40, the change in wrinkle depth was significantly greater in subjects from the treatment group than in the placebo group ($P = 0.035$). In addition, body fat was significantly lower after 8 weeks in the treatment group than in the placebo group ($P = 0.037$). Specifically, body fat remained constant in the treatment group and increased in the placebo group. The subjects reported no adverse effects of treatment.

Fibroblasts produced more collagen and HA *in vivo* when cultured with lophenols and cycloartanols from aloe vera mesophyll. This change was mediated through an increase in the expression of collagen and HA genes. Skin moisture of the upper arm was greater with aloe vera supplementation in women with dry skin. An increase in facial skin moisture was found in both the treatment and placebo groups, and the authors hypothesize that this was related to an increase in use of facial moisturizer as skin became drier during the winter months. Women over 40 also had a decrease in depth of facial wrinkles with aloe vera supplementation. Dermal fibroblast production of collagen and HA has been found to decrease with age. Oral ingestion of aloe vera may result in an increase in the expression of collagen and HA genes and result in the reduction in wrinkles seen in older women. Body fat was found to increase in the placebo group and remain stable with aloe vera supplementation. Other studies of aloe vera in animals and humans have found that aloe vera can affect the percentage of body fat, certainly warranting further studies to understand this phenomenon.

—Cheryl McCutchan, PhD

Referenced article can be accessed at <http://www.dovepress.com/effects-of-plant-sterols-derived-from-aloe-vera-gel-on-human-dermal-fi-peer-reviewed-fulltext-article-CCID>.

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