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Efficacy of an Autophagy-Activitating Skincare Regimen in the Treatment of Photoagingskin

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Abstract

Background: Skin cell damage due to intrinsic and extrinsic stress may be removed by the autophagic pathway, although very few dermocosmetic studies have been undertaken.

Objectives: To assess the efficacy of an autophagy-activating skincare regimen on facial photo-aging in women.

Methods: The study was an open-label and single-arm intervention, without a control group. The women (N = 33) used a topical autophagy-activating skincare regimen twice a day (morning and night) for the 60 day intervention. Self-report skin assessments and facial photographs from the Canfield VISIA® imaging system and by a photographer were undertaken at Day 0 (baseline), Day 30, and Day 60.

Results: Women reported a significant improvement in their skin satisfaction from Day 0 to Day 30 to Day 60, P< .001. The facial photograph ratings by aboard certified dermatologist revealed a significant improvement in the women's fine lines and wrinkles from Day 0 to Day 30 to Day 60, P< .001. Digital photographic analysis using the VISIA® showed significant improvements in skin texture (P < .001) and brown spot (P = .03), and facial wrinkles (P = .08) were found to have a marginally significant improvement from Day 0 to Day 30 to Day 60.

Limitations: This was a small pilot study and hence no randomization was carried out; there were also no comparison arms or blinding.

Conclusion: The autophagy-activating skincare regimen resulted in significant improvements in both self-report and objective facial photo-aging measures.

Keywords: Autophagy; Skin; Wrinkles

Introduction

Autophagy is the natural, regulated, destructive mechanism of the cell that disassembles unnecessary or dysfunctional components [1]. Autophagy declines with age, is related to health and longevity [2], and is associated with decreased expression of several key proteins in the epidermis and dermis [3]. Preliminary research has found that UV-irradiation and free radical inducers suppress autophagy activity, suggesting that autophagy may be a common denominator for intrinsic and extrinsic skin aging [4-6]. Furthermore, in skin cells damage due to intrinsic and extrinsic stress may be removed by the autophagic pathway, although very few dermocosmetic studies have been undertaken [4].

Resurrection grass, trehalose, ceramides, Navarra asparagus extract(REGU®-SCENCE),and Celldetox® (Silab) are compounds that have autophagy-activated abilities [7,8]. No clinical studies exist, however, examining the efficacy of an autophagy-activating skincare regimen for improving facial photo-damage.Thus, the objective of this study was to assess the efficacy of an autophagy-activating topical skincare regimen (resurrection grass, trehalose, ceramides, Navarra asparagus extract, and Celldetox ®) on facial photo-aging in women.

Methods

Participants and procedures

This was an open-label, single arm clinical trial carried out at a single center in Jacksonville Florida between July 2016 and September 2016 (60 day intervention). The protocol was approved by the University's Institutional Review Board. Informed consent was obtained from the women before their inclusion, and women whose photographs have been used in this report have signed a photo release form.

Participants with the following conditions were excluded: pregnant, suspected porphyria, facial skin cancer, chronic or

recurring skin disease, and active skin infection. In addition, women who had received the following treatments were excluded: laser, IPL, or chemical peel in the preceding 2 months, oral isotretinoin in 6 months, topical retinoids in 2 months or topical alpha-hydroxy acid skin care products in the preceding month. Participants were a convenient sample of 33 women (M age = 44.12 ± 5.93) with mild, moderate, or severe facial photo-damage as determined by a dermatologist's assessments.

Participants preconditioned their face for 2 weeks prior to starting the intervention using a mild facial cleanser and a facial moisturizer twice daily in place of their regular cleansing and moisturizing products. After the preconditioning period the women completed the Day 0 (baseline) self-report skin assessments. To complement the self-report assessments, high resolution digital photos of the women's face were taken using the VISIA® CR imaging system and by a photographer. These self-report and objective assessments were also completed at Day 30 and Day 60 of the intervention.

The women used the skin care regimen twice a day (morning and night) for the 60 day intervention after they completed the baseline assessments (Table 1). The skin care products all contained the following autophagy-activating ingredients as determined by in vitro skin analyses: resurrection grass, trehalose, ceramides, Navarra asparagus extract (Silab), and Celldetox®. Facial skin condition and Fitzpatrick skin type was graded by a board-certified dermatologist. The facial photo-damage was graded by the same dermatologist at every visit. Changes in facial wrinkling were assessed by both expert grading and image analysis of the digital images of the women's faces and by self-report assessments.

Table 1: Skincare Product Description.

Product	Description	Instruction for Use	Recommendations
Cleanser	Gentle purifying and exfoliating - double duty cleanser	1. Gently massage a small amount of cleanser onto wet skin for 30 to 60 seconds 2. Rinse thoroughly with water.	Use daily, AM and PM, followed by Essence or Serum.
Essence	Antioxidant-rich daily hydrating essence	With eyes closed, hold about 8 to 10 inches away and lightly mist over entire face.	Use on freshly cleansed skin before serum and cream, or for a refreshing hydration boost throughout the day Can be used over makeup.
Booster	Skin strengthen and rejuvenating – multi active booster	Gently massage 2-3 drops onto entire face and neck OR gently apply 1-2 drops to troublesome fine lines, wrinkles or age spots as a targeted treatment.	Use twice daily prior to Serum or Cream.
Serum	Brightening and firming - renewal serum	Place 1-2 pumps onto fingertips and smooth over entire face and neck in an upward motion.	Use twice daily, morning and night prior to Cream.
Day Cream	24-hr hydration and collagen boosting - day cream + SPF 30	Apply in the morning to entire face and neck in an upward motion.	Use after Serum and prior to makeup.
Night Cream	Deeply nourishing and renewing - night repair cream	Apply nightly to entire face and neck, gently massaging in an upward motion.	Nightly use after Serum.

Measures

Skin satisfaction scale: This 12-item Skin Satisfaction Scale assesses satisfaction with the following 10 facial skin areas: firmness, complexion, glow, pores, youthful appearance, fine lines, elasticity, wrinkles, smoothness, crow's feet, tone, and overall skin satisfaction on a Likert scale anchored at the extremes with 1 (very dissatisfied) to 5 (very satisfied) [9]. A total skin satisfaction score is created by added up the 12-items. This scale has good psychometric properties and the reliability in this study was good (Day 0 α = .82, Day 30 α = .86, Day 60 α = .85).

Open-ended skin change items: The women were asked to indicate their responses in an open-ended manner to the following two questions at Day 60 only: 1) Please describe in your own words the difference you see in your skin at the end of this study vs. the beginning, and 2) How does the change in your skin make you feel?

Wrinkle severity: Wrinkle severity was assessed by a dermatologist using a six-point ordinal photonumeric scale on the facial photos that were taken by a professional photographer [10]. Severity was graded on a 0 (low wrinkles) to 5 (high wrinkles) scale.

Facial photos: Facial photos were taken with the VISIA® CR imaging system (Canfield Scientific, Fairfield, NJ, U.S.A.) and by a professional photographer. Using the VISIA, the women were photographed using standard light, ultraviolet, cross-polarization, and parallel-polarization techniques, which produce high-quality, reproducible facial images. The VISIA photos were analyzed via complexion analysis software. The professional facial photos were analyzed by a board-certified

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dermatologist to get an expert visual analysis on the evolution of the participants' wrinkles and skin health throughout the study.

Results

Thirty-four women were enrolled in the study intervention. One woman dropped out after the 30 day assessment due to a health concern unrelated to study participation, representing a adherence rate of 97%.

Women reported a significant improvement in their total skin satisfaction from Day 0 (M = 36.58, SD = 9.79) to Day 30 (M = 43.18, SD = 5.63) to Day 60 (M = 47.31, SD = 6.92), P< .001. More specifically, women reported significant improvements in their satisfaction with the firmness, complexion, youthful appearance, glow, pores, fine lines, elasticity, wrinkles, smoothness, crow's feet, tone, and overall skin appearance (Table 2).

Table 2: Skin Satisfaction Scale Descriptive Statistics.

Item	Day 0	Day 30	Day 60
	M (SD)	M (SD)	M (SD)
1. Firmness*	3.32 (0.88)	3.67 (0.77)	4.06 (0.61)
2. Complexion*	3.03 (1.03)	3.67 (0.77)	4.09 (0.68)
3. Glow**	2.82 (0.97)	3.72 (0.67)	4.06 (0.79)
4. Pores**	2.79 (1.27)	3.67 (0.69)	3.91 (0.91)
5. Youthful Appearance*	3.41 (3.76)	3.44 (0.78)	3.79 (0.78)
6. Fines lines**	2.91 (1.14)	3.56 (0.70)	3.70 (0.85)
7. Elasticity**	3.00 (1.02)	3.67 (0.59)	3.89 (0.65)
8. Wrinkles**	2.91 (1.06)	3.53 (0.62)	3.61 (0.83)
9. Smoothness**	3.09 (0.99)	4.00 (0.59)	4.24 (0.79)
10. Crow's feet**	2.88 (0.93)	3.47 (0.72)	3.69 (0.82)
11. Tone**	3.56 (3.36)	3.50 (0.79)	3.91 (0.88)
12. Overall skin appearance*	2.88 (0.86)	3.83 (0.38)	4.09 (0.68)

*=significant difference from Day 0 to Day 30 to Day 60.

**=significant difference from Day 0 to Day 60.

The facial photo ratings by the dermatologist revealed a significant improvement in the women's fine lines and wrinkles from Day 0 to Day 30 to Day 60, P< .001. Digital photographic analysis using the VISIA® CR showed statistically significant improvements in skin texture (P< .001) and brown spots (P = .03); and facial wrinkles (P = .08; see Table 3) were found to have a marginally significant improvement from Day 0 to Day 60.

Table 3: Wrinkle, Texture, and Brown Spots VISIA Data.

Item	Day 0	Day 30	Day 60
	M (SD)	M (SD)	M (SD)
Wrinkles	115.93 (41.81)	107.57 (40.91)	105.46 (40.91)
Texture	8.21 (2.16)	7.54 (2.06)	105.46 (40.91)
Brown Spots	479.98 (201.87)	460.83 (212.05)	465.04 (210.93)

The responses to the Open-ended Skin Change Items were analyzed using qualitative techniques. All the responses were positive and thus indicated an improvement in the women's skin (Table 4). The skincare regimen was well perceived by the subjects for efficacy and product attributes. The products were well-tolerated with no adverse events.

Table 4: Open-ended Responses to the Skin Change Items.

Skin Change Open-ended Items	
Please describe in your own words the difference you see in your skin at the end of this study vs. the beginning.	How does the change in your skin make you feel?
My skin is more even toned and moisturized. I feel like it is more protected from the sun.	Younger and more confident
I've never had anyone comment on my skin. I have gotten a few. It looks brighter and smooth. I am in love!	Worthy. Responsible. Beautifully matured. Grown up. Empowered.
More of a glow	Vibrant
My skin is firmer, looks more radiant and glows more now.	The change makes me feel more confident. I do not feel or have the need to hide my face behind any foundation.
My skin tone is more even now versus when we started	I feel better about my skin now that it's more even and the dark spots under my eyes is lighter.
I do not have red lines or patches on my face. I have not suffered from cystic acne. I have noticed the fine lines above my mouth reduced. My face feels clean	Good – I wear less makeup
Less clogged pores and smoother skin	I will now leave the house without makeup
My skin looks brighter and a more all over even tone!	More confident.
My skin seems healthier. No dry spots. More even tones.	The changes in my skin make me feel better about my overall appearance.
My skin feels clean, hydrated and glows	Love it! I feel happy with the results.
Feels more moisturized and bright	More confident.
The texture of my skin is softer. The overall tone of my skin is softer. The overall tone of my skin is more even. Fine lines appear reduced.	Happy that my skin seems to look as if it is aging a little slower
My skin feels more supple and vibrant. More even toned with smaller pores, less visible.	I feel like my make-up goes on smoother and stays on longer. I'm happy.

Discussion

Autophagy and its relationship to increased longevity and health has been identified as a top 10 research category for aging and energetic [2]. The purpose of this study was to assess the efficacy and tolerability of an autophagy-activating skincare regimen on facial photo-aging in women. Study findings, study limitations, and future research directions are discussed below.

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We found that after 60 days of applying the skincare regimen twice a day (morning and night) women reported a significant improvement in their skin satisfaction (e.g., improved satisfaction with firmness, complexion, youthful appearance, glow, pores, fine lines, elasticity, and wrinkles). The objective facial photograph results confirmed the subjective self-report findings of improvements in the women's skin health.

More specifically, the facial photo ratings by the dermatologist revealed a significant improvement in the women's fine lines and wrinkles during the intervention. As well, digital photographic analysis using the VISIA® CR showed statistically significant improvements in skin texture and brown spot, and facial wrinkles had a marginally significant improvement. The marginally significant improvement of wrinkles noted on the VISIA® CR system was similar to findings in previous studies and may be due to VISIA®'s lower sensitivity in detecting changes in wrinkles [11,12].

There were several limitations in this study. Because it was designed to be a pilot study, there was no randomization. It was open-label and single-blinded without a control group. Our pilot study results, although positive, require replication in a variety of populations to determine the generalizability of our findings (e.g., men, older ages). Randomized controlled trials, using objective assessments of autophagy activity in the skin, with long-term follow-up are needed to further examine the efficacy of our study findings. Despite these limitations, our study results provide evidence of the efficacy of an autophagy activating skincare regimen in improving photo-aging in an adult female population.

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