NOVEL HUMAN GROWTH FACTOR AND CYTOKINE SKIN CREAM IMPROVES SKIN SURFACE TOPOGRAPHY OF AGED FACIAL SKIN AS ASSESSED BY 3D IN VIVO OPTICAL SKIN IMAGING

Michael H. Gold (MD)[1,2], Mitchel P. Goldman (MD)[3], Julie Biron[2]

1) Gold Skin Care Center, Nashville, TN 2) Tennessee Clinical Research Center, Nashville, TN 3) La Jolla Spa MD, La Jolla, CA

ABSTRACT

In addition to wound healing, growth factors participate in skin rejuvenation by promoting skin proliferation and stimulating collagen formation. The present placebo-controlled study aimed to further investigate the anti-aging effects of a novel skin cream containing a mixture of human growth factors and cytokines. The mixture was obtained through a biotechnology process using cultured human fetal fibroblasts. The skin surface topography was analyzed by 3D *in vivo* optical skin imaging using the PRIMOS device. This device allows fast, contact free and direct measurement of the skin surface topography *in vivo* at high resolution. This technique is quantitative and more reliable than visual assessment of wrinkles using a scoring system, which is subjective and strongly dependent on investigator and assessment conditions. Using the PRIMOS device, which is also regarded as a more accurate method than the commonly used silicon replica technique, skin surface roughness was shown to significantly decrease between 10 to 18% depending on the roughness parameter after two months of twice daily application of the human growth factor and cytokine cream. This was compared to treatment with the placebo formulation resulting in an approximate 10% decrease of two roughness parameters, whereas the remaining parameters remained unchanged. This study corroborated that topical application of growth factors and cytokines are also beneficial in reducing signs of skin aging.

INTRODUCTION

We previously reported the beneficial use of a novel skin cream containing a mixture of human growth factors and cytokines.[1] The study was performed by assessing facial skin wrinkling and texture using visual scoring. Here, we present the data obtained after quantitatively measuring skin surface topography using the PRIMOS (Phaseshift Rapid In Vivo Measurement Of Skin) 3D *in vivo* optical skin measuring device (GF Messtechnik GmbH, Germany). This device allows direct, fast measurement of skin surface topography at high resolution. The measurement is contact free and therefore less artifact prone than the silicon replica technique, which is commonly used for that purpose.[2,3] The measurement is based on the projection of digital light stripe patterns onto the skin surface followed by the recording of the projected stripes by a camera at a different angle (Fig.1). Employing complex mathematical algorithms, the difference between the projected and recorded light stripe patterns leads to the three-dimensional skin surface topography, which allows measuring the depth of fine skin lines and wrinkles. In addition, the very short measuring time further guarantees that the captured data is little influenced by involuntary movements of the subject.

The cream was developed at the University Hospital of Lausanne, Switzerland, inspired by fetal skin's unique ability to heal without scarring. It contains processed skin cell proteins (PSP), which is a naturally balanced mixture of skin nutrients containing a large number of human growth factors and other cytokines.[4] The mixture is obtained through a biotechnology process using cultured fetal skin cells from a dedicated cell bank.

METHODS

Inclusion criteria

- Female between 35 to 65 years of age of good general health not nursing or pregnant with demonstrable periorbital wrinkling.

Exclusion criteria

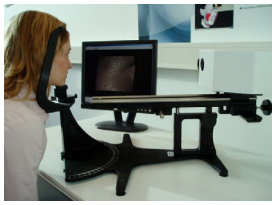
- Any active or any history of skin disease affecting the face.
- Any microdermabrasion, light and medium skin peels within one month, any non-ablative laser, light or radio-frequency treatments in face within three months, any dermabrasion, deep skin peels, ablative laser treatments, Botox® or filler injections, or cosmetic surgery in face within six months prior to study begin.

Treatment regimen

- Application of processed skin cell proteins containing skin cream and placebo (both provided by Neocutis, Inc., San Francisco, CA) in morning and evening to respective, randomly assigned half-face over a period of two months (60 days).

Skin surface topography measurement at baseline and after 60 days

- Skin surface topography of peri-orbital skin area was measured using PRIMOS-3D device (GF Messtechnik, Teltow, Germany; Canfield Scientific, Fairfield, NJ), where optical system (40 mm x 30 mm) was fixed on a 3D stereo-tactic face device (Fig.1).
- Data evaluation was performed with PRIMOS Software Version 5.04 using star roughness function. Thereby, the skin surface topography parameters average roughness (R_a), mean roughness depth (R_z), maximum roughness depth (R_{zmax}), base roughness depth (R_{3z}), maximum base roughness depth (R_{3zmax}) and ten point average roughness (R_{zISO}) were obtained.[5]



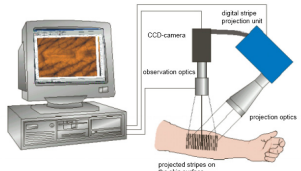


***Figure 1:* PRIMOS 3D in vivo optical skin measuring device allows contact free measurement of skin surface topography** *(reproduced with permission from GF Messtechnik, GmbH)*

RESULTS

Of the 20 subjects enrolled, 18 subjects averaged 52 ± 8 years of age (between 38 to 65 years) completed the study. Two subjects dropped out of the study for product unrelated reasons.

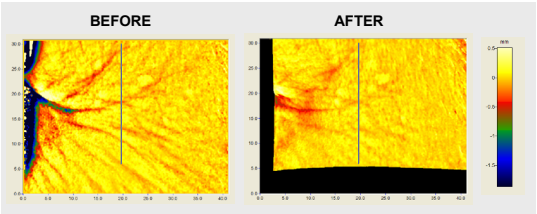


***Figure 2a:* Example of PRIMOS-3D color-coded skin topography picture of 40 mm x 30 mm peri-orbital skin measurement area before (left) and after two months of twice daily use of the human growth factor and cytokine skin cream (right).** *The color coded scale for skin depth is in millimeter (mm). The pictures were matched in order to overlap the peri-orbital surfaces of the before and the after measurement. This allows analysis of structural changes caused by the treatment along cut lines.*

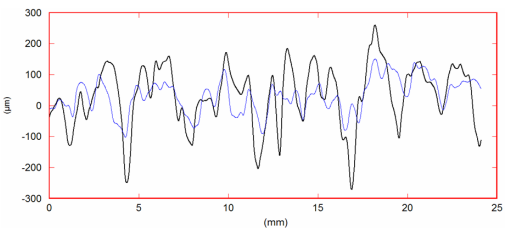


***Figure 2b:* The skin profile along the vertical cut lines (Fig. 2a) is shown in Fig.2b. As compared to the baseline profile (black profile), a significantly smoother profile representative for decreased skin roughness was obtained after the treatment (blue profile).**

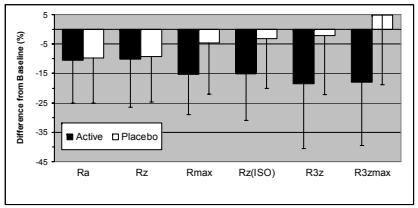


***Figure 3:* Decease in skin roughness R_a, R_z, R_{zmax}, R_{3z}, R_{3zmax} and R_{zISO} after two months of twice daily application of the human growth factor and cytokine skin cream (Active) and the placebo formulation (Placebo) are shown in percentages of the baseline roughness; mean values and standard deviations are given (n = 18).**

The roughness parameters R_a, R_z, R_{zmax}, R_{3z}, R_{3zmax} and R_{zISO} significantly decreased between 10 to 18% depending on the parameter. After treatment with the placebo formulation for two months, only R_a and R_z significantly decreased by about 10%, while the roughness parameters R_{zmax}, R_{3z}, R_{3zmax} and R_{zISO} did not change significantly. After the two month treatment period, the differences between active and placebo for R_{zmax}, R_{3z} and R_{zISO} were statistically significant. The differences between active and placebo for R_a, R_z and R_{3zmax} did not reach statistical significance. However, the difference for R3zmax was close to become significant (p = 0.06) and may have reached statistical significance with more subjects. The baseline values for R_a, R_z, R_{zmax}, R_{3z}, R_{3zmax} and R_{zISO} did not differ significantly between the active and placebo group.

CONCLUSIONS

As assessed quantitatively using 3D *in vivo* optical skin imaging, a skin cream containing a proprietary mixture of human growth factors and cytokines (called PSP or 'processed skin cell proteins') significantly improved peri-orbital skin topography after two months of twice daily application. Skin surface roughness decreased between 10 to 18% depending on the roughness parameter. In particular, the roughness parameters for maximum depths R_{zmax}, R_{3zmax} and R_{zISO} decreased by 15% or more after two months of twice daily application of the cream. Under the present conditions, those "extreme" roughness parameters are descriptive for the pronounced signs of peri-orbital facial skin aging such as moderate and deep wrinkles including Crow's feet. Concluding, this clinical study confirms earlier studies demonstrating that appropriate growth factor mixtures can be successfully used to help reduce the signs of facial elastosis.

REFERENCES

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