

Fluorescent Light Energy Inducing Photobiomodulation to Treat Inflammatory Skin Conditions and Induce Healing

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BACKGROUND

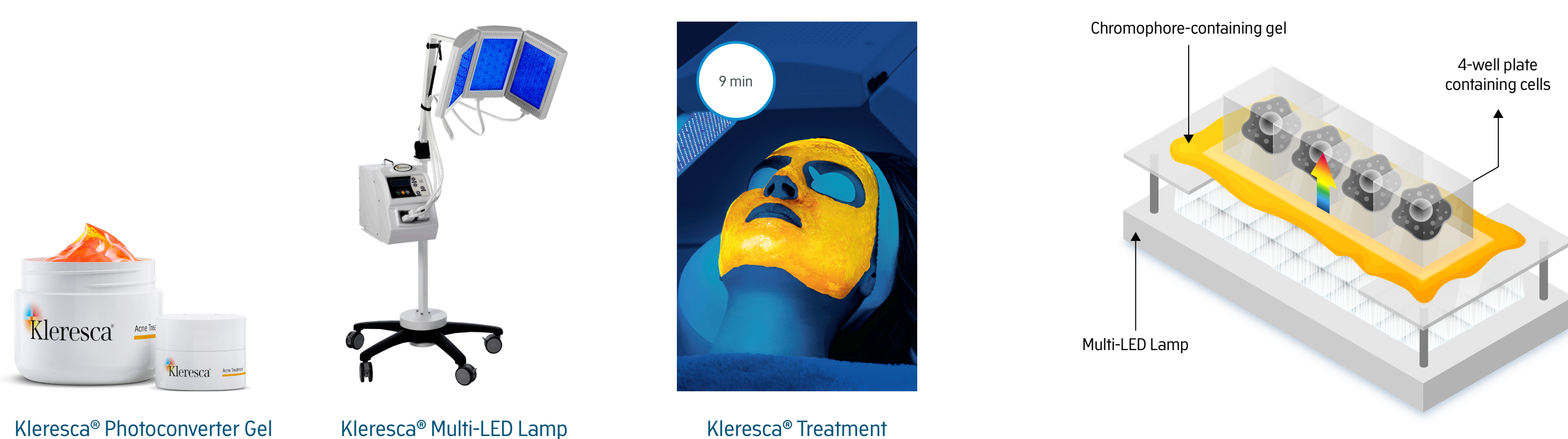
- The Kleresca® biophotonic platform combines a multi-LED and a chromophore containing photoconverter gel, together creating fluorescent light energy (FLE).¹
- Kleresca® differs from other forms of light therapy by delivering polychromatic dynamic FLE covering the visible light spectrum, inducing a novel form of photobiomodulation.
- The biophotonic platform has proven clinical efficacy in treating inflammatory skin conditions,²⁻⁵ rejuvenating the skin as a stand alone treatment,⁶ or pre-post other more invasive procedures.⁷
- Here we sought to investigate some of the key mechanisms underlying its efficacy.

METHOD

FLE Generation



The picture on the left shows the 3 major layers of the skin, from top to bottom; the epidermis, dermis and subcutis. A layer of chromophore-containing gel (orange layer) is placed on the skin and irradiated with blue light from the multi-LED lamp. The centre panel highlights a chromophore in the gel interacting with photons of blue light. On the right, upon absorption of the blue light the gel acts as a photoconverter where the chromophores re-emit a dynamic multi-wavelength spectrum of fluorescent light (approx. 510-610 nm).



Picture shows the Kleresca® biophotonic platform comprising: the chromophore containing photoconverter gel (left) and the multi-LED lamp (middle). For the treatment (right), a 2-mm thick layer of gel is applied to the patient's face and illuminated for 9 min with the LED lamp.

Illustration showing cells being treated with the Kleresca® biophotonic platform. A layer of gel is applied to the bottom of the cell plate, before being illuminated with the multi-LED lamp.

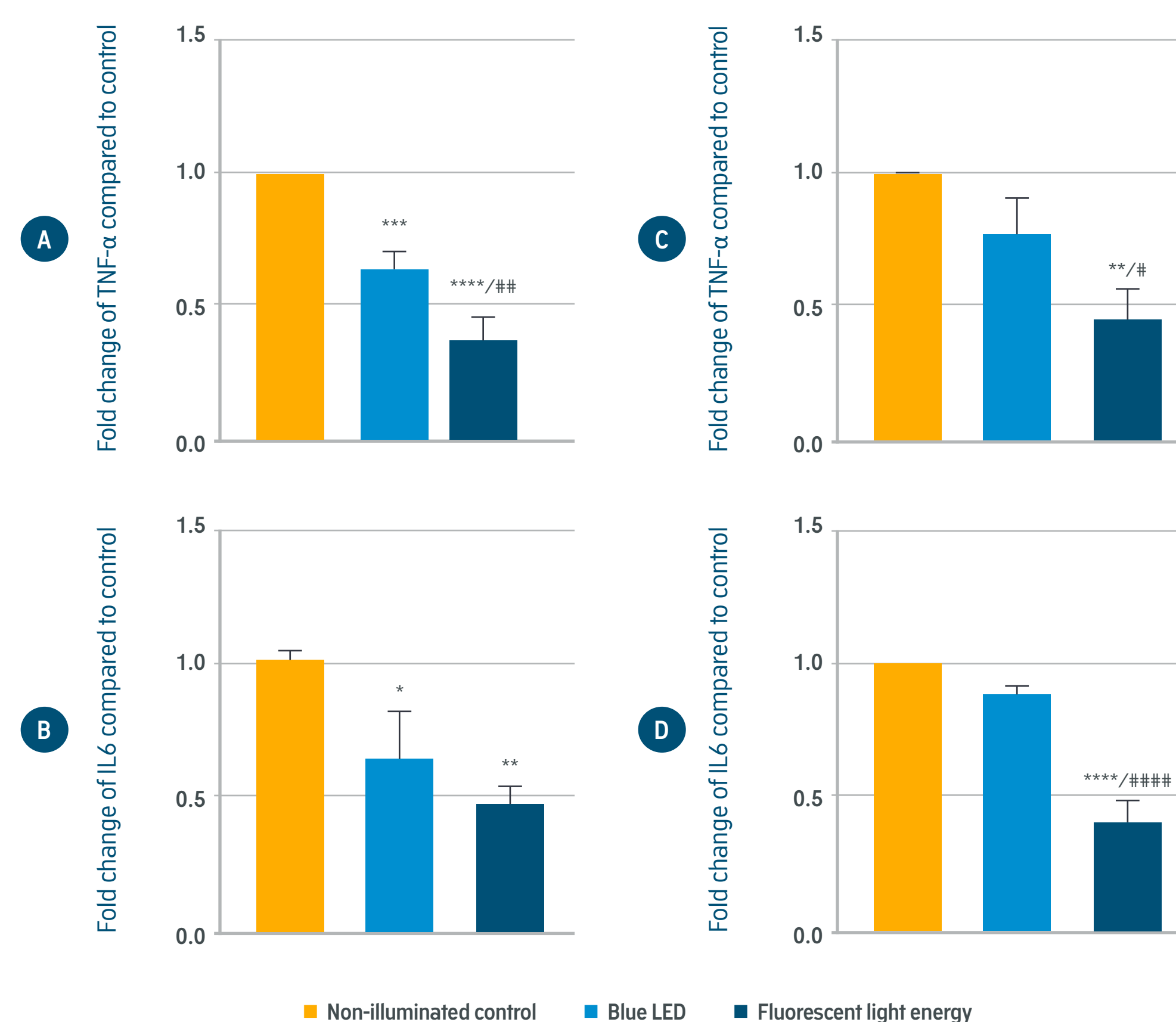
RESULTS

FLE Decreases Inflammation and Improves Skin Texture



Representative clinical case of an Investigator Global Assessment (IGA) grade 4 acne vulgaris patient's response to FLE. A reduction in inflammatory lesions and associated redness can be seen at the end of the treatment period, consisting of 2 treatments per week for 6 weeks (B). This continued to resolve over time (C-G), depicted by the graph (H) showing the percentage of the face occupied by inflammation decreasing over time, analyzed with ImageJ. With the resolution of inflammation there is an improvement in the appearance of scars and the overall texture of the skin. * denotes one additional (booster) treatment.

FLE Decreases the Inflammatory Response of Key Connective Tissue Cells

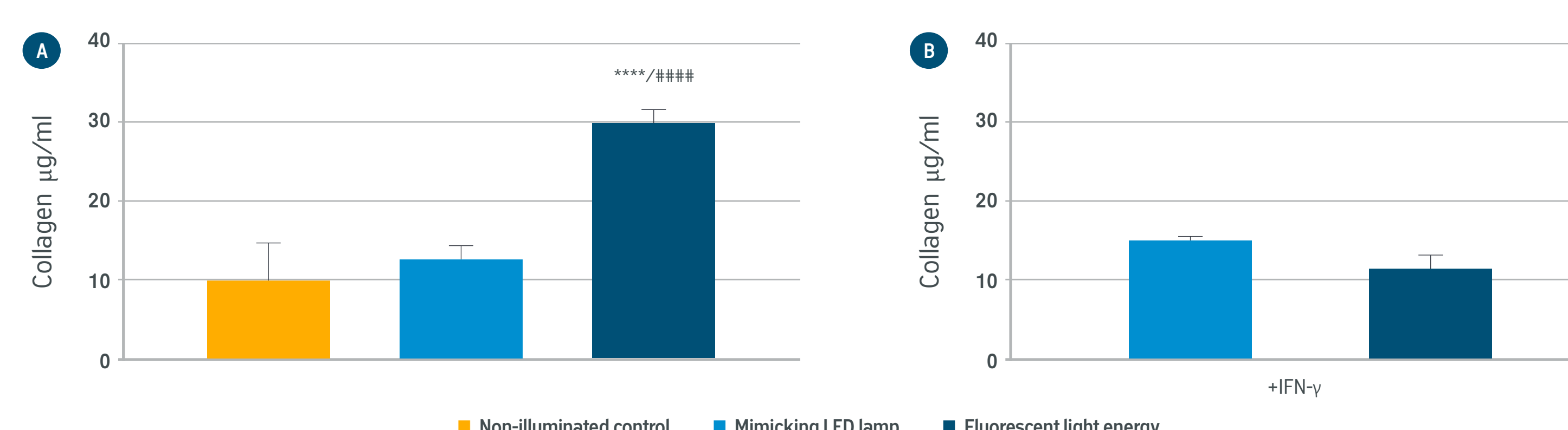


HDF and human epidermal keratinocytes were exposed to M1-macrophage conditioned media before being illuminated with blue LED-light alone or FLE.

FLE significantly decreased the release of two key pro-inflammatory cytokines: IL-6 and TNF-α from HDF (A-B) and HEK (C-D) cells + compared to both non-illuminated control cells and those exposed to only blue-LED light.

Data is mean ± SD of three independent experiments performed in triplicate. * compared to non-illuminated control and, # compared to blue LED lamp.

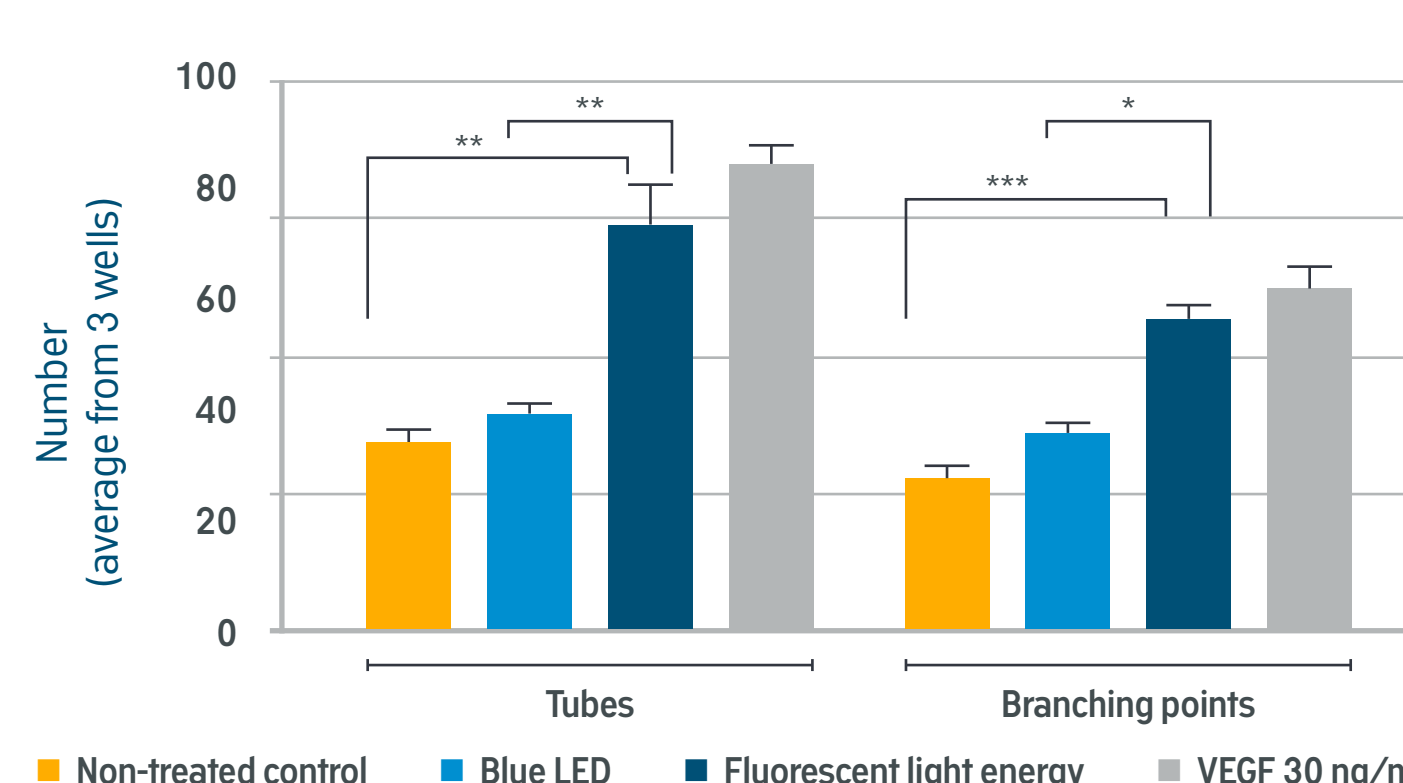
FLE Increases Collagen Production from Human Dermal Fibroblasts - A Response Blocked in the Presence of Inflammation



Collagen production by human dermal fibroblast was increased following FLE and not a comparable LED-lamp that mimicked the FLE emission spectra (A). In the presence of the inflammatory cytokine, interferon gamma (INF-γ) – mimicking a stressed environment, this response was blocked (B). Data is mean ± SD of two independent experiments performed in duplicate.

* FLE vs. control, # FLE vs. Mimicking LED lamp.

FLE Induces Angiogenesis



HDF cells were treated with either blue LED light or FLE. 72hr later conditioned media was collected and applied to human endothelial aortic cells to assess the process of new tube formation and branching.

FLE-derived conditioned media from HDF cells induced angiogenesis in HAEC, comparable to the pro-angiogenic mediator, vascular endothelial growth factor (VEGF). N=3

Proposed effect of angiogenesis in rosacea patients. (Left) depicts an inflamed disrupted/stressed blood vessel typical of rosacea. On the (right) we hypothesise that with the resolution of inflammation healthy new blood vessels can be induced following FLE, leading to a general stress reduction in the vasculature.



CONCLUSIONS

- Enhanced fibroblastic collagen production, attenuation of the inflammatory signature of connection tissue cells and the promotion of angiogenesis all contribute to the de-stressing and normalizing properties of fluorescent light energy.
- FLE effectively targets inflammation in acne and rosacea and offers support in these conditions by improving the skins overall texture and the appearance of scars. Furthermore, it has been used in combination with more invasive cosmetic procedures for an enhanced effect.