BIOPHOTONIC THERAPY INDUCED PHOTOBIOMODULATION

EDGE, D. *ET AL.* 2020

INTRODUCTION

Fluorescent light emission is a naturally occurring phenomenon throughout the animal kingdom, ascribable to endogenous chromo/fluorophore. A novel biophotonic platform utilizing Fluorescent Light Energy (FLE) has emerged as a highly effective non-invasive treatment choice in dermatology. Here the current mechanisms and effects of FLE are reported.

MECHANISM OF ACTION

- Energy following the absorption of a photon can be emitted as lower energy light through fluorescence or as the release of heat.

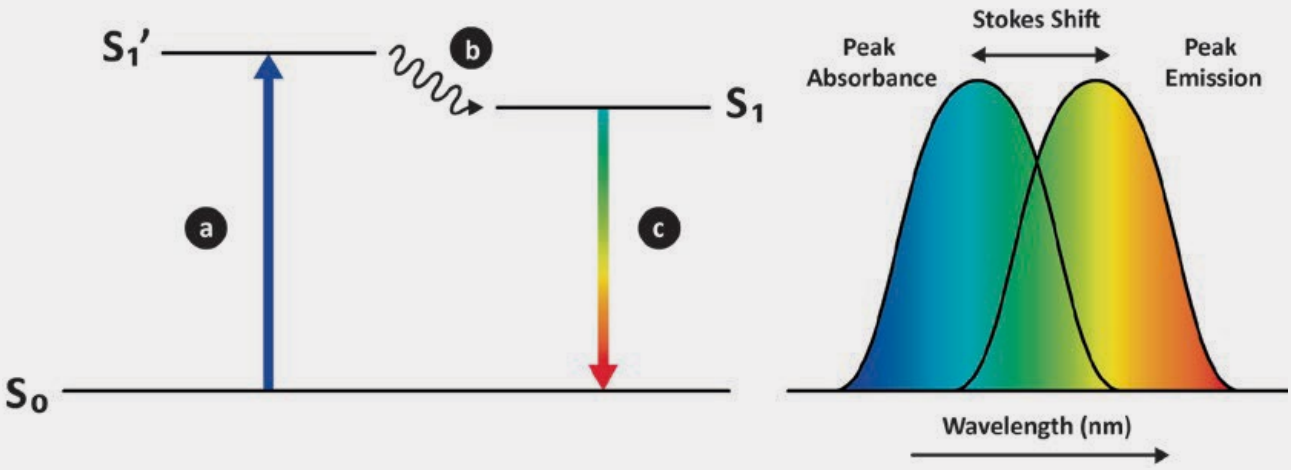

Fig.1: The generation of fluorescence explained by Jablonski's diagram.

- The mechanism is based on that chromophore begins in its ground energy state (S0). Upon absorption of light energy, the molecule becomes excited and transitions (a) to an excited singlet state (S1′) and releases some energy in the process transitioning to a relaxed single state (S1) (b). Finally, the molecule returns to its ground state and releases the remaining energy in the form of fluorescence (**Fig. 1**).
- Returning to its ground state the molecule releases the remaining energy, as the re-emission of fluorescent light of a longer wavelength (lower energy), as per the phenomenon of Stokes shift (**Fig. 1**).
- Through Stokes shift, the light generated by this biophotonic platform covers the continuum of the visible spectrum (~415–610 nm).

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A POLYCHROMATIC EMISSION

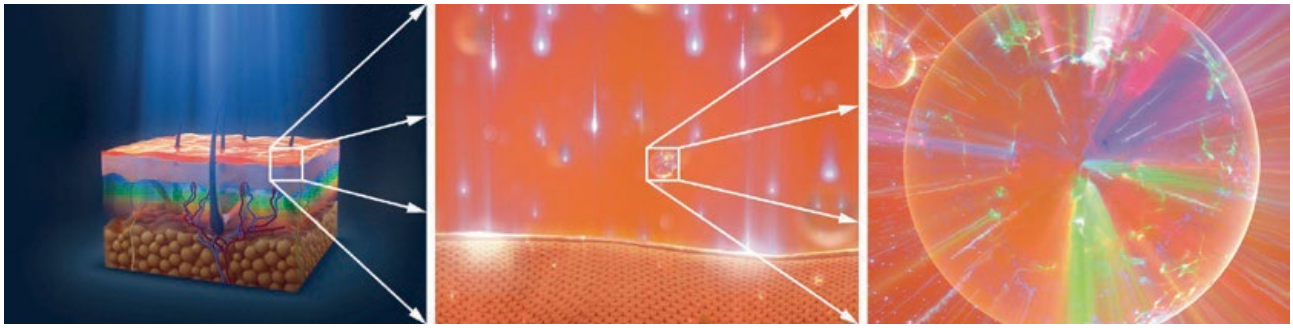

Fig.2: The generation of Fluorescent Light Energy.

- FLE platform differs from other LED modalities since the photoconverter gel emits polychromatic fluorescent light covering the continuum of the visible spectrum (~415–610 nm)(**Fig.2**).
- The wavelength of light determines the depth of tissue penetration:

Blue light	(415–500) nm has the shortest tissue penetration, reaching the stratum corneum and epidermis. It is used to treat acne vulgaris, it is also thought to have an anti-inflammatory effect regulating cytokines.
Green light	(500–570 nm) targets the epidermis and upper dermis to access fibroblasts and endothelial cells mediating proliferation and healing, the key elements in skin rejuvenation.
Yellow light	(570–590 nm) is indicated in wound healing by reaching the papillary dermal layer. It is used in post-laser recovery and is implicated in photoaging modulating ATP and fibroblast activity.
Orange and Red light	(590–760 nm) with the deepest skin penetration are noted for vascular activation, reducing inflammation, improving wound healing, and increasing collagen production.

APPLICATIONS IN THE FIELD OF DERMATOLOGY

- FLE improves acne severity, inflammatory lesion count, and associated erythema.
- FLE can target the inflammatory and erythematous reactions common to rosacea subtypes.
- FLE induced a 400% increase in collagen production. The enhanced arrangement of collagen impacts the reflection of light with a 'glow' effect observed. Indeed, FLE contributes to antiaging results.
- FLE significantly reduces the size of visible pores, the appearance of fine lines and wrinkles and, reduce the appearance of scars.

CONCLUSIONS

FLE non-invasively stimulates the skin's repair mechanisms. It has the potential to offer peculiar support to invasive treatments, both before (pre-invasive treatment) and after (post-invasive treatment), by preparing the skin and stimulating biological processes, and by aiding in the healing process.

For more information and data, visit the original publication.

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