SkinCeuticals

ATMOSPHERIC SKIN AGING

Visible light exposure has been demonstrated to generate skin-damaging oxidative stress in vivo

INTRODUCTION

Over the past few decades, a considerable amount of research has been conducted to examine the deleterious effects of ultraviolet (UV) radiation on human skin. The underlying molecular and biochemical mechanisms of UV radiation from natural and artificial sources are now well understood. In contrast, the effects of visible light exposure on human skin, specifically with respect to free-radical production, is virtually unstudied. Visible light comprises approximately 40% of the solar radiation that reaches the surface of the earth. Additional artificial sources of visible light include electronic devices such as computers and mobile devices, as well as indoor lighting. These sources have been measured to generate an appreciable amount of visible light radiation. A relevant, single high-dose visible light exposure of 480 J/cm^2 is equivalent to approximately two and a half hours outdoors on a sunny day, or 133 hours of indoor light.[1] While sources of visible light continue to grow, there remains very limited research detailing the effects of the visible light on skin. Given this, further research on the topic of visible light and its impact on skin is quite pertinent.

OBJECTIVE

To evaluate the impact of high-dose visible light exposure (480 J/cm^2) both clinically and histologically in subjects with Fitzpatrick skin types I–II and V–VI.

CLINICAL METHODOLOGY

An 8-day, single-center clinical study was conducted on eight subjects. Two investigational sites were delineated on healthy skin from non-sun-exposed lower back or buttock, including a non-exposed site (control), and a visible light-treated zone irradiated at a dose of 480 J/cm^2 for four consecutive days. Efficacy evaluations were conducted before and after each exposure, as well as 24 and 96 hours following the last visible light exposure. Efficacy measures were composed of bioinstrumentation measurement, chromameter evaluation, and biopsies which were collected for biological assessment.

Inclusion Criteria

- Healthy males and females over the age of 18 years
- Fitzpatrick skin types I–II and V–VI

RESULTS

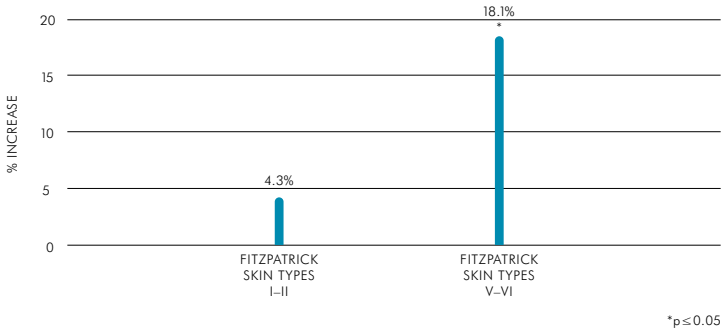
L* fold-change values, as measured by chromameter, showed an increase in pigmentation, which was statistically significant in Fitzpatrick skin types V–VI, compared to the control. (Graph 1)

Biopsy analysis exhibited a marked increase in the number of p53 positive cells in Fitzpatrick skin types I–II and V–VI, compared to the control. Additionally, hematoxylin and eosin (H&E) staining exhibited cutaneous damage and the production of inflammatory responses indicative of free radical generation in Fitzpatrick skin types V–VI, compared to the control. (Graph 2 and Figure 1)

1. Kang, J. 2017. Johns Hopkins School of Medicine

CLINICAL STUDY RESULTS

Graph 1: Chromameter Results (L* value) at Day 4: Increase in Pigmentation



*p≤0.05

Graph 2: Increase in p53 Induction

Biopsies were collected 24 and 96 hours after the last visible light exposure.

An increase in expression of p53 indicates damage to the skin.

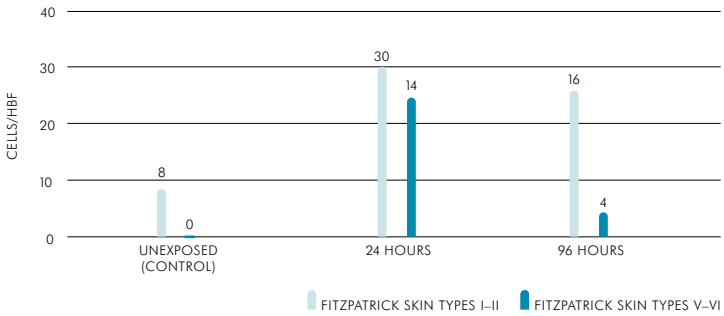
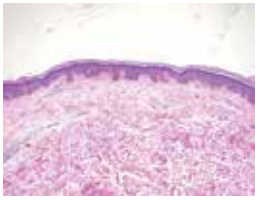


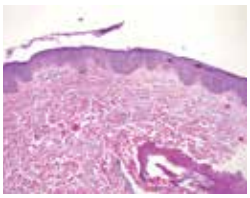
Figure 1: Hematoxylin and Eosin (H&E) Staining

Histological changes observed in Fitzpatrick skin types V–VI. There were no histological changes observed in Fitzpatrick skin types I–II.



UNEXPOSED (CONTROL)

24 HOURS
- Deep lymphocytic perivascular infiltrate
- Focal epidermal necrosis
- Singular apoptotic keratinocytes



96 HOURS
- Mild and moderate inflammatory infiltrate
- Extensive epidermal necrosis
- Two singular apoptotic keratinocytes

CONCLUSION

Visible light exposure is shown to have a significant impact both clinically and histologically on skin, most notably in Fitzpatrick skin types V–VI.

Clinical studies demonstrated:
- significant increase in pigmentation
- pronounced histologic changes exhibiting cutaneous damage and the production of inflammatory responses indicative of free radical generation