

## WHITE LIGHTENING™ COMPLEX: CYTOKINE MEASUREMENT

Dr. Charlene DeHaven  
Clinical Director, INNOVATIVE SKINCARE®

Study conducted by MatTek, Inc.

### STUDY OBJECTIVE

The inflammatory cytokine Prostaglandin E2 was measured after human skin was exposed to WHITE LIGHTENING COMPLEX, two other products, and a control, to evaluate whether or not the products contributed to pro-inflammatory upregulation.

### STUDY DESIGN

Human skin was exposed to WHITE LIGHTENING COMPLEX and two other lightening products in the marketplace. A negative control, with no product applied, was also evaluated. The inflammatory cytokine Prostaglandin E2, an indicator of inflammation, was measured.

### SIGNIFICANCE OF STUDY

Inflammatory cytokines are messenger molecules in all cells that signal the body to increase inflammation. Evolution resulted in the development of robust inflammatory processes that assist the organism in a wide variety of conditions including infections, healing of wounds, and replacement of damaged cells and tissues. Any process that damages or kills cells will result in the release of inflammatory cytokines and thus cause inflammatory processes to increase. Upregulated inflammation is helpful in many conditions, but it is also one of the processes that increases skin pigmentation.

The inflammatory cytokine Prostaglandin E2 (PGE2) is a key player in all processes involving inflammation.<sup>1</sup> This messenger molecule stimulates melanocytes to produce melanin<sup>2</sup> and is involved in post-inflammatory hyperpigmentation. PGE2 is found in inflammatory skin lesions and is released by keratinocytes following UVB radiation.<sup>3</sup> The erythema of sunburn is related to PGE2 release.<sup>4</sup> PGE2 is an important cytokine messenger for diseases having an inflammatory

component such as arthritis<sup>5</sup> and cancer.<sup>6,7,8</sup> It also acts on the brain to produce fever and pain.<sup>9</sup>

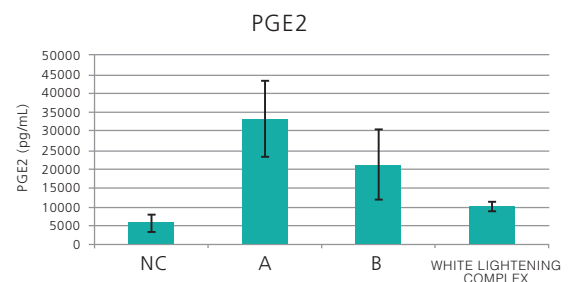
These biochemical and cellular pro-inflammatory events would be in opposition to the desired effect of controlling pigmentation. Products having lower cytokine release would be expected to induce less inflammation and would not be expected to cause post-inflammatory hyperpigmentation.

### RESULTS AND CONCLUSIONS

Human skin was exposed to WHITE LIGHTENING COMPLEX and two other products in the marketplace. A negative control, without product exposure, was also performed. Presence of the inflammatory cytokine Prostaglandin E2 was measured on the four samples, which provides an indicator of upregulated inflammation. Prostaglandin E2 was far lower with WHITE LIGHTENING COMPLEX than with the other products tested, which indicates that it does not significantly upregulate the skin's inflammatory process. The graph below illustrates these findings.

#### WHITE LIGHTENING COMPLEX AND CYTOKINE RELEASE

Skin was exposed to WHITE LIGHTENING COMPLEX and two other topicals. The inflammatory cytokine Prostaglandin E2 was measured, and was lowest with WHITE LIGHTENING COMPLEX. Products A and B markedly upregulated PGE2.



#### PRODUCT KEY

NC: NEGATIVE CONTROL  
A: PRODUCT CONTAINING 4% HYDROQUINONE  
B: PRODUCT CONTAINING 4% HYDROQUINONE, 0.05% TRETINOIN, 0.01% FLUOCINOLONE ACETONIDE

Inflammatory upregulation may confound attempts to mitigate hyperpigmentation ultimately resulting in a type of post-inflammatory hyperpigmentation. This complication would not be expected with WHITE LIGHTENING COMPLEX, considering a cytokine level very near the control. By comparison, the two other products led to significantly higher levels of Prostaglandin E2. These results indicate that Products A and B increase inflammation via release of the inflammatory cytokine PGE2. This is counterproductive to skin lightening goals and overall skin health.

## REFERENCES

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