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Anti-inflammatory properties of narrow-band blue light.

[Shnitkind E](#)¹, [Yaping E](#), [Geen S](#), [Shalita AR](#), [Lee WL](#).

+ Author information

Abstract

BACKGROUND: Narrow-band blue light (420 nm) has demonstrated safety and efficacy in the treatment of acne vulgaris. It works by exhibiting a phototoxic effect on the heme metabolism of *Propionibacterium acnes*. Previous studies using blue light showed more improvement in inflammatory lesions than in comedones, as well as some improvement on the untreated side. Cytokines have demonstrated a critical role in the development of inflammation. The expression of pro-inflammatory cytokines such as IL-1alpha have been shown to result in the expression of vascular and dermal adhesion molecules, the chemoattraction of inflammatory cells, and the stimulation of other inflammatory mediators. In addition, UVB radiation serves as a potent modulator of cell-mediated immune responses.

PURPOSE: This study investigated the effect of narrow-band blue light on the inflammatory process in the presence and absence of cytokines and UVB using IL-1alpha and ICAM-1 as markers for inflammation.

METHODS: Two immortalized keratinocyte cell lines were compared: HaCaT, produced by spontaneous immortalization of a genetically altered cell line, and hTERT, obtained by stable transfection of primary cell culture with human telomerase reverse transcriptase. Cells were treated with INF-gamma and TNF-alpha and exposed to UVB (312 nm at 50 mJ/cm²) and/or blue light (420 nm at 54 mJ/cm² and 134 mJ/cm²). The expression of IL-1alpha and ICAM-1 was measured by quantitative ELISA.

RESULTS: The results showed that blue light and low-dose UVB treatment of HaCaT and hTERT cells resulted in inhibition of cytokine-induced production of IL-1alpha. The level of IL-1alpha decreased by 82% in HaCaT and by 75% in hTERT cells when exposed to blue light. It decreased by 95% in HaCaT and by 91% in hTERT cells when blue light was used in combination with UVB. ICAM-1 expression was similarly reduced in HaCaT, but not in hTERT cells.

CONCLUSIONS: This study showed that narrow-band blue light has anti-inflammatory effects on keratinocytes by decreasing the cytokine-induced production of IL-1alpha and ICAM-1. In addition, blue light demonstrated synergistic effects with low-dose UVB light. These results expand the properties of narrow-band blue light in modulating the inflammatory process and will facilitate testing of its phototherapeutic applications in different inflammatory skin conditions.

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