

ABSTRACT | VOLUME 81, ISSUE 4, SUPPLEMENT 1, AB434, OCTOBER 2019

## Low-level red and infrared light increases expression of collagen, elastin, and hyaluronic acid in skin

Light therapy has attracted medical interests as a safe, alternative treatment for photoaging and photodamaged skin. Clinical treatment with a relatively high energy level of red or infrared light using light-emitting diode (LED) devices has been shown to augment tissue repair and promote regeneration and skin rejuvenation. Recent research has suggested that the therapeutic activity of red or infrared light may be effective at much lower-energy levels than are used clinically; however, previous studies have not investigated the effect of submilliwatt/cm<sup>2</sup> levels of red or infrared light on skin in order to determine if the low level red or infrared light therapy is effective for photoaging. The objective of this study was to evaluate the efficacy of low level red or infrared LED light on the expression of extracellular matrix (ECM) proteins in human skin cells.

Primary human dermal fibroblasts or human skin tissues obtained from plastic surgery were irradiated daily by red (640 nm), infrared (830 nm) LED lights, or combinations of red/infrared LED lights at 0.3 J/cm<sup>2</sup> (0.5 mW for 10 minutes), and ECM protein expression measured. Real time qPCR was used to investigate gene expression and either ELISA or histology measured to determine protein expression. In addition a novel noninvasive fluorescent measurement was used to assess cross-linking of ECM, which is an indication of functional ECM proteins. Treatment of human skin cells with low level red and infrared LED lights were found to significantly increase hyaluronic acid synthase (HAS2) and elastin (ELN) gene expression in human fibroblasts in as little as 3 days.

Furthermore, synthesis of hyaluronic acid, collagen protein and elastin protein were also increased in human fibroblasts exposed to red or infrared light. Treating human skin explants with low level red and infrared LED lights similarly induced gene expression of HAS2, ELN, and collagen types Col1A1 and Col1A3 within 1 week. In addition, treating human skin explants with low level red and infrared LED lights was found to increase the expression of cross-linked dermal fibers as measured by fluorescence and increased procollagen and elastin fiber formation in human skin explants.

In conclusion, these results demonstrate that low level red and infrared light can significantly induce the expression of extracellular matrix proteins in human skin. Since low level red and infrared light stimulated the production of multiple biomarkers associated with antiaging skin benefits these findings suggest that low level red and infrared light treatments present opportunities for daily, at-home treatments for patients with photoaging and photodamaged skin.