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Visible blue light does not induce DNA damage in human dermal fibroblasts

Photobiomodulation (PBM) is a non-invasive treatment modality that utilizes light to influence cellular activity. PBM has applications in various dermatological conditions. As blue light (BL, 400-500 nm) therapy gains popularity, concerns about its potential to induce DNA damage remain. This study investigates the effects of fluorescent BL (417 nm \pm 5 nm) on human dermal fibroblast DNA, specifically examining the formation of cyclobutane pyrimidine dimers (CPD) and 6-4 photoproducts (6-4PPs) at fluences of 10 J/cm², 30 J/cm², and 45 J/cm². The measurement techniques employed to perform these analyses were ELISA tests and dot blot assays. Our results demonstrate that BL exposure does not induce detectable DNA damage, in contrast to the well-documented effects of ultraviolet light, which is known to cause such damage. These findings support the safety of fluorescent BL therapy and align with prior research on LED-red and LED-near-infrared wavelengths. Continued clinical investigation of the effects of BL on skin will add to the understanding of the safety profile.