

## **The Effects of Light-Emitting Diode Photon Irradiation on Proliferation of Human Dermal Fibroblasts**

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Light-emitting diodes (LED) have shown promise for delivering light into body tissues to promote wound healing. Fibroblast proliferation occurs in the early phase of wound healing and is a major step leading to wound closure and healing. The purpose of this study was to assess the ability of 660nm CW LED irradiation ( $1.5\text{mW}/\text{cm}^2$ ) to enhance proliferation of cultured adult human dermal fibroblasts (HDF).

HDF were cultured in DMEM supplied with 10% fetal bovine serum (FBS) and (1X) antibiotic antimycotic (ABAM). Cultured cells were seeded into 96 well dishes 36hrs before irradiation at a density of 200 cells/well and stressed with 1% FBS/DMEM 12hrs before irradiation. HDF were exposed to a single dose of  $0\text{-}5\text{J}/\text{cm}^2$  of irradiation. BrdU immunolabeling was added right after irradiation with cells then fixed using 4% paraformaldehyde at 3hrs, 6hrs, 12hrs, 18hrs, 24hrs, and 48hrs following irradiation, respectively. The proliferation rate (dividing cells as a percentage of total number of cells) was determined by using VECTASTAIN Elite ABC KIT for BrdU immunohistochemical staining. Positive and total cell counts were determined manually.

We found that the photon irradiation increased the mean mitotic rate over the control in all the dosages tested from  $1\text{-}5\text{J}/\text{cm}^2$ . The mean mitotic rates increased between 12 and 24hrs, and started to decline after 24hrs. The greatest mean mitotic rates were observed between 18 and 24hrs. From 12hrs throughout the 48hr observation period, the mean mitotic rates for the irradiated cells were always greater than the controls'.

**Key Words:** biostimulation, human dermal fibroblast, light-emitting diodes, proliferation, BrdU, wound healing