

The Effect of Phototherapy on the Migration of Skin Cells

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Introduction: Recently, reports of the success of phototherapy for use in wound healing, acne treatment, and other dermatological applications have increased.¹ A large number of studies use laser light in the evaluations, while relatively few use LED light. This is significant since LED light has recently been marketed to consumers of phototherapy for improving skin tone. While it has been demonstrated that keratinocyte viability and migration is negatively impacted by blue LED light and positively impacted by red LED light,² the effects of using such over the counter devices have been scarce. In this study, we evaluated the effect on keratinocytes of one 10 minute dose of red, blue, or UV light delivered from one such over the counter LED device.

Materials and Methods: HaCaT keratinocytes were used during this experiment. Cells were propagated in complete culture media consisting of DMEM, 10% fetal bovine serum, and 1% penicillin/ streptomycin and cultured in a humidified incubator with 5% CO₂. Four 6-well plates were seeded with cells and allowed to reach confluency (~590 cells/cm²). Each experimental plate was treated with light from a commercial phototherapy device for 10 minutes. One plate was placed under red light (635-700 nm), another ultraviolet UV light (10-400 nm), the third blue light (380-500 nm), and the last plate was not exposed to any light and served as a control group for the experiment. Following light exposure, a 10 ml pipette tip was used to scratch all 24 wells. Photographs were taken 0, 3, 6, 24, 48, and 72 hours after and scratch closure was observed. Scratch images were analyzed using NIH ImageJ's Wound Healing Tool.

Results and Discussion: As expected, UV light completely killed all seeded cells. Our results confirmed previous reports that blue light impeded healing (Figure 1). Contrary to prior results, our data show that red light also impedes scratch closure, with the control group scratches closing faster than all other groups.

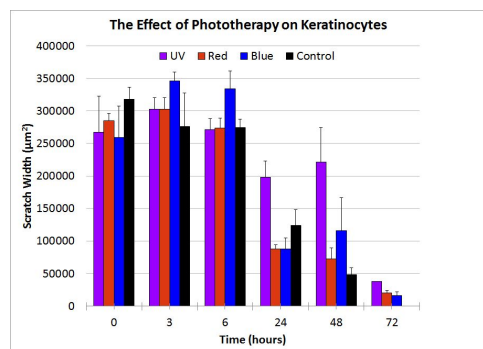


Figure 1. Scratch area over time. The average scratch areas for each plate with each color of light it was exposed to were taken. It is evident that the control closed scratches the quickest in the long term, followed by the red then blue. In the first 24 hours, however, blue and red light performed equally at a better rate than control. In the first 48 hours, the red light outperformed all other groups. The UV light killed the cells and there was no healing after 24 hours had elapsed.

Conclusion: Our results confirm and extend previous findings reporting on the effect of blue and red light on keratinocytes. In studies where keratinocytes received multiple 10 minute doses over a period of days, red light was found to be beneficial while blue light was harmful. Our single dose study that demonstrated some benefit to blue light might suggest that there is a dose response to various wavelengths of light that have hitherto been unexplored.

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References:

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