

Effect of Photobiomodulation on Mesenchymal Stem Cells

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Abstract

Objective: The purpose of this study was to review available literature about the effect of photobiomodulation (PBM) on mesenchymal stem cells (MSCs).

Background data: The effects of coherent and noncoherent light sources such as low-level lasers and light-emitting diodes (LEDs) on cells and tissues, known as PBM, form the basis of photomedicine. This treatment technique effects cell function, proliferation, and migration, and plays an important role in tissue regeneration. Stem cells have been found to be helpful elements in tissue regeneration, and the combination of stem cell therapy and laser therapy appears to positively affect treatment results.

Materials and methods: An electronic search in PubMed was conducted of publications from the previous 12 years. English language articles related to the subject were found using selected key words. The full texts of potentially suitable articles were assessed according to inclusion and exclusion criteria.

Results: After evaluation, 30 articles were deemed relevant according to the inclusion criteria. The energy density of the laser was 0.7–9 J/cm². The power used for visible light was 30–110 mW and that used for infrared light was 50–800 mW. Nearly all studies showed that low-level laser therapy had a positive effect on cell proliferation. Similar outcomes were found for LED; however, some studies suggest that the laser alone is not effective, and should be used as an adjunct tool.

Conclusions: PBM has positive effects on MSCs. This review concluded that doses of 0.7–4 J/cm² and wavelengths of 600–700 nm are appropriate for light therapy. The results were dependent upon different parameters; therefore, optimization of parameters used in light therapy to obtain favorable results is required to provide more accurate comparison.