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Low Intensity Laser Irradiation (LILI) in combination with Growth Factors in a Co-culture System supports the Differentiation of Mesenchymal Stem Cells

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Abstract content
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Abstract. Mesenchymal stem cells have the capacity to differentiate into a variety of cell types that could potentially be used in tissue engineering and regenerative medicine. Low intensity laser irradiation (LILI) has been shown to have positive effects on different cell types, including a significant increase in cell viability and proliferation. Growth factors such as retinoic acid (RA) and transforming growth factor β 1 (TGF β 1) have been shown to play important roles in the differentiation of cells. The aim of this study was to investigate whether LILI in combination with growth factors could induce the differentiation of adipose derived stem cells (ADSCs) co-cultured with smooth muscle cells (SMCs). The study used primary and continuous ADSC cell lines and a SMC line (SKUT-1). Cells were co-cultured directly at a ratio of 1:1 using established methods, with and without growth factors and then exposed to LILI at 5 J/cm² using a 636 nm diode laser. The cellular morphology, viability and proliferation of the co-cultures were assessed over a period of one week. The study also monitored the expression of cell specific markers over the same period of time. Cell viability and proliferation increased significantly in the co-cultured groups that were exposed to laser alone, as well as in combination with growth factors. Furthermore, there was a significant decrease in the expression of stem cell markers in the ADSCs over time. The results indicate that LILI in combination with growth factors not only increases the viability and proliferation of co-cultured cells but also decreases the expression of ADSC stem cell markers. This could indicate the possible differentiation of ADSCs into SMCs.

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