

عنوان مقاله:

Cerebrospinal Fluid and Photobiomodulation Effects on Neural Gene Expression in Dental Pulp Stem Cells

محل انتشار:

مجله لیزر در علوم پزشکی، دوره 10، شماره 0 (سال: 1398)

تعداد صفحات اصل مقاله: 7

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خلاصه مقاله:

Abstract Introduction: Dental pulp cells, a unique source of ectomesenchymal pluripotent stem cells, are originated from the skull neural crest. They are considered as one ideal source of cells for the regenerative medicine applications. Cerebrospinal fluid (CSF), a transparent fluid found in the brain and spinal cord, is enriched with electrolytes, proteins, and growth factors such as EGF, bFGF, BDNF, GDNF, and neuropeptides and can be utilized as a trigger in order to induce the neural differentiation. On the other hand, photobiomodulation (PBM), with the ability to prevent cell apoptosis, can induce cell proliferation by means of increasing the ATP synthesis in mitochondria and facilitating the secretion of the growth factors. In this research, we first aimed to isolate and culture the dental pulp stem cells (DPSCs) and subsequently to investigate their potential for neural differentiation. **Methods:** Human dental pulp stem cells (hDPSCs) were isolated from the pulp tissues using an outgrowth method and subsequently cultured. In order to access the cells' differentiation potential, cells were firstly classified into four groups which were treated with CSF, gallium aluminum arsenide diode laser irradiation (808 nm ; 40 mW power output) and a combination of both, while the fourth group was considered as the control. MTT assay was then used to examine the viability of cells following the treatments. After 4, 7, and 14 days the cell morphology in the treated groups was evaluated while RT-PCR was used in order to evaluate the Nestin and β -tubulinIII neural gene marker expressions. **Results:** It was shown that PBM has the ability to elevate the proliferation of DPSCs. Also, the differentiated morphology was obvious in the CSF treated group, especially on day 14 with the formation of three-dimensional (3D) structures. The results of gene expression analysis showed that on the fourth day of post-treatment, Nestin, and β -tubulinIII gene expressions were reduced in all groups while a rising trend in their expression was observed subsequently on days 7 and 14. **Conclusion:** In accordance with previous studies, including functional and protein base researches, it has been demonstrated that CSF has a direct role in neural induction. Although past works have been significant, none of them shows a 3D structure. In this article, we investigated the dual effect of PBM and CSF. Initial results confirmed the upregulation of neural-related ... transcription factors. The 3D organization of the formed tissue could imply the initiation of organogenesis which has not been reported before

کلمات کلیدی:

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