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Photonic light irradiation by 660 nm inhibits oxidative stress and induces brain-derived neurotrophic factor expression in neurons

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Low-level light therapy (LLLT) is a therapeutic technique that can be used to stimulate or inhibit cell function. Initially, it was used for wound healing or muscle relaxation. Recently, many studies have been carried out in the field of neurological diseases such as Alzheimer disease (AD) and Parkinson disease (PD). AD is known to be associated with a decrease in brain-derived neurotrophic factor (BDNF). Many drugs have been introduced as a way to increase BDNF. However, perfectly delivery of drugs to the target site is still a problem. In this paper, we introduce photonic light irradiation method to increase the BDNF expression. This method can be applied to the brain implanted photonic sensor to stimulating neurons for AD and PD patients. HT-22 cells are mouse hippocampal cell lines. HT-22 cells were used for treatment with photonic light source (DC4104, Thorlabs, CA, USA). HT-22 cells were cultured in 96-well microplates at a density of 2×104 cells/well. To investigate the inhibition of oxidative stress through an optical source, hydrogen peroxide (H2O2, 25 μM) was injected into the cells before irradiation. The HT-22 cells were irradiated with a 660 nm light source of 500 mA intensity. After 24 hours, the cell viability was measured by MTT assay and protein expression of BDNF was measured using Western blot analysis. From the experiments, we found that the photonic light source irradiation on HT-22 cells increased BDNF expression. Thus, photonic light irradiation of 660 nm is effective for recovery of memory mechanism of hippocampal cell.

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