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Parkinson's Disease and Photobiomodulation: Potential for Treatment

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Abstract

Parkinson's disease is the second most common neurodegenerative disease and is increasing in incidence. The combination of motor and non-motor symptoms makes this a devastating disease for people with Parkinson's disease and their care givers. Parkinson's disease is characterised by mitochondrial dysfunction and neuronal death in the substantia nigra, a reduction in dopamine, accumulation of α-synuclein aggregates and neuroinflammation. The microbiome-gut-brain axis is also important in Parkinson's disease, involved in the spread of inflammation and aggregated α-synuclein. The mainstay of Parkinson's disease treatment is dopamine replacement therapy, which can reduce some of the motor signs. There is a need for additional treatment options to supplement available medications. Photobiomodulation (PBM) is a form of light therapy that has been shown to have multiple clinical benefits due to its enhancement of the mitochondrial electron transport chain and the subsequent increase in mitochondrial membrane potential and ATP production. PBM also modulates cellular signalling and has been shown to reduce inflammation. Clinically, PBM has been used for decades to improve wound healing, treat pain, reduce swelling and heal deep tissues. Pre-clinical experiments have indicated that PBM has the potential to improve the clinical signs of Parkinson's disease and to provide neuroprotection. This effect is seen whether the PBM is directed to the head of the animal or to other parts of the body (remotely). A small number of clinical trials has given weight to the possibility that using PBM can improve both motor and non-motor clinical signs and symptoms of Parkinson's disease and may potentially slow its progression.

Keywords: Parkinson’s disease; neuroprotection; photobiomodulation; remote; transcranial.

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Conflict of interest statement

B.B. and A.L. are co-founders and shareholders of SYMBYX Pty Ltd., which develops photobiomodulation therapies for neurological diseases. G.H. declares no conflicts of interest.