Mapping Central Nervous System Mechanisms Underlying Photobiomodulation and Neuromodulation to Treat Injury-Induced Neuropathy

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Millions of people worldwide suffer from chronic pain with few treatments other than opioids available. Photobiomodulation (PBM) and electroacupuncture (EA) are two treatments for chronic pain that haven't been widely explored, particularly from a mechanistic viewpoint. In addition, how the therapies improve behavior related to pain perception and inflammatory markers could further improve understanding of these non-opioid therapies. Mice were sedated with isoflurane, and their left hind paws were injected with 50 microliters of Complete Freunds Adjuvant. Behavior tests were done one day after the injection and every day for the duration of the experiment. Electroacupuncture treatment was given every other day, with needles placed into ST36 and ST37 acupoints and stimulate at 4 Hz, .1mA for 30 minutes. Photobiomodulation treatment, 2.5 Hz, 660/850 nm, 500W/m2 pulsed was given every other day. Mice were perfused and blood was drawn after seven days. Brain slices and spinal cord slices were analyzed and an ELISA test was performed on blood samples. Overall, both PBM and EA improved the pain-related behavior of the mice measured by distributed weight analysis. Interleukin-6 levels, related to the inflammatory response, were highest in control (43.8 pg/ml) and lowest in the PBM group (22.6 pg/ml). There was significantly less activation of chronic pain centers in the brain in both the EA and PBM groups. This is the first time where PBM and EA treatments have not only been shown to reduce inflammation but also been shown to reduce the activation of neurons in the brain regions that are known to be related to chronic pain. These findings also correlated with treatment-related behavior change, showing less perception of pain.

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