Light-Emitting Diode (LED) Therapy Attenuates Neurotoxicity of Methanol-Induced Memory Impairment and Apoptosis in the Hippocampus

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Abstract

Background & Objective: The adolescent brain has a higher vulnerability to alcoholinduced neurotoxicity, compared to adult's brain. Most studies have investigated the effect of ethanol consumption on the body, however, methanol consumption, which peaked in the last years, is still poorly explored.

Method: In this study, we investigated the effects of methanol neurotoxicity on memory function and pathological outcomes in the hippocampus of adolescent rats and examined the efficacy of Light-Emitting Diode (LED) therapy. Methanol induced neurotoxic rats showed a significant decrease in the latency period, in comparison to controls, which was significantly improved in LED treated rats at 7, 14 and 28 days, indicating recovery of memory function. In addition, methanol neurotoxicity in hippocampus caused a significant increase in cell death (caspase3+ cells) and cell edema at 7 and 28 days, which were significantly decreased by LED therapy. Furthermore, the number of glial fibrillary acid protein astrocytes was significantly lower in methanol rats, compared to controls, whereas LED treatment caused their significant increase. Finally, methanol neurotoxicity caused a significant decrease in the number of brain-derived neurotrophic factor (BDNF+) cells, but also circulating serum BDNF, at 7 and 28 days, compared to controls, which were significantly increased by LED therapy. Importantly, LED significantly increased the number of Ki-67+ cells and BDNF levels in the serum and hypothalamus in control-LED rats, compared to controls without LED therapy.

Conclusion: In conclusion, chronic methanol administration caused severe memory impairments and several pathological outcomes in the hippocampus of adolescent rats which were improved by LED therapy.

Keywords

Author Keywords: Methanol; astrocytes; brain-derived neurotrophic factor; hippocampus; light-emitting diode; apoptosis
KeyWords Plus: STATE-DEPENDENT MEMORY; NEUROTROPHIC FACTOR; ADOLESCENT MICE; ADULT NEUROGENESIS; COMBINED EXPOSURE; ETHANOL; BRAIN; CELLS; RATS; BDNF

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