Indian Journal of Experimental Biology
Vol. 63, May 2025, pp. 407-412
DOI: 10.56042/ijeb.v63i05.14854

Exploring the influence of cannabinoid system activation on axon sprouting: A study of ATRX, STK24, GDF10, RTN4, and PTEN proteins

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Received 05 November 2024; revised 11 February 2025

Axonal damage in the central nervous system (CNS) often results in long-term neurological impairments due to the limited regenerative capacity of neurons. Identifying mechanisms and therapeutic agents that promote axon sprouting is essential for advancing treatments for neurological disorders. Cannabinoids, through their interaction with CB_1 and CB_2 receptors, have been implicated in neuronal development and regulation. Numerous studies have demonstrated that proteins analyzed in this study, including ATP-dependent helicase (ATRX), Serine/threonine-protein kinase 24 (STK24), Growth differentiation factor 10 (GDF10), Reticulon 4 (RTN4), and Phosphatase and tensin homolog (PTEN), play a crucial role in axon sprouting. The objective of this study is to determine whether the cannabinoid system, in conjunction with ATRX, STK24, GDF10, RTN4, and PTEN proteins, collectively influences axon sprouting. Therefore, the effect of Δ-9-THC on the expression of ATRX, STK24, GDF10, RTN4, and PTEN proteins is examined. For this purpose, the neuronal cell line model (SH-SY5Y) was grown in culture and treated with Δ-9-THC. The amounts of related proteins were measured by ELISA method and compared with control group. The administration of Δ-9-THC significantly ($P < 0.05$) increased the levels of ATRX, STK24, and GDF10 proteins, whereas it had no significant effect on RTN4 and PTEN proteins. Given the stimulating role of ATRX, STK24, and GDF10 proteins in axon sprouting, it is reasonable to speculate that the activation of the cannabinoid system may enhance axon sprouting. We anticipate that these findings will contribute to future studies aimed at addressing nerve cell losses in conditions such as stroke, ischemia, Alzheimer's, and Parkinson's.

Keywords: Axon growth, Cannabinoid receptors, Delta-9-THC, ELISA, SH-SY5Y cell line