The Effect of Orphan Receptor GPR83 on Neuronal Differentiation

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G-protein Coupled Receptor 83 (GPR83) is a constitutively active orphan GPCR for which the ligand and molecular signaling pathways have yet to be fully characterized. Studies have shown that GPR83 is primarily expressed in the central nervous system structures of the forebrain limbic system, the striatum, and different hypothalamic regions. This study focuses on neuronal differentiation, which is crucial to understanding the process of neuro-development. It is well known that the CB1 cannabinoid receptor is heavily expressed in the brain and promotes neuronal differentiation. Therefore, the purpose of this study is to explore the independent and combined effects of GPR83 and CB1 receptor activation on neuronal differentiation. Neuro-2A cells were transfected with green fluorescent protein cDNA (GFP for control) and GPR83 cDNA. Twenty-four hours after transfection, the cells were treated with different dosages of CP55940, a ligand for the CB1 receptor. Following all treatments, random cell images were taken under a fluorescent microscope. The cells were counted, and the percentages of differentiated cells out of the total number of cells per experimental group were calculated. The results showed that increased neuronal differentiation occurred as a result of GPR83 expression. This study also proved that CB1 activation promotes neuronal differentiation. However, differentiation decreased when CB1 activation was combined with GPR83 expression compared to differentiation in cells expressing GPR83 alone. The results from this study demonstrate that GPR83 expression promotes neuronal differentiation. The results also indicate the existence of interactions between GPR83 and CB1 signaling that decrease GPR83 promoted neuronal differentiation.

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