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Cognitive Enhancement Effects of Bacopa Monnieri (Brahmi) on Novel Object Recognition and NMDA Receptor Immunodensity in the Prefrontal Cortex and Hippocampus of Sub-Chronic Phencyclidine Rat Model of Schizophrenia

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Abstract

Background: Cognitive impairment is a common characteristic in schizophrenia that cannot be attenuated by antipsychotics. Brahmi, popularly known as a cognitive enhancer, might be a new frontier of cognitive deficit treatment in schizophrenia.

Objective: To study effects of Brahmi on attenuation at cognitive deficit and cerebral glutamate/N-methyl-D-aspartate (NMDA) receptor density in sub-chronic phencyclidine (PCP) rat model of schizophrenia.

Material and Method: Rats were administered PCP or vehicle. Half of the PCP-group was treated with Brahmi. Discrimination ratio (DR) representing cognitive ability was obtained from novel object recognition task. NMDA immunodensity was measured in prefrontal cortex, striatum, cornu ammonis fields 1 to 3 of hippocampus (CA1-3), and dentate gyrus (DG) using immunohistochemistry.

Results: DR in PCP-group was significantly decreased compared with control. This occurred alongside NMDA up-regulation in prefrontal cortex and CA1-3, but not in striatum and DG. PCP with Brahmi showed a significant increase in DR score compared with PCP alone. This occurred alongside significant decrease in NMDA immunodensity in prefrontal cortex and CA1-3. No significant difference in cerebral NMDA immunodensity was observed between PCP with Brahmi and control.

Conclusion: Cognitive deficit observed in PCP-administered rats was mediated by NMDA up-regulation in prefrontal cortex and CA1-3. Interestingly, Brahmi could recover this cognitive deficit by decreasing NMDA density in these brain areas to normal.

Keywords: Brahmi, Schizophrenia, Animal model, Novel object recognition, NMDA receptor

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