Neuroprotective Effects of a Combination of Panax ginseng and Ginkgo biloba Extracts on Multiple Cerebral Embolism via Modulating NMDA Receptor Pathway in Rats

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Background: Glutamate excitotoxicity has been suggested to be a critical initiating event in the ischemia-induced brain damage. Panax ginseng (ginseng) and Ginkgo biloba (ginkgo) have both demonstrate to possess neuroprotection effects. However, the exact underlying mechanisms have still not been fully understood.

Methods: Fifty rats were randomly divided into 5 groups including sham group, multiple cerebral embolism (MCE) group, MCE+Tat-NR2B9C group, MCE + Extracts (low dose) group, and MCE + Extracts (high dose) group. The concentrations of glutamate and GABA were measured with ELISA assay; The volume of infarct sizes was stained with TTC, and expression of NMDAR2B and PSD95 were determined using Western blotting and immunohistochemistry techniques. The expression of CaMKIV and CREB were evaluated using Western blotting and qPCR.

Results: In the current study, the combination of ginseng and ginkgo extracts significantly decreased neurological scores and infarct volume via modulating the NMDA pathway. Glutamate level, and expression of NMDAR2B and PSD95 significantly increased in response to cerebral ischemia. These increases were reversed by Tat-NR2B9C and ginseng and ginkgo combination. Furthermore, CaMKIV and CREB were markedly increased in Tat-NR2B9C and ginseng and ginkgo combination groups compared to that of MCE group.

Conclusion: The results indicated that the neuroprotective effect of the ginseng and ginkgo combination on cerebral ischemia injury is possible through regulating the NMDA receptor signaling pathway.