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Protective effects of ginseng saponins on 3-nitropropionic acid-induced striatal degeneration in rats

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The precise cause of neuronal cell death in Huntington's disease (HD) is unknown. Systemic administration of 3-nitropropionic acid (3-NP) not only induces a cellular ATP depletions but also causes a selective striatal degeneration similar to that seen in HD. Recent accumulatingreports have shown that ginsenosides, the major active ingredients of *Panax* ginseng, have protective effects against neurotoxin insults. In the present study, we examined *in vitro* and *in vivo* effects of ginsenosides on chronic 3-NP-induced striatal neurotoxicity in rats. Here, we report that systemic administration of ginsenosides produced significant protections against systemic 3-NP- and intrastriatal malonate-induced lesions in rat striatum with dose-dependent manner. To explain the mechanisms underlying in vivoprotective effects of ginsenosides against 3-NP-induced striatal degeneration, we examined in vitro effect of ginsenosides against 3-NP-caused cytotoxicity using cultured rat striatal neurons. We found that ginsenosides inhibited 3-NP-induced intracellular Ca^{2+} elevations. Ginsenosides restored 3-NP-caused mitochondrial transmembrane potential reduction in cultured rat striatal neurons. Ginsenosides also prevented 3-NP-induced striatal neuronal cell deaths with dose-dependent manner. The EC_{50} was 12.6 ± 0.7 ug/ml. These results suggest that in vivo protective effects of ginsenosides against 3-NP-induced rat striatal degeneration might be achieved via in vitro inhibition of 3-NP-induced intracellular Ca^{2+} elevations and cytotoxicity of striatal neurons.