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The effects of vitamin C on paraquat induced dopaminergic neurotoxicity in C57BL/6 mice

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Vitamin C is involved in the biosynthesis of catecholamines as a cofactor of dopamine β -hydroxylase in the brain. Vitamin C can inhibit the peroxidation and act as a scavenger of free radicals. Paraquat (PQ) exerts selective dopaminergic neurotoxicity. In this study, we investigated the effects of vitamin C on PQ induced dopaminergic neurotoxicity in mice. Male C57BL/6 mice (aged 7 weeks and 23–25 g) were divided into eight groups (n=10): control (saline), PQ, LC, LCPQ, MC, MCPQ, HC, and HCPQ group. PQ (10 mg/kg body weight, i.p.) was injected twice per week for 3 consecutive weeks. Vitamin C (LC, MC, and HC: 4, 40, and 400 mg/kg body weight, i.p.) treated daily for 4 weeks from 3 d before first PQ injection. The levels of dopamine (DA) and its metabolites 3,4-dihydroxyphenylacetic acid (DOPAC), 3-methoxytryamine (3-MT), and homovanillic acid (HVA) in the selective brain tissues (striatum and substantia nigra) were analyzed by HPLC. Behavioral changes, tyrosine hydroxylase immunoreactivity (TH-ir), and total glutathione levels (oxidated and reduced GSH) were determined. Statistical analysis was performed by two-way ANOVA. In the striatum, decrease of DA levels by PQ was attenuated in LCPQ and MCPQ groups. The DOPAC and 3-MT levels of the ventral part in the rostral and caudal striatum of LCPQ group were lower than that of PQ group. The striatum TH-ir levels of HC group were similar to that of HCPQ group. Total GSH level in the dorsal part of rostral striatum and ventral part of caudal striatum of LCPQ group was lower than that of PQ group. It suggests that vitamin C has a protective effect on paraquat induced dopaminergic neurotoxicity in the dose of 4 and 40 mg/kg body weight. The 400 mg/kg dose of vitamin C (HC and HCPQ), however, did not show protective effect on paraquat induced toxicity of dopaminergic neuron. PQ reproduce features of Parkinson's disease (PD) in experimental animals. Thus, vitamin C may be beneficial to prevent PD when consumed in the dose of 4 and 40 mg/kg body weight.