THE ROLE OF NORADRENERGIC CEREBELLAR INNERVATION IN THE TREMOR INDUCED BY HARMALINE

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Introduction: Abnormal synchronous activation of the glutamatergic olivo-cerebellar pathway has been suggested to be crucial for the harmaline-induced tremor and the essential tremor in humans. The cerebellum receives innervation arising in regions affected in Parkinson’s disease: the dopaminergic pathway from the ventral tegmental area/substantia nigra pars compacta, and the noradrenergic route from the locus coerules. Moreover, recent studies have suggested some contribution of the cerebellum to the tremor accompanying Parkinson’s disease.

Aims: The aim of the present study was to examine a contribution of the cerebellar catecholaminergic innervations to the harmaline-induced tremor in rats.

Methods: Rats were injected into the cerebellar vermis with 6-hydroxydopamine (6-OHDA) (8 µg/0.5 µl) either alone or this treatment was preceded by desipramine (15 mg/kg ip). Harmaline was administered in doses of 7.5 or 15 mg/kg. Tremor of forelimbs was measured as a number of episodes. Rats were killed by decapitation and the levels of monoamines and their metabolites were measured by HPLC in the cerebellum.

Results: 6-OHDA injected alone decreased the cerebellar noradrenaline level by ca. 40-80% and enhanced the harmaline-induced tremor. When 6-OHDA treatment was preceded by desipramine, it decreased dopaminergic transmission in some regions of the cerebellum, induced its compensatory activation in others and did not influence the tremor induced by harmaline.

Conclusions: The present study indicates that the noradrenergic innervation of the cerebellum plays an inhibitory role in the harmaline-induced tremor.

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