

P15

Protective effects of betaxolol in eyes with kainic acid-induced neuronal death

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The purpose of this study was to determine whether betaxolol, a selective β_1 -adrenoceptor antagonist, has retinal neuroprotective effects in the kainic acid (KA)-injected animal model for retinal neurotoxicity. Neurotoxicities were induced in adult male rats by intravitreal injection of KA (total amount, 6 nmol). To examine the neuroprotective effects of betaxolol, rats were pretreated with betaxolol topically 60 min before KA injection to the rat eyes and twice daily for 1, 3, and 7 days after KA injection. The retinal damages were evaluated by measuring the thickness of the various retinal layers, and by counting the number of choline acetyltransferase (ChAT)- and tyrosine hydroxylase (TH)-positive cells in each retinal layer.

The retina is highly vulnerable to KA-induced neuronal damage. In non-treated eyes, the thickness of the retinal layers decreased markedly both 3 and 7 days after KA injection. Furthermore, the numbers of ChAT- and TH-positive cells were significantly reduced by intravitreal injection of KA. However, when eyes were treated with betaxolol after KA injection, both the reduction of the retinal layers thickness and the retinal ChAT- and TH-positive cells were significantly attenuated. These results suggest that topically applied betaxolol is an efficient neuroprotective agent and prevents the retinal cell damage caused by KA injection to the rat retina.