

Using histochemical analysis (NADPH-diaphorase, Fluoro-Jade B dye and bisbenzimidazole 33342 Hoechst) we studied the influence of intraperitoneal administration of nicotine, kainic acid and combination of both these substances on hippocampal neurons and their changes. In experiments, 18- 25- and 35-day-old male rats of the Wistar strain were used. 30 minutes prior to the kainic acid application (10 mg/kg), animals were pre-treated with 1 mg/kg of nicotine. After 2 days, the animals were transcardially perfused with 4% paraformaldehyde under deep thiopental anaesthesia. Cryostat sections were stained to identify NADPH-diaphorase positive neurons that were then quantified in the CA1 and CA3 areas of the hippocampus, in the dorsal and ventral blades of the dentate gyrus and in the hilus of the dentate gyrus. Fluoro-Jade B positive cells were examined, in the same areas, to elucidate possibly neurodegeneration.

Results have shown that nicotine administration brings about the increase of the density of NADPH-diaphorase positive neurons in CA1 and CA3 areas of the hippocampus and in the hilus of the dentate gyrus in 18-day-old animals, in 25-day-old animals in CA3 area of the hippocampus, hilus of the dentate gyrus and in the ventral blade of the dentate gyrus, in 35-day-old animals only in the CA3 area of the hippocampus and hilus of the dentate gyrus.

Administration of kainic acid brought about decrease of nitrenergic neurons in CA1 and CA3 areas of the hippocampus and in the hilus of the dentate gyrus in 18-day-old animals and in all studied regions of the hippocampus in 25- and 35-day-old animals.

Nicotine pretreatment 30 minutes before kainic acid administration, compared to control group brought about decrease of nitrenergic neurons in CA1 area of the hippocampus and ventral blade of the dentate gyrus and in the hilus of the dentate gyrus in 35-day-old animals, in CA1 and CA3 areas of the hippocampus and in the dorsal blade of the dentate gyrus in 25-day-old animals, in CA1 area of the hippocampus in 18-day-old animals.

Nicotine pretreatment 30 minutes before kainic acid administration, compared to group, which received kainic acid only brought about increase of nitrenergic neuron in CA1 area of the hippocampus and brought about decrease in ventral blade of the dentate gyrus, in 25-day-old animal brought about increase of nitrenergic neurons in CA1 and CA3 areas of the hippocampus, in ventral blade of the dentate gyrus and in the hilus of the dentate gyrus, the density decreased in dorsal blade of the dentate gyrus, in 18-day-old animals the density of NADPH-d positive neurons increased in CA3 area of the hippocampus.

Presented results allow following conclusions:

1. Kainic acid administration decreases or unchanged the density of NADPH-d positive neurons in the hippocampus (working hypothesis I was not fully confirmed)
2. Nicotine administration increases or unchanged the density of NADPH-d positive neurons in the hippocampus (working hypothesis II was not fully confirmed)
3. Nicotine pretreatment before kainic acid administration can both increase and decrease the number of NADPH-d positive neurons in the hippocampus (working hypothesis III was not confirmed)
4. Nicotine pretreatment before kainic acid administration leads to a lesser extent exhibited degeneration (working hypothesis IV was confirmed)

Our results show, that both nicotine and kainic acid influence hippocampal nitrenergic system strongly. This effect is age dependent and region specific. Nicotine attenuates the pathological changes in hippocampus associated with kainic acid administration.