Influence of quercetin-loaded magnetic nanoparticles on the firing patterns of hippocampal neurons in kainic acid-injected rats

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The purpose of present research was to use an external static magnetic field exposure (ESMFE) for targeted delivery of quercetin-loaded magnetic nanoparticles (Q-MNPs) and to investigate the effects of quercetin/Q-MNPS on electrophysiological parameters of baseline and evoked responses in the CA1 field of the hippocampus.

In ketamine-anesthetized wild tape laboratory rats metal (constatntan) tripolar electrodes were stereotaxically implanted in to the both side of the hippocampus for the unipolar registration of the neuronal activity and bipolar stimulation of the CA1 field. Single and paired-pulse electrical stimulation protocol were administrated. After registering the baseline activity unilateral 5 tames kainic acid (KA) injection were performed in the CA3 field of the hippocampus for the generation of epileptiform activity. To evaluate the effect of quercetin/Q-MNP on kainite-induced epileptiform activity tail vein injection of quercetin/Q-MNP were carried out under condition of 60 min ESMFE (1 Tesla). Recording of hippocampal neuronal activity and analyses of obtained data were performed using Chart5.5 software. For statistical analyses was used software PRIZM.

Our experiment showed that quercetin as well as magnetic field itself did not significantly change the mean amplitude and the frequency of neuronal activity. Q-MNP decreased the amplitude and increased the frequency of background activity, Q-MNP induced depression of single evoked responses and changes in strength of PP-facilitation. Preliminary administration of Q-MNP but not quercetin statically reliably reduced the frequency and amplitudes of the repetitive epileptiform discharges caused by intrahippocampal injection of the KA. Our experiments suggests that Q-MNP has inhibitory effects on epileptiform discharges and the exposure of magnetic field improves target-delivery of the Q-MNP to the brain.

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