

Effects of Quercetin-loaded magnetic nanoparticles on disturbances induced by kainic acid status epilepticus in rats

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Epilepsy is a chronic disorder of the CNS characterized by the appearance of spontaneous recurrent seizures generated by an imbalance of excitatory/inhibitory synaptic transmissions. Reduction of the total antioxidant status and the generation of reactive oxygen species were also demonstrated. The special role of flavonoids - antioxidants of plant origin has been identified in the strategy of treating resistant form of epilepsy. The use of nanoparticles for the targeted delivery of drugs on an epilepsy loci is promising modern tool.

Experiments were conducted on rats. Kainic acid status epilepticus (KA-SE) model was used to define anti-amnesic potency of quercetin-loaded magnetic nanoparticles (Q-MNPs). In ketamine-anesthetized control and KA-SE-animals Q-MNPs were injected in the tail vena under external static magnetic field (ESMF) exposure on the brain. Behavioral experiments were performed in the open field and T-maze tests. Prussian blue stain was used to determine the Fe inserts in the brain. In electrophysiological experiments KA-SE-induced changes were monitored and the effects of quercetin/Q-MNPs were analyzed.

Our experiments demonstrated that ESMF/MNPs alone do not change the behavior of animals. Quercetin/Q-MNPs facilitate the learning of the control rats. Only Q-MNPs targeted by ESMF showed statistically significant improvement of KA-SE-induced memory impairment. Quercetin alone/Q-MNPs without ESMF was ineffective against epilepsy-induced memory disturbance. Morphological experiments revealed that the number of Fe inserts are significantly higher in the site of ESMF-exposure with comparison the untreated site, suggesting that the ESMF improves targeted-delivery of the Q-MNPs to the brain. Targeted-delivery of Q-MNPs effectively abolish memory impairment induced by KA-SE.

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