Effect of quercetin-loaded magnetic nanoparticles (Q-MNP) on the epileptiform activity in CA1 field of the hippocampus caused by intrahippocampal injection of kainic acid

Nanuli Doreulee[a], Mariam Kurasbediani[b], Manana Chikovani[b], Roza Bukia[b], Besarion Partsvania[b]

e-mail: nanuli.doreuli@tsu.ge

[a, b] Biology Department, Faculty of Exact and Natural Science, Iv. Javakhishvili Tbilisi State University, University str. 2, 0143, Tbilisi, Georgia

Epilepsy is a chronic disease of the brain that is found in 1% of the world population. The disease is controlled with antiepileptic drugs, but about 35% of epilepsy is resistant. In recent years, treatment strategies have a high focus on flavonoids. Despite their varied biological effects poor bioavailability of flavonoids (e.g. quercetin) limits using them in clinic [1]. The nanoparticles have the ability to load the drugs, thus ensuring their stability and movement across biological membranes [2]. Consequently, determining the influence of Q-MNP on epilepsy locus is actual and important.

The purpose of our research was to load the magnetic nanoparticles (MNP) to the Quercetin and in the presence of unilateral exposure of the external magnetic field on the brain evaluate their effects on the frequency and duration of epileptiform activity caused by intrahippocampal injection of Kainic Acid (KA).

In ketamine-anesthetized wild tape laboratory rats (150-180g) metal 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. After registering the baseline activity using the chemitrode unilateral 5 tames (15min intervals) KA injection (5x1mkl, 7.5mkg KA each times) were performed in the CA3 field of the hippocampus for the generation of epileptiform activity. To evaluate the effect of Q-MNP on epileptiform activity tail vein Q-MNP (54µl DMSO : 4.5mg quercetin+34µl MNP(30nm)+45µl DMSO) injection were carried out under condition of 60 min external unilateral magnetic field (1 tesla) exposure. The effects of Q-MNP on the hippocampal background and evoked (electrical/pharmacological) responses were appreciated. Recording of hippocampal activity and analyses of obtained data were performed by Chart5.5 software (Adinstruments). For statistical analyses was used software PRIZM.

Our experiment showed that Q-MNP as well as magnetic field itself did not significantly change the mean amplitude and the frequency of neuronal activity, although preliminary administration of both factors statically reliably reduced the frequency and amplitudes of the repetitive epileptiform discharges caused by intrahippocampal injection of the KA.

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References

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