Investigation of behavioral effects of Quercetin-loaded iron oxide nanoparticles in rats

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The study of effective remedies against neurodegenerative disorders showed neuroprotective nature of flavonoids - an antioxidant of plant origin [1]. Quercetin is one of the widespread representatives of this group and the interest of scientists towards it contributed to numerous biological abilities of Quercetin [2]. Many of its pharmacological effects are known: anti-inflammatory, anti-bacterial, anti-cancer, but the use of Quercetin has been limited due to it poor bioavailability. The modern approach to solve problem is usage of nanoparticles (NP). It is shown that nanoparticles protect, control the release and increase the influence of bioactive compounds to the target area [3].

The aim of our study was to investigate the effects of intravenous injected Quercetin-loaded magnetic iron oxide nanoparticles (Q-MNP) on behavioral characteristics of the rats and compare it with results from the experiments of systemic application of Quercetin. Experiments were conducted on wild type white laboratory rats (180-200gr). Ketamine-anesthetized animals were fixed in a stereotaxic apparatus and Q-MNPs (Quercetin 4.5mg: 54µl DMSO + 34µl MNP (30 nm) +45µl DMSO) were injected in the tail vena under unilateral external magnetic field (1 tesla) exposure to the temporal lobe projection of the rat brain. After 2-3 days of Q-MNN injection in rats behavioral experiments were performed in the open field and T-maze tests. The animals have been divided into two groups based on the presence or absence of magnetic field. Each group combines 4 series of experiments: 1. control + physiological solution, 2. + MNP, 3. + Quercetin 4. + Q-MNP. The motor activity/emotional state and the number of correct reactions were monitoring in rats in open field (5days, 15min per day) and T-maze tests (11 days of training with 10 trials per day) respectively. For statistical analyses of obtained data software PRIZM was used.

The experiments demonstrated that magnetic field, as well as MNP itself, does not change the behavior of animals in the open field. However Quercetin and Q-MNN improve the learning ability of the rats, which was reflected as a statistically significant increase of the number of correct reaction in T-maze test. There is no difference between the data of Quercetin and the Q-MNP series.

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Reference

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