Role of GLT-1 transporter activation in the effect of ceftriaxone on spatial memory

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INTRODUCTION: In the central nervous system, glutamate appears to be the principal excitatory amino acid neurotransmitter. Recent findings show that beta-lactam antibiotics, by stimulating glutamate transporter (GLT-1) expression, offer neuroprotection. The purpose of our study is to observe the effect of ceftriaxone, a beta-lactam antibiotic, on spatial memory in mice.

MATERIALS AND METHODS: Male Balb-c mice, weighing 20-25 g, were trained in Morris Water-Maze (n=12 for each group) task. Animals were given 4 trials per day for 7 consecutive days to locate a hidden platform (acquisition phase). On the eighth day, the platform is removed and the animals were swum for one session of 60 seconds (retention phase). Learning and memory functions of the animals were evaluated based on their performances in these tests. Ceftriaxone was given for 9 days at different doses (50, 100, and 200 mg/kg, i.p.); additionally, its acute effect was evaluated in one group (200 mg/kg, i.p.). All data were expressed as mean ± SEM. Acquisition phase trials were evaluated by one-way analysis of variance (ANOVA) and repeated measures two-way ANOVA were used for retention phase comparisons, all followed by Bonferroni-t test. Values of p < 0.05 were considered to be significant.

RESULTS: Evaluation of the acquisition parameters, such as time to reach platform, distance moved, mean distance to platform indicate that chronic ceftriaxone has no effect on learning curves of the animals (p > 0.05). When retention phase parameters (e.g. time to reach target quadrant, swim duration in target quadrant, mean distance to platform area) are evaluated, it was found that both chronic and acute ceftriaxone did not affect memory at any dose used (p > 0.05).

CONCLUSION: In contrast to the contribution of GLT-1 expression to various central nervous system diseases, such as chronic pain, amyotrophic lateral sclerosis, Parkinson’s disease and seizures, our findings suggest that ceftriaxone has no effect on spatial memory function in mice.

Key Words: ceftriaxone, glutamate, GLT-1, spatial memory