

Role of short-term dietary restriction on lasting memory following a passive avoidance task in rat

Tajmah Mombeini^{1,2}, Jamal Shams^{2,3}, Ahmad Reza Dehpour⁴

¹ Department of Pharmacology, School of Medicine, Shahed University; ² Neuroscience Research Center, Shahid Beheshti University of Medical Sciences; ³ Department of Psychiatry, Shahid Beheshti University of Medical Sciences; ⁴ Department of Pharmacology, School of Medicine, Tehran University of Medical Sciences; Tehran, Iran.

Background and aims: Dietary restriction (DR) has been shown to be associated with marked changes in brain function. DR may enhance brain functions including learning and memory, synaptic plasticity and neurogenesis, all of which are associated with brain health. Recently in a study, effects of different levels of food restriction on passive-avoidance memory were investigated in young mice. The results showed that the memory after 24 hr of learning was not changed by food restriction, whereas long-term memory was improved significantly in 20% food restriction mice. In addition, 60% and 80% food restriction did not impair the mice's memory. Also, effects of post-trial administration of a cholinergic agonist and a muscarinic antagonist on retention of a passive avoidance task were tested in control mice and compared with those observed following food restriction. Food restriction enhanced the facilitatory effects of oxotremorine and reduced the impairing effects of atropine on memory consolidation. However, effect of dietary restriction on lasting memory, has not been studied, yet. The aim of the present study is evaluating effects of short-term dietary restriction on lasting memory following a passive avoidance task in animal model of rat.

Methods

Twenty-four adult male Wistar rats (260-320 g) were randomly divided into two groups: group I and group II (n=12 per group). The experiment included two phases. At phase I, rats in both group had free access to standard pellet food and tap water from two weeks before passive avoidance procedure. Passive avoidance task was conducted as following: after two days of adaptation of rat to the apparatus, on acquisition day, once rat entered the dark compartment, an electric foot shock (0.8 mA for 2 s) was delivered through the grid floor. The step-through latency was carried out 24 hr later. At phase II, one week after acquisition, normal diet of group II was changed to a diet with 40% decrement, i.e. dietary restriction, DR group, and group I considered as ad libitum group, with no change in amount of received food, both for 14 days. Then, for evaluating lasting memory, step-through latency was tested again (21 days after acquisition).

Results: In phase I, step-through latency was not different between two groups. However, in DR group, step-through latency was significantly decreased at day 21 compared with that in day 1 ($p < 0.001$).

Conclusions: Findings of the present study is suggestive that probably short-term dietary restriction impairs retention of lasting memory following a passive avoidance task in rat.

Key words: *Passive avoidance task, lasting memory, Dietary restriction*