

Dietary Composition Modulates Memory Performance in Rats: Role of β -Amyloid 1-42 and Oxidative Stress - Maha M. Deif - Alexandria University - Egypt

Maha M. Deif

Alexandria University, Egypt

Novel evidence showed that the high fructose consumption impaired cognitive abilities and disrupted the insulin signaling. High-fat diet consumption also caused learning impairment. Learning and memory deficit were induced by β -amyloid peptide 1-42 was documented in recent studies. Based on this assumption, the aim of the present study was to test the hypothesis that diet would modulate β -amyloid 1-42 deposition in the brain, which may be implicated in causing memory deficit.

Introduction:

The novel evidence showed that the high fructose consumption impaired cognitive abilities and disrupted the insulin signaling. High-fat diet consumption also caused learning impairment. Learning and memory deficit were induced by β -amyloid peptide 1-42 was documented in recent studies. Based on this assumption, the aim of the present study was to test the hypothesis that diet would modulate β -amyloid 1-42 deposition in the brain, which may be implicated in causing memory deficit.

Materials and Methods:

The study was conducted on 30 adult male albino rats, aged 12-14 months, ranging in body weight from 150–200 g, divided into 3 groups (n=10), each was given one of 3 different diets: group I given Control diet (CD) consisted of standard chow pellets, group II given high unsaturated-fat diet (HUFd) and group III given high carbohydrate diet (HCD), for the entire test period which lasted for 8 weeks. On the last day of the eight weeks, memory training through water maze test was done. 24 hours later, memory testing was performed after which rats were allowed to fast for 12 hours before being sacrificed. Blood obtained from the jugular vein was collected and plasma was separated for measuring fasting blood glucose and plasma lipids, hippocampus was homogenized and stored for biochemical determinations of β -amyloid 1-42, and superoxide dismutase activity in all groups.

Results:

The results showed a significant improvement of memory consolidation in group II rats (HUFd) manifested by increased time spent in the target quadrant compared with groups I and III, and increased distance swum in the target quadrant compared with group I, however, β -amyloid 1-42 was significantly increased in group III(HCD) compared with groups I and II, SOD activity was significantly decreased in groups II and III compared with group I. Plasma cholesterol, triglycerides and LDL showed a significant decrease in group II relative to groups I and III, unlike HDL which reported a significant increase in group II compared with groups I and III. Fasting blood glucose was significantly increased in group III (HCD) relative to groups I and II with no significant difference between both groups. The total energy intake was significantly decreased in groups II and III compared with the control group with significant increase in group III compared with group II. The weight gain was significantly decreased in group II as compared with groups I and III. Finally, A significant negative correlation was detected between β -amyloid 1-42 and both time and distance spent in target quadrant in all groups signifying memory impairment.

Conclusions:

From the previous findings, we can conclude that high monounsaturated olive oil consumption proved to possess beneficial effects on memory performance and helped to overcome memory deficits found in aging and diseases, such as those related to the overproduction of amyloid- β protein, by decreasing β -amyloid 1-42 deposition in the hippocampus, reversing oxidative damage in the brain and increasing insulin sensitivity effects that are reinforced by improving lipid profile and glucose metabolism.