

Role of Maternal Astaxanthin Supplementation on Brain Derived Neurotrophic Factor and Spatial Learning Behavior in Wistar Rat Offspring's

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Abstract : Background: Maternal health and nutrition are considered as the predominant factors influencing brain functional development. If the mother is free of illness and genetic defects, maternal nutrition would be one of the most critical factors affecting the brain development. Calorie restrictions cause significant impairment in spatial learning ability and the levels of Brain Derived Neurotrophic Factor (BDNF) in rats. But, the mechanism by which the prenatal under-nutrition leads to impairment in brain learning and memory function is still unclear. In the present study, prenatal Astaxanthin supplementation on BDNF level, spatial learning and memory performance in the offspring's of normal, calorie restricted and Astaxanthin supplemented rats was investigated. Methodology: The rats were administered with 6mg and 12 mg of astaxanthin /kg bw for 21 days following which acquisition and retention of spatial memory was tested in a partially-baited eight arm radial maze. The BDNF level in different regions of the brain (cerebral cortex, hippocampus and cerebellum) was estimated by ELISA method. Results: Calorie restricted animals treated with astaxanthin made significantly more correct choices ($P < 0.05$), and fewer reference memory errors ($P < 0.05$) on the tenth day of training compared to offsprings of calorie restricted animals. Calorie restricted animals treated with astaxanthin also made significantly higher correct choices ($P < 0.001$) than untreated calorie restricted animals in a retention test 10 days after the training period. The mean BDNF level in cerebral cortex, Hippocampus and cerebellum in Calorie restricted animals treated with astaxanthin didnot show significant variation from that of control animals. Conclusion: Findings of the study indicated that memory and learning was impaired in the offspring's of calorie restricted rats which was effectively modulated by astaxanthin at the dosage of 12 mg/kg body weight. In the same way the BDNF level at cerebral cortex, Hippocampus and Cerebellum was also declined in the offspring's of calorie restricted animals, which was also found to be effectively normalized by astaxanthin.

Keywords : calorie restriction, learning, Memory, Cerebral cortex, Hippocampus, Cerebellum, BDNF, Astaxanthin

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