

Topic category: Neurosciences

Hypercaloric Feeding Differentially Affects the Neuron Populations of the Hippocampus

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Introduction: The generation of obesity through hypercaloric dieting is accompanied by a reduction of some indexes of cognitive performance such as spatial learning and memory in animal models. This suggests that hypercaloric feeding interferes in the dynamics of the neuron populations of the hippocampus. It is known that feeding hypercaloric diets implies a calorie-based regulation of food intake that results in a reduction of the protein and micronutrient supply, which in itself could affect metabolic and cognitive variables in addition to obesity.

Objective: In this study we discriminate the effects of obesity and undernutrition on the structure of the neuron populations of the Ammon Horn (CA) and the dentate gyrus (GD) of the rat hippocampus.

Material and Methods: A group of rats was maintained on a hypercaloric diet or on a hypercaloric diet supplemented with proteins and micronutrients, for 25 weeks. At the end of the treatment, the animals were tested for spatial learning performance and then sacrificed to obtain the brains. Samples were processed and analyzed by conventional histological technique to evaluate the integrity of the pyramidal neurons of each hippocampal region.

Results: The hypercaloric feeding raised metabolic markers of obesity and insulin resistance, and caused an increase in the number of atrophic neurons in all fields of CA but not in GD. Dietary restitution did not modify the development of obesity; however, it prevented the neuronal damage specifically in CA1 but not in CA 2 to 4. The DG was not affected in any condition. The reduction of neuronal damage in CA1 coincided with an improvement in performance in memory tests.

Conclusions: These results suggest that the hypercaloric diet exerts differential effects on the different neuron populations of the hippocampus, which in some cases are due to nutritional deficiency and in others to obesity itself.

Keywords: hypercaloric diet, rats, neuron population, hippocampus, obesity, insulin resistance

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