

Is High-Fat High-Carbohydrate Diet (HFCD) Neuroprotective? A Magnetic Resonance Imaging Study in Wistar Rats.

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Introduction: Obesity was associated with accelerated aging and elevated risk of neurodegenerative diseases. In animal models, high-fat high-carbohydrate diet (**HFCD**) is commonly used to induce obesity. We hypothesized that HFCD will lead to poorer memory, smaller hippocampi and lower concentrations of brain metabolites in hippocampi, which are predictors of neurodegenerative diseases both in humans and in laboratory animals.

Methods: Twenty five male Wistar rats were put on HFCD (~35% fat, ~35% carbohydrates) on their 55th day of life, while 25 control male rats (CON) remained on chow. Both groups underwent memory tests in 8-arm radial maze at 3rd, 6th, and 9th month. At one year, all animals underwent MRI to evaluate hippocampal volumes and 1H magnetic resonance spectroscopy at 7T.

Results: HFCD rats consumed slightly more calories than CON, but less proteins. However, their protein intake was within recommended amounts. Levels of sugar and ketone bodies were within healthy norms in both groups; however, numerically they were higher in the HFCD group.

Contrary to our hypotheses, HFCD rats had better scores of memory than CON throughout the experiment. At one year, their hippocampi were by 3% larger than in CON ($p=0.05$), whereas concentration of N-acetylo-aspartate (NAA, marker of neuronal viability) was 8% higher ($p=0.01$).

Conclusions: The results do not support the thesis that HFCD *per se* leads to degeneration of the nervous system. On the contrary, they consistently suggest that HFCD enhances memory and slows aging. More research is needed to pinpoint the mediating factors.

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