The Effects of Western Diet on Sarco/Endoplasmic Reticulum Ca2+-ATPase Expression and Calcium Dysregulation in the Brain

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Western diet has been linked with health issues, such as obesity and Alzheimer’s disease. It is vital to understand the mechanisms in which diet affects the brain in order to identify therapeutic targets for diet- induced cognitive disorders. The aim of this study is to examine the effects of western diet on calcium dysregulation, a noted consequence of cognitive disorders, by analyzing sarco/endoplasmic reticulum Ca2+-ATPase (SERCA) , a calcium pump. Cerebral tissue was obtained from a previous study, in which mice were fed with high sucrose/ high fat western diet (WD) or normal diet for 15 weeks. The tissue was then analyzed using western diet analysis. To identify whether the high fat, high sucrose components contribute in calcium dysregulation, NTERA-2 cells, differentiated into neural genotype (hNT) were treated with either palmitic acid or high D-glucose. hNT were then subjected to dual-wavelength ratiometric imaging, then treated with thapsigargin, a SERCA inhibitor to determine the extent in which calcium regulation was impaired. Western blot analysis was conducted on hNT cells to measure SERCA levels after palmitic acid or glucose treatment. Western diet intake resulted in suppression of SERCA in mice cerebral tissue. hNT treated with high glucose or palmitic acid both displayed raised basal levels of free cytoplasmic calcium, and large calcium peaks with treatments of thapsigargen, indicating that both the high fat, high sucrose components of western diet contributes to perturbation of calcium regulation. Furthermore, western blot analysis revealed that prolonged glucose elevations as a consequence of sucrose intake resulted in SERCA suppression.

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