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Effects of Western Diet on Murinometrical and Biochemical Markers and On Metabolism Hepatic in Rat Offspring Subjected to Perinatal Protein Malnutrition

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In the last decades, a new nutritional paradigm has been configured, in which undernutrition has been replaced by overnutrition, characterizing a nutritional transition. This has been associated to the consumption of westernized diets with high fat content and to the increased risk factor for cardiometabolic diseases in adulthood. Herein, we evaluated the effects of a western diet (WD) in the post-weaning offspring subjected to maternal protein restriction on the food consumption (FC), body mass (BM), adipose tissue (AT), serum levels of cholesterol (COL), triglycerides (TGL) and glucose (GLU), and hepatic enzymes activity of the metabolism of carbohydrates [phosphofructokinase (PFK-1) and Glucose-6-phosphate dehydrogenase (G6PDH)], lipids [β -hydroxyacyl-CoA dehydrogenase activity (β -HAD)] and energy production [citrate synthase (CS)]. Adults male *Wistar* rats were used, whose mothers received low (8% protein, LP) or normal protein diet (17% protein, NP) during pregnancy and weaning. After weaning (21 days old), rats were fed with WD or NP until 90 days of life and three groups were obtained: NPNP (n=12), LPNP (n=14) and LPWD (n=12). Data are expressed as mean \pm SEM and analyzed by Student t-test or one-way ANOVA and Newman-Keuls post-hoc test ($p < 0.05$). The procedures were approved by the CEUA/UFPE (044287/2015-96). At 90 days of life, FC decreased in the LPNP and LPWD groups when compared to the control group (NPNP: 19.9 ± 0.4 ; LPNP: 16.1 ± 0.9 ; LPWD: 15.8 ± 0.5 g/day), BM decreased in the LPNP, but not in LPWD group (NPNP: 371.3 ± 7.3 ; LPNP: 320.0 ± 5.7 ; LPWD: 336.2 ± 16.4). Epididimal, mesenteric, retroperitoneal and subcutaneous AT were similar among the groups. Likewise, TGL, COL and GLU serum levels were similar to the control groups. Regarding hepatic enzyme activities, LPWD rats showed G6PDH activity similar to the control, but higher than LPNP group (NPNP: 102.1 ± 9.1 ; LPNP: 46.8 ± 8.7 ; LPWD: 91.8 ± 12.5 U/mg of prot.). However, no differences were observed in PFK-1 activity. With regard to lipid metabolism, β -HAD activity of the LPWD was greater than NPNP and LPNP groups (NPNP: 68.1 ± 19.4 ; LPNP: 128.8 ± 6.0 ; LPWD: 217.0 ± 11.3 U/mg of prot.). CS activity was similar between LPWD and LPNP, but they were higher than control group (NPNP: 3.1 ± 0.5 ; LPNP: 8.8 ± 1.1 ; LPWD: 9.0 ± 0.8 U/mg of prot.). Thus, our data suggests that WD consumption in maternal protein-restricted offspring did not alter the ponderal gain, fat mass and serum levels of markers of the lipid and carbohydrate metabolisms. At least in part, these normal values observed were due to the adaptive mechanisms elicited in liver at 90-days-old, with increased activity of key enzymes of lipid and carbohydrate metabolisms.

Biography:

Simões-Alves, A.C. is nurse at the Federal University of Pernambuco (CAV-UFPE). Master in Nutrition, Physical Activity and Phenotypic Plasticity at the CAV-UFPE. She is currently PhD student in the Graduate Program in Nutrition at the UFPE. She has experience in the field of biochemistry, with emphasis on mitochondrial bioenergetics, cell metabolism and physiology, with emphasis on cardiovascular function and metabolism, acting mainly on the mechanisms underlying the development of cardiometabolic diseases. It is currently studying the repercussions of protein malnutrition in the gestation and lactation period and of western diets during adulthood on cardiometabolic parameters.