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Short-Term Consumption of Hyperlipidic Diet Enhances Serum Lipid Levels and NTS Gene Expression in Rat Offspring Subjected to Maternal Protein Under nutrition

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Protein malnutrition during gestation and lactation (perinatal period) has been identified as one of the main causes for the development of cardiovascular disorders, and when associated with a hyperlipidic diet (HL) it seems to accentuate the effects caused by malnutrition. Thus, we propose to evaluate the short-term effects of the HL on biochemical variables and analysis of gene expression in the offspring of rats coming from mothers subjected to protein malnutrition during the perinatal period. Male Wistar rats were used from dams subjected to normo- (NP: 19% protein, 62.4% carbohydrate and 7.3% lipid) or low protein diet (LP: 9.6% protein, 75.1% carbohydrate and 7.5% lipid) during perinatal period. After weaning (day 21), offspring received NP or HL diet until day 30 [HL: 20% protein, 32% lipids (with respect to fatty acids: 68% saturated, 16% monounsaturated, 16% polyunsaturated) and 49% carbohydrate]. Thus, we obtained the following post-weaning groups: NP-NP, NP-HL, LP-NP and LP-HL. Serum levels of total proteins, albumin, total cholesterol, glucose and triglycerides were analyzed at the postnatal day 21 and 30. At 30-d-old, part of the animals were sacrificed for nucleus the solitary tract (NTS) collection and subsequent analysis by Applied Biosystems 7500 Real-Time PCR System, using RQ- relative quantification of the gene expression of HIF (transcription factor related to cardiovascular risk factor), mTOR and AKT (cellular energy indicators). All protocols and procedures were approved by the Ethic Committee for Animal Use (CEUA). The results are expressed as mean ± SEM and were analyzed using GraphPadPrism® version 5 through Unpaired Student's t test and significance level of $p<0.05$. The analysis of the biochemical parameters of the animals at 21d-old (weaning), showed that protein malnutrition (LP group) reduced serum levels of total proteins (NP: 5.01 ± 0.06, n=19 vs. LP: 4.67 ±0.07 g/dL, n=24, p=0.0014) e albumin (NP: 3.97±0.05, n=19 vs. LP: 3.37±0.03 g/dL, n=24, $p<0.0001$) and increased cholesterol levels (NP: 130.5 ± 3.6 , n= 19 vs. LP: 152.5 ± 6.4 mg/dL, n= 24, p=0.0082). Following short-term consumption of HL (postnatal day 21 until 30), it was demonstrated that the albumin and total protein contents of LP animals were normalized. However, the LP-HL group had greater levels of triglycerides (LP-NP: 143.7 ± 15.5, n=10 vs. LP-HL: 219.3 ± 26.7 mg/dL, n=12, p=0.001) and of cholesterol (LP-NP: 110.8 ± 4.3, n=10 vs. LP-HL: 120.5 ± 3.3 mg/dL, n=12, p=0.001) when compared to the LP.NP. Regarding NTS gene expression, no differences were noted in the levels of HIF. On the other hand, HL post-weaning increased the NTS gene expression of mTOR and AKT in offspring subjected to maternal protein undernutrition (mTor: NP, 0.56±0.02 vs. LP, 0.88 ± 0.06, n= 6, p= 0.006 RQ; AKT: NP, 0.66±0.07 vs. LP.HL: 1.11±0.11, n=6, p= 0.008 RQ). Our data suggested that short-term effects of HL intake by the rat offspring subjected to maternal protein undernutrition may alter the lipid metabolism and can modify cell signaling of energy availability in the NTS.

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 ha experience in the field of biochemistry, with emphasis on mitochondrial bioenergetics, cell metabolism and physiology,