

**Título:** Impact of early overfeeding on the transcriptional regulation of genes associated with food intake control.

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Nutritional environment is critical during perinatal period and could impact in health in adult life. Litter size reduction is a good experimental model for the study of early overfeeding and obesity. Our aim was to analyze the effects of early overfeeding on the brain control of food intake in rats at postnatal day (PND) 21. Male offspring were divided in 2 experimental groups: small litter (SL, n=4) or normal litter (NL, n=10), from PND3 to PND21. On PND21, animals were sacrificed and the body weight and epididymal fat pad (EFP) were measured. Micropunch technique was used to isolate specific nuclei from rat brains. Energy intake control neuropeptides and mesolimbic dopaminergic related genes were measured by RT-PCR and their epigenetic control were analyzed (N=10/group). Our results showed that the SL group had higher body and EFP weights than the NL group. Moreover, SL rats showed changes in the expression of: a) anorexigenic and orexigenic neuropeptides on specific nuclei of the hypothalamus; and b) mesolimbic dopaminergic related genes in ventral tegmental area and nucleus accumbens. Changes in gene expression were related with the methylation status of their promoter regions, suggesting that the SL group developed an anorectic signal in different regions of the brain controlled by methylation-related mechanisms. Overfeeding during lactation triggered an epigenetic control of genes related with food intake, regulating the body energy balance in SL animals at weaning.