Unpredictable variable prenatal stress programs expression of genes involved in appetite control and energy expenditure

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Exposure to stress in the womb shapes neurobiological and physiological outcomes of offspring in later life, including body weight regulation and metabolic profiles. Our previous work utilizing a centrifugation-induced hypergravity demonstrated significantly increased (8-15%) body mass in male, but not female, rats exposed throughout gestation to chronic 2-g from conception to birth. We reported the same outcome in adult offspring exposed throughout gestation to Unpredictable Variable Prenatal Stress (UVPS). Here we examine gene expression changes using our UVPS model to identify a potential role for prenatal stress in this hypergravity programming effect. Specifically we focused on appetite control and energy expenditure pathways in prenatally stressed adult (90-day-old) male Sprague-Dawley rats. Time-mated female rats were exposed throughout their 22-day pregnancy to UVPS consisting of white noise, strobe light, and tube restraint individually once per day on an unpredictable schedule for 15, 30 or 60 min. To control for potential changes in postnatal maternal care, newborn pups were fostered to non-manipulated, newly parturient dams. At 90-days of age, we analyzed plasma concentrations of hormones involved in appetite control and energy expenditure (leptin and adiponectin), and quantified expression of key genes in epididymal fat pads harvested from adult male offspring and controls. Leptin regulates energy balance by inhibiting hunger, and adiponectin modulates glucose levels and fatty acid breakdown. Our findings indicate significantly elevated plasma leptin concentrations and reduced expression of epididymal fat leptin (OB) and adiponectin (ADIPOQ) genes compared to controls. Analyses presently underway include quantification of plasma insulin and glucose, and the expression of ghrelin, a peptide that acts on the central nervous system and the body's perception of hunger. Collectively, these findings will further understanding of the consequences of UVPS on body weight regulation and metabolism, and provide further insight into the effect of gravity modulation on mammalian fetal development. Research supported by NICHD 1R0150201 and NASA NNA04CK83.