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Abstract

The Effect of a Maternal Cafeteria Diet on Adipose Tissue Browning in Rats and the Body Composition of Mothers and Their Offspring †

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Abstract: Obesity is a growing public health problem worldwide, including among pregnant women. The Western dietary pattern, with its high energy density and low nutritional value, supports excessive fat accumulation in the body and the obesity epidemic. Three types of adipose tissue are known: white (WAT), beige (BeAT), and brown (BAT). BAT and BeAT have the potential to oxidize fatty acids and glucose and dissipate energy in the form of heat. The aim of this study was to investigate the effects of a maternal cafeteria diet administered in an animal model prior to pregnancy, during pregnancy, and during lactation on the body composition and browning of adipose tissue of females and their offspring. Eight-week-old female Wistar rats were fed prior to conception, during pregnancy, and during lactation with a cafeteria diet (CAF) or a control diet (C). After weaning, the offspring were fed a standard AIN93G semisynthetic diet. Body mass and composition were measured (Minispec LF90II, Bruker). The transcript levels of *Ucp1* and *Cidea* in the rats' BeAT were determined using real-time PCR (LightCycler 480 II, Roche). The CAF offspring had lower body weights at PND 4 than the C group offspring (9.6 ± 0.3 vs. 10.4 ± 0.2 g, $p < 0.005$). CAF male and female offspring had lower body weight values than the control group from postnatal day (PND) 21 to 60 ($p < 0.05$). The amount of adipose tissue in females from the CAF group was lower than in group C females at PND 35 ($p < 0.05$). The CAF group had higher *Ucp1* transcript levels in male offspring at PND 40 and 45 ($p < 0.05$) than the C group, but the *Cidea* transcript levels did not differ between the groups. It was concluded that a maternal cafeteria diet affected the body weight of the offspring of both sexes. However, adiposity-related outcomes were affected in a sex-specific manner. The level of adipose tissue was lower only in female offspring. On the other hand, transcripts of the *Ucp1* gene, which is a marker of browning, were altered only in male offspring.

Keywords: cafeteria diet; *Ucp1*; adipose tissue; obesity

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