

Altered adipose tissue metabolism in offspring of dietary obese rat dam

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Abstract :

To investigate further the mechanisms of developmental programming, we analysed the effects of maternal overnutrition and of postnatal high-fat feeding on adipose tissue metabolism in the offspring. Postnatal changes in serum adiponectin, leptin and TAG [triacylglycerol (triglyceride)] levels, adipose tissue TAGs, fatty acids and enzyme activities were determined in offspring of cafeteria-diet-fed dams during gestation and lactation, weaned on to standard chow or on to cafeteria diet. Obese rats showed higher adiposity (+35% to 85%) as well as a significant increase in serum glucose, insulin, leptin, adiponectin and TAG levels ($P < 0.01$) and adipose tissue LPL (lipoprotein lipase) and GPDH (glycerol-3-phosphate dehydrogenase) activities ($P < 0.01$), compared with control pups at weaning (day 21) and at adulthood (day 90). Adipose HSL (hormone-sensitive lipase) activity was increased only at day 90 ($P < 0.05$), and FAS (fatty acid synthase) activity remained unchanged. The proportions of SFAs (saturated fatty acids) and MUFAs (mono-unsaturated fatty acids) and the $\Delta(9)$ -desaturation index were significantly increased ($P < 0.05$), whereas PUFAs (polyunsaturated fatty acids) were decreased ($P < 0.01$) in serum and adipose TAGs of obese pups compared with controls. The cafeteria diet at weaning induced more severe abnormalities in obese rats. In conclusion, maternal overnutrition induced permanent changes in adipose tissue metabolism of the offspring. These pre-existing alterations in offspring were worsened under a high-fat diet from weaning to adulthood. Consequently, adipose adipokines and enzymes could provide a potential therapeutic target, and new investigations in this field could constitute strategies to improve the impact of early-life overnutrition.

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