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Publication date:
2012

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Citation (APA):

Ingvorsen, C., & Hellgren, L. (2012). *Maternal high-fat/high-sucrose diet during lactation results in increased adipose tissue mass, and altered hepatic fatty acid metabolism at weaning*. Abstract from Symposium for Biotech Research at DTU - Systems Biology, Lyngby, Denmark.

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Maternal high-fat/high-sucrose diet during lactation results in increased adipose tissue mass, and altered hepatic fatty acid metabolism at weaning

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Aim Maternal nutrition during gestation and lactation has been implicated as a factor that might modulate the metabolic risk of the offspring. Therefore, we have investigated how maternal high-fat/high sucrose diet during gestation and lactation effect weight and weight gain during lactation, as well as lipid liver metabolism and metabolic status at weaning.

Methods Female obese-prone rats were fed a conventional (C) or a high fat/high sucrose (HFHS) diet for 17 weeks before and during gestation and lactation. All female pups are sacrificed at day 0 and male pups are cross-fostered during lactation giving 4 groups of offspring: (maternal diet during gestation, maternal diet during lactation) CC, CH, HC and HH. Male pups are then sacrificed at weaning at 4 weeks of age.

Results There were no difference in weight and metabolic status of the dams before or after gestation and lactation. The C born pups had a higher birth weight ($p=0.06$), and a significantly higher weight gain the first week resulting in a higher body weight at 1 and 2 weeks of age. From 2 weeks of age, the diet of the lactating dam dominates the effect on the offspring's growth rate. Although there were no difference in fat content of the milk, pups lactated by HFHS dams have an increased weight gain during 3th and 4th week of lactation, resulting in increased adipose tissue mass and circulating leptin at weaning. Interestingly, at four weeks of age, all groups that had been either born or lactated by HFHS-fed dam's had increased blood glucose, but only pups both born and lactated by HFHS-dams had significantly increased HOMA-IR. Furthermore, based on substrate/product ratios, it is evident that both pre- and postnatal HFHS-intake by the dams affected the activity of hepatic $\Delta 5$ - and $\Delta 6$ -desaturases, and hence potentially the long-chained n-6 and n-3 PUFA levels in the offspring.