Long-term effects of nutrition on mammary gland development and milk composition leading to offspring predisposition to obesity

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Aim of the study

Mammary epithelial growth and differentiation are tightly modulated by several hormonal and metabolic signals (Hennighausen and Robinson, 2005). The major developmental steps of this organ may be altered by differences in the body weight due to inadequate nutrition during lifetime periods of critical importance (Sejrsen et al, 1997). In humans, obesity is considered to be a major worldwide health issue and a predisposing risk for the morbidity of type 2 diabetes, hypertension and cardiovascular diseases. Obesity has also been strongly correlated with an increased risk of mammary tumorigenesis (Stoll, 2000).

We have further investigated the impact of dams obesity on mammary gland development of the offspring. During this study, we used a model of rabbits receiving an obesogenic diet (OB rabbits), starting before puberty and extended until weaning. We have studied lactation of those animals and followed the growth of the offspring, which was first fed by an OB or C (control) milk and after weaning by an OB or C diet. Moreover, mammary phenotype of the offspring was analysed.

Experimental design

Model: obese female rabbit

Results

Weight differences according to the type of milk:
Pups OB milk / OB diet > Pups T milk / OB diet

- Abnormal mammary gland development in OB/OB rabbits (nanozoomer and electron microscopy).
- Distension of ducts and accumulation of products in the lumen (OB/OB rabbits).

Conclusion

Consuming a milk from a OB mother potentiates the effect of an OB diet. Results provide an insight on effects of maternal obesity on lactation and on growth of their offspring. They might thus lead to breastfeeding recommendations to obese women.