

Study of the long-term impacts of the duration of lactation period on the maternal energy metabolism in mice

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Abstract

Repeated exposition to pregnancy/breastfeeding or pregnancy without breastfeeding in mice results in different changes related to energy metabolism and body weight. Breastfeeding for 21 days seems to promote increased cholesterol but not glucose levels. In addition, regular breastfeeding is paralleled by increased body weight 21 days after delivery, as compared to age-matched control mice.

Key words: Pregnancy, lactation, metabolism

Introduction

Several medical studies demonstrate that the duration of the lactation period exerts long-term impacts on maternal metabolism. In general, these studies demonstrate that longer lactation inversely correlates with the maternal risk for metabolic syndrome. Mothers that breastfeed for short periods develop an inadequate profile of circulating lipids (high levels of LDL and low levels of HDL), higher levels of circulating TG, increased body weight and increased risk of Type 2 Diabetes Mellitus (DMT2)¹. However, the mechanisms through which lactation period impacts maternal energy metabolism are not fully described. The present project aimed to establish an experimental model that allowed mice to breastfeed for different time intervals after delivery for two consecutive cycles of pregnancy. These mothers were assigned to the following groups: Lac-0 - mice that did not breastfeed after delivery; Lac-10 - mice that breastfed for 10 days after weaning; Lac-21 - mice that breastfed for 21 days after delivery. Virgin age-matched mice were used as controls.

Results and Discussion

We found that body weights (21 days after deliveries) and total cholesterol levels were increased in Lac-21 mice compared to those of the others groups ($P < 0.05$). Breastfeed for 21 days also correlated with a trend towards increased LDL-c and HDL-c levels immediately after weaning. Fasting glucose levels in Lac-0 and Lac-10 mice exhibited increased, but not significant values ($P = 0.17$ and 0.15), when compared to the virgin counterparts. Data obtained after second cycle of pregnancy/lactation are shown in Table 1.

Table 1: Biochemical and morphological parameters after the second cycle of pregnancy/lactation

Groups	Virgin	Lac-0	Lac-10	Lac-21
Triglyceride (mg/dL)	55,40 +/- 10,73 (5)	57,51 +/- 13,55 (4)	54,93 +/- 4,648 (2)	57,28 +/- 4,470 (4)
Cholesterol (mg/dL)	51,36 +/- 7,866 (5)	61,39 +/- 9,435 (4)	59,57 +/- 10,74 (3)	95,27 +/- 16,80 (4)
VLDL (mg/dL)	11,08 +/- 2,145 (5)	11,50 +/- 2,710 (4)	10,99 +/- 0,9295 (2)	11,46 +/- 0,8941 (4)
LDL (mg/dL)	11,95 +/- 5,473 (3)	12,49 +/- 10,09 (4)	18,00 +/- 2,933 (2)	37,72 +/- 19,25 (4)
HDL (mg/dL)	34,76 +/- 1,745 (4)	37,40 +/- 5,836 (4)	34,76 +/- 3,998 (3)	46,09 +/- 7,247 (4)
Glicemia (mg/dL)	85,40 +/- 19,98 (5)	105,0 +/- 18,89 (4)	108,3 +/- 17,95 (3)	92,75 +/- 6,652 (4)
Body weight 21 days after delivery (g)	22,77 +/- 1,351 (5)	24,45 +/- 0,5153 (4)	27,20 +/- 1,972 (3)	30,94 +/- 2,634 (4)

Conclusions

This data is still preliminary but points to differential metabolic adaptation of mothers subjected to distinct breastfeeding periods. As our results reveal, breastfeed for 21 days seems to promote increased cholesterol but not glucose levels. We are currently extending the follow up of our dams to elucidate whether these adaptations yield long-term impacts on maternal health.

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¹ Stuebe, A. M.; Rich-Edwards, J. W.; Willett, W. C.; Manson, J. E. e Michels, K. B. *JAMA*. **2005**, 294, 2601.