mRNA abundance of the components of the adiponectin system in adipose tissue and in liver of dairy cows supplemented with or without conjugated linoleic acids throughout lactation

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Introduction

Adiponectin is an adipokine related to lipid metabolism and insulin sensitivity. Activation of adiponectin receptors 1 and 2 (AdipoR1 and AdipoR2) increases insulin sensitivity and decreases inflammation. In men and mice, AdipoR1 is expressed ubiquitously and most abundantly in skeletal muscle, whereas AdipoR2 shows high expression levels mainly in liver. Both receptors mediate increased AMPK and PPARα ligand activities, β-oxidation and glucose uptake by adiponectin. Early lactation in high yielding dairy cows results in negative energy balance associated with reduced insulin sensitivity. Supplementing diets with conjugated linoleic acids (CLA) decreases milk-fat and might thereby reduce the energy requirements for milk production and thus ameliorate metabolic stress.

Objectives

- Characterization of mRNA expression of adiponectin in subcutaneous (s.c.) adipose tissue and of AdipoR1 and AdipoR2 in liver tissue during an entire lactation period
- Testing the effects of CLA during lactation on the expression of the adiponectin system components

Materials and Methods

Multiparous Holstein Frisian cows were divided into a control group (n=10) and a CLA group (n=11, receiving 10 g each of the cis-9,trans11- and the trans-10,cis-12-CLA isomers per day from day 1 post partum until day 182). Biopsies were collected from s.c. adipose tissue from tail head and from liver at day -21, 1, 21, 70, 105, 182, 196, 224 and 252 relative to calving. The mRNAs of adiponectin in s.c adipose tissue and of AdipoR1 and AdipoR2 in liver were quantified by real-time RT-PCR (for the CLA group only d -21, 21, 105, 196 and 252). Data were normalized based on data from three reference genes (RG) and analyzed with the general linear model or nonparametric test ($p \leq 0.05$).

Results

The mRNA abundance of adiponectin in s.c. adipose tissue (Fig.1) and its receptors in liver was not different between control and CLA group. Therefore, data from both groups were merged for further analyses. Adiponectin mRNA abundance in s.c. adipose tissue (Fig. 2) decreased post partum (p.p.) compared to ante partum values (a.p.). AdipoR1 mRNA abundance in liver (Fig. 3) increased p.p. vs. a.p. AdipoR2 expression in liver (Fig.4) also increased in early lactation but decreased again in late lactation.

Conclusion

- We herein provide a comprehensive longitudinal study about lactation-related changes in mRNA abundance of the three components of the adiponectin system.
- The mRNA expression seems unaltered by CLA indicating that CLA does not affect the adiponectin system under the conditions investigated.

Acknowledgements

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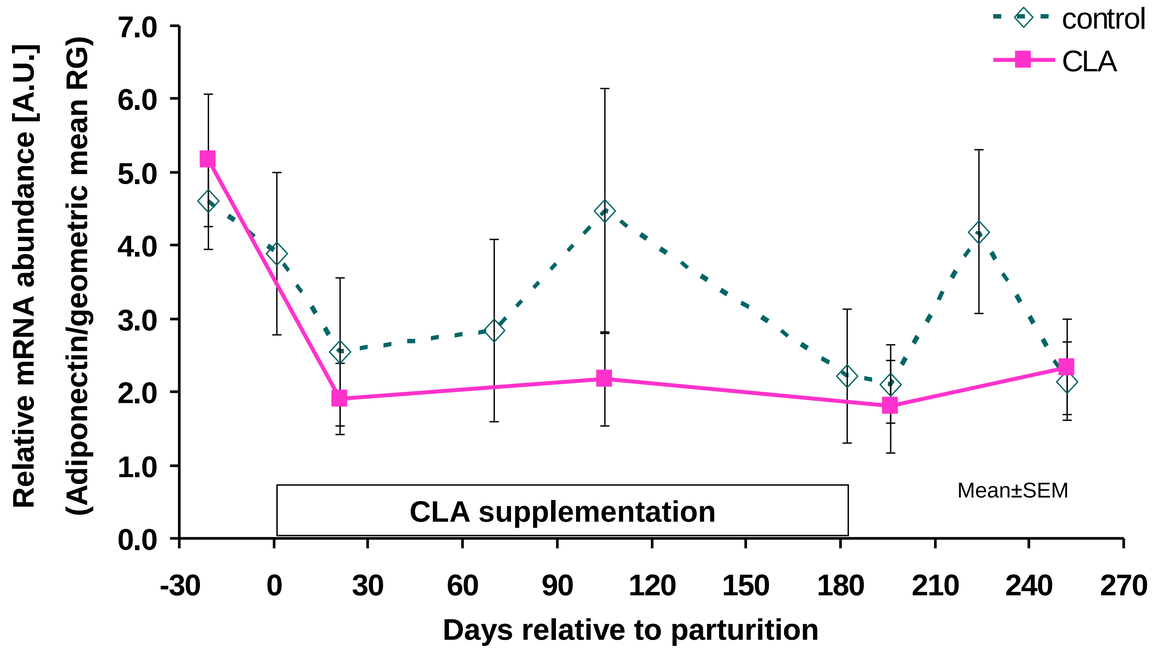

Fig. 1 Timely changes of **adiponectin mRNA** abundance **in s.c. fat** from dairy cows treated with or without CLA during 182 days of lactation

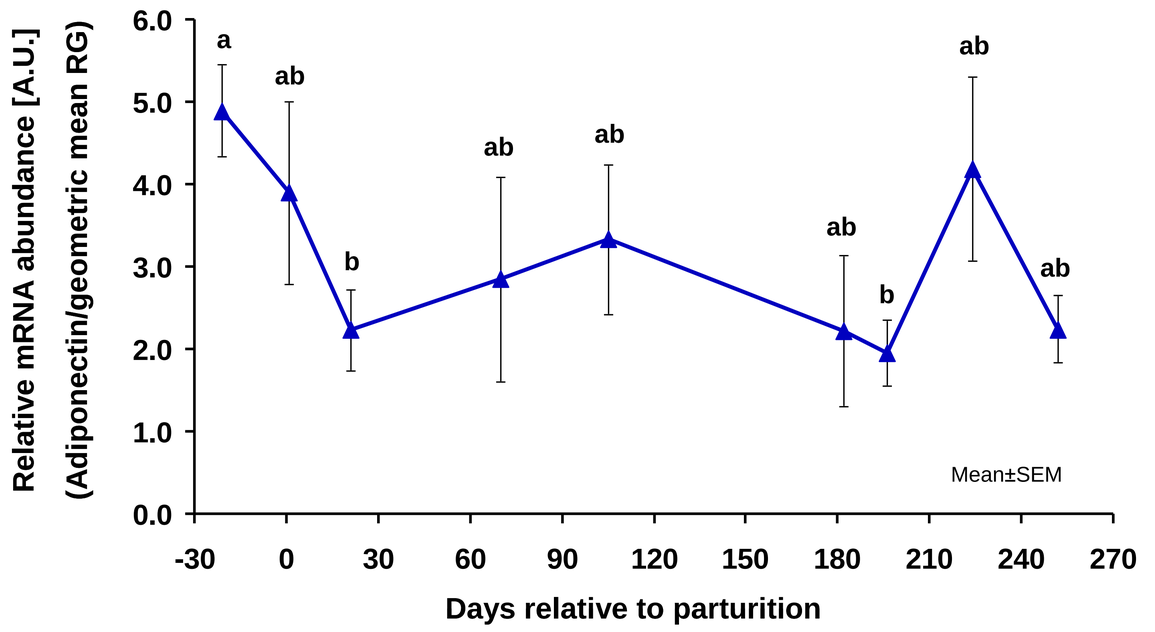

Fig. 2 Timely changes of **adiponectin** mRNA abundance **in s.c. fat** from dairy cows during late pregnancy and the following 252 days lactation

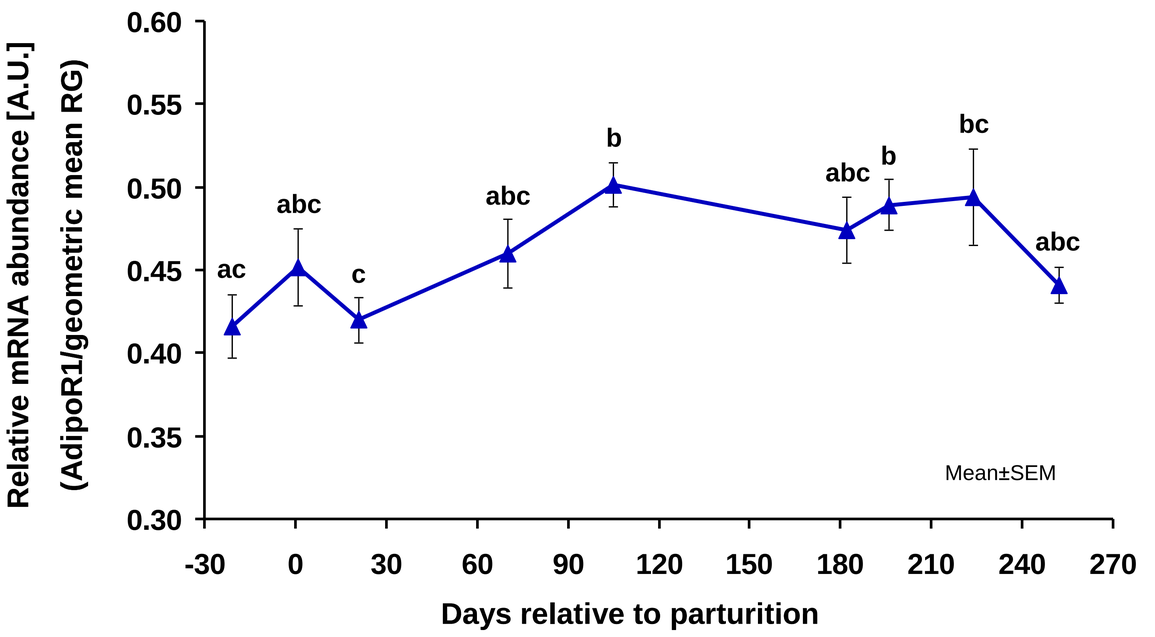

Fig. 3 Timely changes of **AdipoR1 mRNA** abundance **in liver** from dairy cows during late pregnancy and the following 252 days lactation

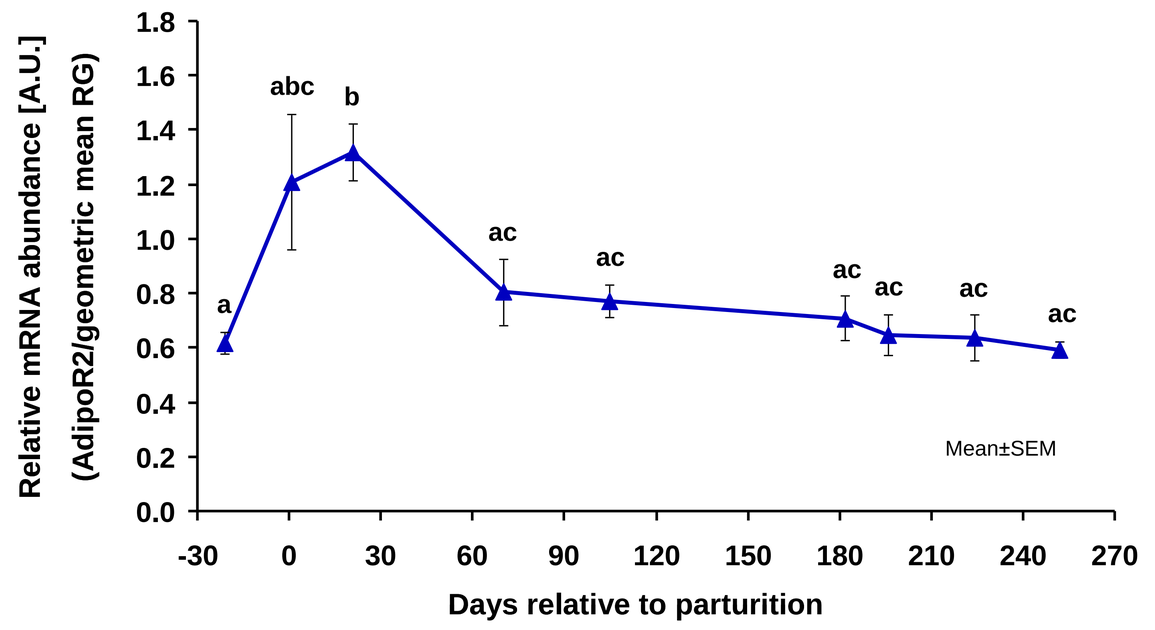

Fig. 4 Timely changes of **AdipoR2 mRNA** abundance in **liver** from dairy cows during late pregnancy and the following 252 days lactation