# Haptoglobin mRNA expression in bovine adipose and liver tissue: Physiological and conjugated linoleic acids (CLA)-induced throughout lactation

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## Introduction

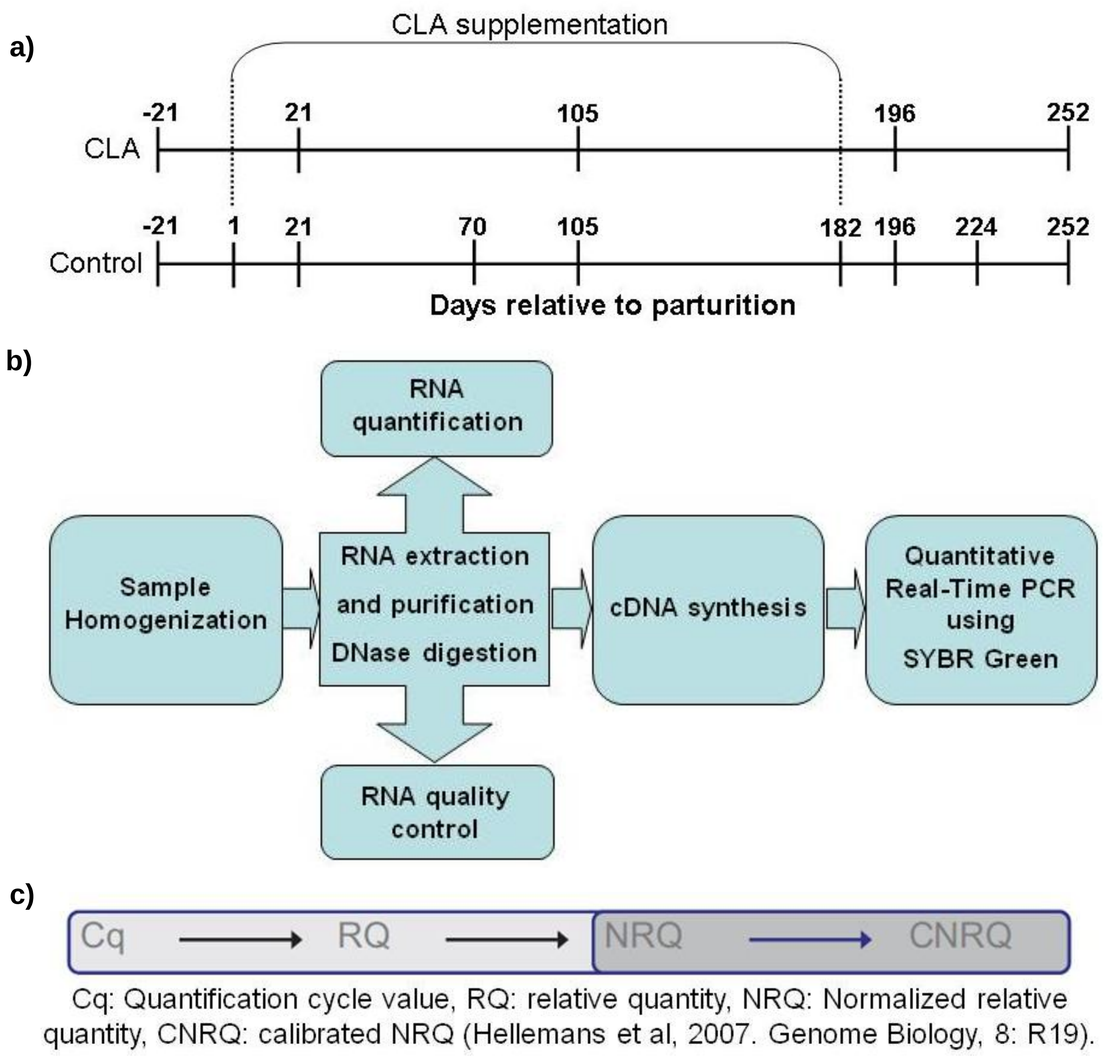
- Haptoglobin (Hp) is the most relevant acute phase protein in cattle, secreted mainly by the liver.
- In rats, supplementation with CLA affects Hp in serum, but not Hp mRNA abundance in liver.
- For dairy cows, Hp mRNA expression in liver has not been comprehensively characterized during an entire lactation period; for bovine adipose tissue (AT), we documented the presence of Hp and now provide quantitative data.

## Objectives

- Characterization of mRNA expression of Hp in subcutaneous (sc) adipose tissue and liver tissue during an entire lactation period.
- Consideration of CLA supplementation on the mRNA expression of Hp.

## Materials and Methods

Holstein Frisian heifers were grouped as control (n=10) or CLA (n=11, receiving 10 g each of the cis-9,trans-11 and the trans-10,cis-12-CLA isomers from d 1 in milk (DIM) until d 182). Workflow was as shown in Fig. 1. Data were analyzed using repeated measurement analysis (SAS 9.2, P<0.05).




Cq: Quantification cycle value, RQ: relative quantity, NRQ: Normalized relative quantity, CNRQ: calibrated NRQ (Hellemans et al, 2007. Genome Biology, 8: R19).

Fig. 1: a) Time table of biopsies (scAT and liver), b) Lab work flowchart, c) Data normalization based on geometric mean of three most stable reference genes (Eucariotic translation initiation factor, lipoproteinreceptor-related protein 10, LRP10; RNA polymerase 2 in liver and glycerylaldehydephosphate dehydrogenase, LRP10 and RNA polymerase 2 in scAT).

## Results

CLA did neither affect liver nor AT Hp mRNA abundance. Therefore, data from both groups were merged for further analyses. At calving, Hp mRNA abundance in liver increased (P<0.05, Fig. 2&3) from prepartal values by a factor of 9 and then decreased again to precalving values. Between DIM 182 and 196, Hp mRNA increased again [5.3 fold, P<0.05]. In AT (Fig. 4), the amount of Hp mRNA was lower than in liver and was detectable in 49% of the samples only (Table 1). No significant time-related differences were observed throughout lactation for Hp mRNA in AT.

## Conclusion

- Here, a comprehensive longitudinal study about lactation-related changes in Hp mRNA abundance is provided for both liver and AT.
- The peak in liver Hp mRNA after calving corresponds to Hp serum concentrations and confirms the liver as main source of Hp during acute phase reactions.
- The Hp mRNA expression seems unaltered by CLA, indicating that CLA does not affect Hp under the conditions of this investigation.
- Hp expression role in AT might rather be related to local inflammatory reactions and requires further investigation.

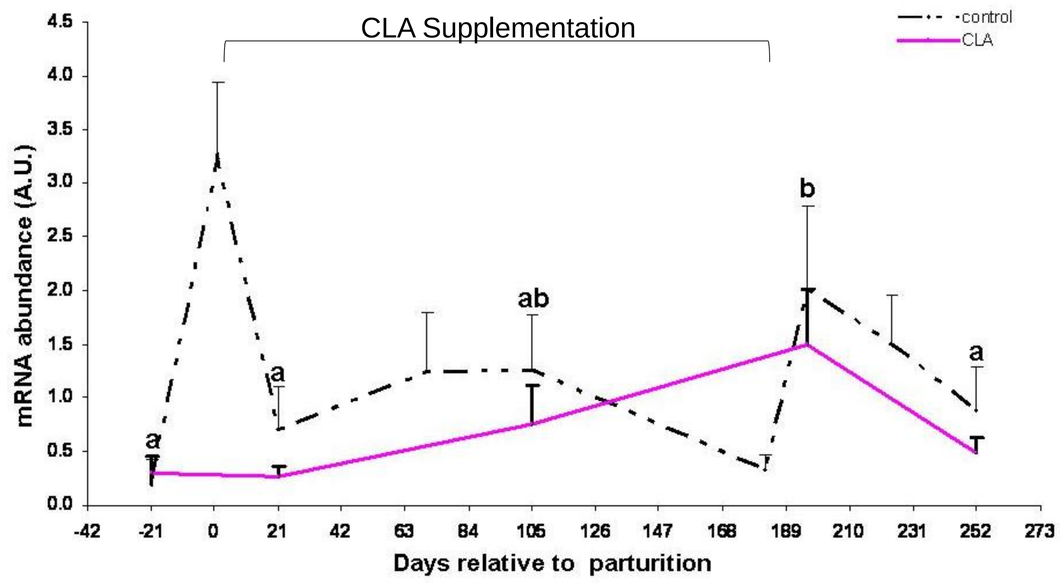



Fig. 2: **Haptoglobin mRNA** abundance **in liver** of dairy cows in control and CLA group during late pregnancy up to 252 DIM

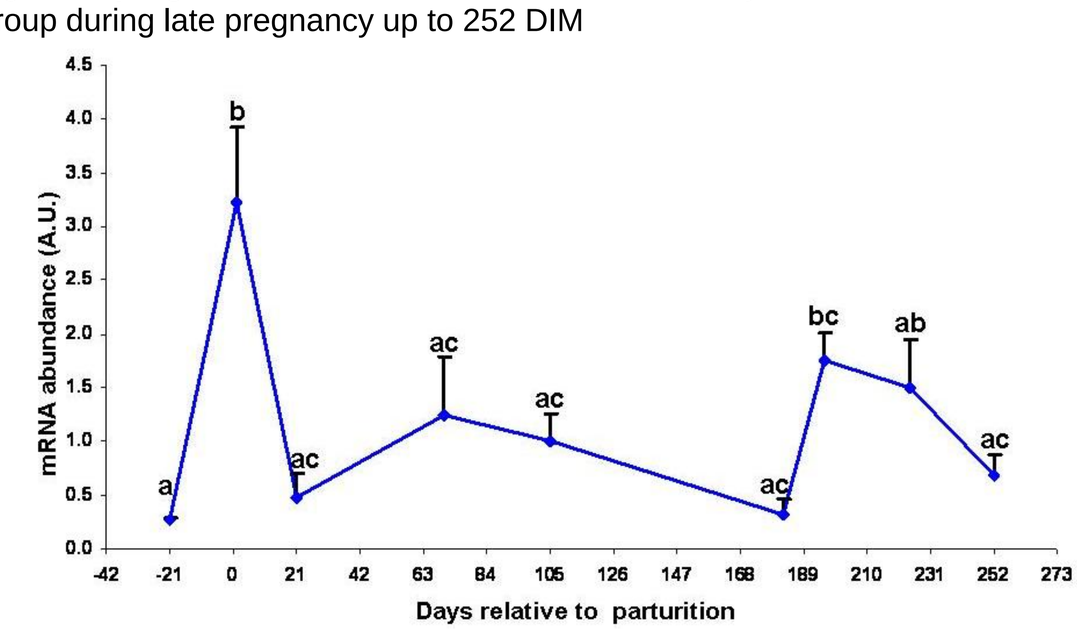



Fig. 3: Physiological changes in **Haptoglobin mRNA** abundance **in liver** of dairy cows during late pregnancy up to 252 DIM

Table 1: Number of AT biopsies with Hp expression in control or CLA groups

| Days | -21 | 1 | 21 | 70 | 105 | 182 | 196 | 224 | 252 |
|---|---|---|---|---|---|---|---|---|---|
| control | 8 | 5 | 7 | 3 | 7 | 4 | 3 | 3 | 5 |
| CLA 100 | 10 | 0 | 9 | 0 | 5 | 0 | 2 | 0 | 5 |

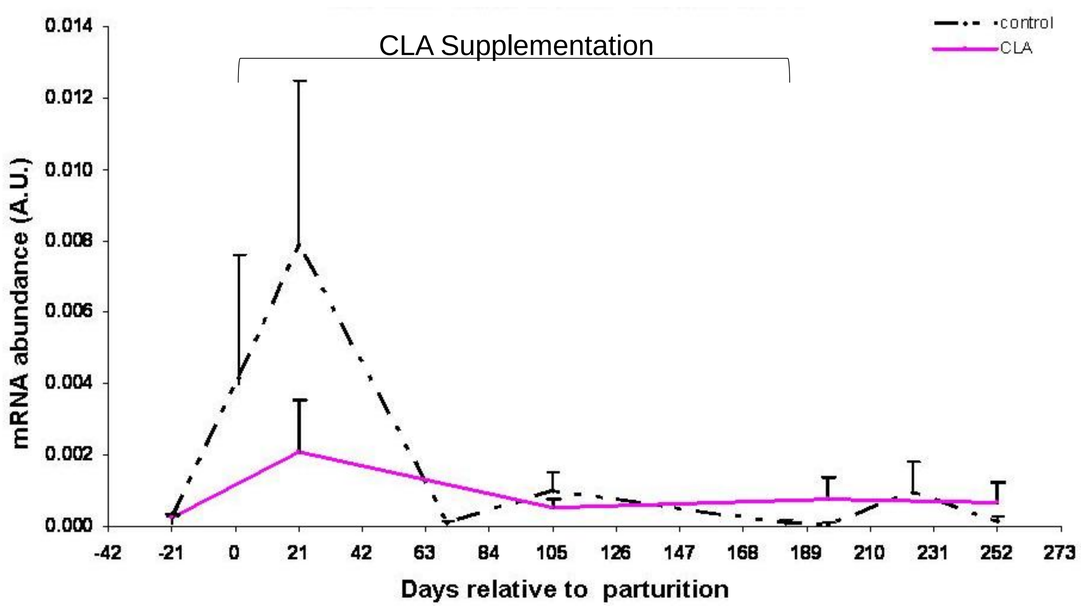



Fig. 4: **Haptoglobin mRNA** abundance **in scAT** of dairy cows in control and CLA group during late pregnancy up to 252 DIM (Data from samples in which Hp mRNA were not detectable were not considered in this graph and in the respective statistics)

## Acknowledgements

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