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Adiponectin and leptin system: long term physiological and conjugated linoleic acid induced changes

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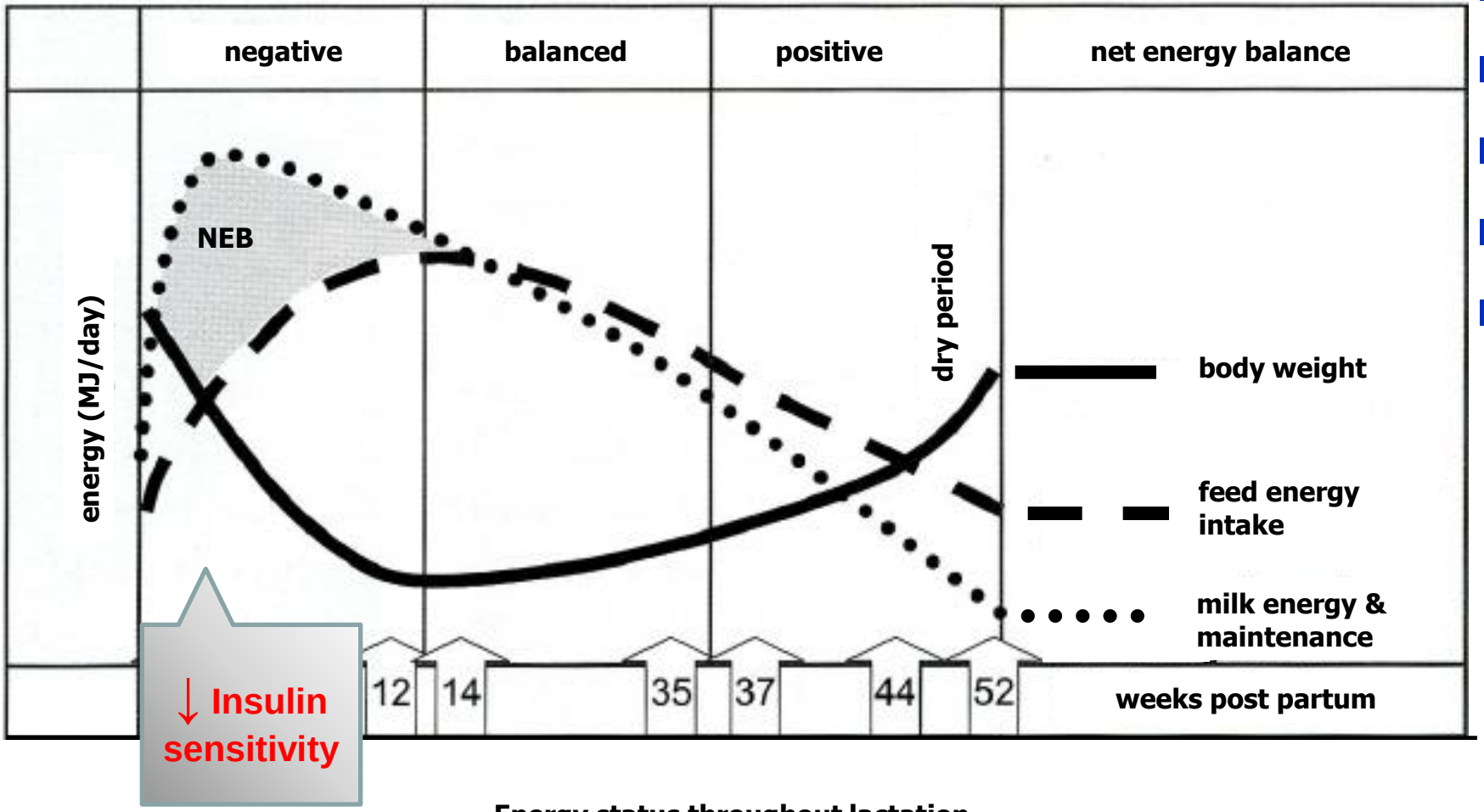
Introduction



Energy status throughout lactation

Adapted from Busch et al (2004)

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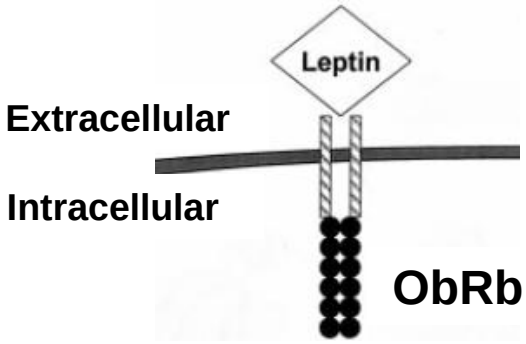
Introduction



LEP

Kawachi et al (2007)

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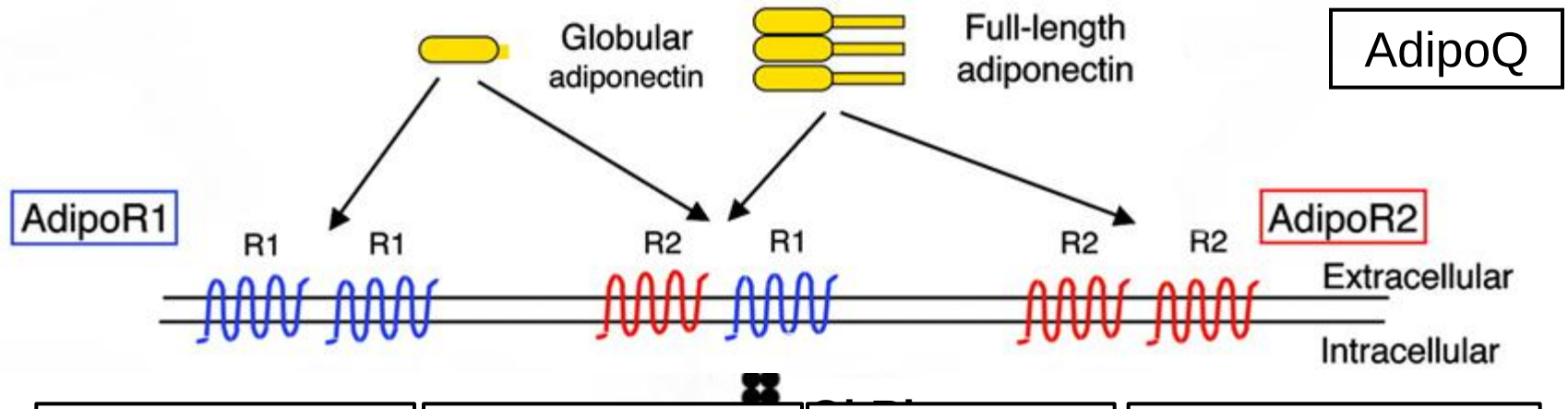
Introduction



Glucose uptake ↑ Skeletal muscle	FA oxidation ↑ Skeletal muscle	FA oxidation ↑ Liver	Gluconeogenesis ↓ Liver
Glucose uptake ↑ Adipose tissue	FA oxidation ↑ Adipose tissue		

Kadowaki and Yamauchi (2005)
Wu et al (2003)
Puigserver et al (2001)

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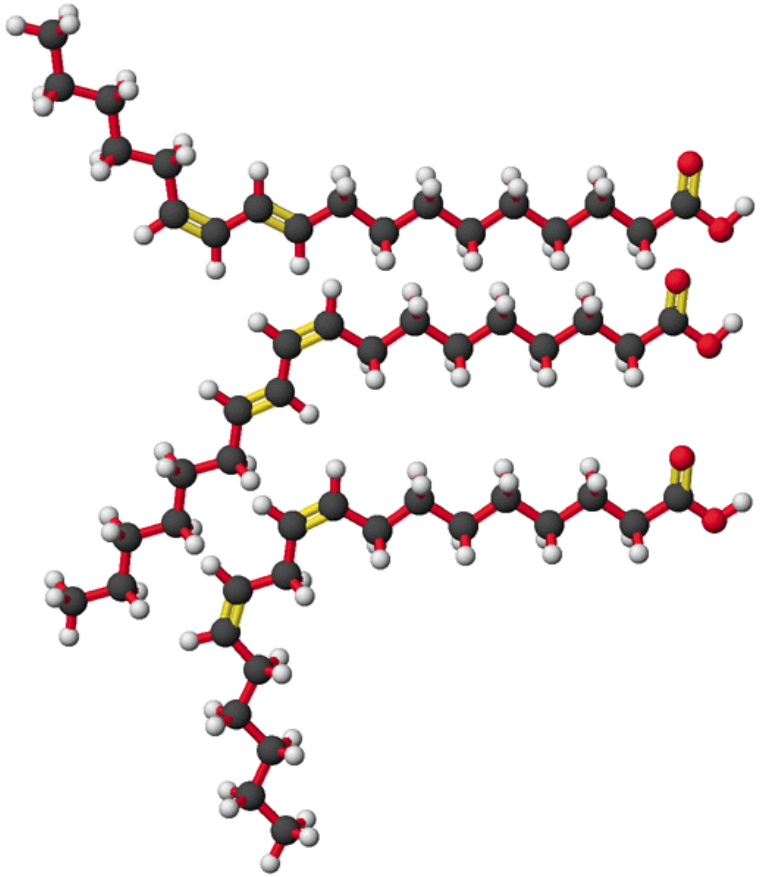
Introduction

conjugated linoleic acids (CLA)



trans-10, cis-12 CLA

cis-9, trans-11 CLA

linoleic acid (cis-9, cis-12)

- **Milk fat ↓**
- **Adipocyte size ↓**
- **No effect on insulin, leptin, etc**

- **Insulin sensitivity ↓**
- **Fat mass ↓**

Monogastrics **Dairy cows**

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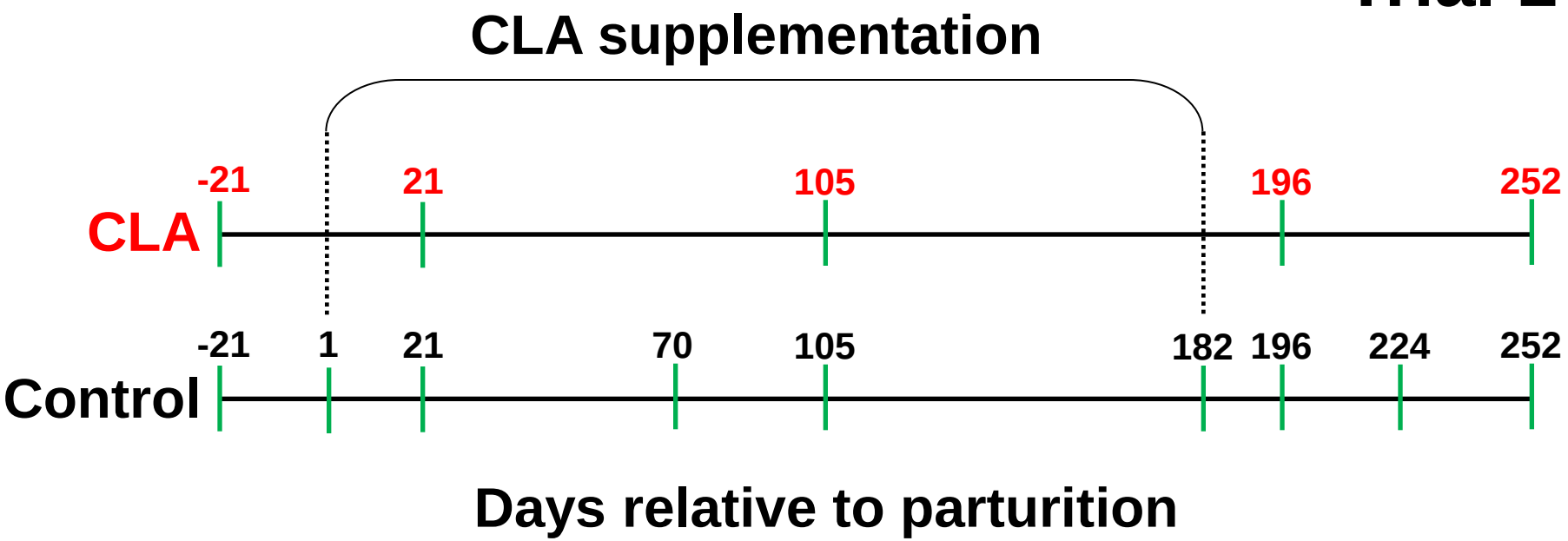
Materials & methods

Days when biopsies from s.c.AT and liver were taken

Trial 1



Control (10 cows)
CLA substituted with stearic acid
(Silafat®, BASF, Germany)
100 g/day

CLA (11 cows)
12% each of the *cis-9, trans-11* and the *trans-10, cis-12* isomers
(Lutrell pure®, BASF, Germany)
100 g/day

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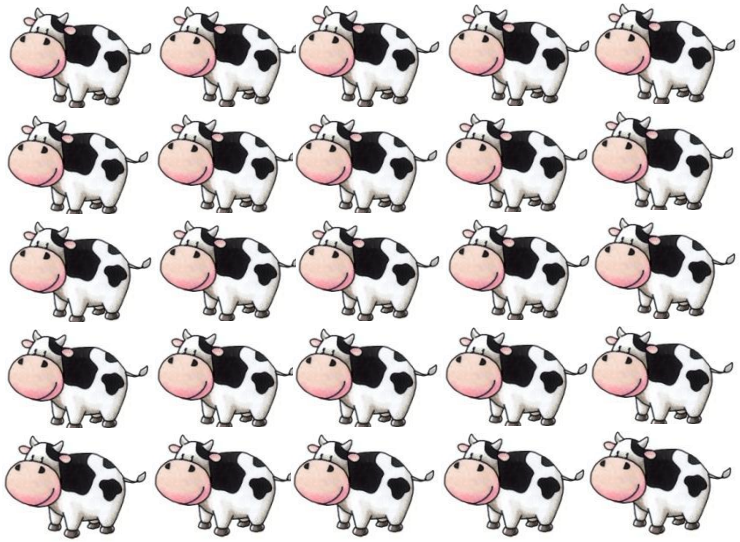
Materials & methods

25 heifers

Trial 2



Control

CLA substituted with stearic acid
(Silafat®, BASF, Germany)
100 g/day

CLA

12% each of the *cis-9, trans-11* and the *trans-10, cis-12* isomers
(Lutrell pure®, BASF, Germany)
100 g/day

Materials & methods

Trial 2

Day 1 post partum

Day 42 post partum

Control

Day 42 post partum

CLA

Day 105 post partum

Day 105 post partum

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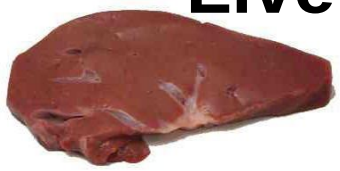
Materials & methods

Semitendinosus Muscle

Trial 2

Liver



Mammary gland

Adipose tissues (AT)

Subcutaneous (s.c.)

- Sternum
- Tail head
- Withers

Visceral (v.c.)

- Mesenterial
- Omental
- Retroperitoneal

Materials & methods

- ✓ **mRNA abundance (Ab) determined using real-time PCR**

- ✓ **Statistics (SPSS, $P < 0.05$):**
  - **Mixed model (trial 1)**
  - **GLM or non parametric test (trial 2)**

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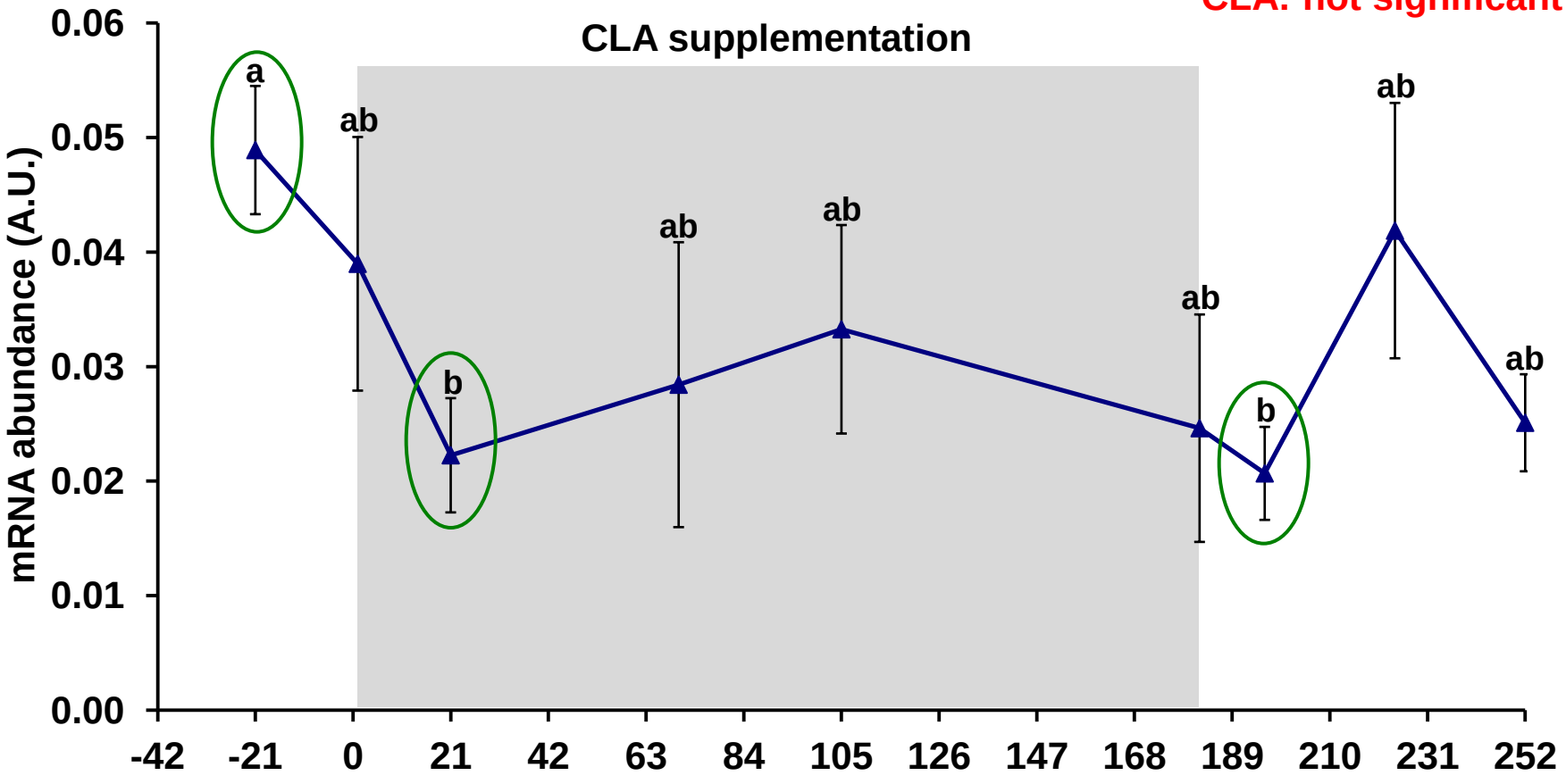
AdipoQ mRNA Ab in s.c. AT (trial 1)

CLA: not significant



a, b: significant differences between dates ($P < 0.05$)

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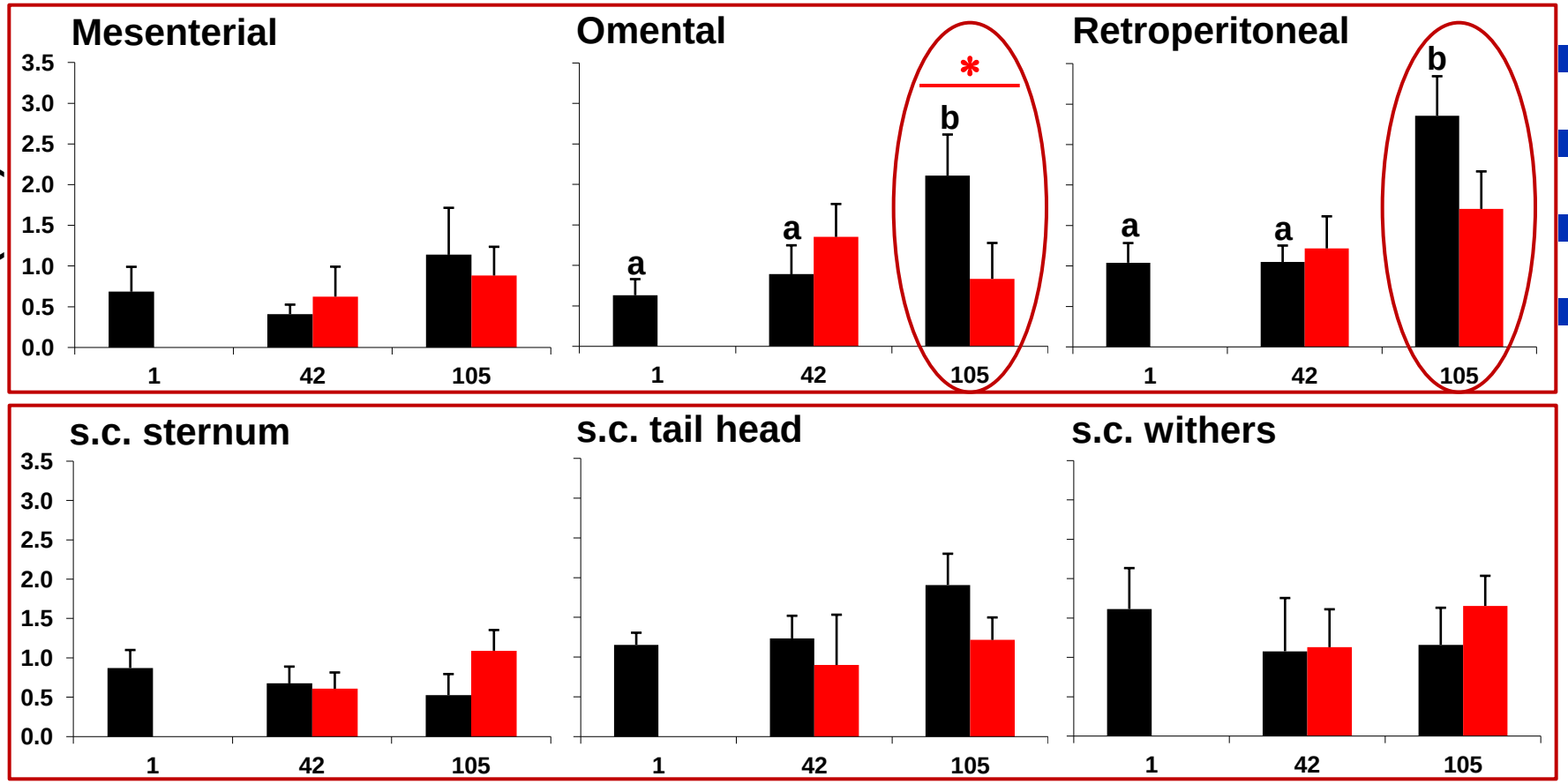
AdipoQ mRNA Ab in different AT (trial 2)



a, b: significant differences between dates ($P < 0.05$)

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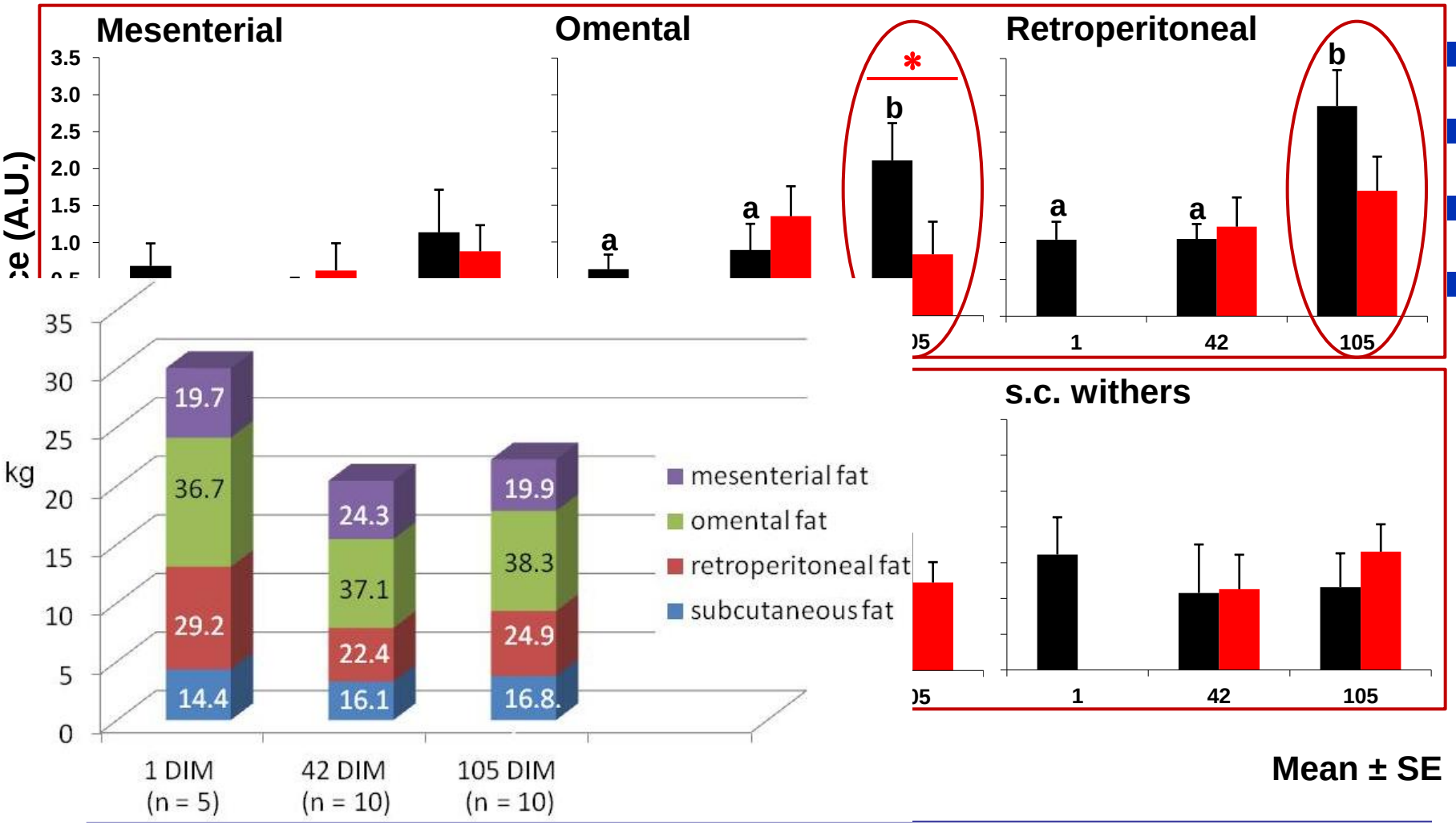
AdipoQ mRNA Ab in different AT (trial 2)



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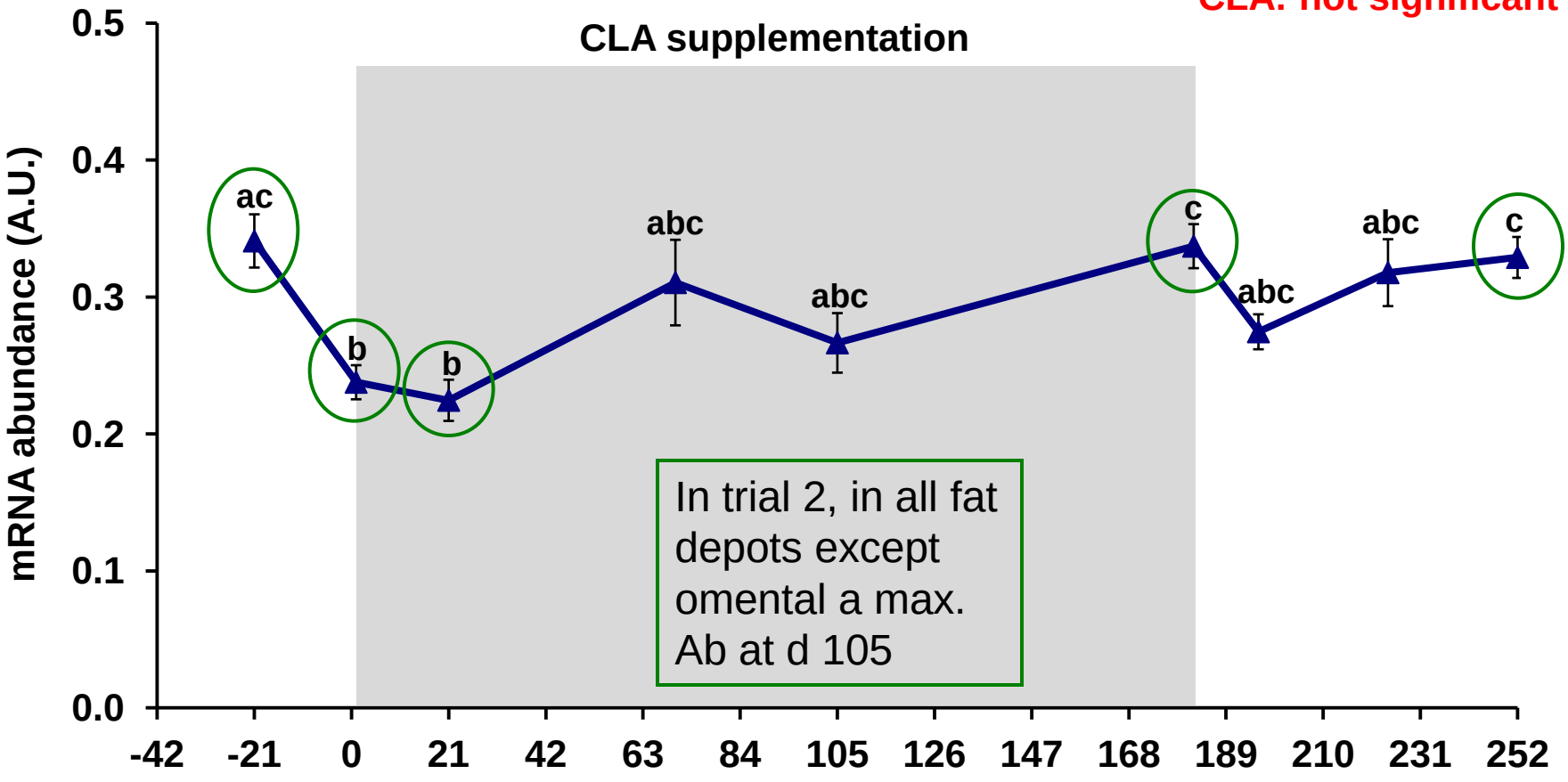
AdipoR1 mRNA Ab in s.c. AT (trial 1)

CLA: not significant



a, b: significant differences between dates ($P < 0.05$)

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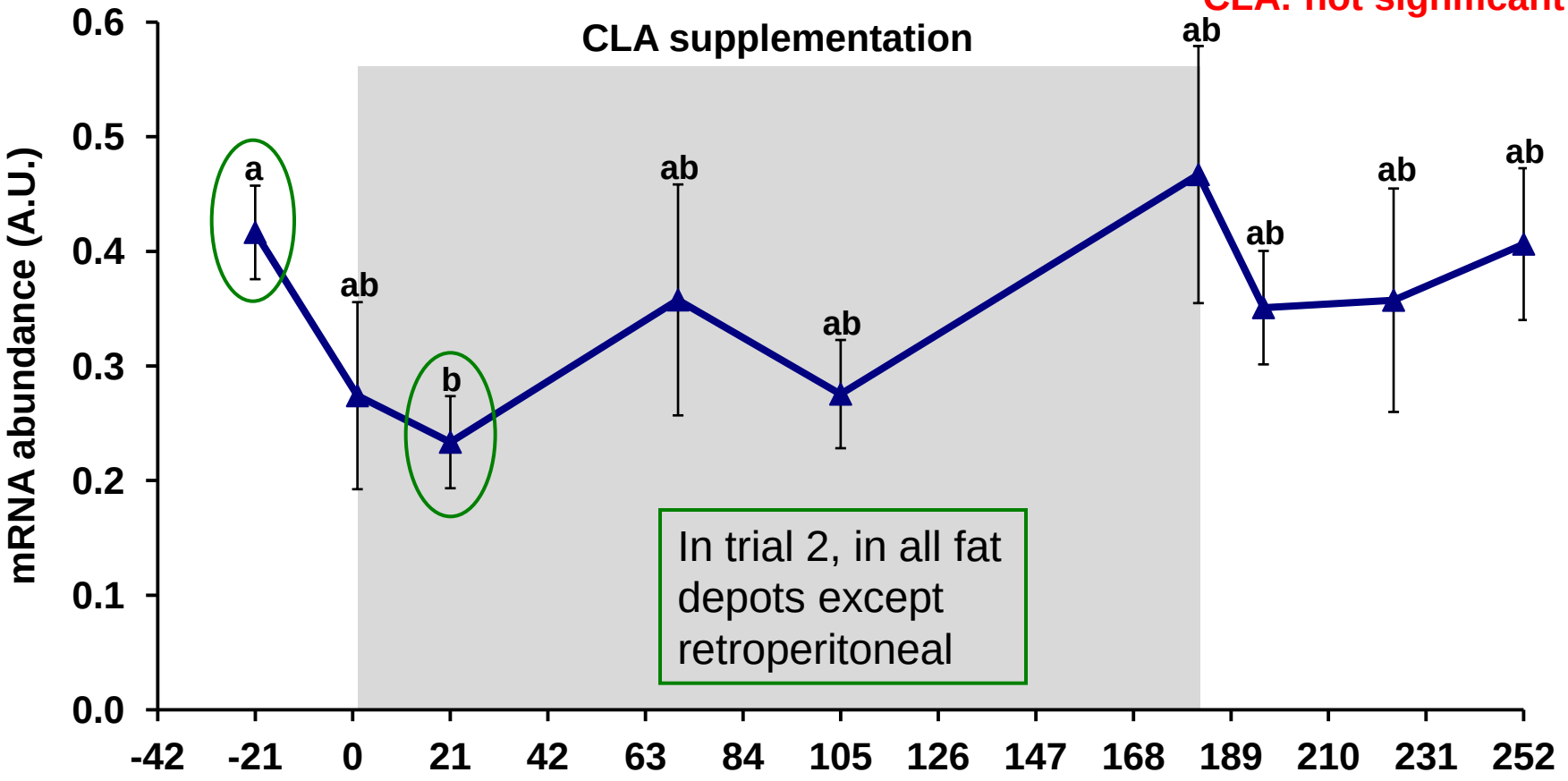
AdipoR2 mRNA Ab in s.c. AT (trial 1)

CLA: not significant



a, b: significant differences between dates ($P < 0.05$)

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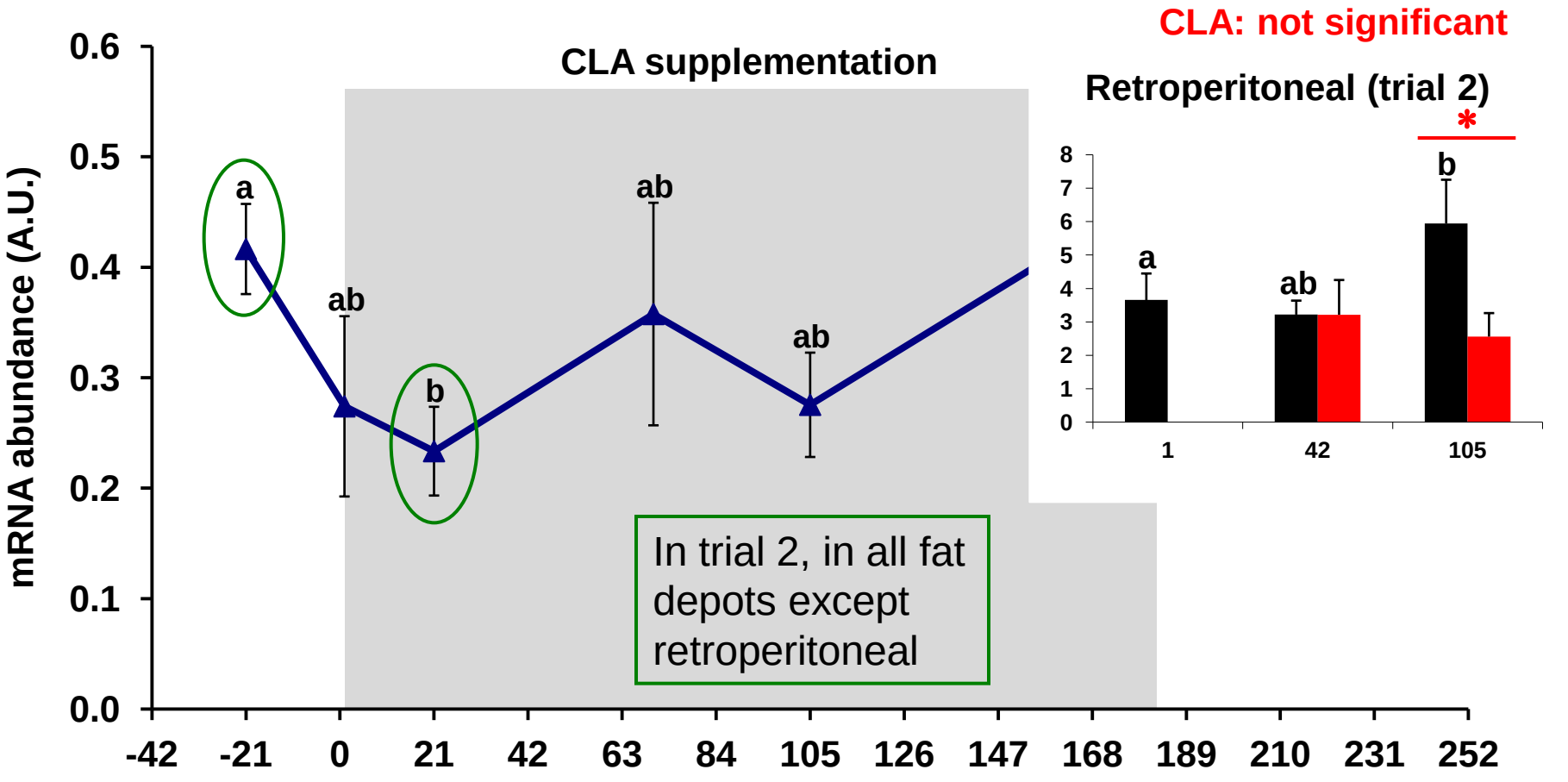
AdipoR2 mRNA Ab in s.c. AT (trial 1)



a, b: significant differences between dates ($P < 0.05$)

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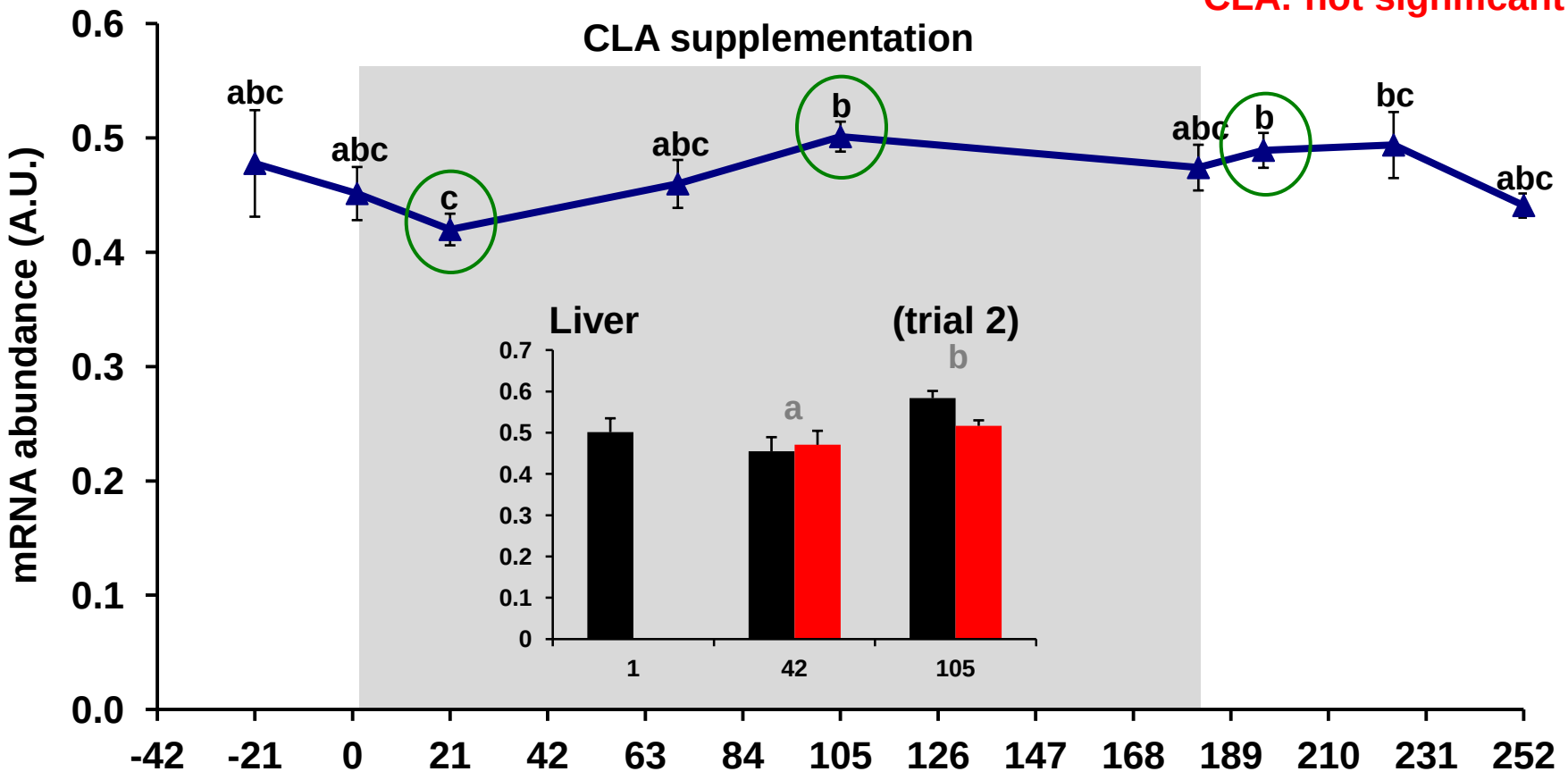
AdipoR1 mRNA Ab in liver (trial 1)

CLA: not significant



a, b: significant differences between dates ($P < 0.05$)

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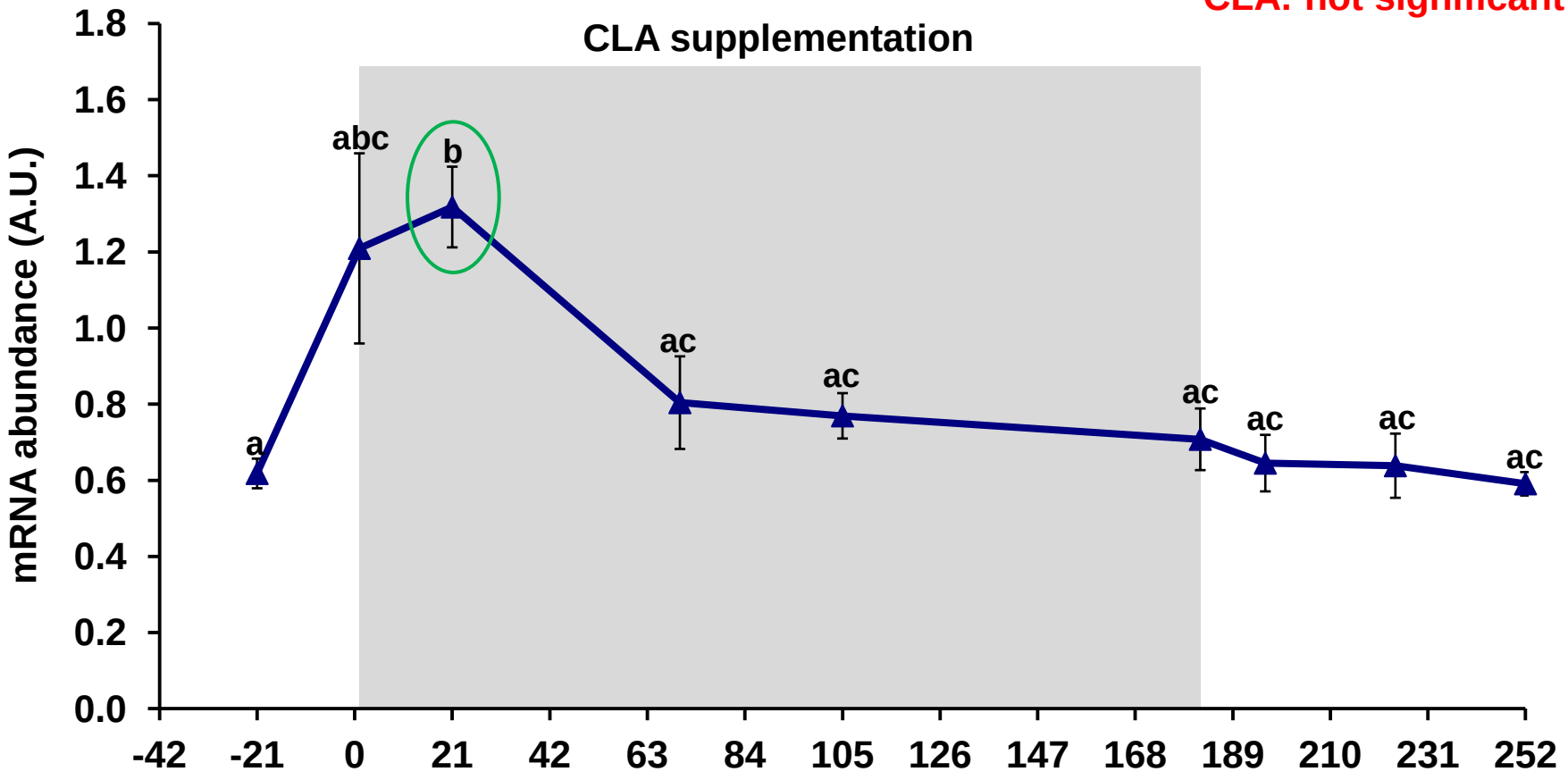
AdipoR2 mRNA Ab in liver (trial 1)

CLA: not significant



a, b: significant differences between dates ($P < 0.05$)

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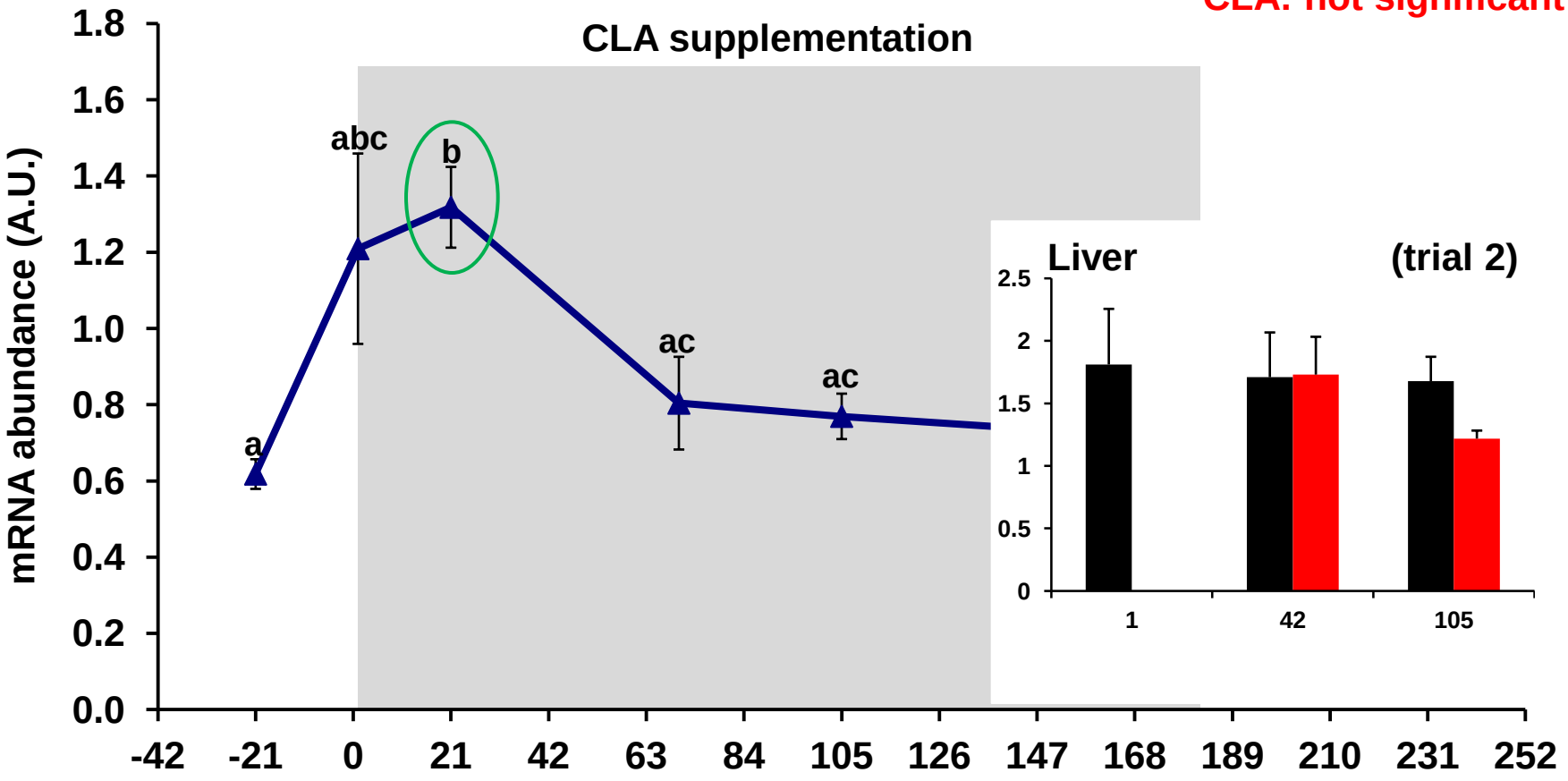
AdipoR2 mRNA Ab in liver (trial 1)

CLA: not significant



Merged data from control & CLA

Days relative to parturition

Mean ± SE

a, b: significant differences between dates ($P < 0.05$)

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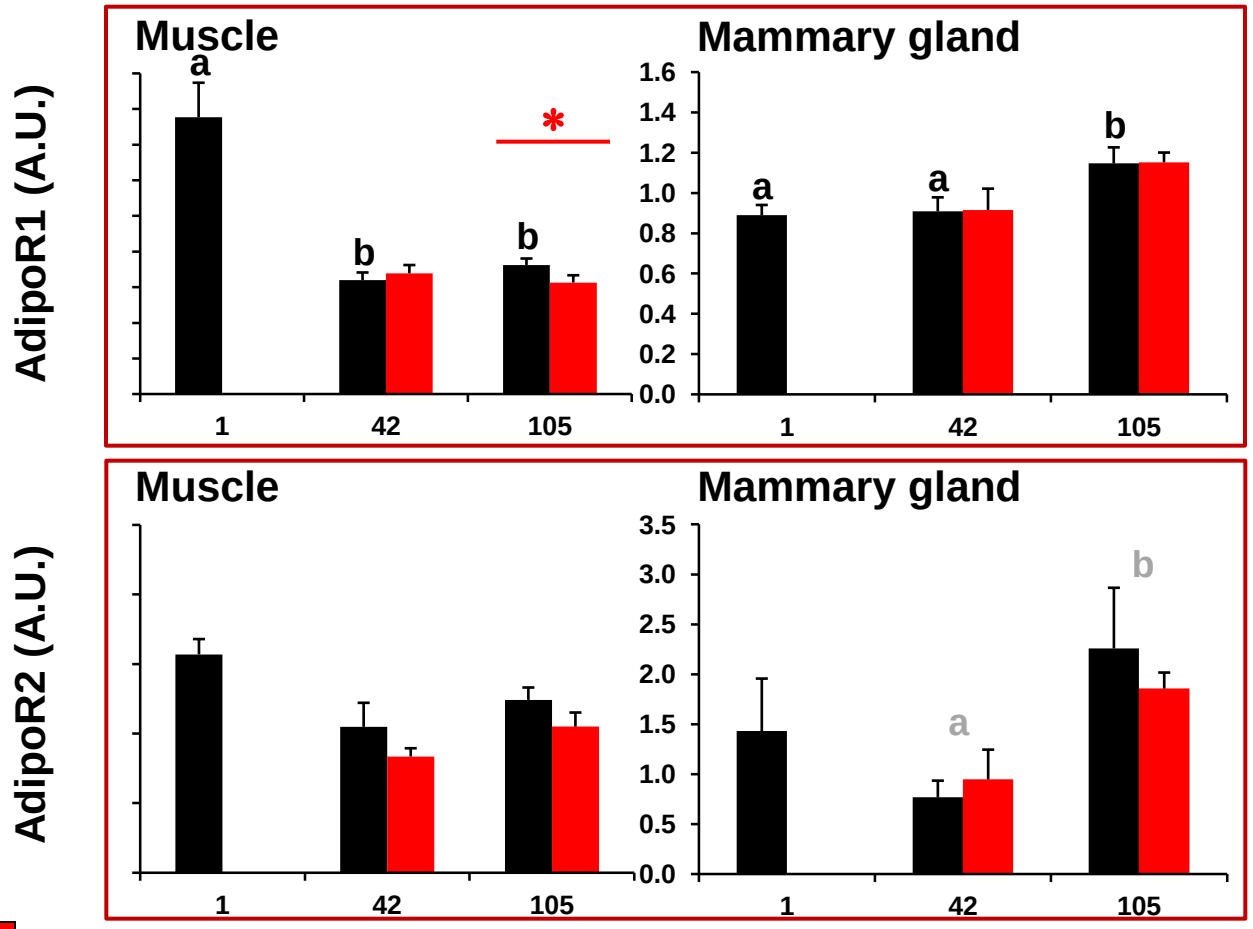
AdipoR1&R2 mRNA Ab in non AT (trial 2)



a, b: significant differences between dates ($P < 0.05$)

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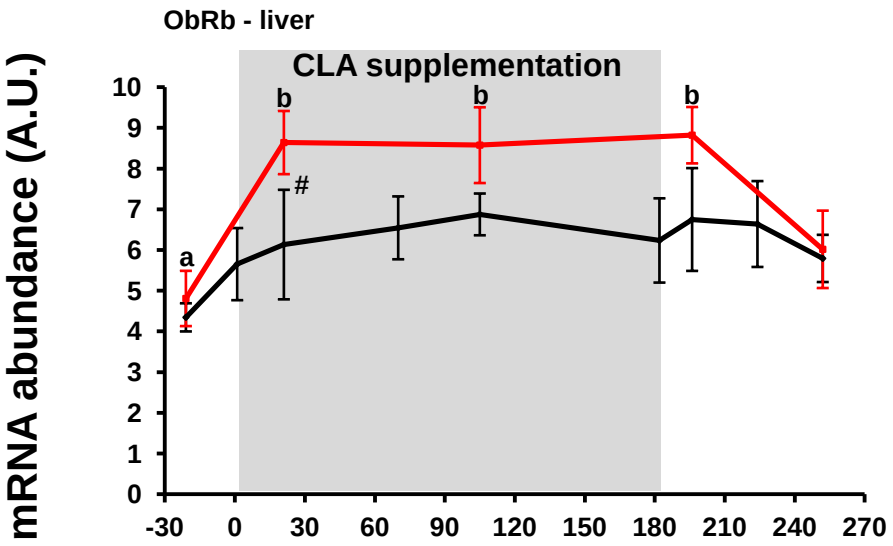
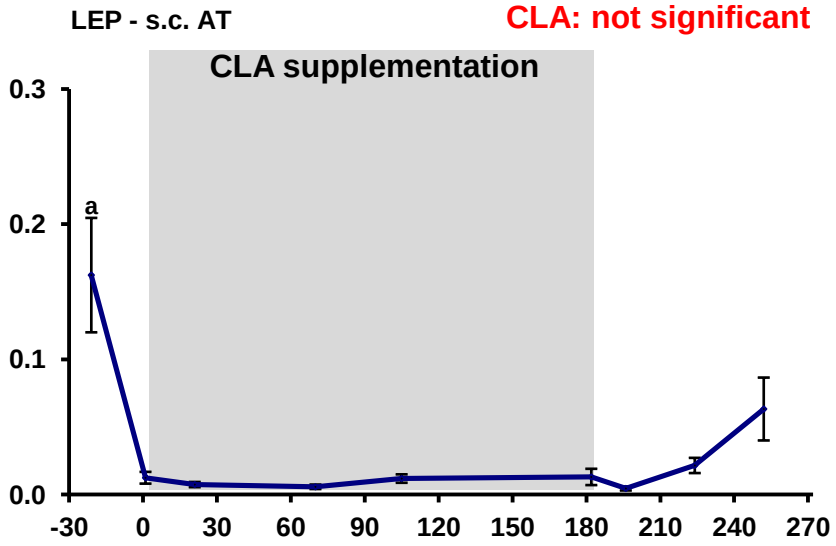
LEP system mRNA Ab (trial 1)



In trial 2, a similar pattern without CLA effect



In trial 2, in all fat depots stably expression

Merged data from control & CLA

Control CLA

Days relative to parturition

Mean ± SE

a, b: significant differences between dates ($P < 0.05$)

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LEP system mRNA Ab (trial 1)

In trial 2, ObRb shows a reduction from d 1 to 42 and 105 in visceral AT and mammary gland opposite to muscle tissue.

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Conclusions

- AdipoQ, AdipoR1, and AdipoR2 mRNA were lower in omental AT, muscle, and in retroperitoneal fat during long term CLA supplementation to the cows, indicating insulin desensitizing effects of CLA. This needs to be verified at the level of protein.
- As to whether the effects of CLA on the adiponectin system will affect insulin sensitivity in the different tissues and in the entire organism remains to be clarified.
- LEP system was not affected in general. However, ObRb mRNA in s.c. AT was affected in a parity dependent manner.

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Thank you for your attention

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