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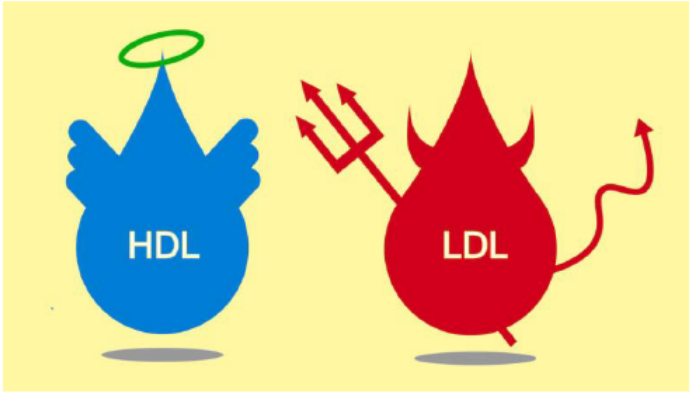
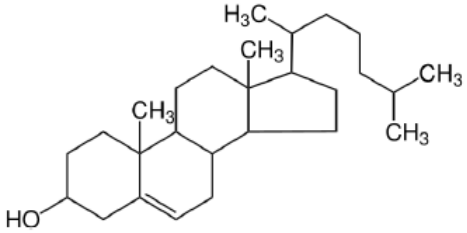
Plasma cholesterol and adaptation of metabolism and milk production in feed restricted cows





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Background: Metabolism and cholesterol during early lactation in dairy cows

Adipose tissue is mobilized

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Increasing supply of NEFA

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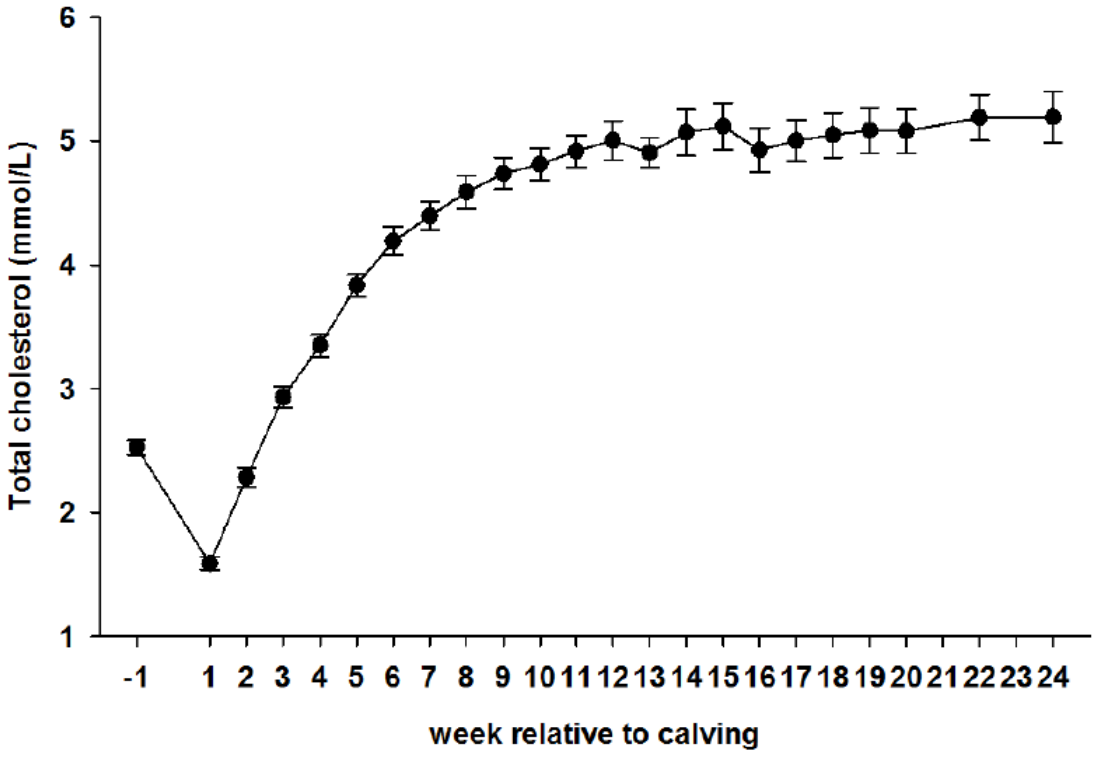
Liver: oxidation of fatty acids or re-esterification to triglycerides (TG)

↓

TG synthesis exceeds export of TG as very low density lipoproteins (VLDL)

↓

Risk of fatty liver



Modified from Kessler et al., JDS 2014 and Gross et al., PlosOne 2015

Objectives

Are **cholesterol levels** in early lactation related to **short-term adaptations** of metabolism and milk production?

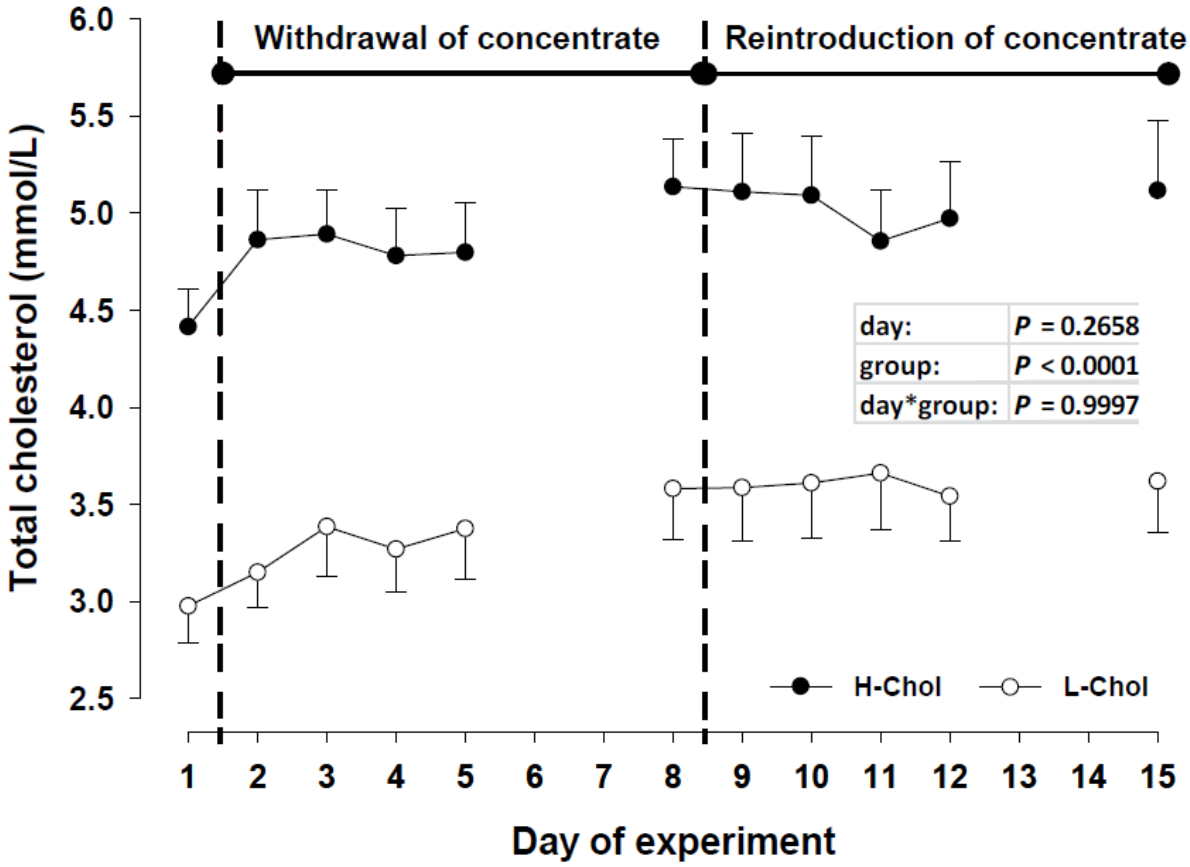
- Early lactation with low cholesterol concentrations
- Exposure to a transient concentrate withdrawal (one week) that further aggravates energy deficiency

Material and Methods

- 15 multiparous Holstein dairy cows
- Experimental period 21 days (first week for adaptation) starting at 24±7 days in milk
- Pasture + additional concentrate in week 1 and 3 of the experiment; **concentrate withdrawal in week 2**
- Blood sampling daily, milk samples twice/day
- **Retrospective grouping** according to total cholesterol concentration (median: 3.36 mmol/l) in week 1
- Statistical analysis: Mixed models (SAS, v. 9.4), group, time fixed effects, cow random subject

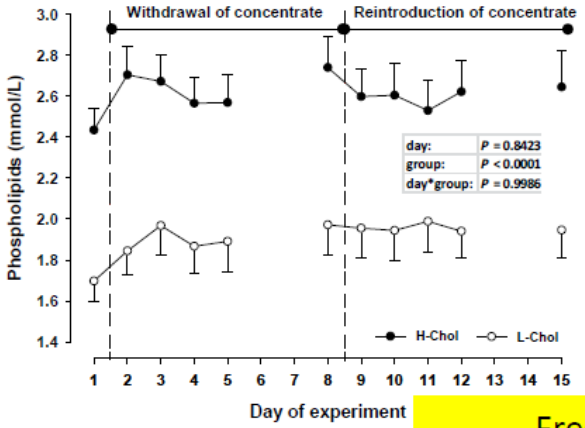
Results

Total cholesterol

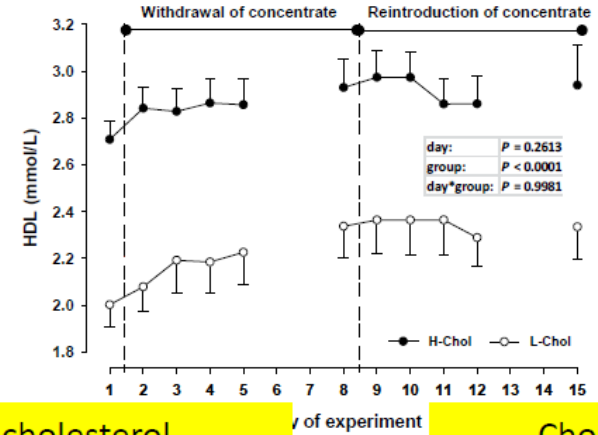


Results

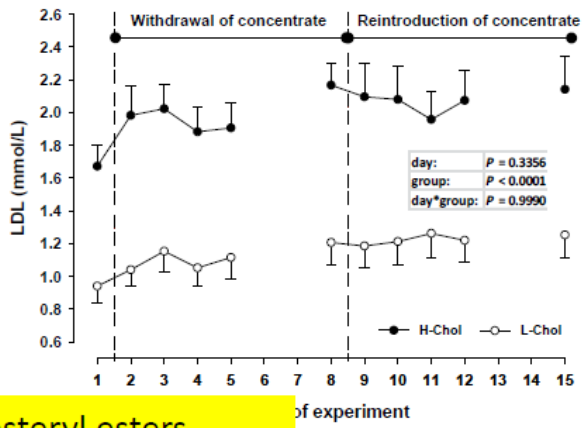
Phospholipids



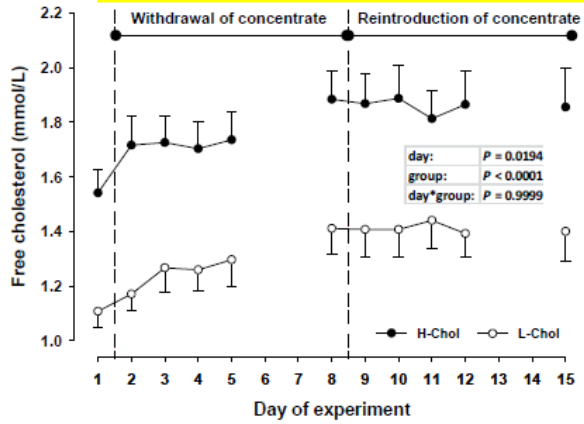
HDL



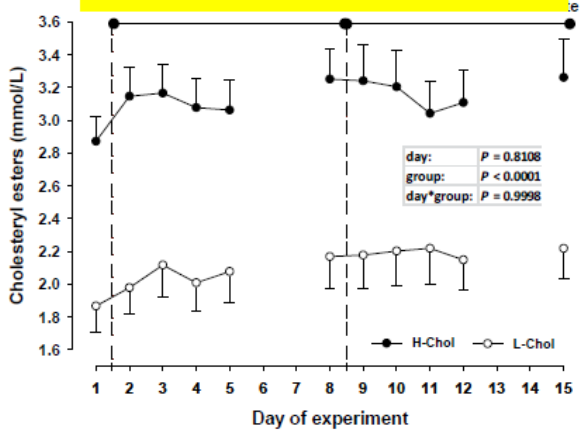
LDL



Free cholesterol

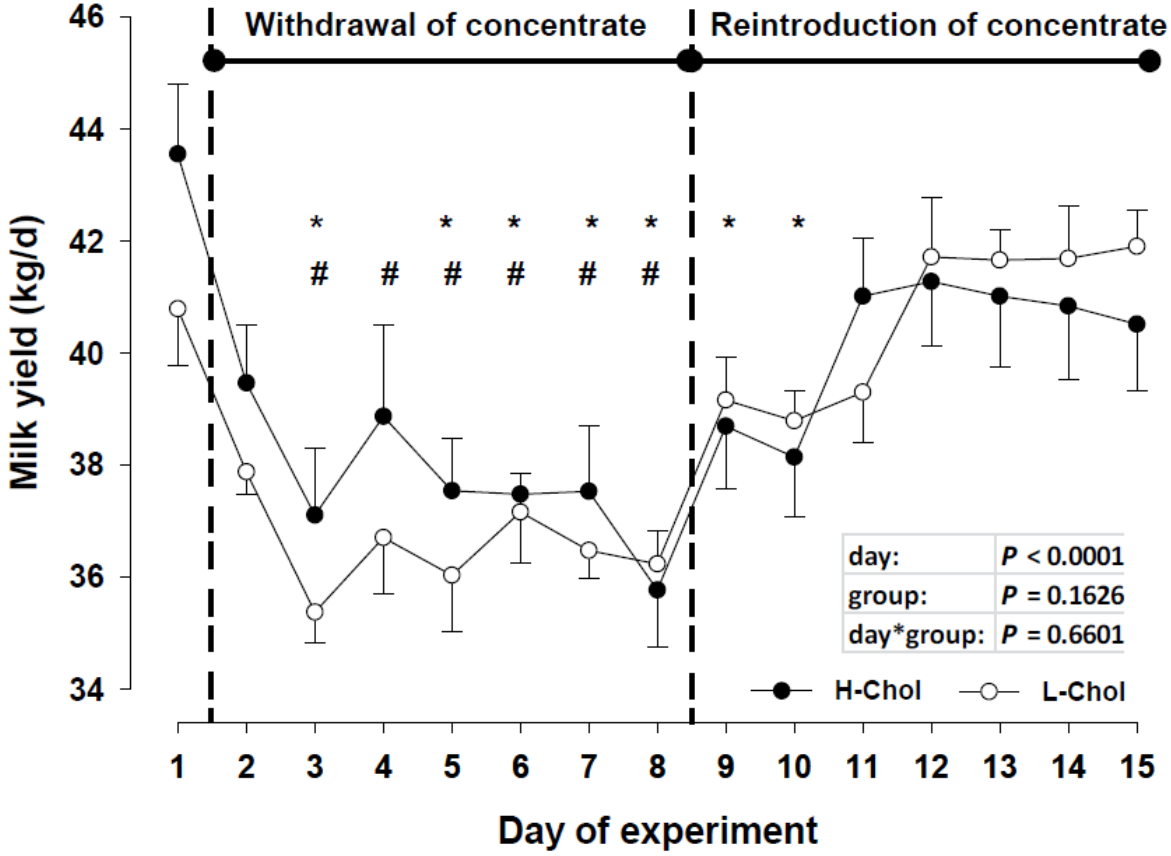


Cholesteryl esters



Results

Milk yield

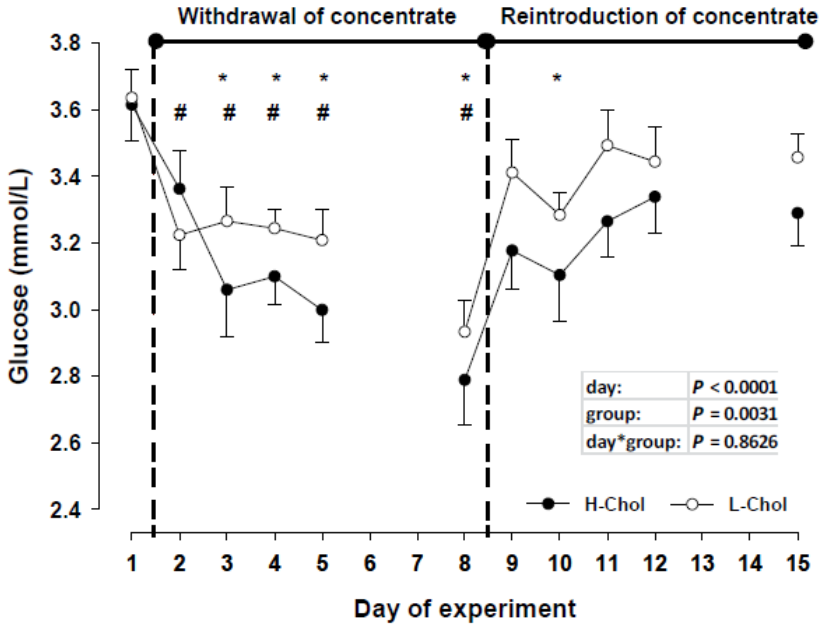


*Different from day 1 in H-Chol (P<0.05)

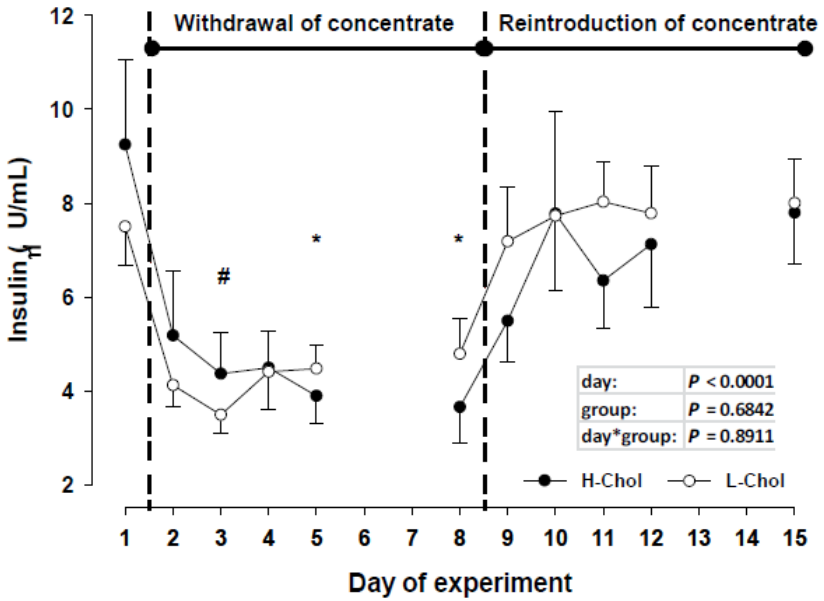
#Different from day 1 in L-Chol (P<0.05)

Results

Glucose



Insulin

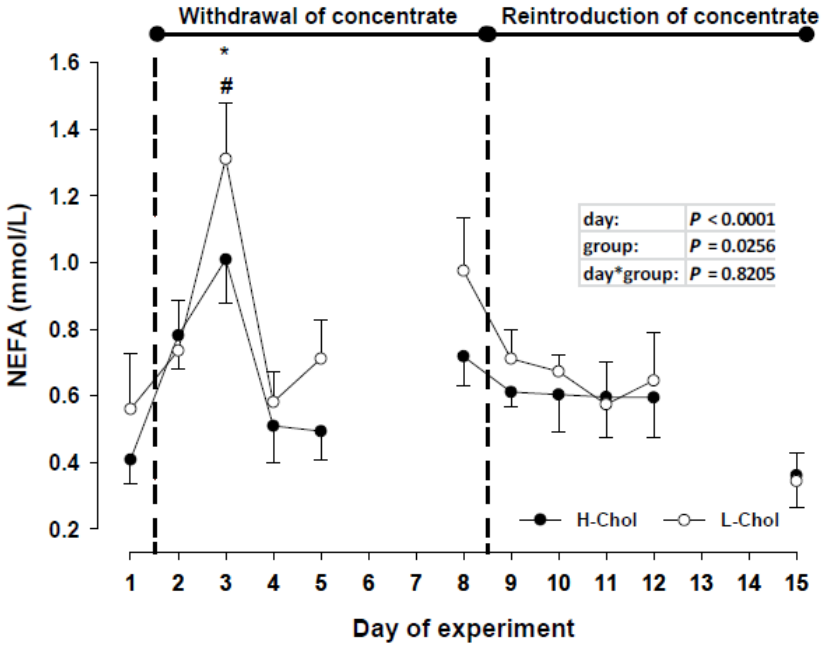


*Different from day 1 in H-Chol (P<0.05)

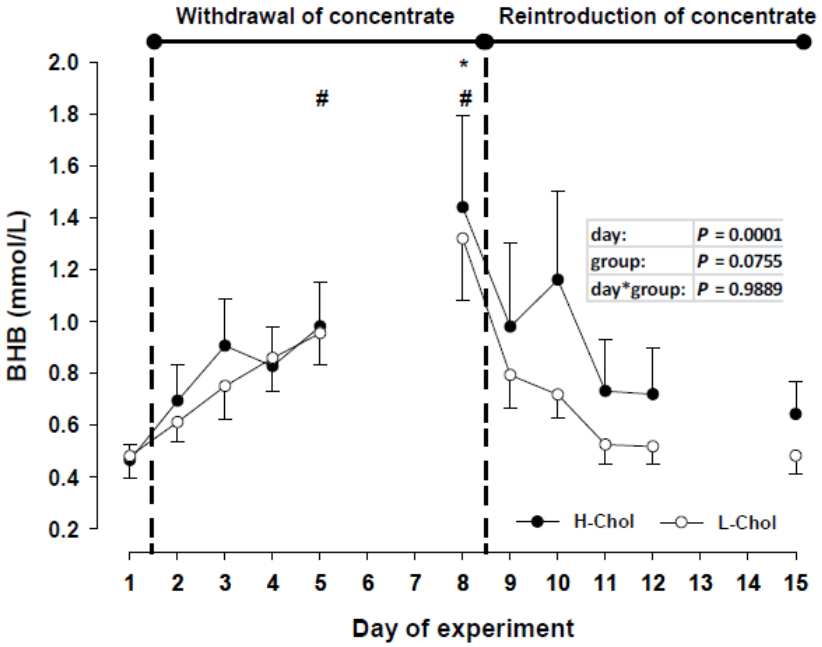
#Different from day 1 in L-Chol (P<0.05)

Results

NEFA



BHB

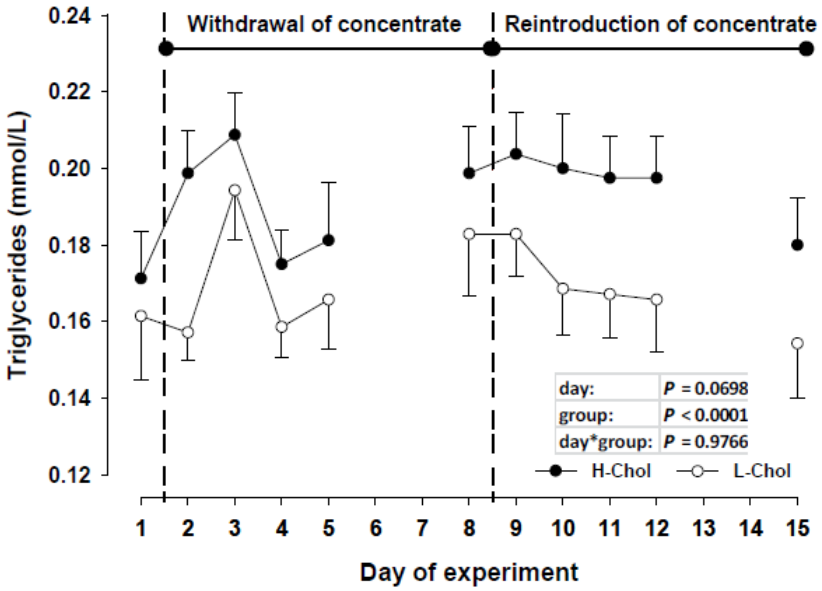


*Different from day 1 in H-Chol (P<0.05)

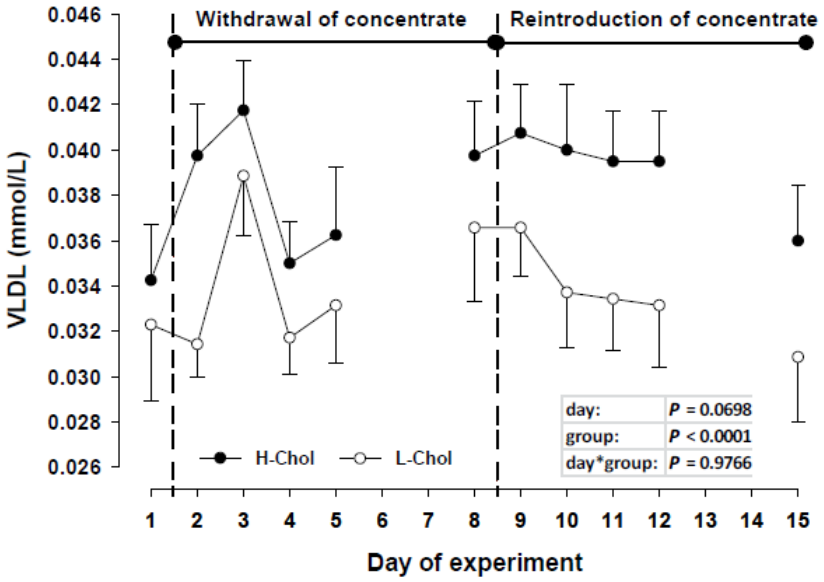
#Different from day 1 in L-Chol (P<0.05)

Results

Triglycerides

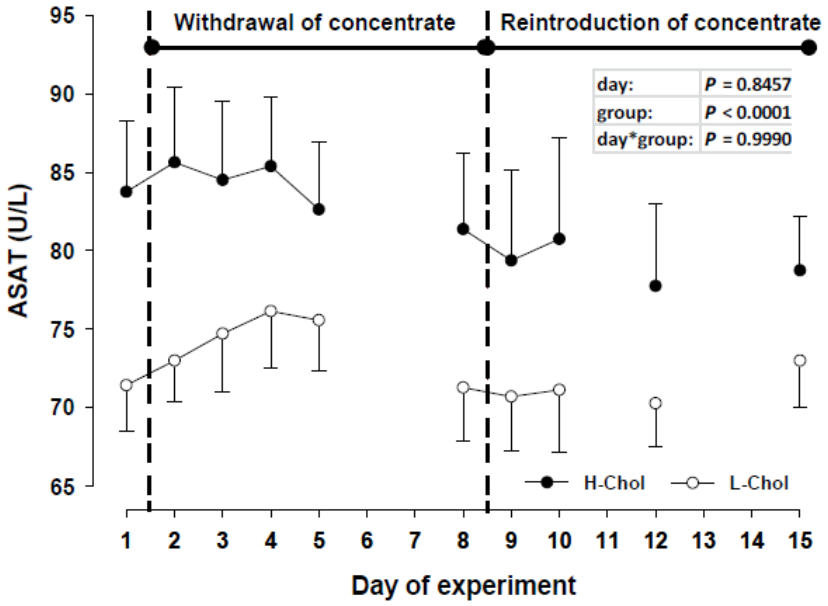


VLDL

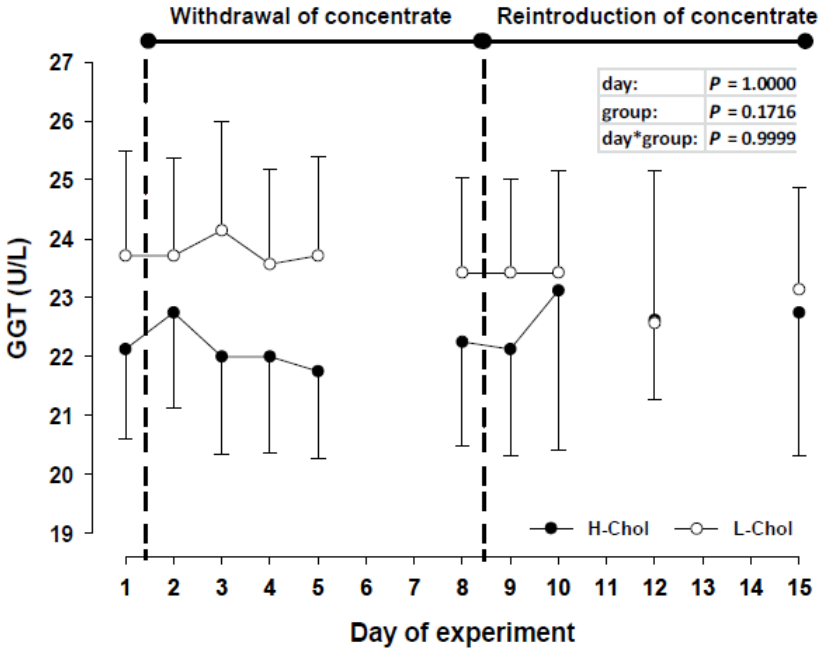


Results

ASAT



GGT



Conclusions

- Circulating **cholesterol levels** in early lactation are associated with the extent of short-term adaptation responses to energy availability:
  - but: no changes of lipoproteins and phospholipids during aggravated energy deficiency in early lactation
  - reduction and recovery of milk yield
  - adaptation of glucose, NEFA, BHB and insulin
  - Activity of ASAT

Thank you for your attention!