UNIVERSITY OF HOHENHEIM

Faculty of Agricultural Sciences, Institute of Animal Science

Korinna Huber

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Potential new indicators predicting longer productive lives in dairy cows

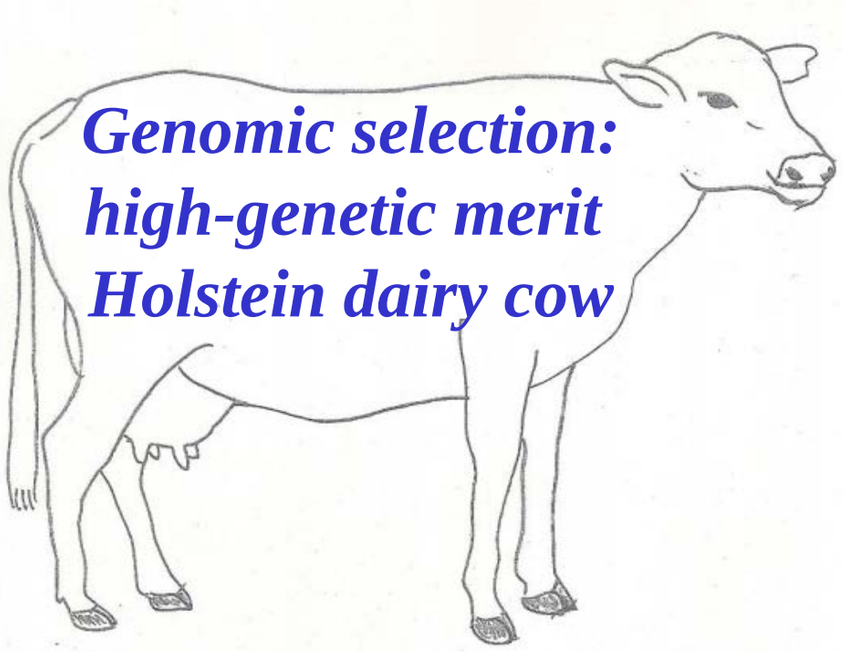
Abstract #23353

Collaborative project

Prof. M. v. Bergen (Leipzig),
Prof. S. Dänicke (Braunschweig),
Prof. J. Rehage (Hannover),
Prof. H. Sauerwein (Bonn)

} and all members of the workgroups

Huber et al. SREP 2016



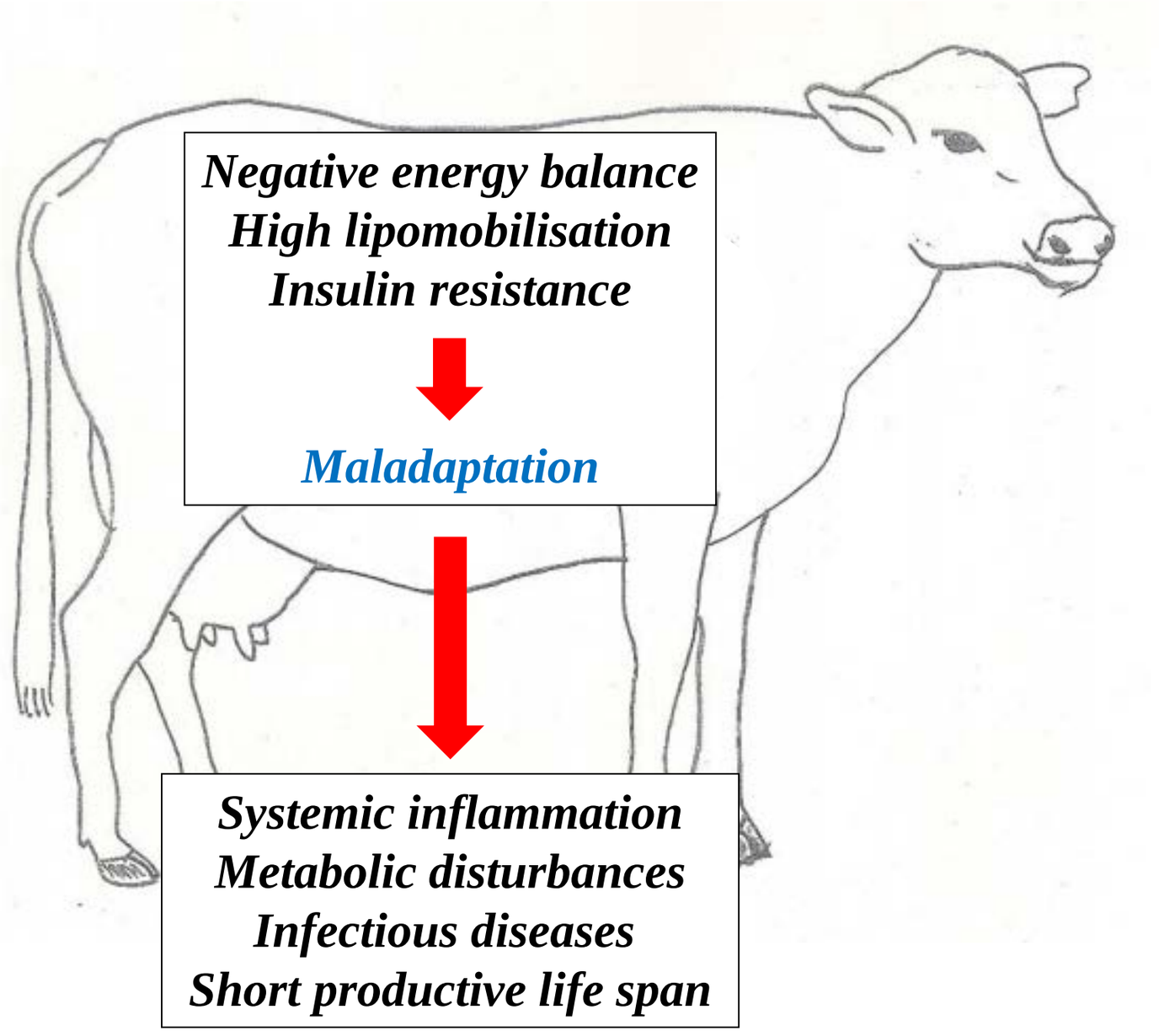
Inter-individual variation in adaptation to lactation

health ***disease***

Management matches genetic needs

Management does not match genetic needs

Maladaptation in individual cows



Reasons for maladaptation in individuals? - Hypotheses

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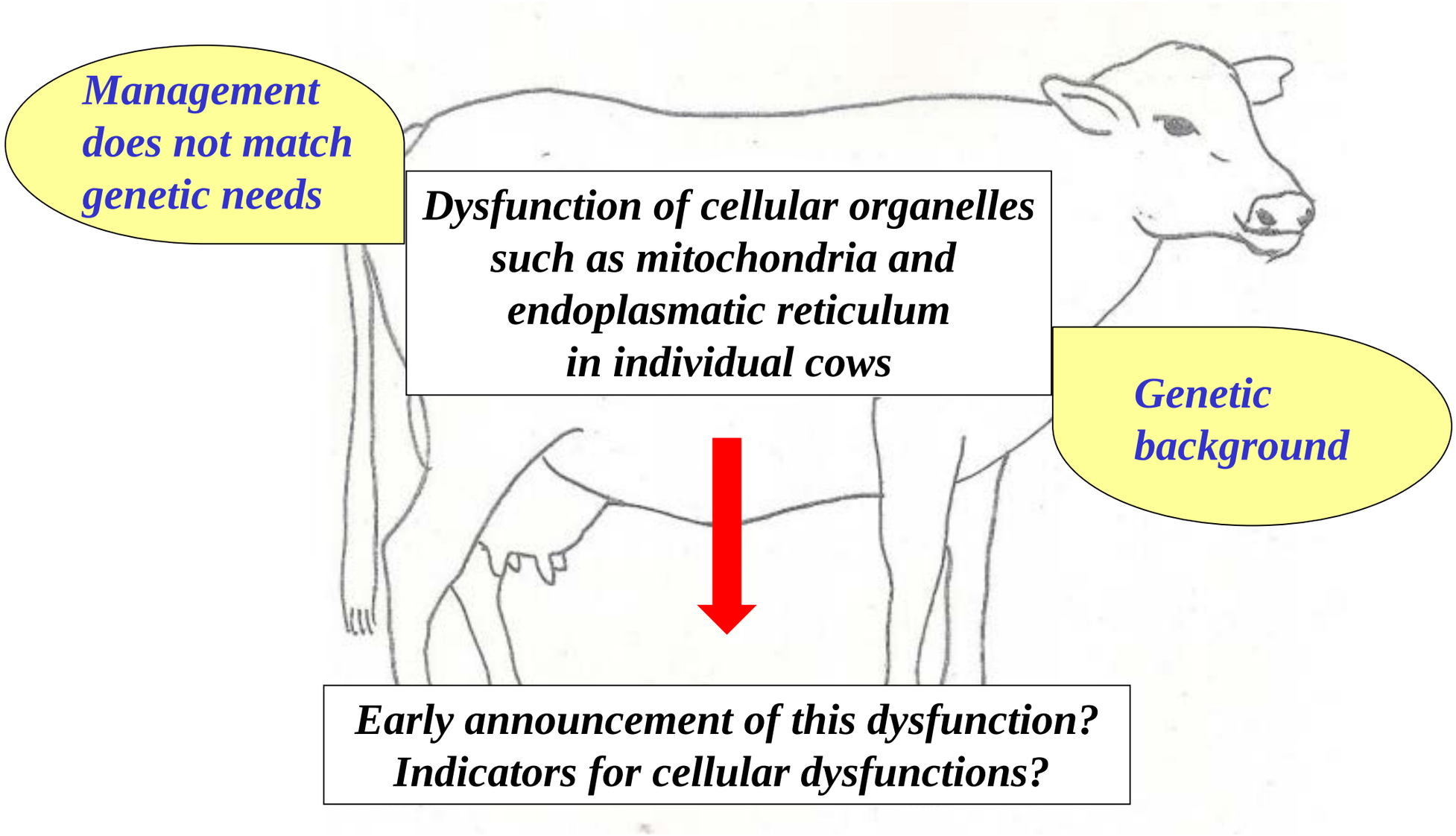

Material and Methods

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- 19 Holstein cows, 2nd to 4th lactation
- Experimental time: day -42 in relation to parturition until day +100 postpartum
- Measures of BCS (ante partum), DMI, EB, milk yield, BFT, VAT, Liver TAG
- Plasma samples at day -42, +3, +21 and +100
  for assessment of classical physiological variables and hormones
  and
  for a targeted metabolomic approach (180 metabolites/day/cow)
- History of cow - day of leaving productive life

Grouping according to history

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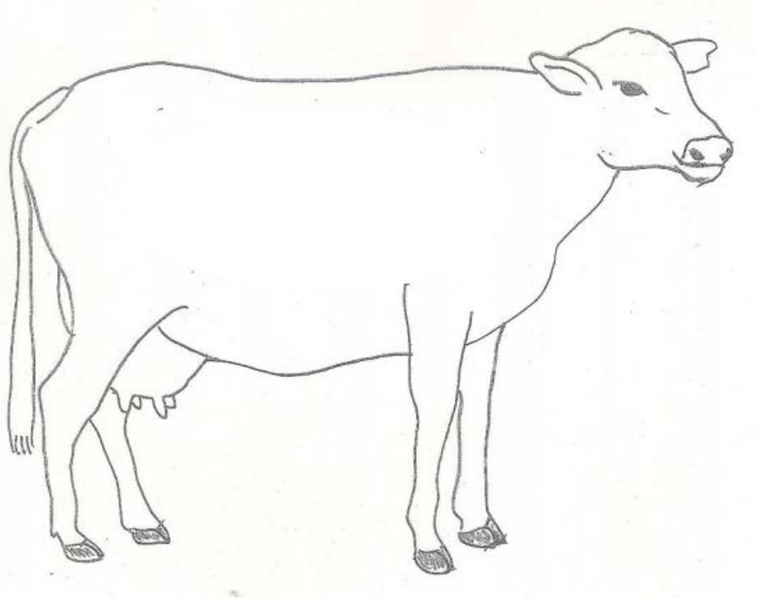
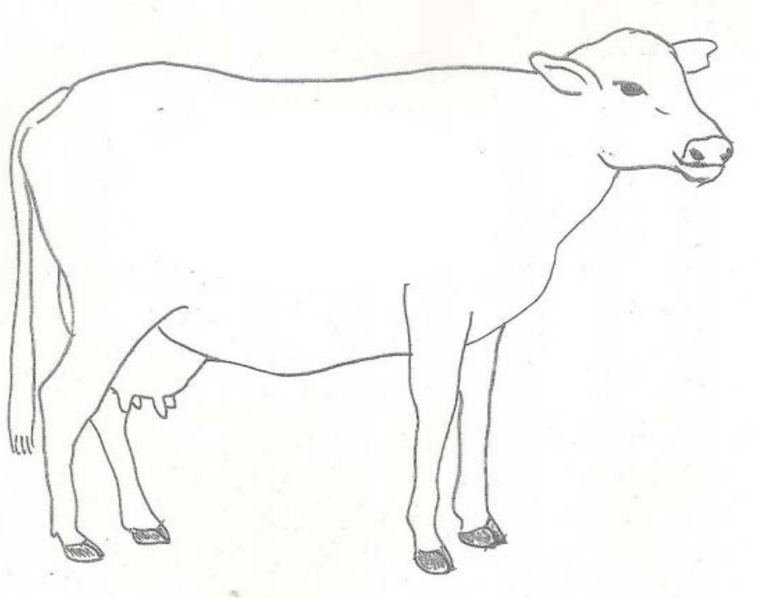


Leaving productive life early
within current lactation
(after day 100)
8 cows = **Group LE**



Healthy status
throughout current lactation

11 cows = **Group H**

Material and Methods

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Biocrates Absolute IDQ® p180 panel (Biocrates Innsbruck, Austria)

for **targeted, standardised and quality controlled metabolic phenotyping**
based on LC/MS-MS analysis (unit µmol/l)

Metabolic phenotypes were assessed by determination of

Acylcarnitines (40)
Amino acids and amines (40)
Glycerophospholipids (90)
Sphingolipids (15)
Sugars (1)

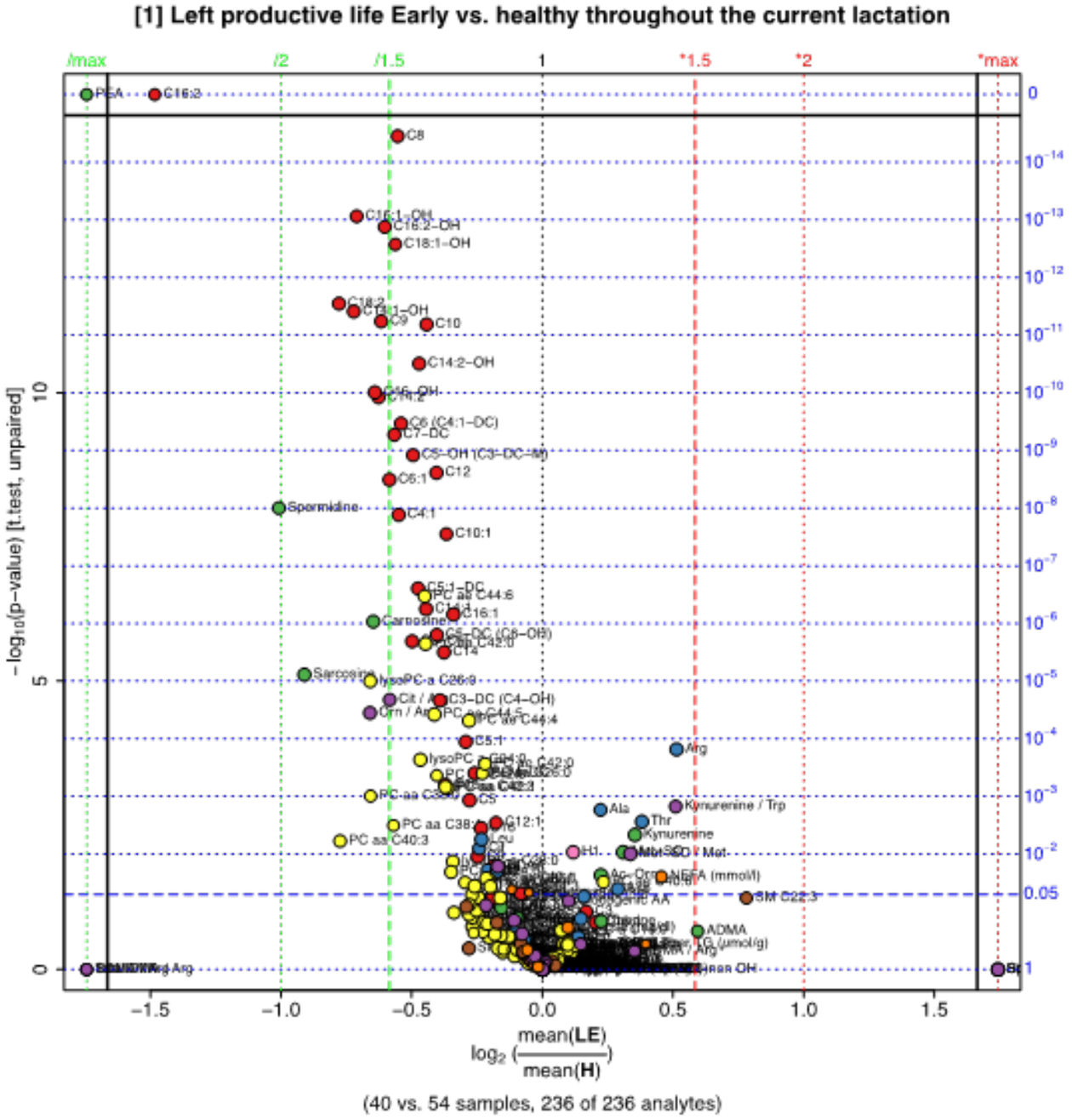
Bioinformatic evaluation of data (software package R (www.r-project.org))
Volcano Plots to assess metabolites of interest
All values - Two Way ANOVA for factors day and group; and day x group interactions

Volcano Plot

as bioinformatic tool to identify metabolites of interest

Left = higher in H

Right = lower in H



Results and Discussion

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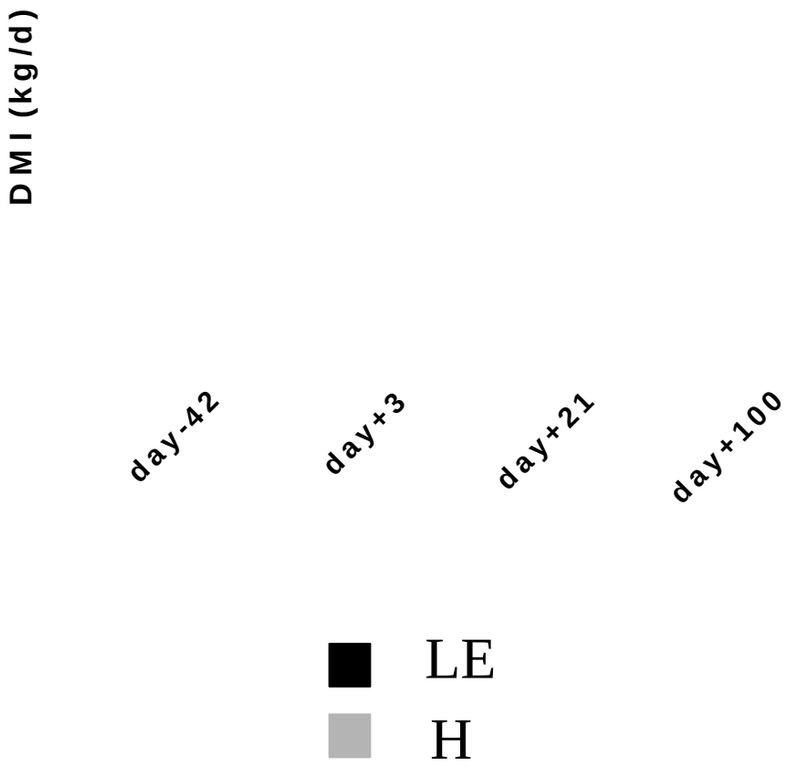
Classical indicators



Results and Discussion

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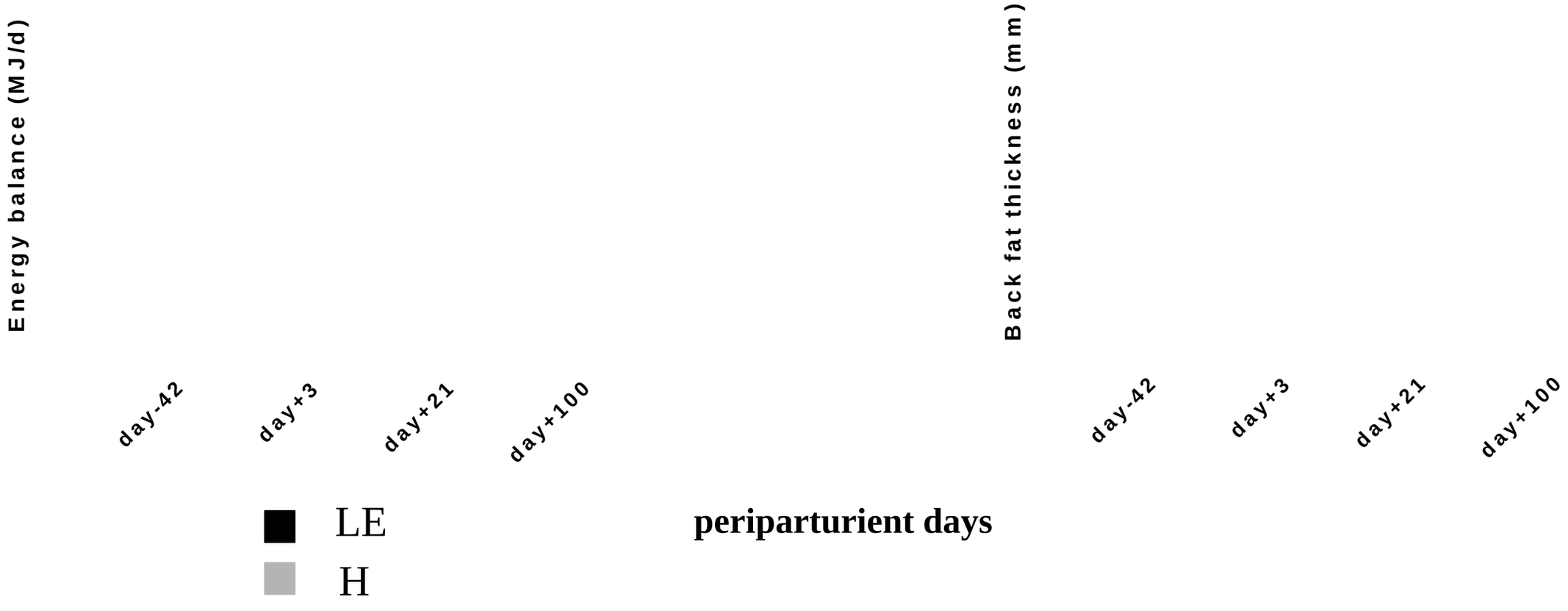
Classical indicators



Results and Discussion

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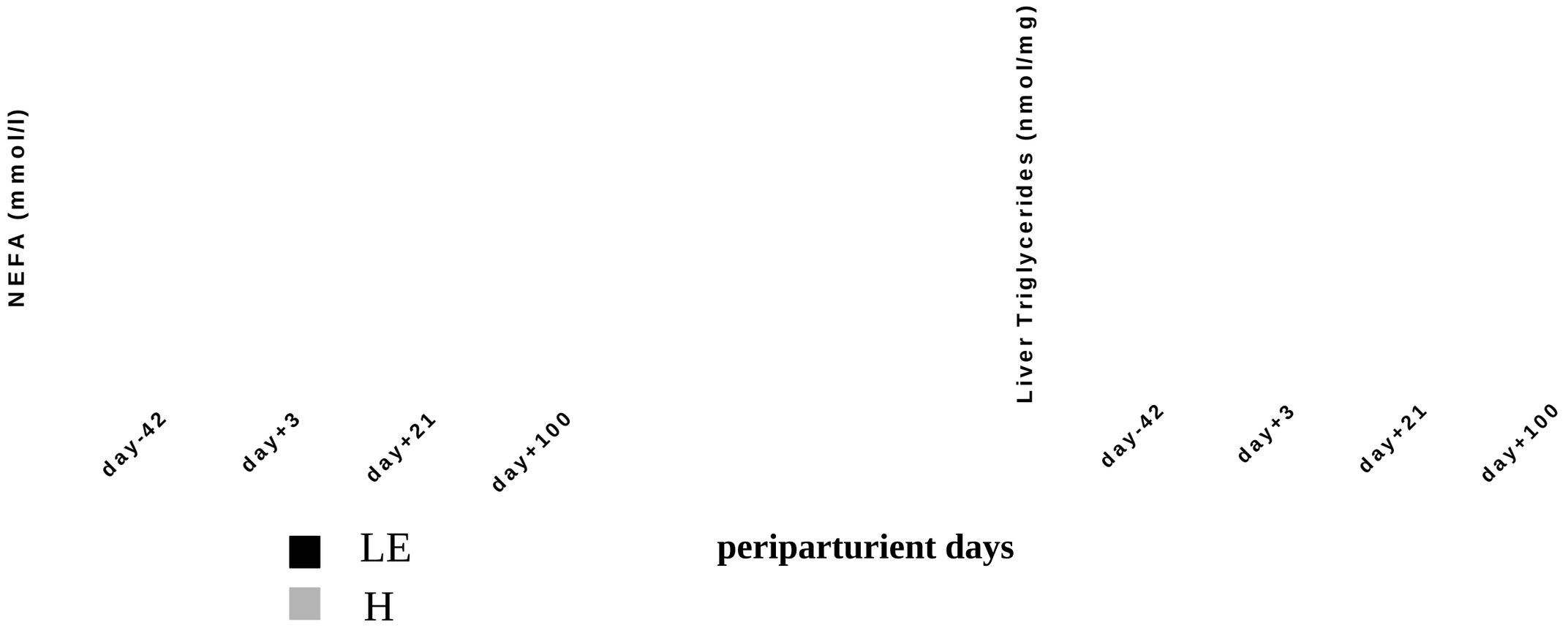
Classical indicators



Results and Discussion

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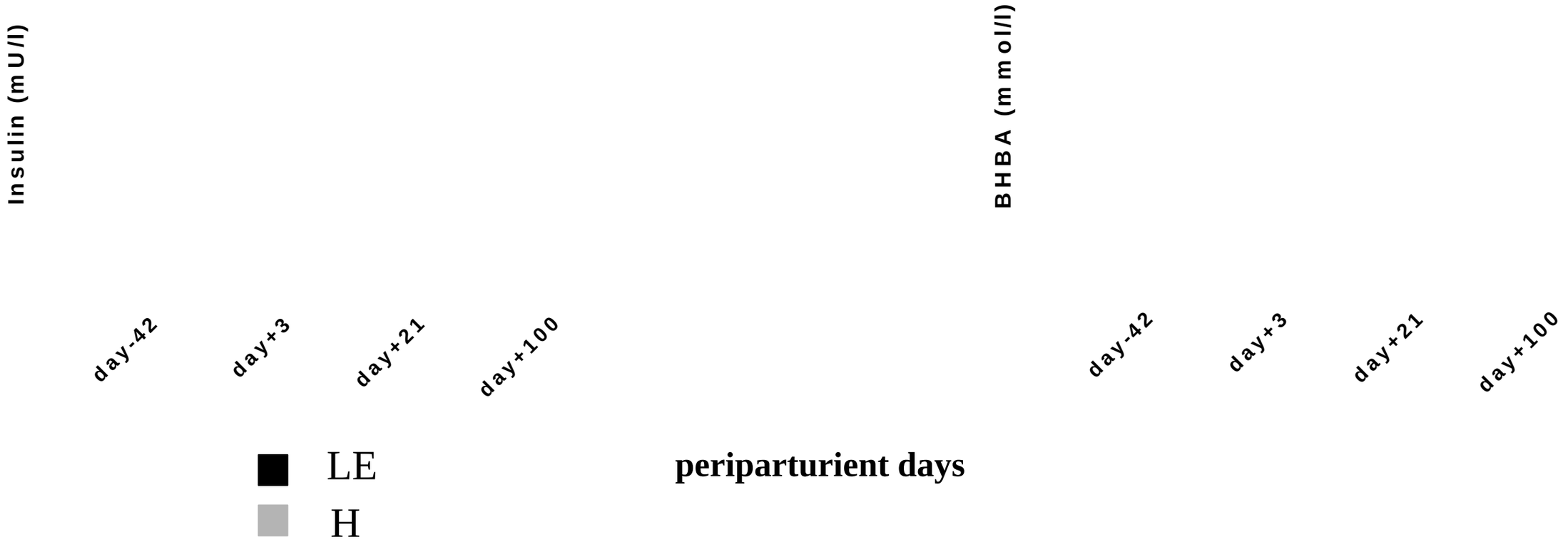
Classical indicators



Results and Discussion

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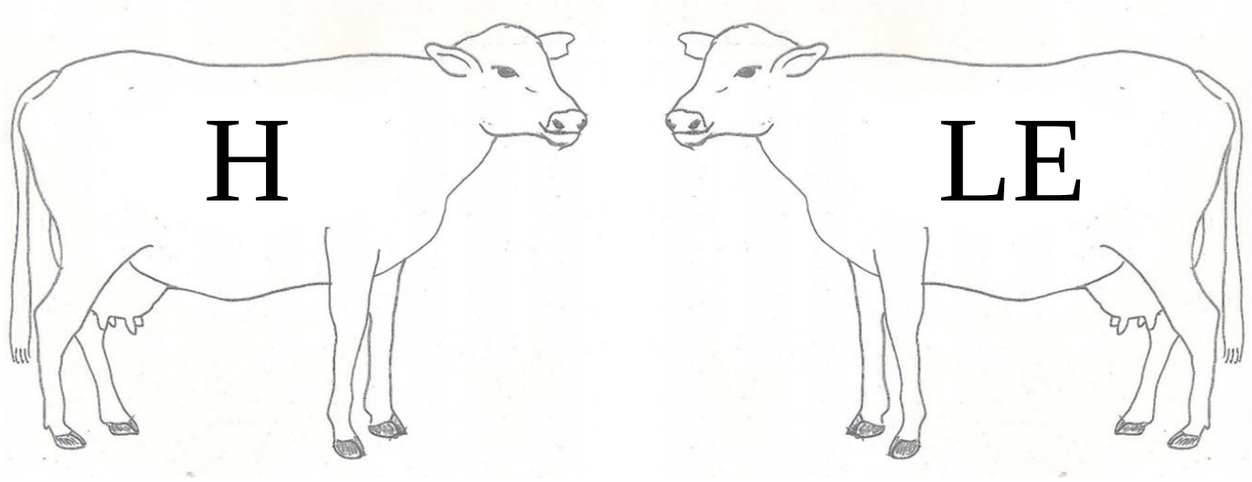
Classical indicators
did not show any differences
between H and LE cows



Results and Discussion

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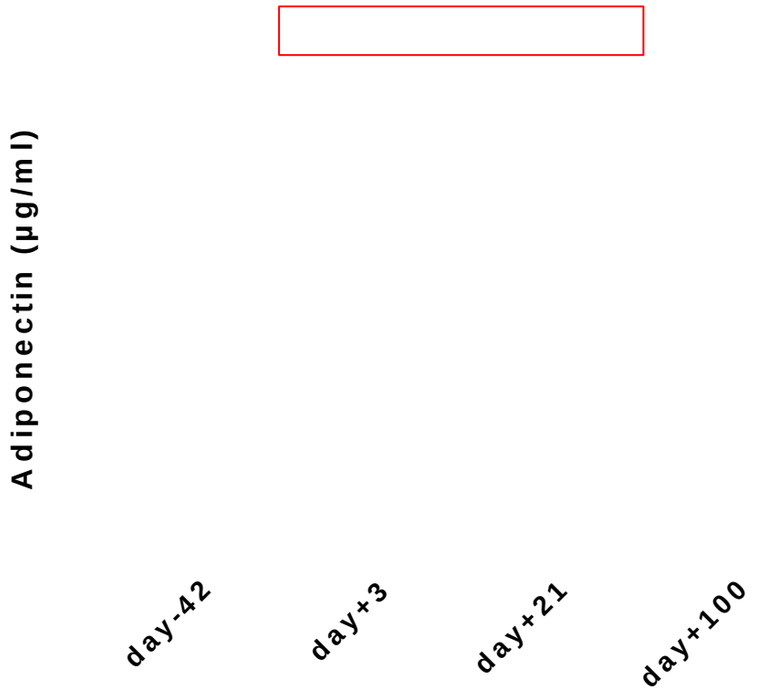
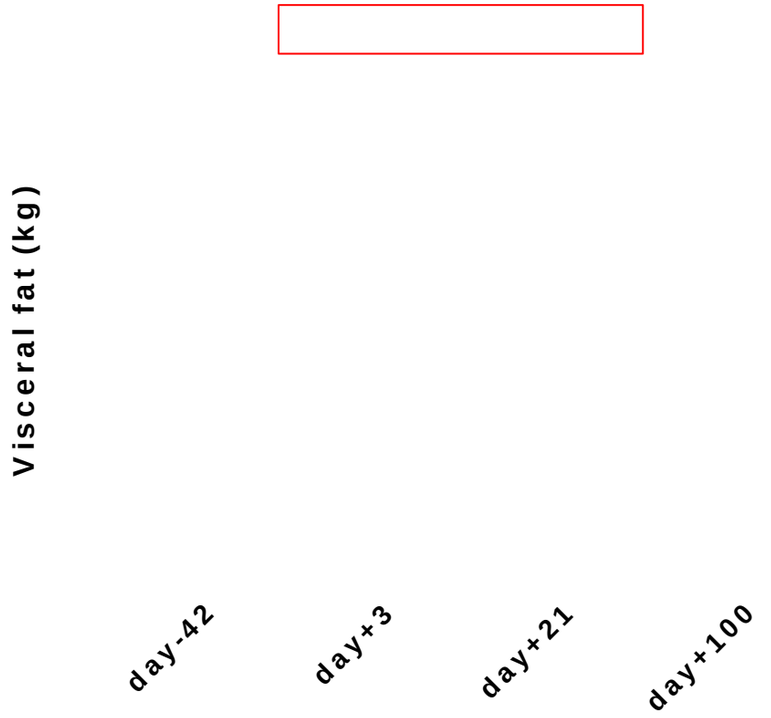
Adiponectin



Visceral adipose tissue mass



Sources of adiponectin - Singh et al. 2014

Results and Discussion

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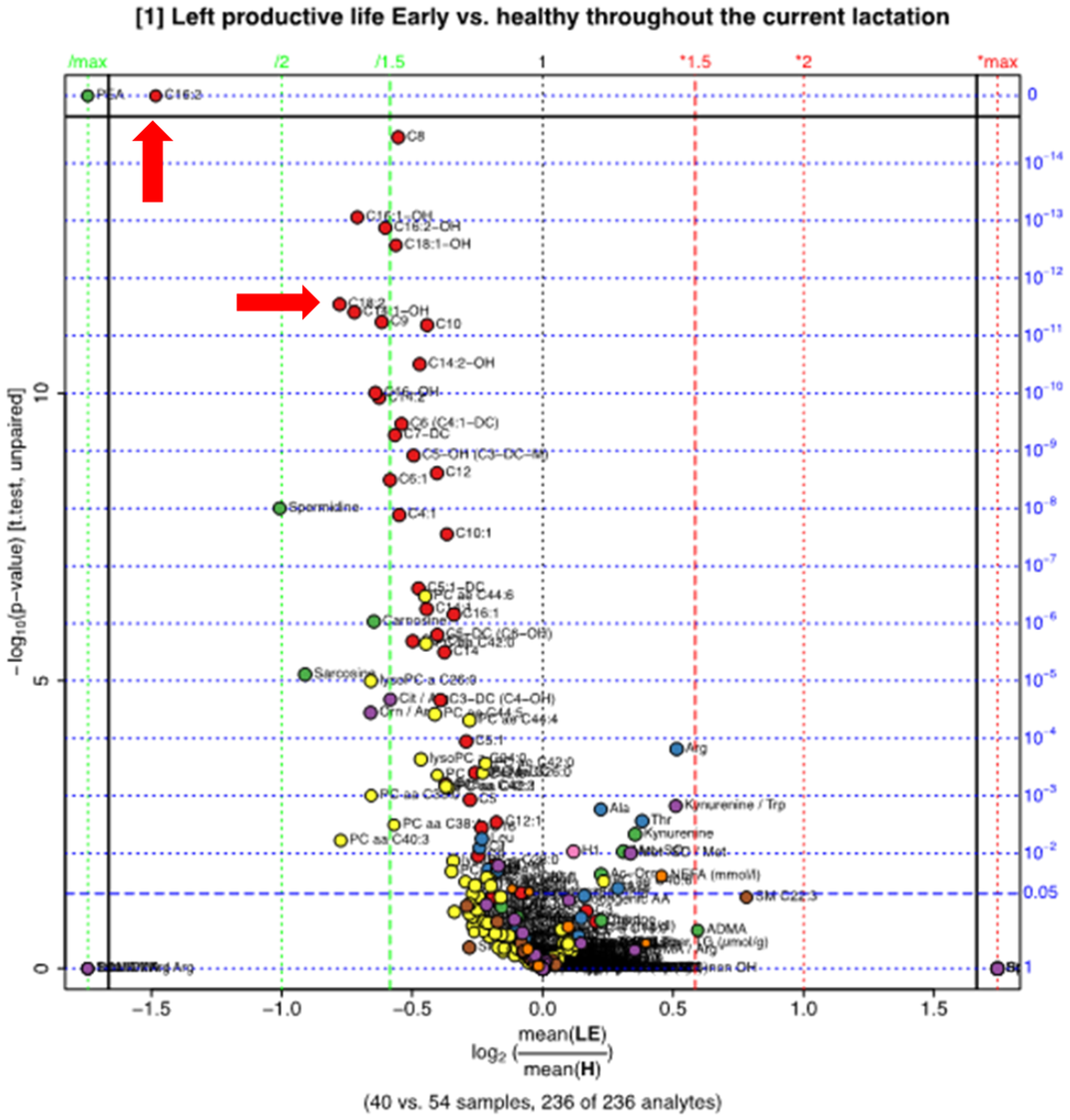
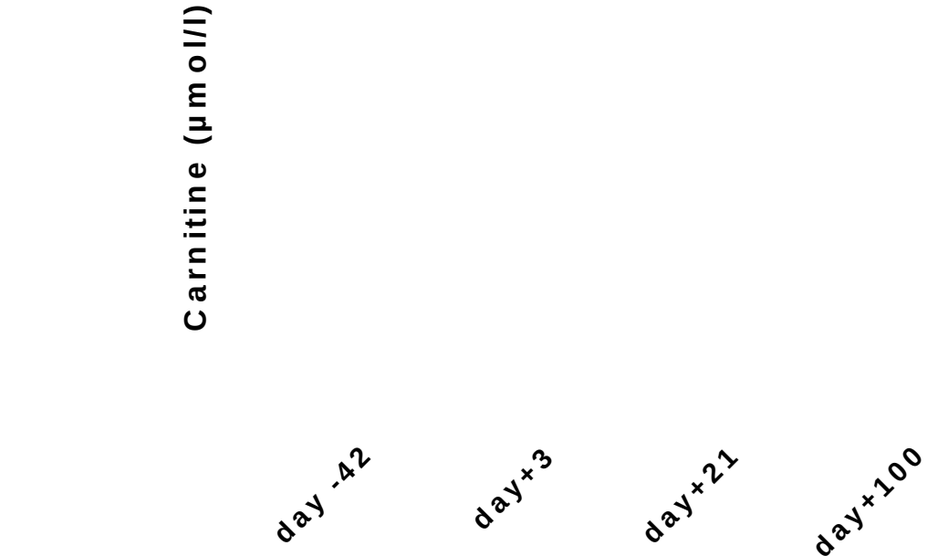


Carnitine



Results and Discussion

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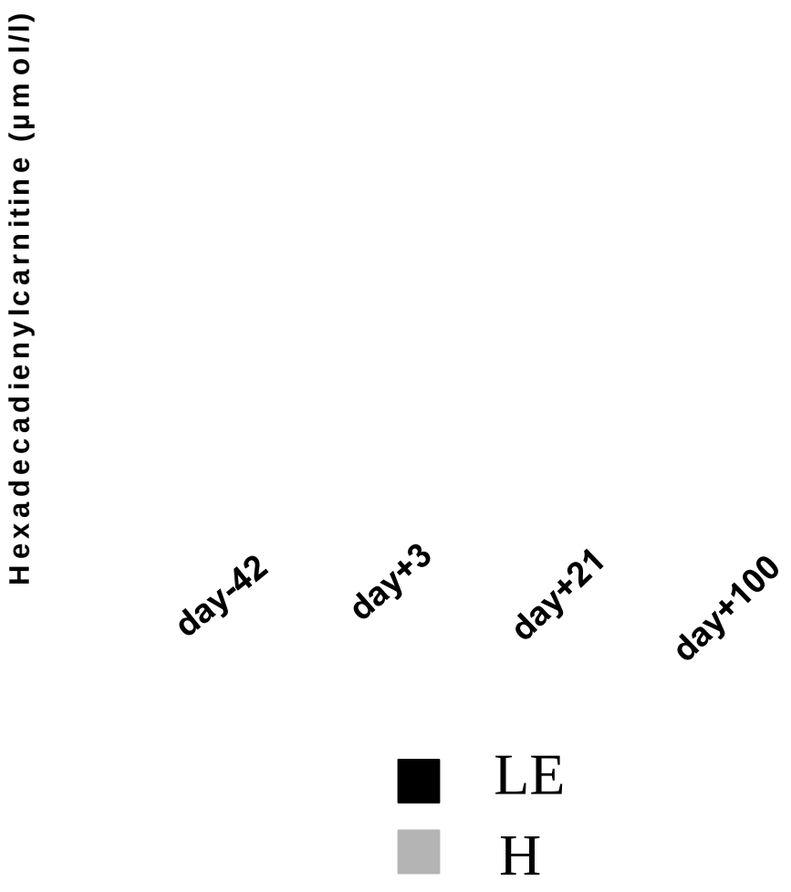
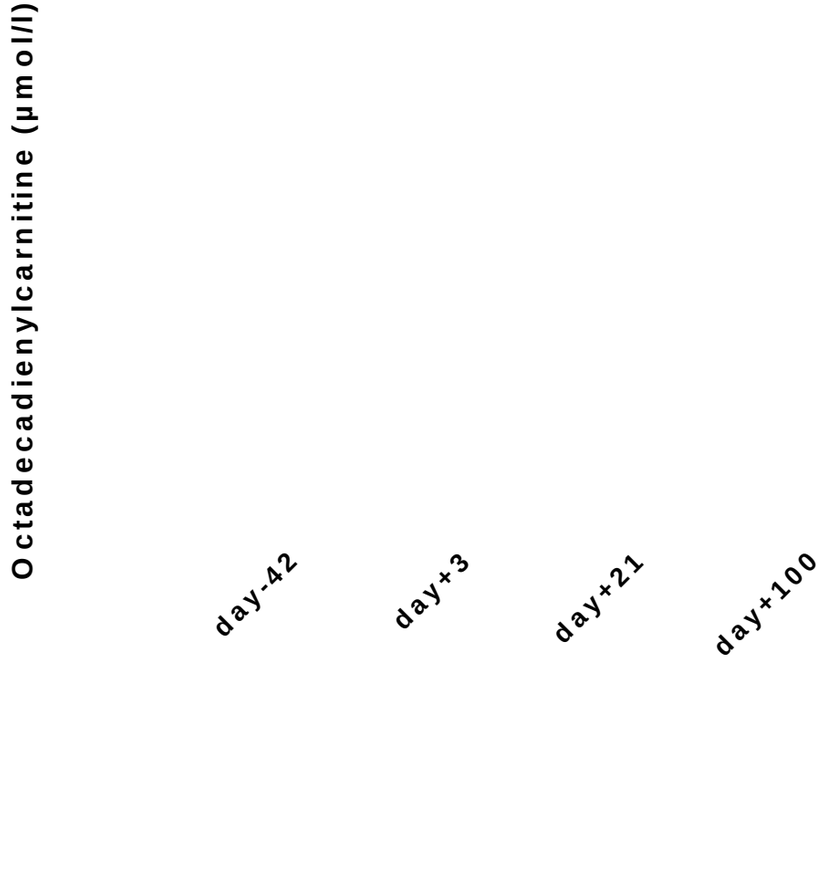
C16:2 – acyl carnitine



C18:2 – linoleyl carnitine



Results and Discussion

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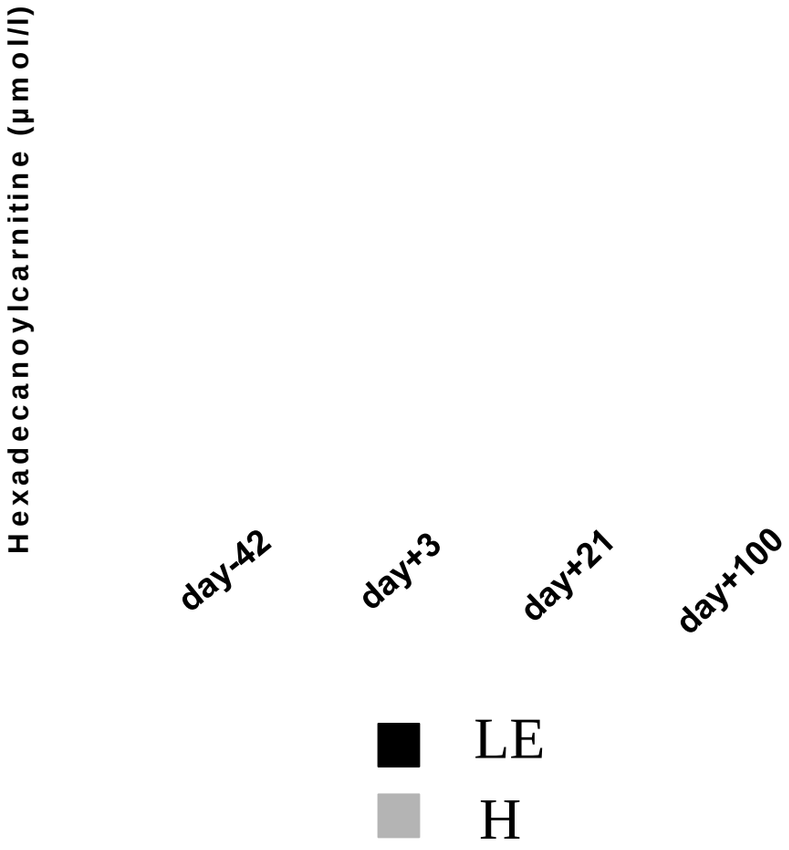
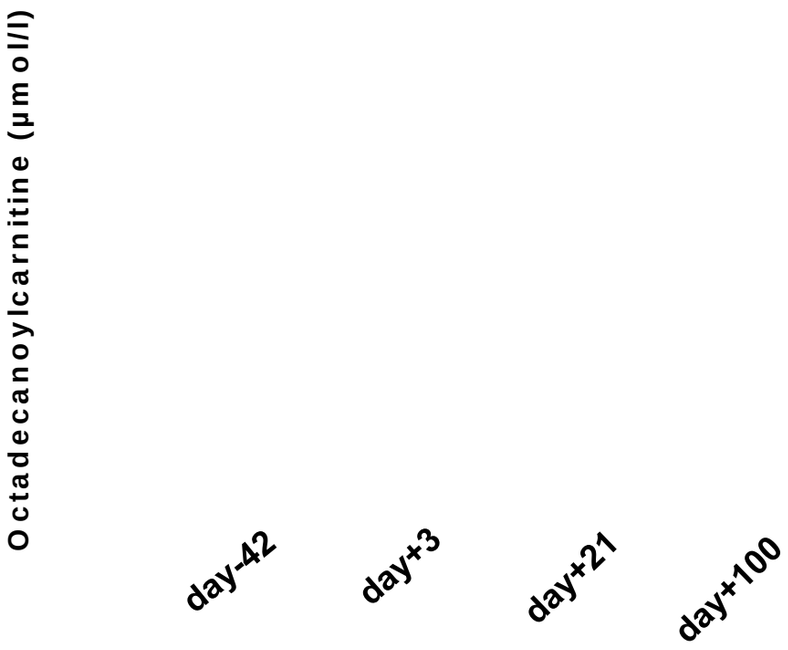
C16 – palmitoyl carnitine



C18 – stearoyl carnitine



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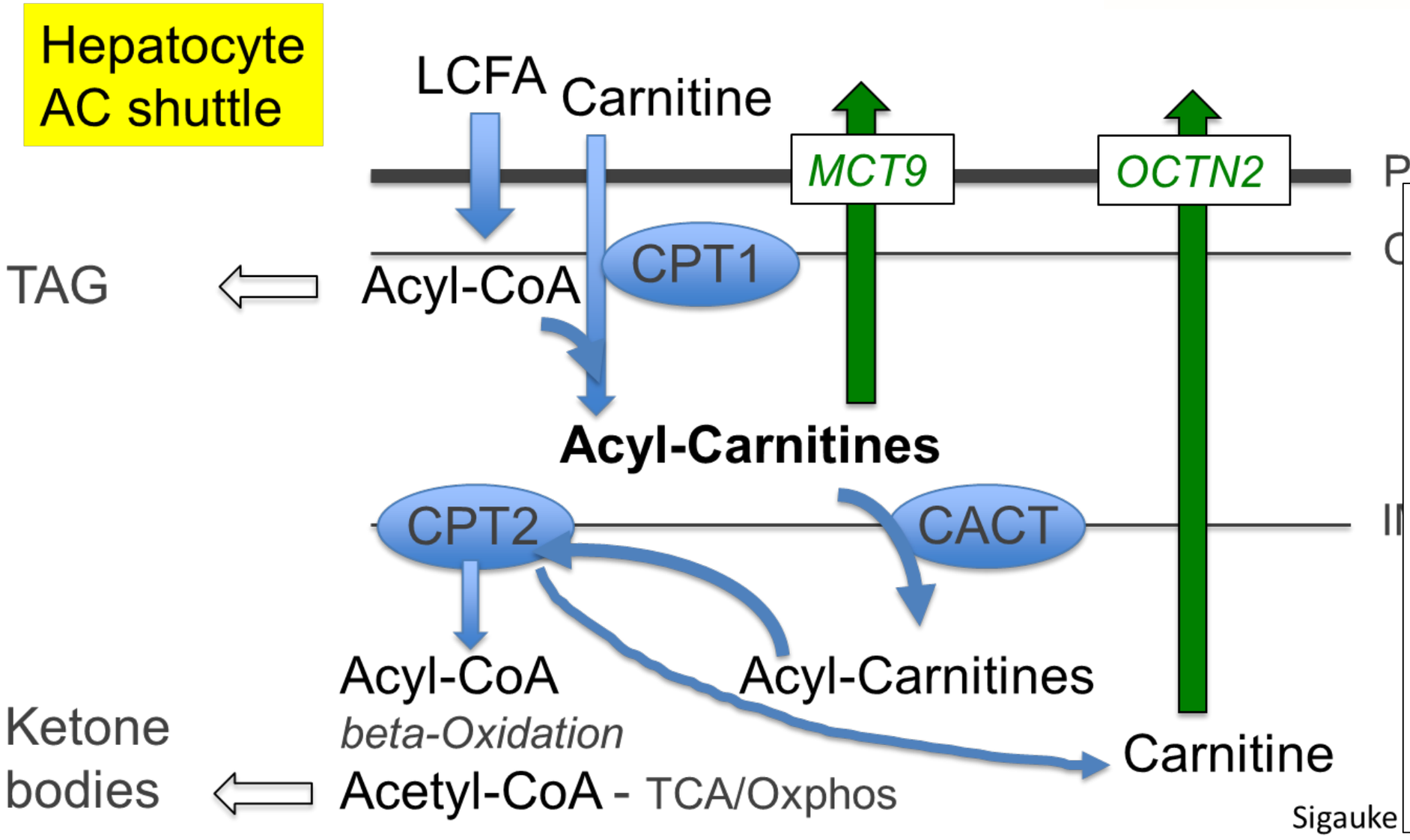

Healthy dairy cows

-can release excess of fatty acids as AC (mitochondrial protection)?

-do have more AC signals in plasma?

-preserve unsaturated fatty acids?

Results and Discussion

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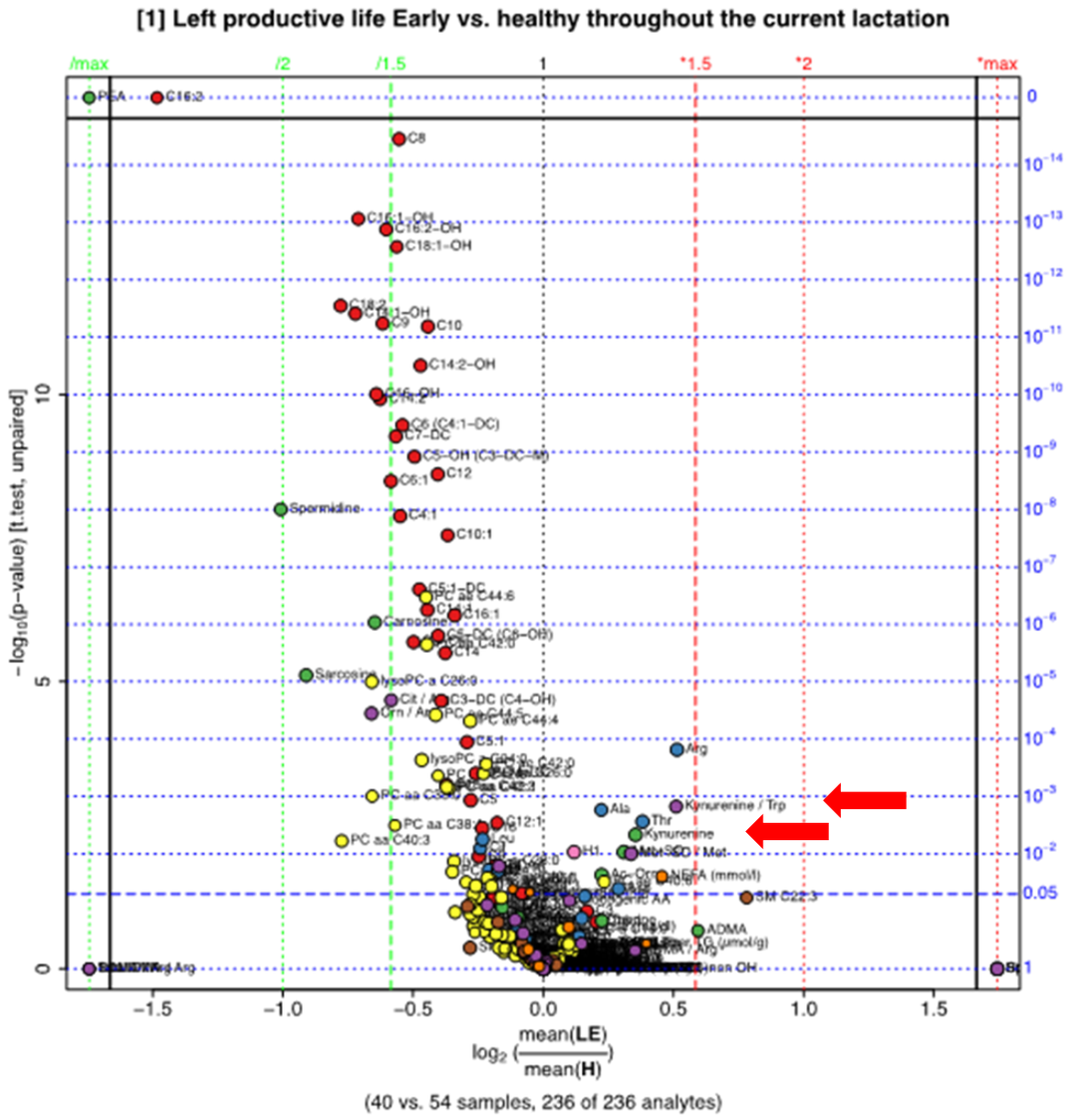
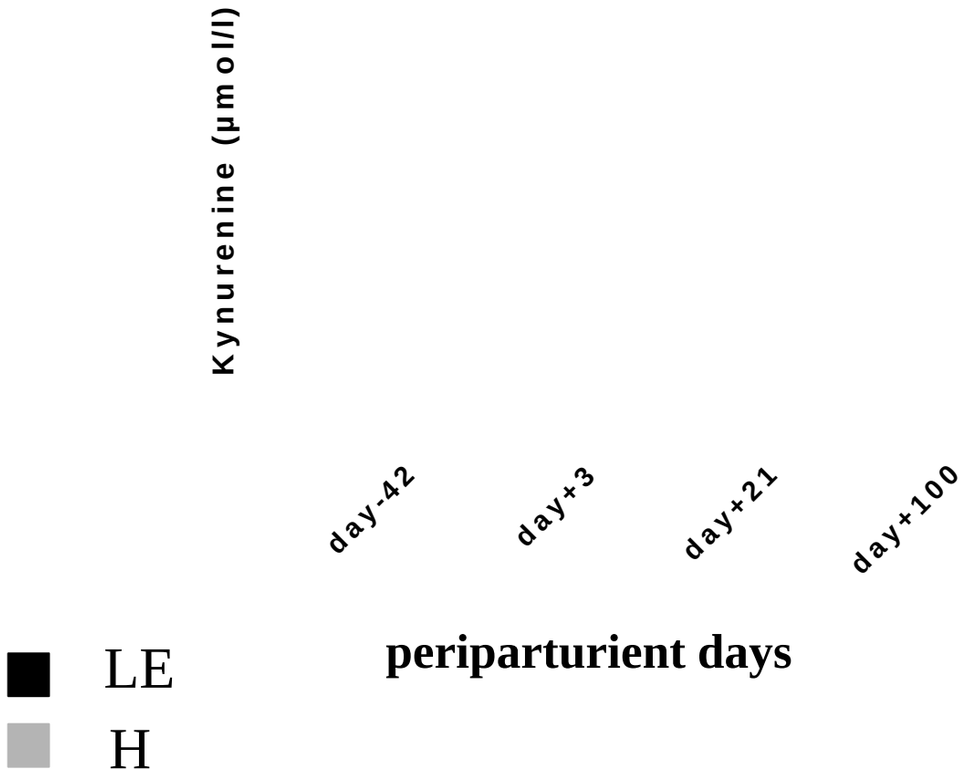


Kynurenine



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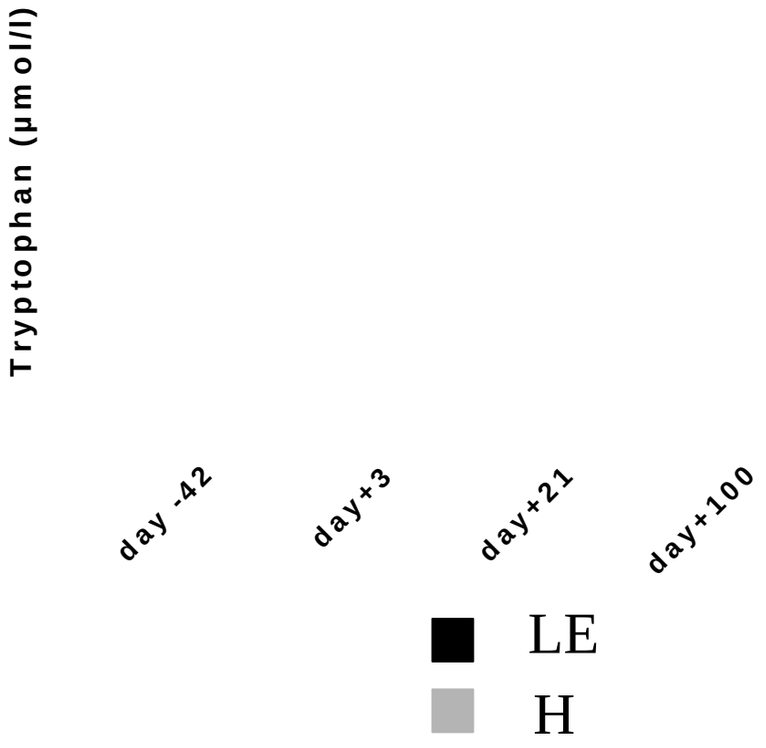
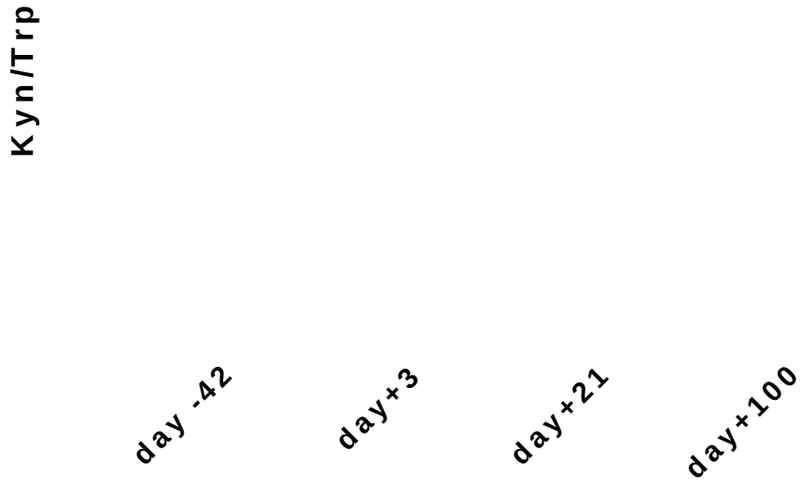
Tryptophan



Kyn/Trp ratio



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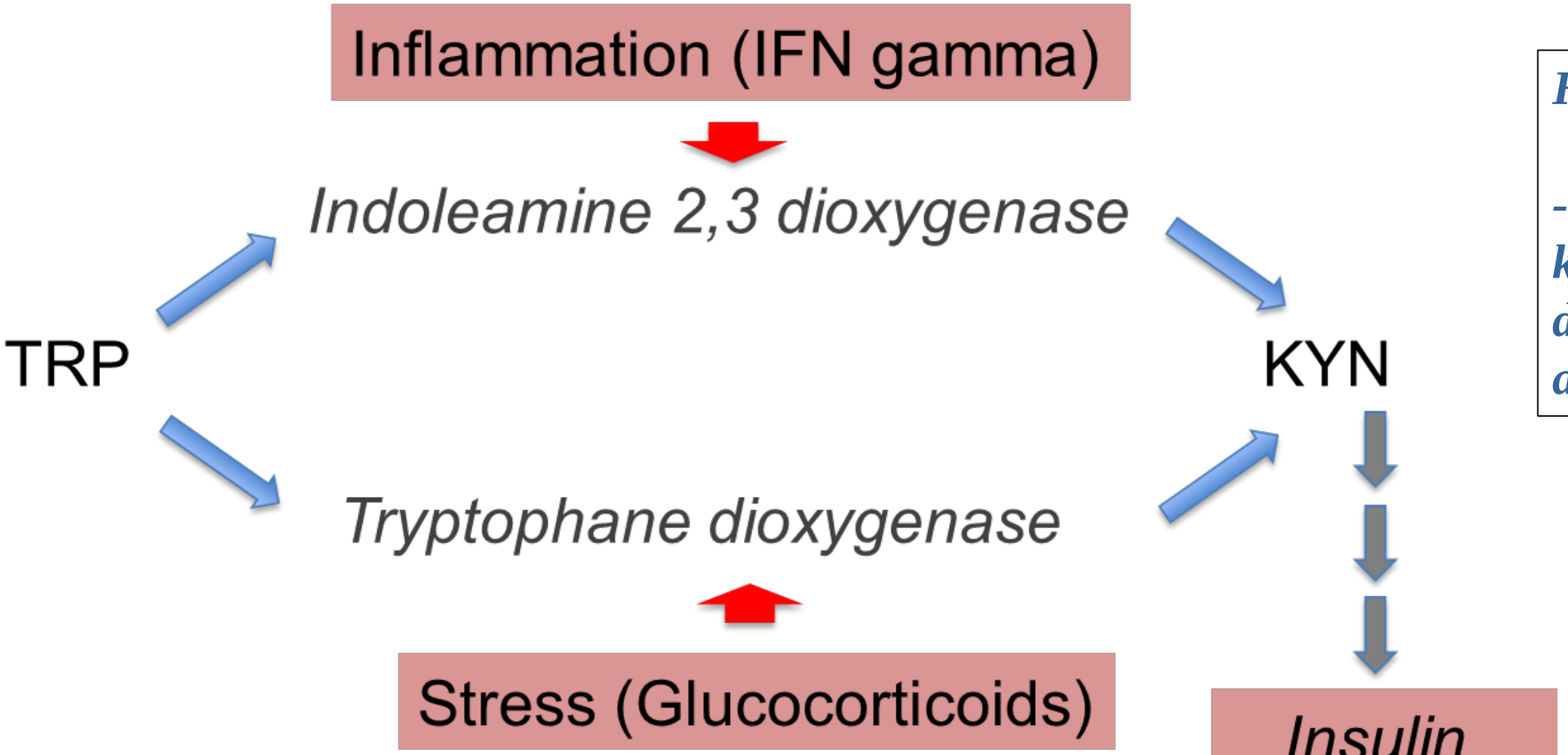

Healthy dairy cows

- have less activated kynurenine pathway due to lower stress and inflammation?

Oxenkrug 2013

Results and Discussion

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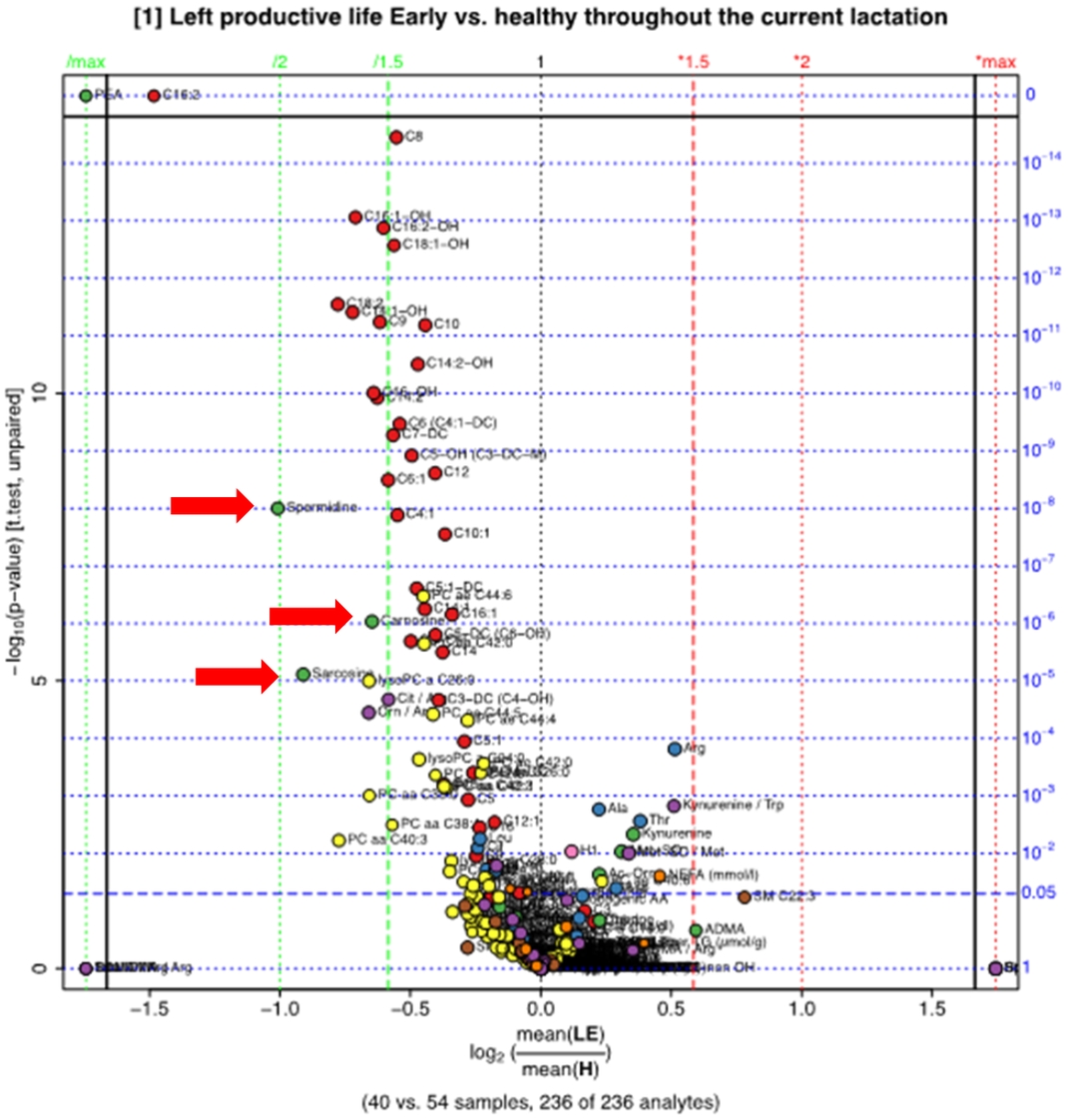
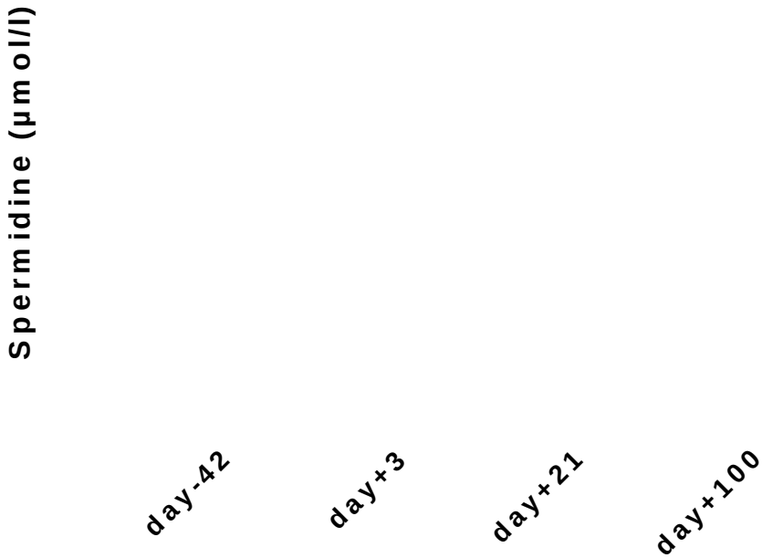


Spermidine



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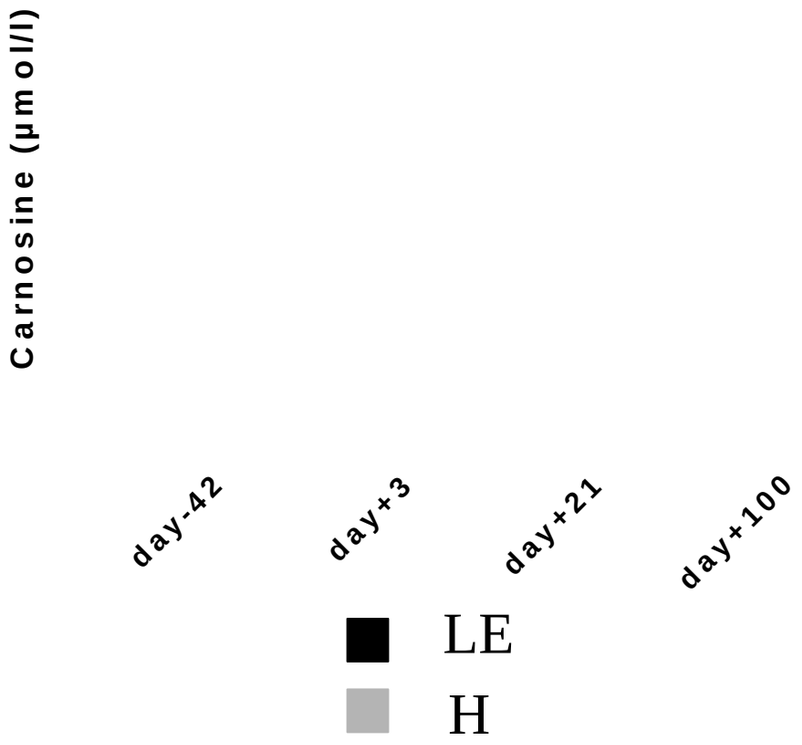
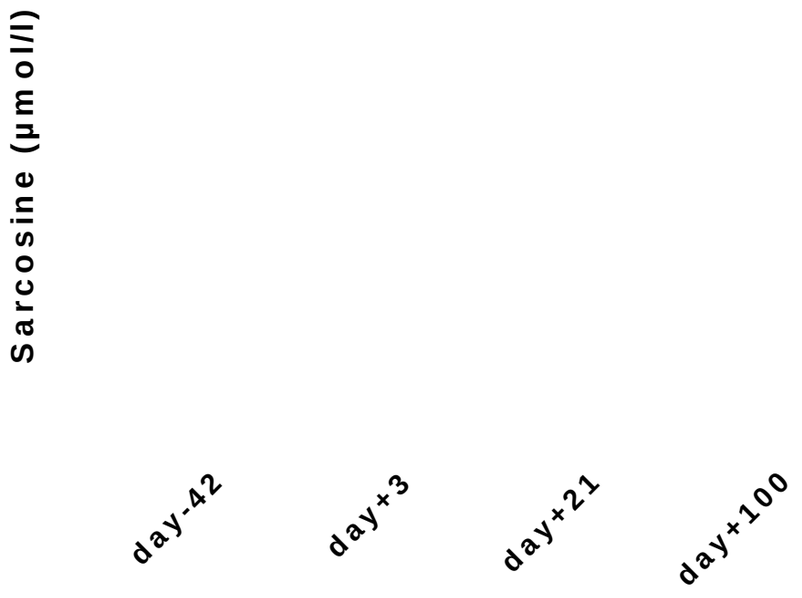
Carnosine



Sarcosine



Results and Discussion

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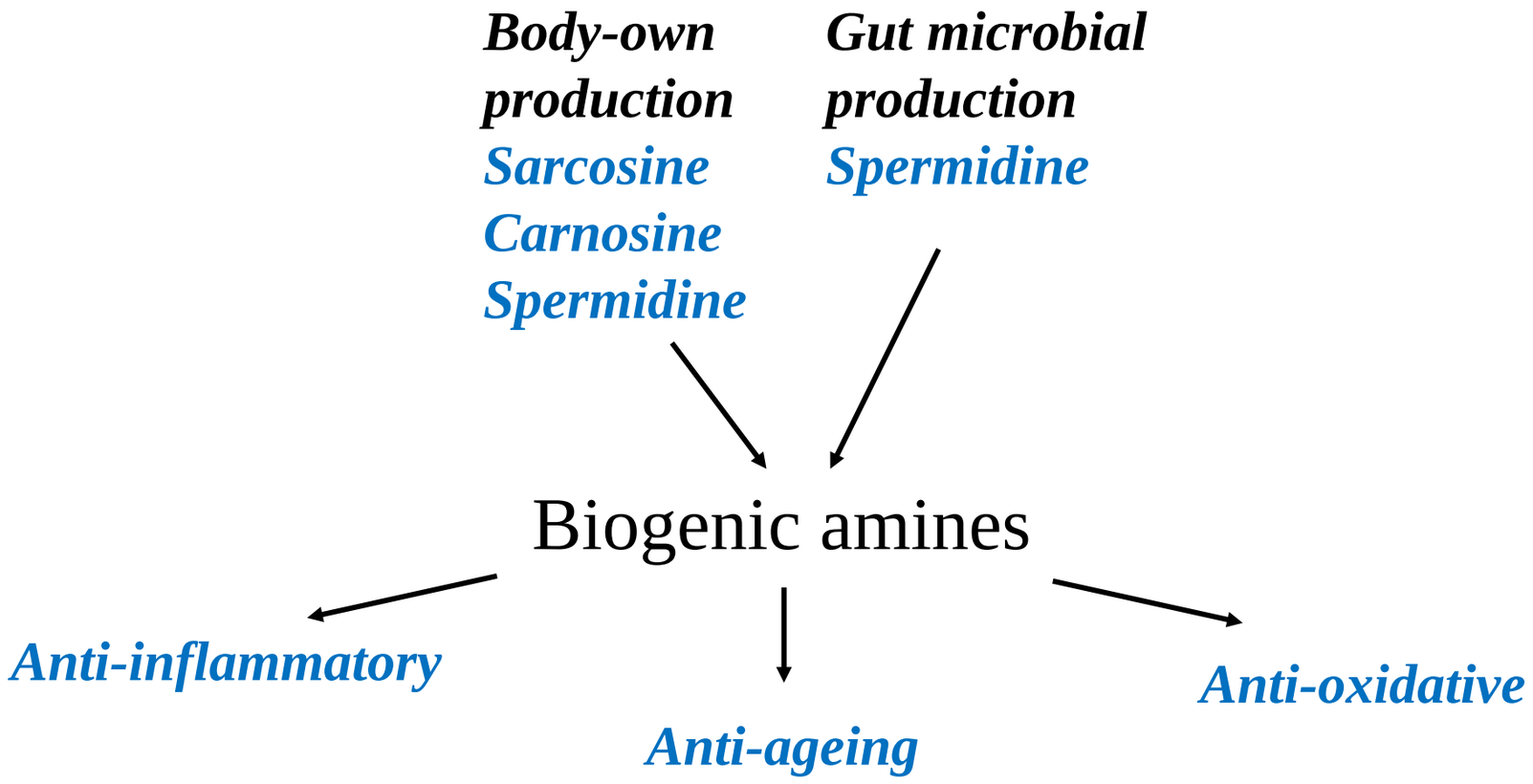

Healthy dairy cows

-have better support by biogenic amines?

Biogenic amines – Minois et al. 2011

Results and Discussion

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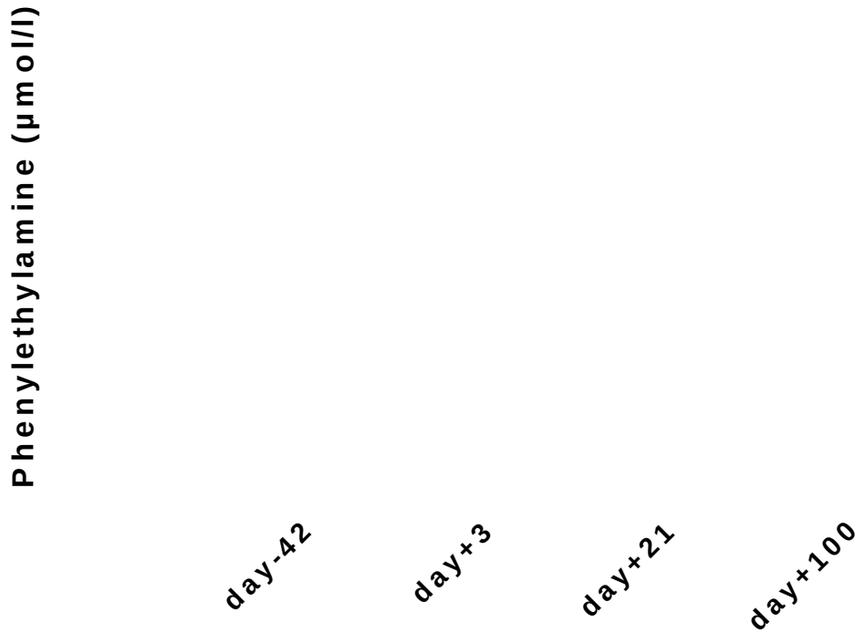
Phenylethylamine

Healthy dairy cows

- are happier?



- LE (6 of 8 below detection limit)
- H (1 of 11 below detection limit)

Beta-Phenylethylamine

- *Bioactive trace amine; endogenous amphetamine (from Phe endogenously, but also of bacterial origin)*
- *TAAR (trace aa receptors)*
- *Neurotransmitter in the brain*
- *Increases availability of dopamine, serotonin and NA*
- *Controls appetite and satiety*
- *Euphoriant, positively affects mood*

Summary and Conclusion

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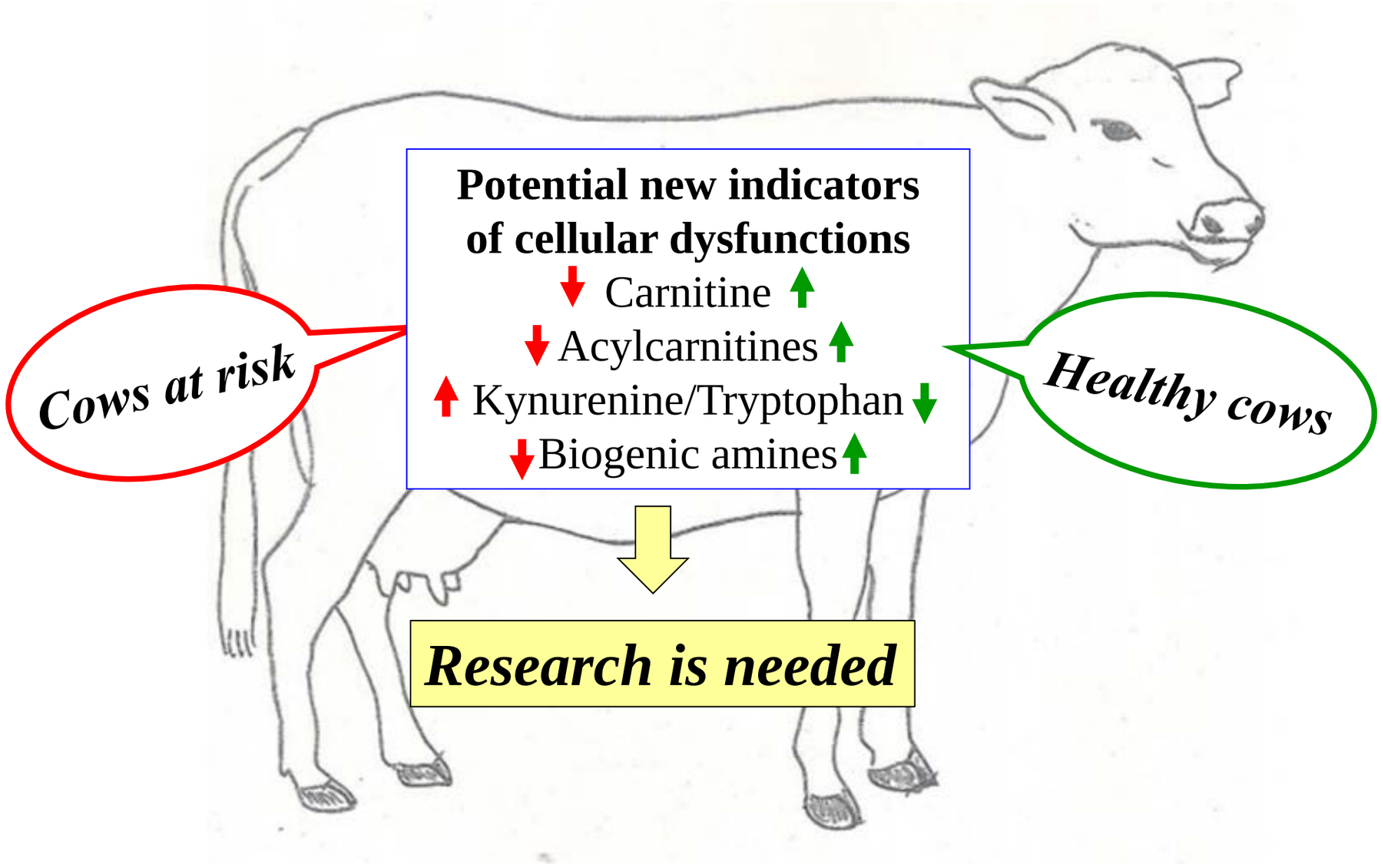

Thank you for your attention!