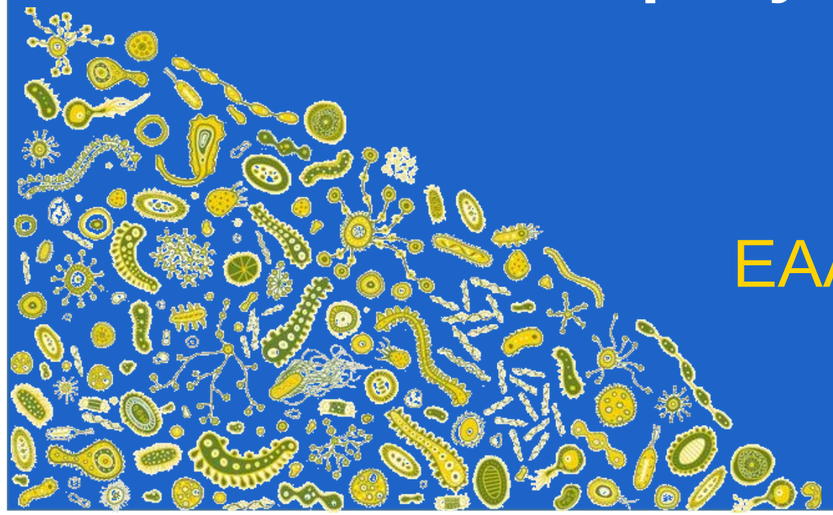
FACULTY OF
BIOSCIENCE ENGINEERING

DEPARTMENT OF ANIMAL SCIENCES AND AQUATIC ECOLOGY
LABORATORY FOR ANIMAL NUTRITION AND ANIMAL PRODUCT QUALITY (LANUPRO)

Distinct blood and milk 18-carbon fatty acid proportions and buccal bacterial populations in dairy cows differing in reticulorumen pH response to dietary supplementation of rapidly fermentable carbohydrates



Lore Dewanckele

EAAP 2019, Ghent, Belgium

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MILK FAT DEPRESSION

A reduction in milk fat content and yield, and alterations in milk fatty acid composition without changes in milk yield or in the yield of other milk components

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MILK FAT DEPRESSION

☹ Reduction in milk fat content and yield

- Direct economic loss
- Reduction feed conversion efficiency

ECONOMIC

☹ Imbalanced rumen conditions

- Impaired animal health
- Reduced ruminal efficiency
- Economic loss

ANIMAL WELFARE

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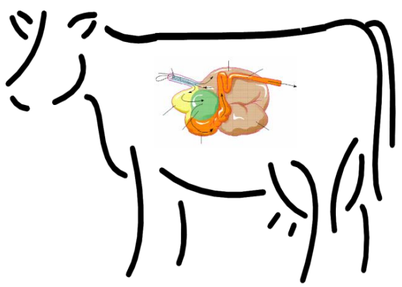
BIOHYDROGENATION THEORY



***Trans*-11 to *trans*-10 shift**

trans

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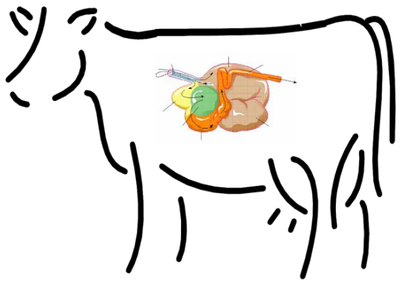
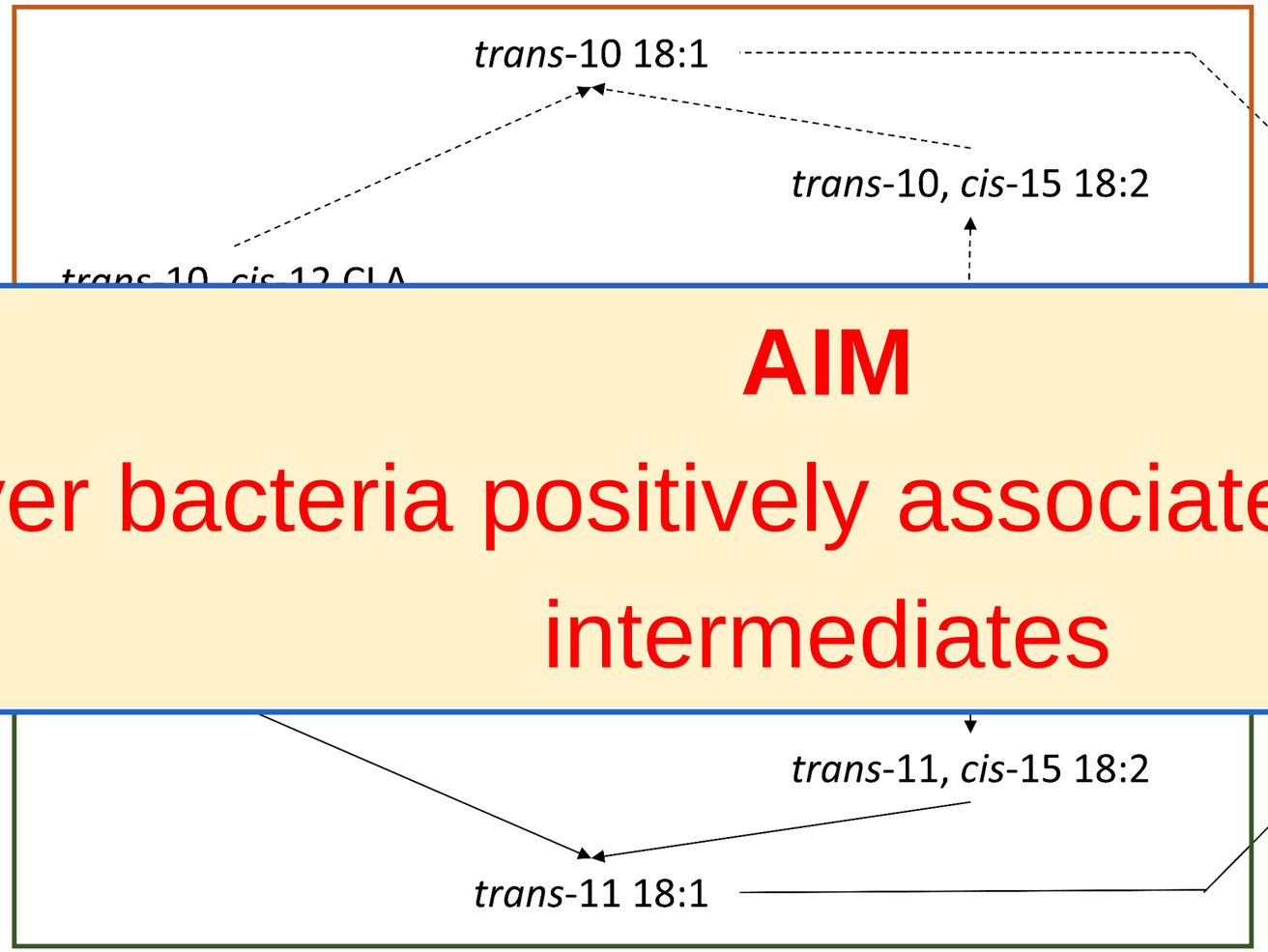
MICROBIAL ETIOLOGY



***trans*-10**

***trans*-11**



AIM

Uncover bacteria positively associated with *trans*-10 intermediates

Butyrivibrio fibrisolvens

Butyrivibrio proteoclasticus

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ANIMALS, EXPERIMENTAL DESIGN AND DIETS

- 10 Holstein-Friesian dairy cows (selected based on Jing et al., 2018)

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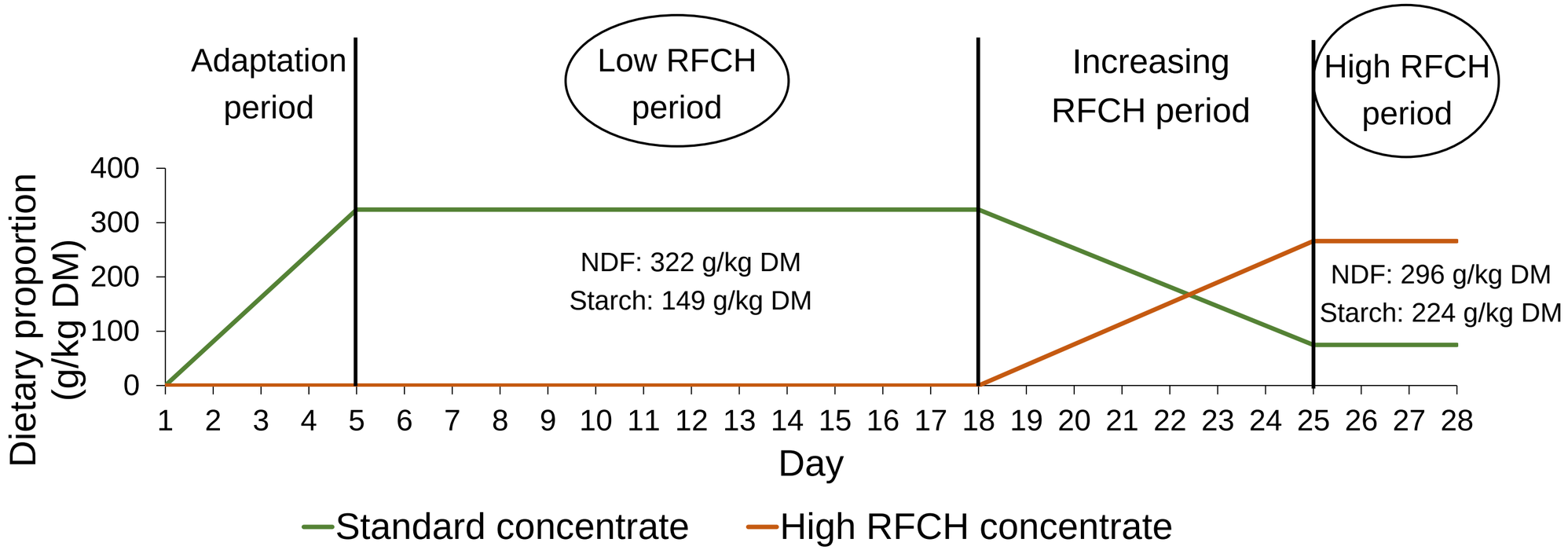
ANIMALS, EXPERIMENTAL DESIGN AND DIETS

- 10 Holstein-Friesian dairy cows (selected based on Jing et al., 2018)
- Treatment: increasing dietary proportions of rapidly fermentable carbohydrates (RFCH)



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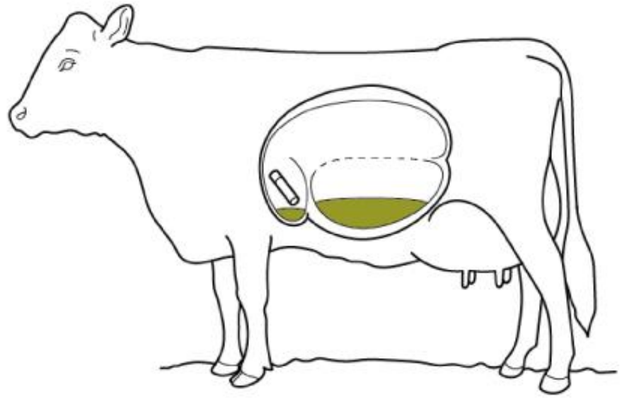
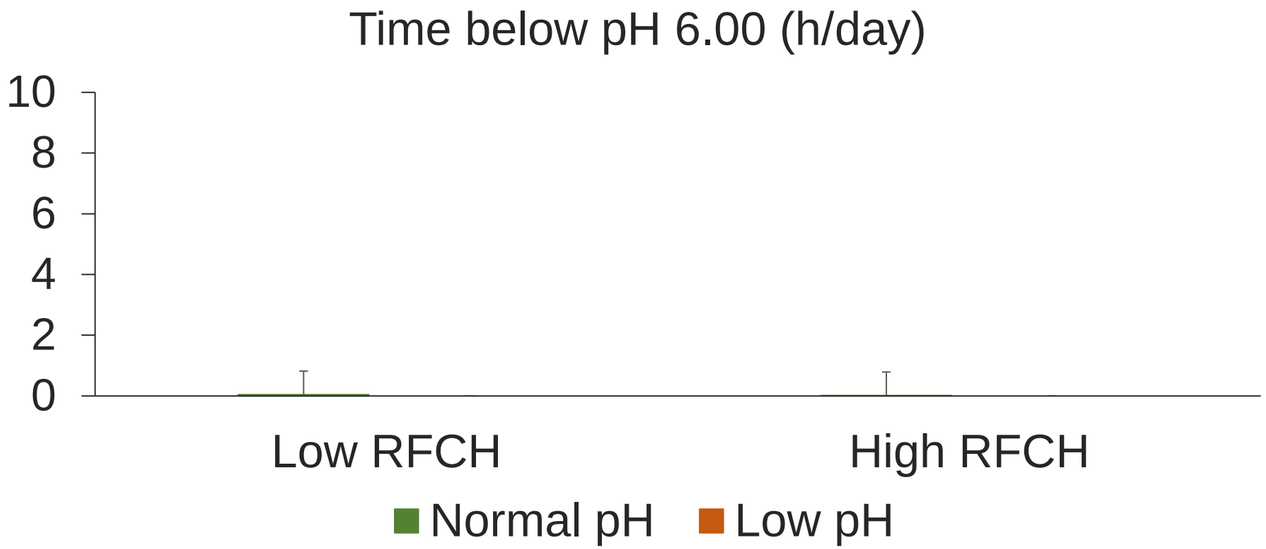
RETICULAR PH – GROUPING OF ANIMALS

- **Reticular pH** via a SmaXtec Premium bolus

  → Two groups of cows based on time below pH 6.00

  i/ Normal pH cows (n = 4; t ≤ 0.10 h/d)

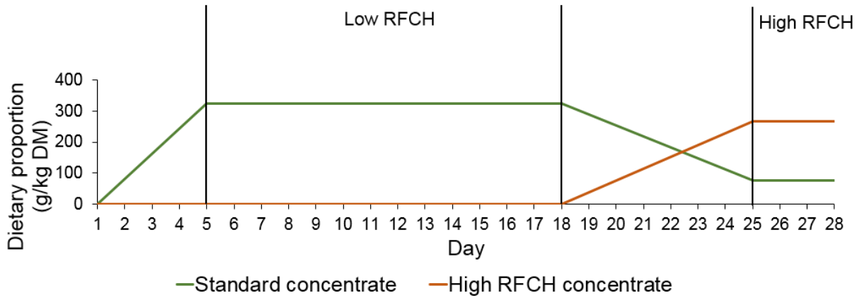




$P_{group} < 0.001$

$P_{period} = 0.722$

$P_{interaction} = 0.751$



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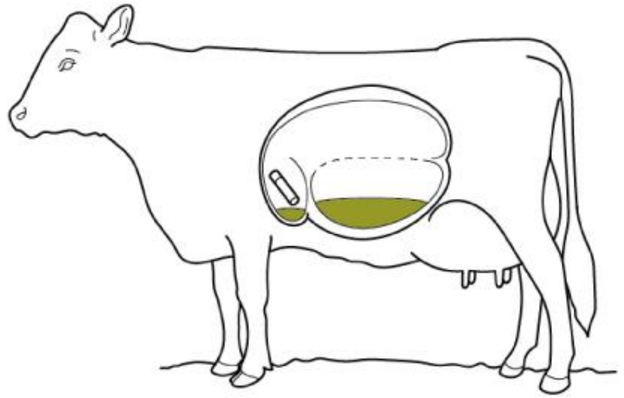
RETICULAR PH – GROUPING OF ANIMALS

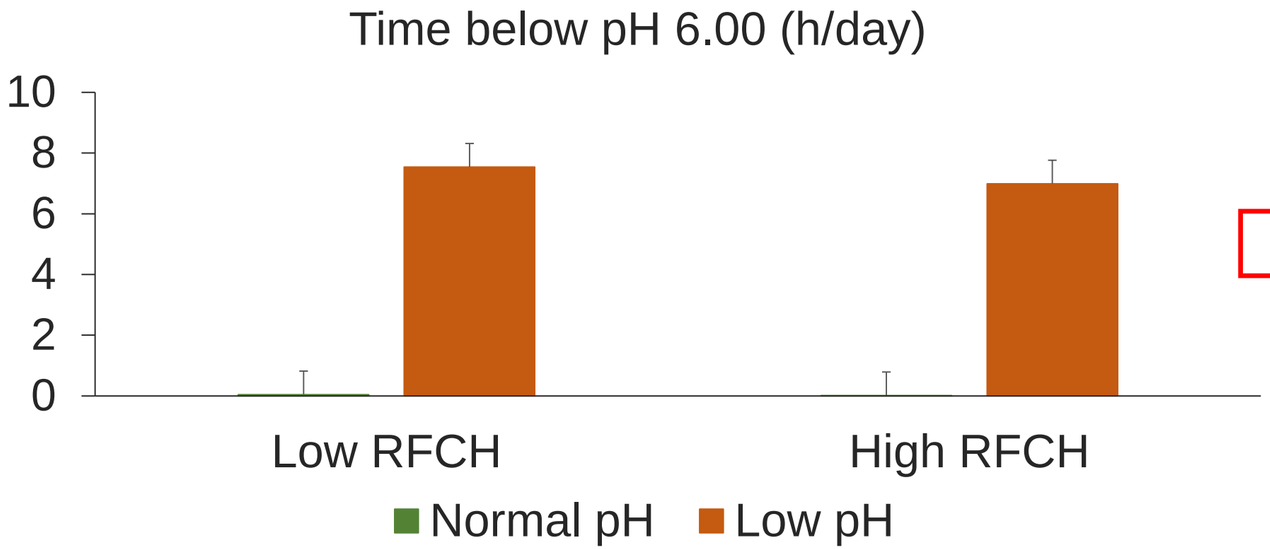
- **Reticular pH** via a SmaXtec Premium bolus

  → Two groups of cows based on time below pH 6.00

  i/ Normal pH cows (n = 4; t ≤ 0.10 h/d)

  ii/ Low pH cows (n = 5; t ≥ 1.00 h/d)





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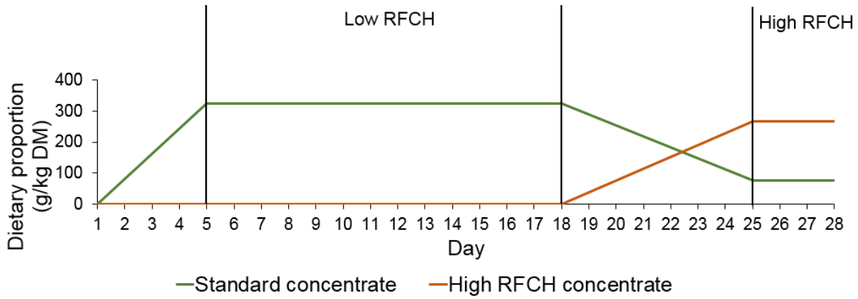

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HYPOTHESIS

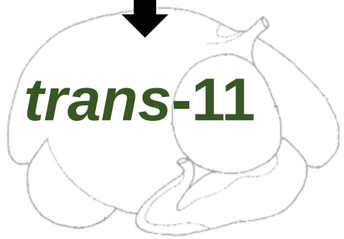
Normal pH cows

Low pH cows

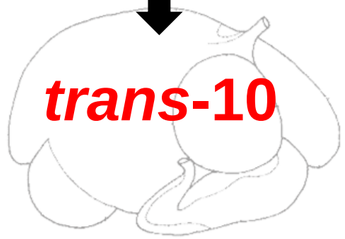
?

No milk fat depression

Milk fat depression



***trans*-11**



***trans*-10**

Bacterial community

≠

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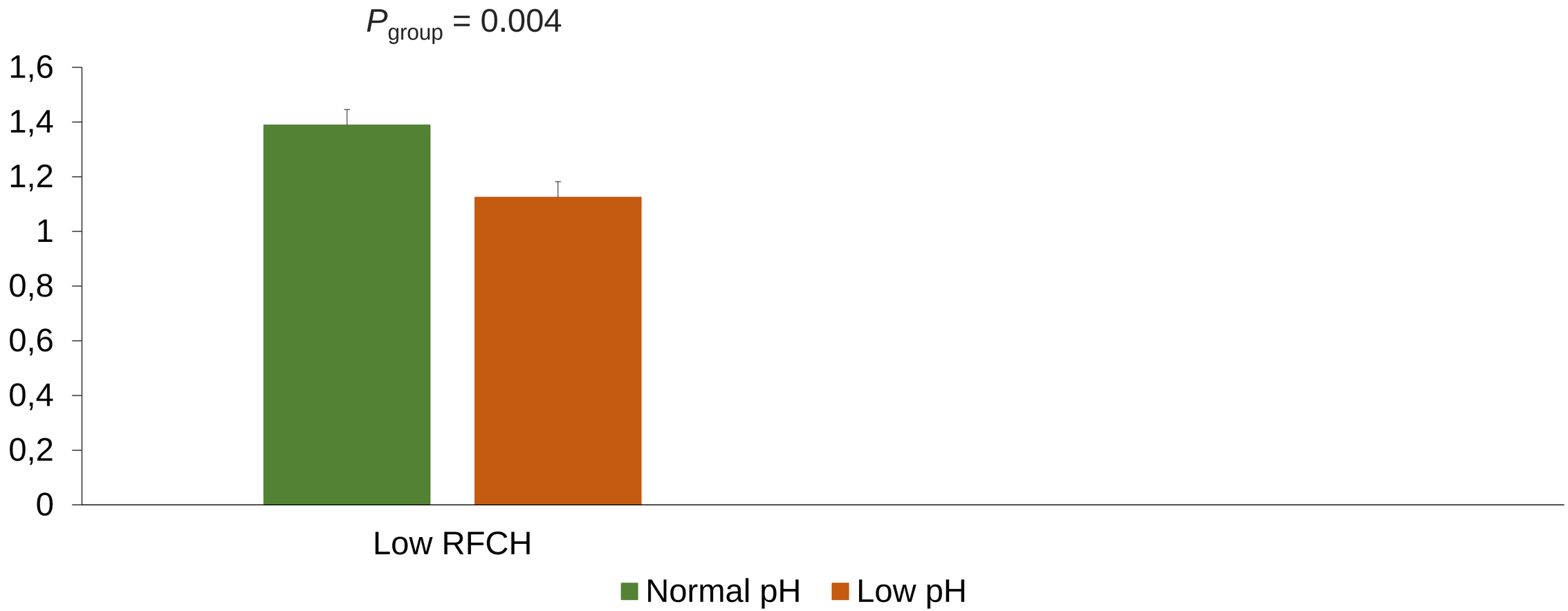
MILK FAT YIELD (KG/D)



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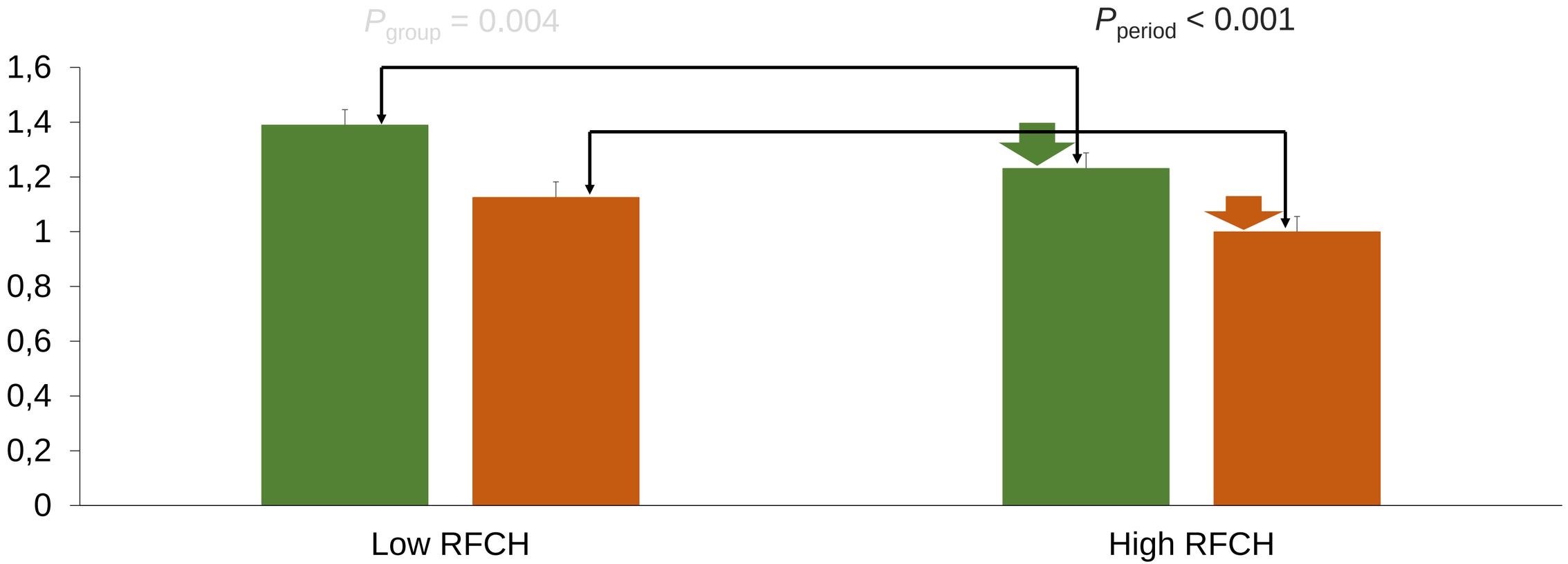
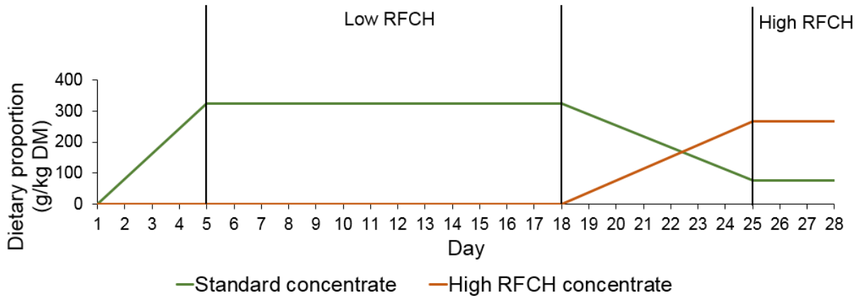
MILK FAT YIELD (KG/D)





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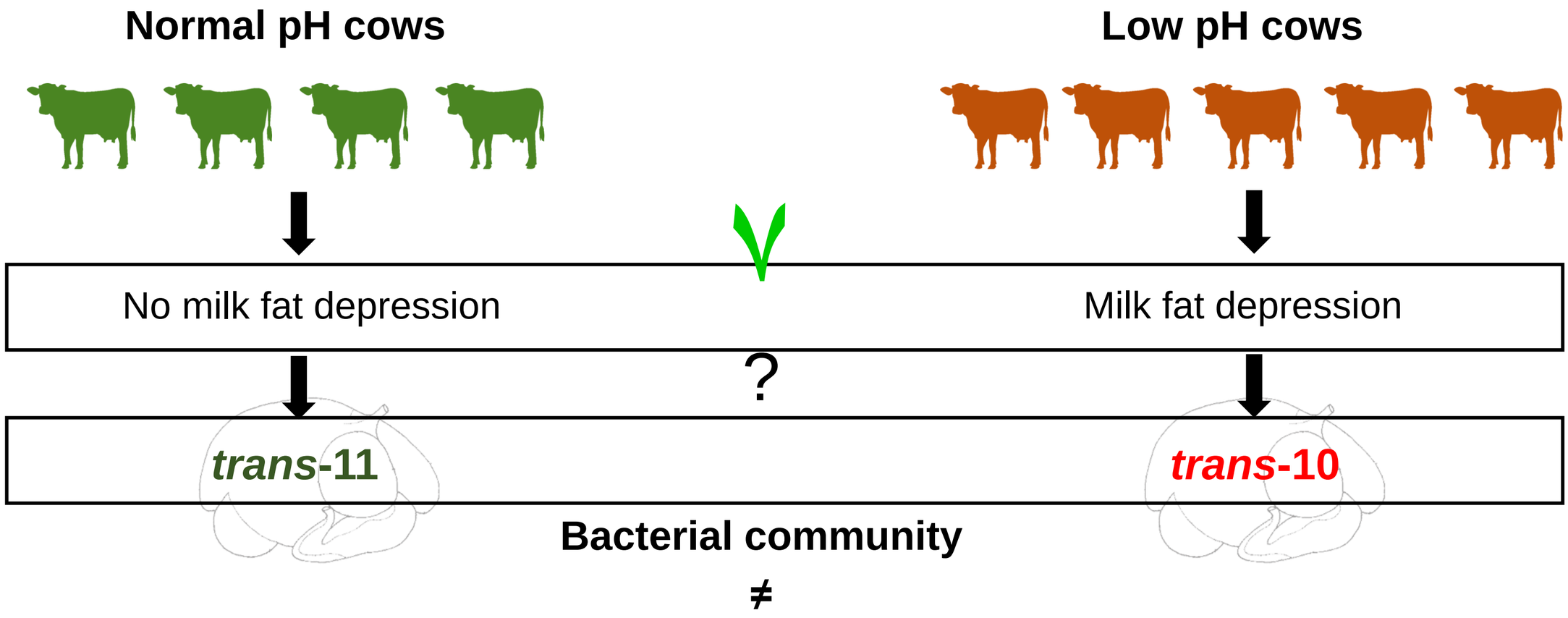
HYPOTHESIS



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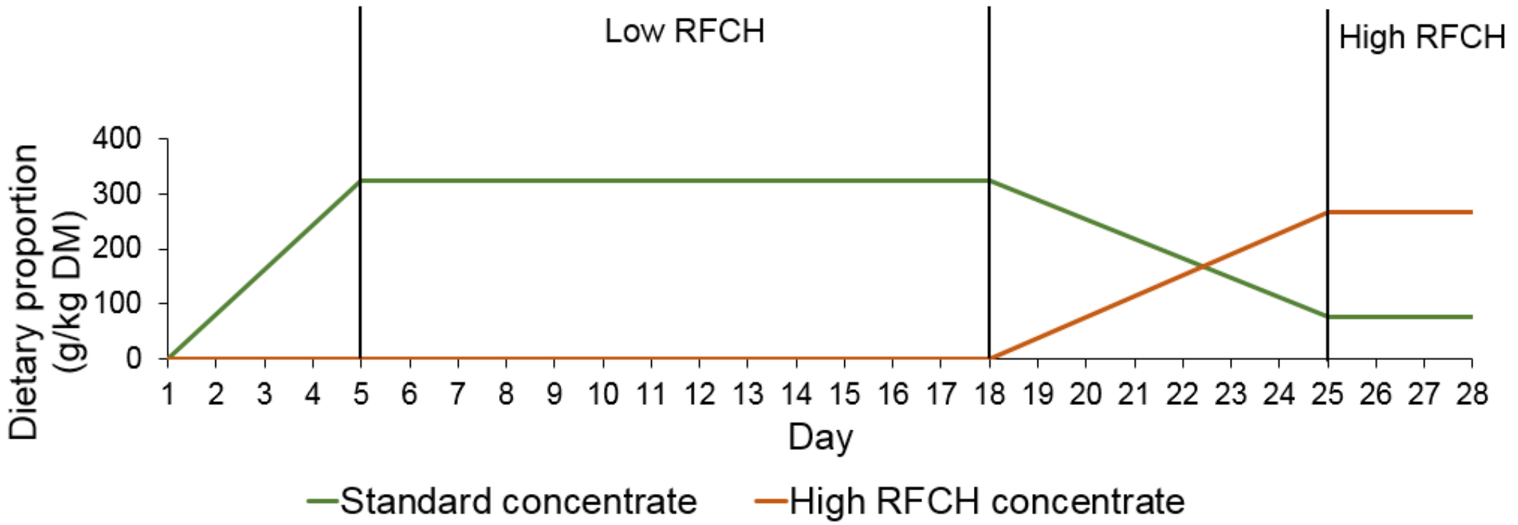
SAMPLING AND FATTY ACID ANALYSIS



- Extraction
- Methylation
- GC analysis

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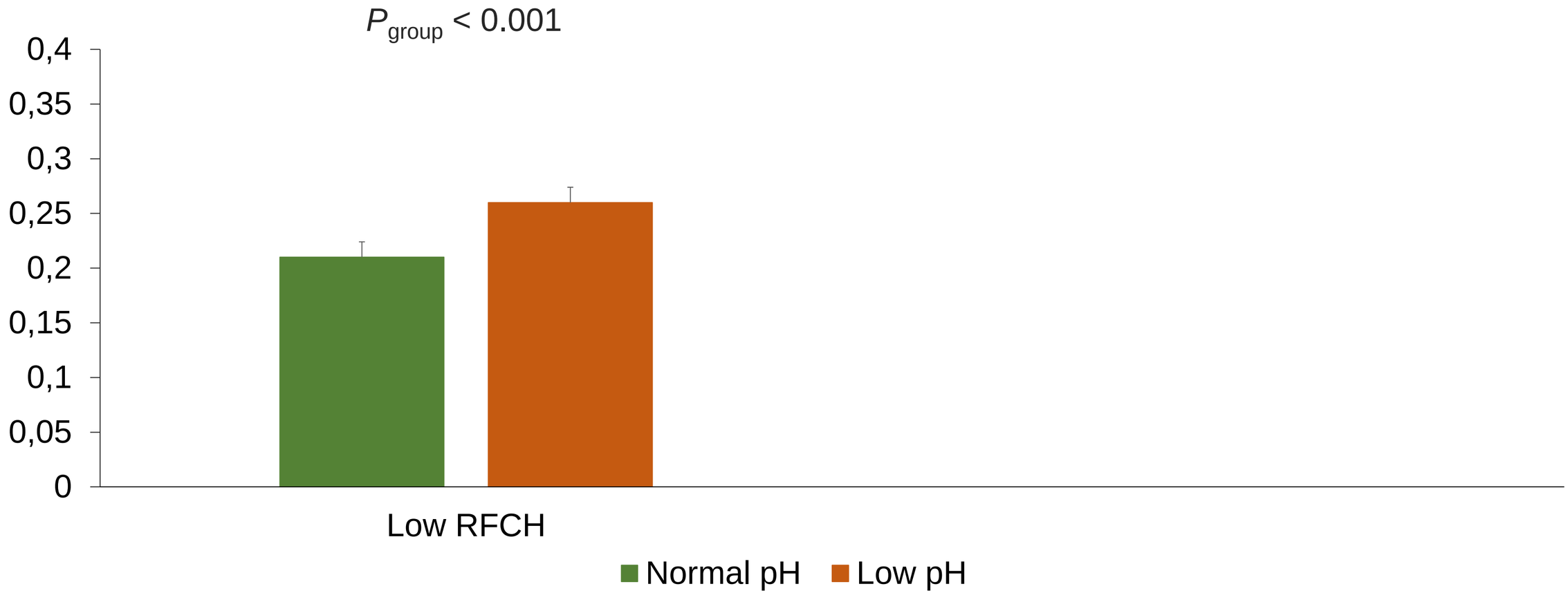
TRANS-10:*TRANS*-11 (MILK FAT)



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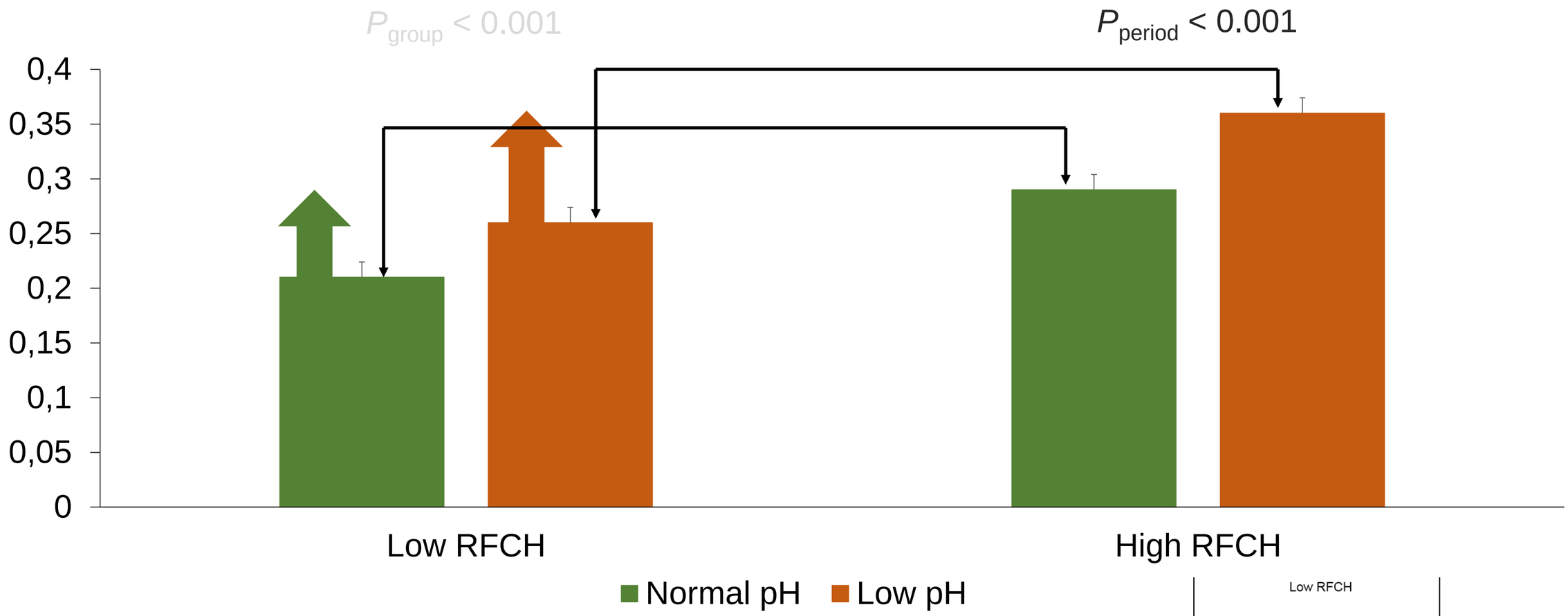
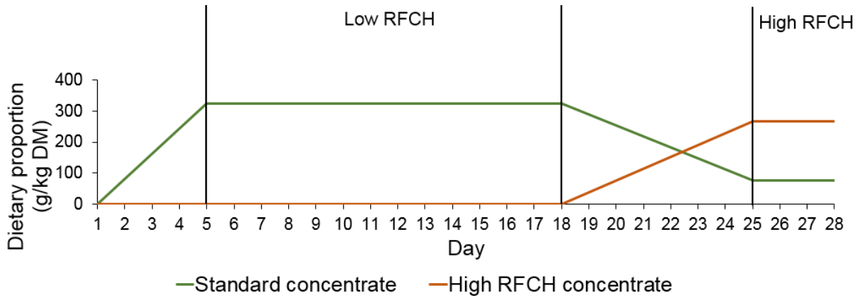
TRANS-10:*TRANS*-11 (MILK FAT)





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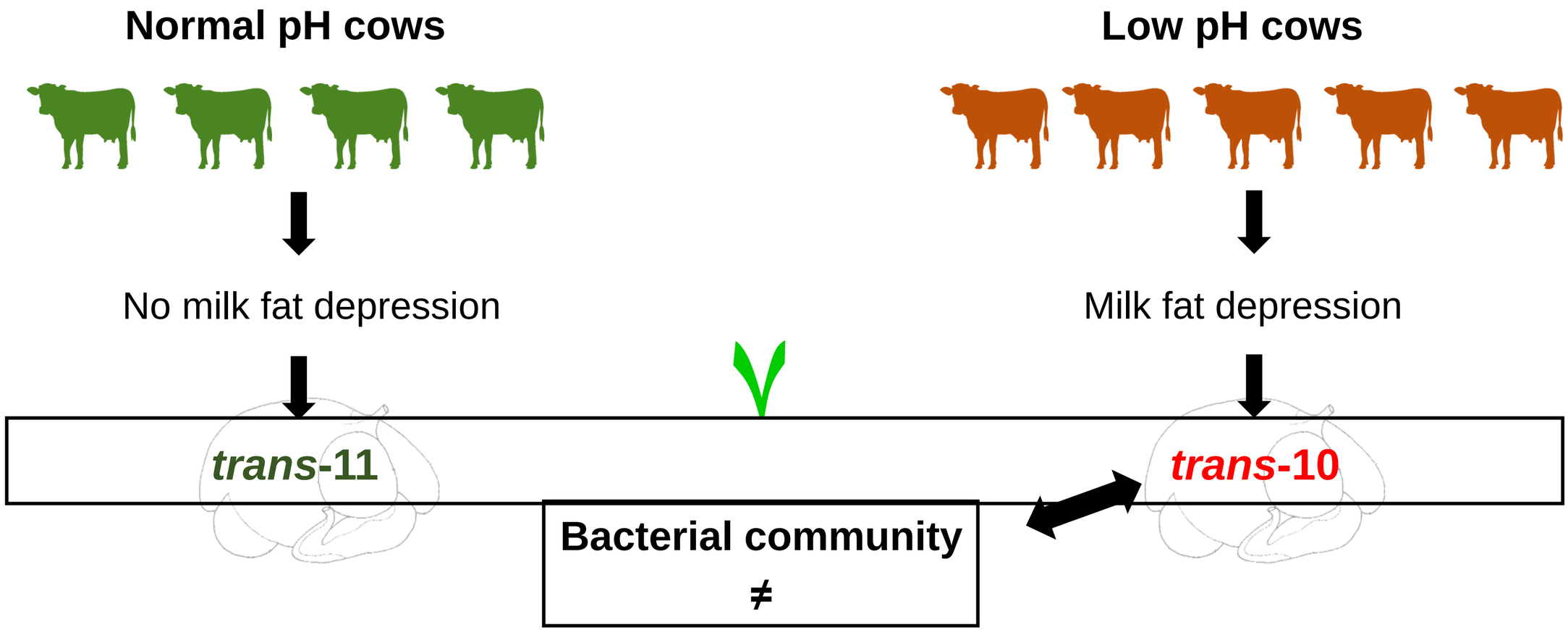
HYPOTHESIS



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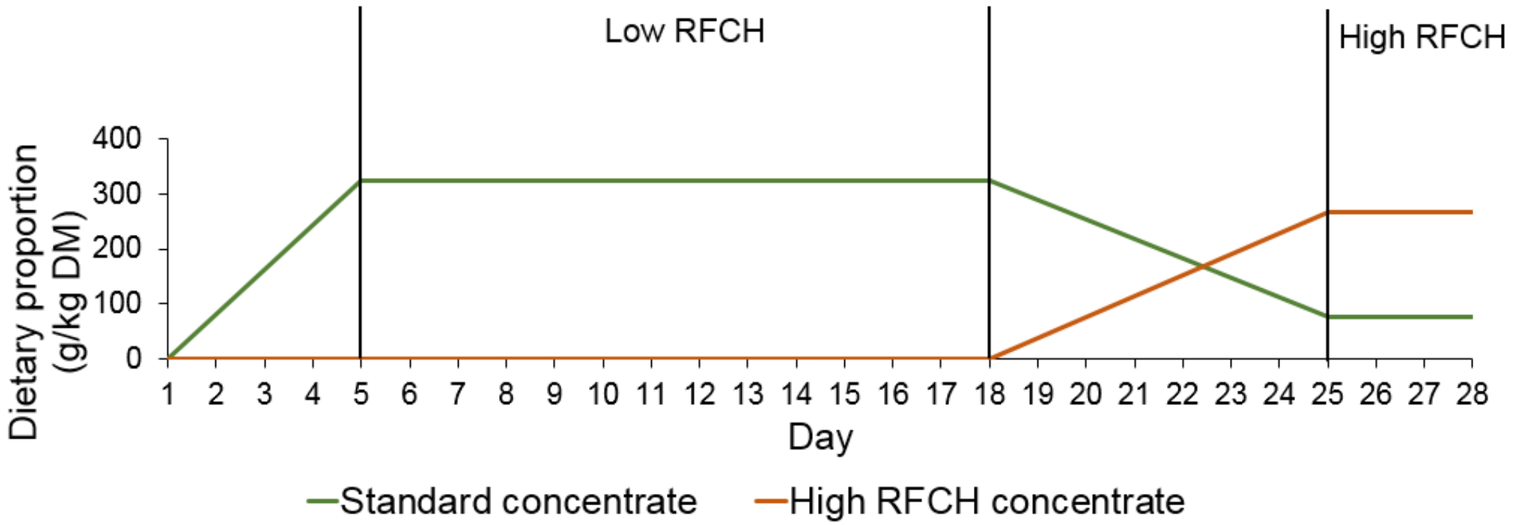
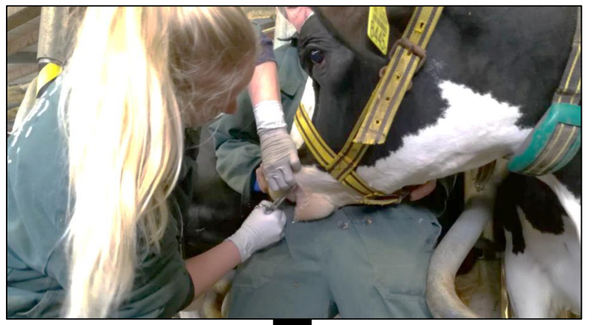
SAMPLING AND MICROBIAL COMMUNITY ANALYSIS



Buccal swab samples



- DNA extraction
- 16S rRNA gene amplicon sequencing

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BACTERIA ASSOCIATED WITH *TRANS*-10

Positive correlation with *trans*-10 intermediates:

- *Dialister* spp.
- *Sharpea* spp.
- *Carnobacterium* spp.
- *Acidaminococcus* spp.

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CONCLUSIONS

- Inter-animal variation in reticular pH → normal pH vs. low pH cows
- Lower reticular pH and dietary RFCH supplementation were associated with milk fat depression
- Lower milk fat levels were accompanied with a *trans*-11 to *trans*-10 shift
- *Dialister* spp., *Sharpea* spp., *Carnobacterium* spp. and *Acidaminococcus* spp. were more abundant in situations with greater *trans*-10 accumulation

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Thank you for your attention!
Questions?

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