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The relationship between buccal microbiota and methane emission of Holstein Friesian dams and their calves

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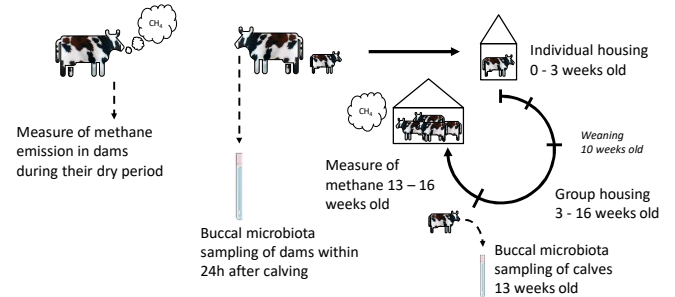


Introduction

In ruminants the rumen microbiota is responsible for the production of methane, a potent greenhouse gas. The development of rumen microbiota in young ruminants is strongly influenced by maternal microbial transfer¹. Buccal microbiota is considered a proxy for rumen microbiota² as cows regurgitate the content of their rumen. However, it is not clear if the buccal microbiota of dams and calves can be used to assess the maternal transfer and if buccal microbiota can be associated with methane emission.

Objective: investigate (1) the parental relationship between dams and calves based on buccal microbiota and (2) whether buccal microbiota is associated with methane emission in dams and calves

Methods



Results

Parental relationship

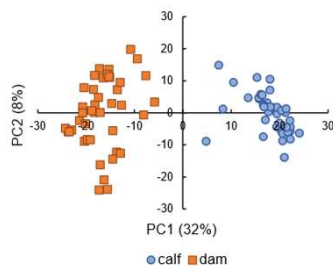


Fig.1 Principal component analysis of dams and calves buccal microbiota. Clear separation of the two groups indicates a difference in buccal microbiota composition.

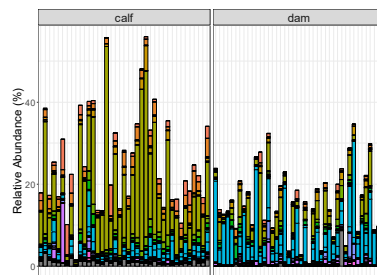


Fig.2 Relative abundance of Actinobacteriota families in the buccal microbiota of dams and calves, Green: Corynebacteraceae; blue: Micrococcaceae

- Buccal microbiota of dams and calves is different
- Calves have a higher relative abundance of Corynebacteraceae and dams a higher relative abundance of Micrococcaceae
- Parental relationship is not significant for common ASVs correlation between true dam-calf pairs

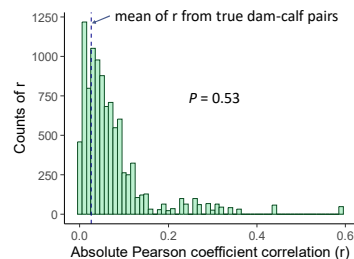
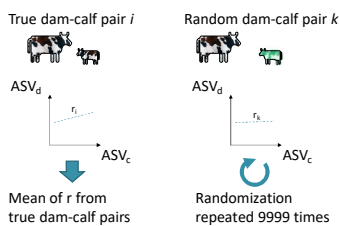
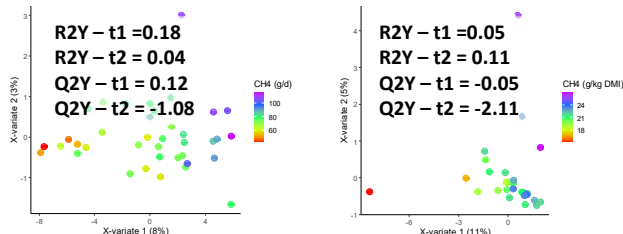


Fig.3 Empirical *P*-value calculated from random permutation of true dam-calf pairs. **Left:** Statistical approach to determine whether true dam-calf pair buccal microbiota show a significant relationship. **Right:** Histogram of Pearson correlation coefficients *r* for random dam-calf pairs. The blue dashed line is the mean of the Pearson correlation coefficients for true dam-calf pairs. The *P*-value corresponds to the fraction of *r* above the (absolute) mean of true dam-calf pairs *r*.

Buccal microbiota – CH₄



- Negative Q2 indicates overfitting of models
- No relationship between buccal microbiota and methane emission in calves or dams

Fig.4 sPLS score plots and model performance metrics to relate buccal microbiota to methane emission. **Left:** sPLS of calves; **Right:** sPLS of dams

Conclusions

1. Dams and calves had different buccal microbiota
2. No relationship between the buccal microbiota of dams and their calves
3. Buccal microbiota was not associated with methane emission

Perspectives

- Investigate the maternal transfer of microbiota in rumen fluid
- Explore the human-assisted transfer of rumen microbiota from dam to calf
- Determine the extent to which buccal microbiota is similar to rumen microbiota

References

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