

➤ Effect of sampling method, oral-stomach sampling vs. sampling through ruminal cannula, on ruminal pH and concentrations of volatile fatty acids and mineral of during an acidogenic challenge in dairy cows

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➤ A need to address the controversy surrounding the use of fistulated ruminants

Fistulated ruminants have provided tools for:

reasoning
the feed
efficiency
of diets

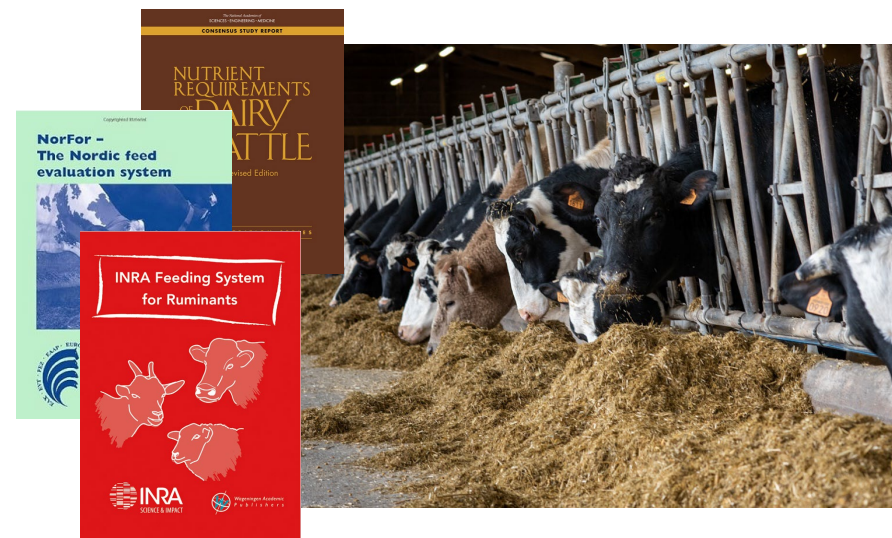
limiting
effluents
or gas
(CH₄)

anticipating
the variability
in the quality of
animal products

but ...
acceptability ?

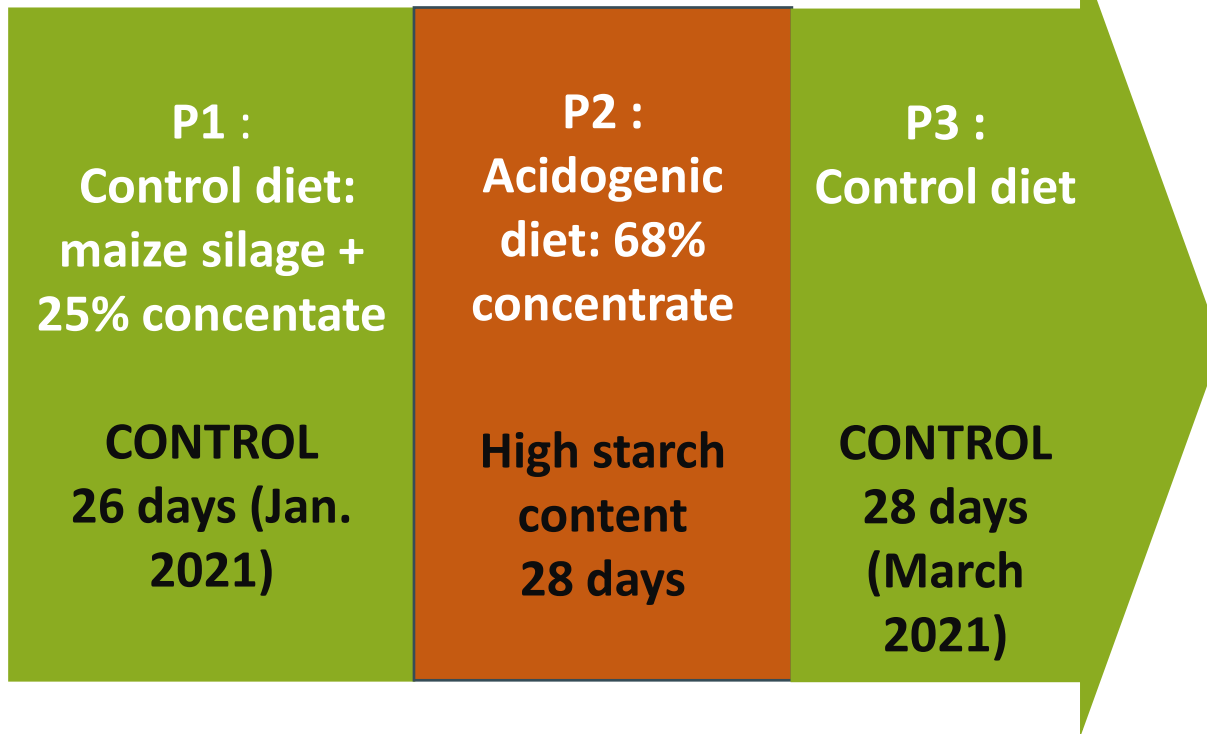
Is oral-stomach sampling as an acceptable
alternative to characterize the variability of
rumen fluid composition during an acidogenic
challenge in dairy cows?

Not a new question, but an urgent
need to develop skills in this method



➤ Material and Methods

- **6 fistulated lactating dairy cows**
- **3 one month-periods**
- **TMR based on maize silage**



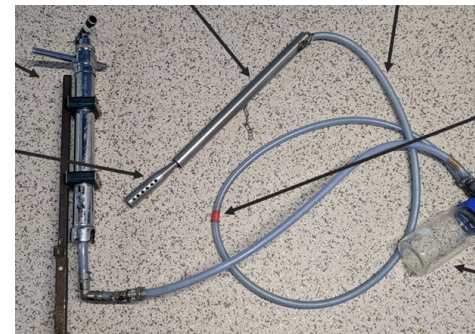
Ruminal samplings every week (1d/wk):

- Through ruminal cannulae (Cn):



- 3 points/d:
8h30 before morning
feeding, 13h30, 16h30
- 3 locations in the rumen

- Oral-stomach sampling (OSS):

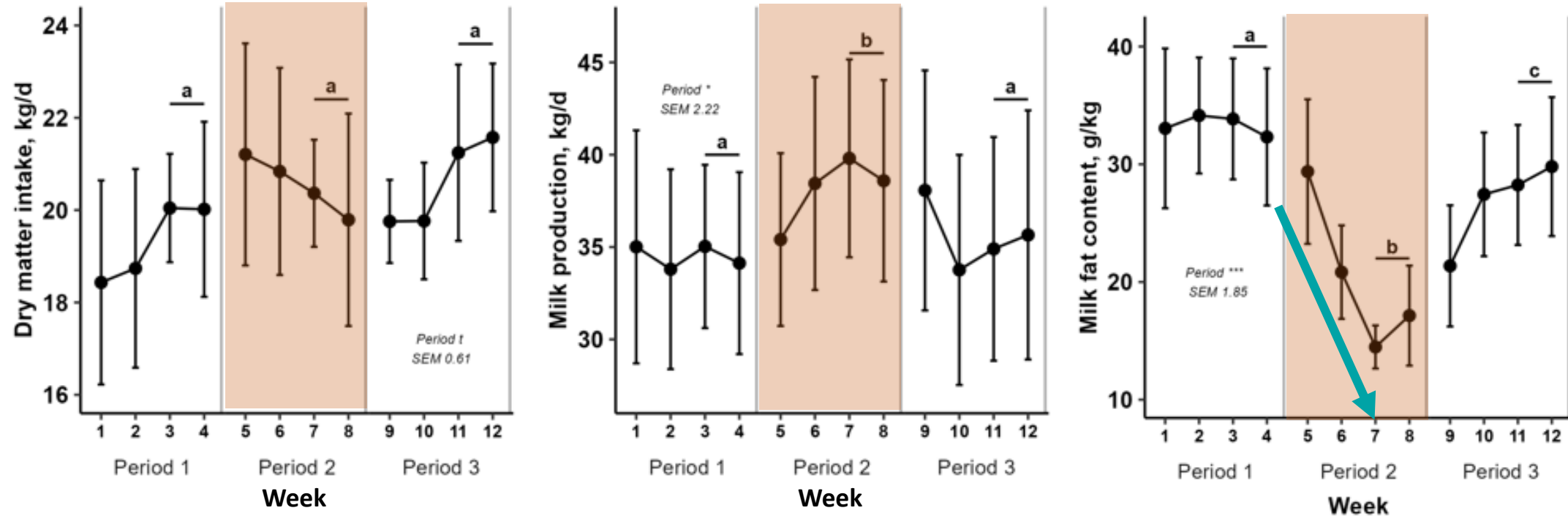


- 1 point/d: 8h30 before
morning feeding
(except in the 3rd wk of
each period with 2
points/d: 8h30 and
13h30)

➤ Actual acidogenic diet in period 2?

Acidogenic
diet

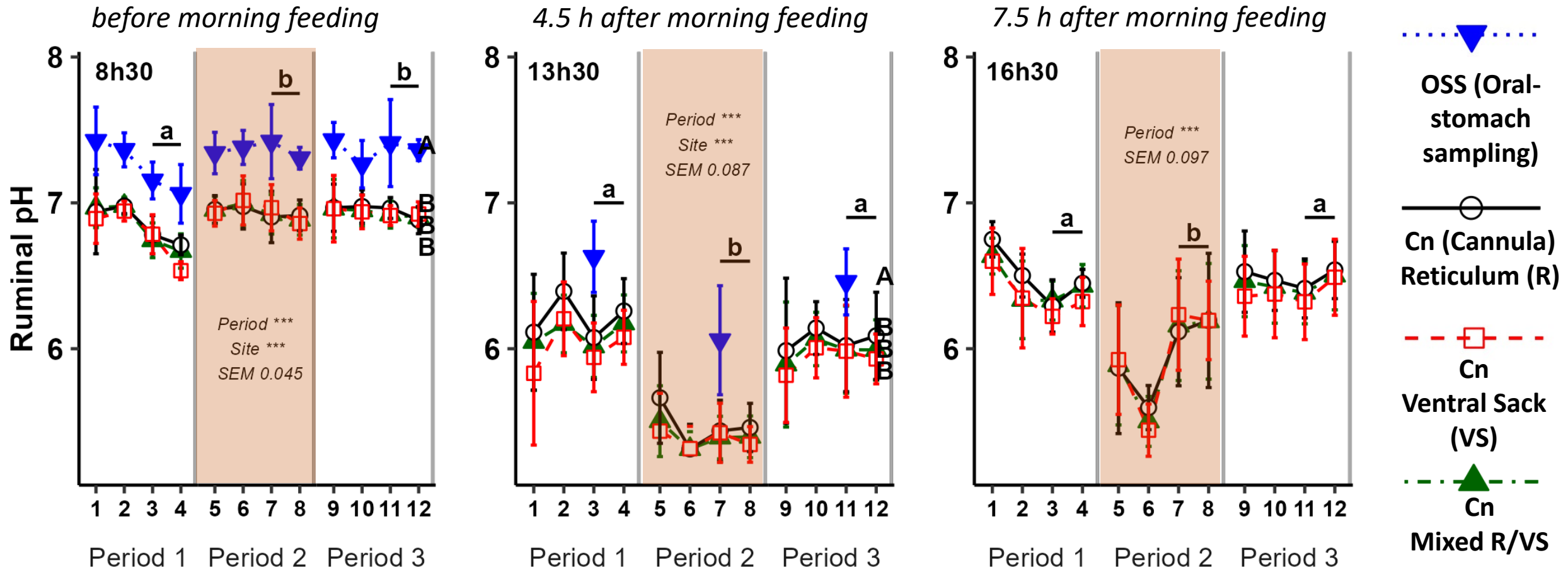
Objective: to increase variability of rumen fluid composition



A marked drop in milk fat
content in P2

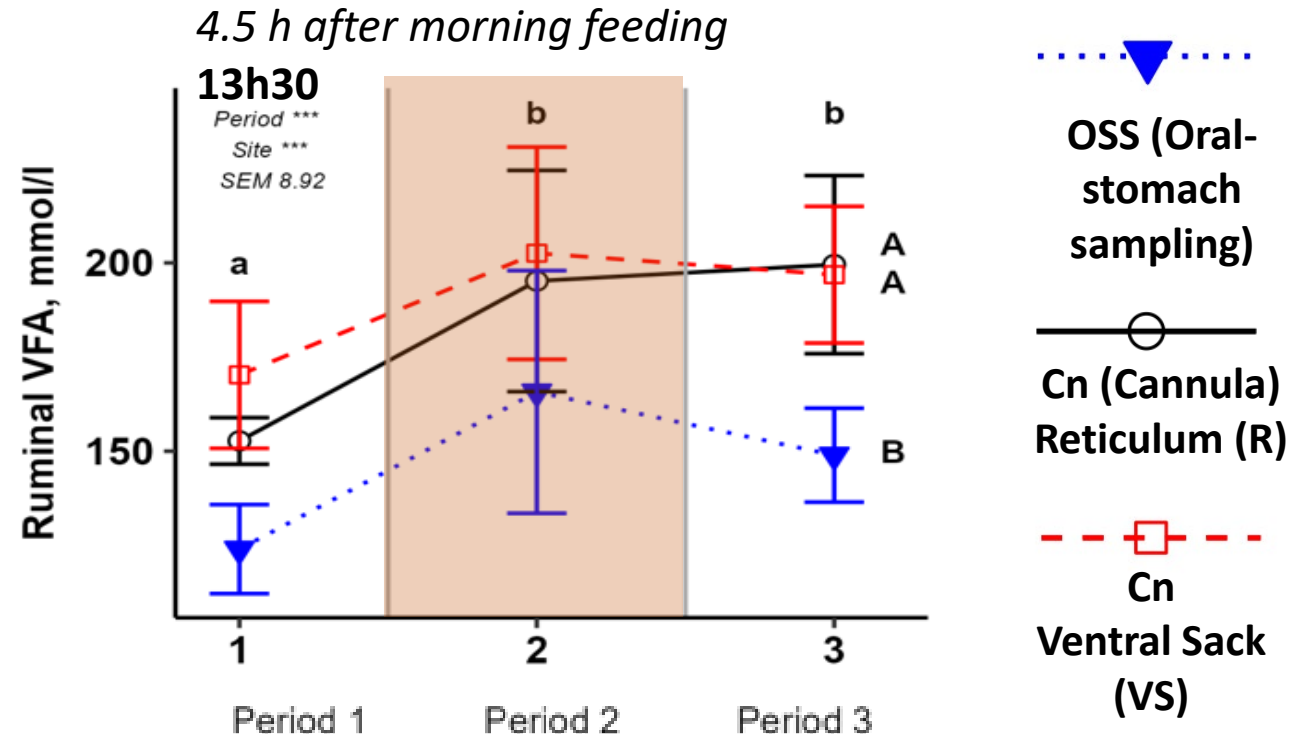
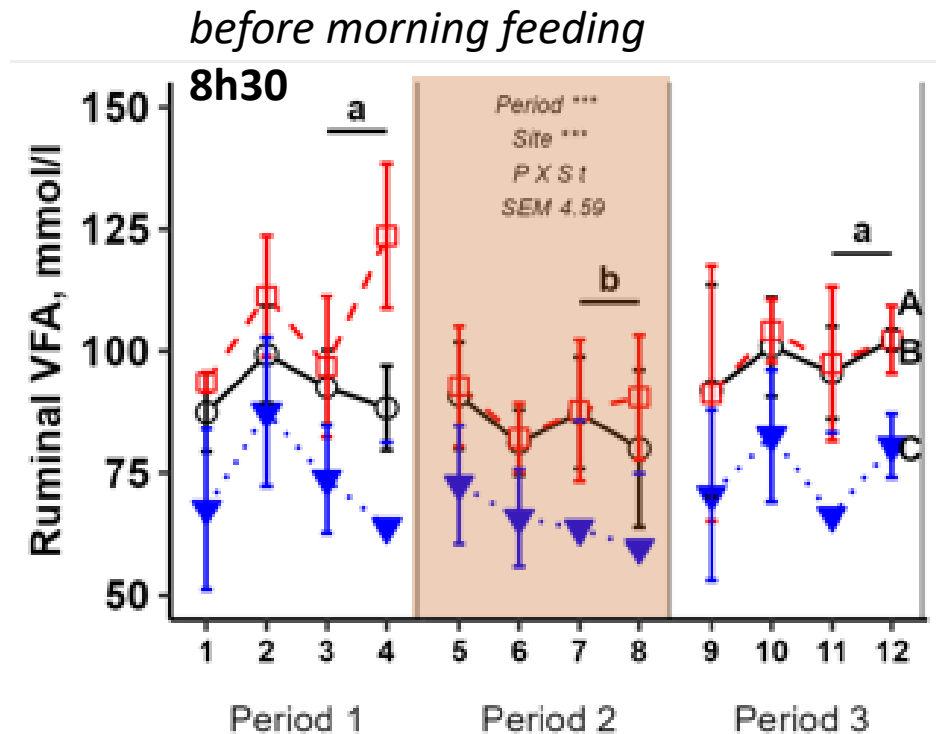
*consistent with acidosis challenges in
experimental dairy cows (Silberberg et al., 2024)*

➤ Higher pH with OSS than with Ca & limited effect of Ca sampling location



- > Expected variations with time and periods
- > Higher pH with OSS than with Cn at 8h30 and at 13h30.
- > pH not affected by sampling sites with Cn

➤ Consistently lower VFA concentration with OSS than with Ca



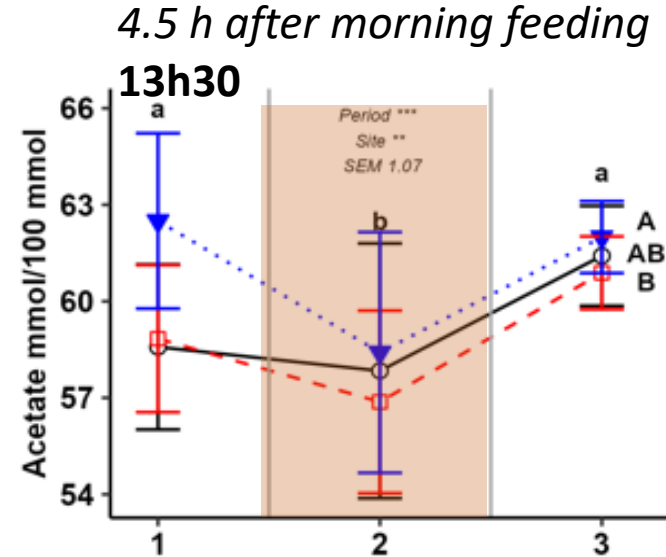
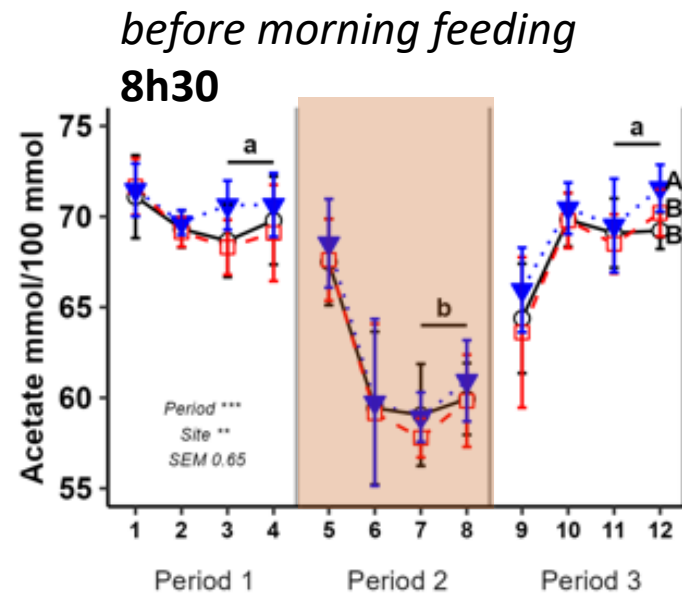
Only samples collected in the 3rd week of each period were analyzed.

> Variations of ruminal VFA concentrations consistent with pH

> Results in line with many other studies, although some studies did not observe any bias.

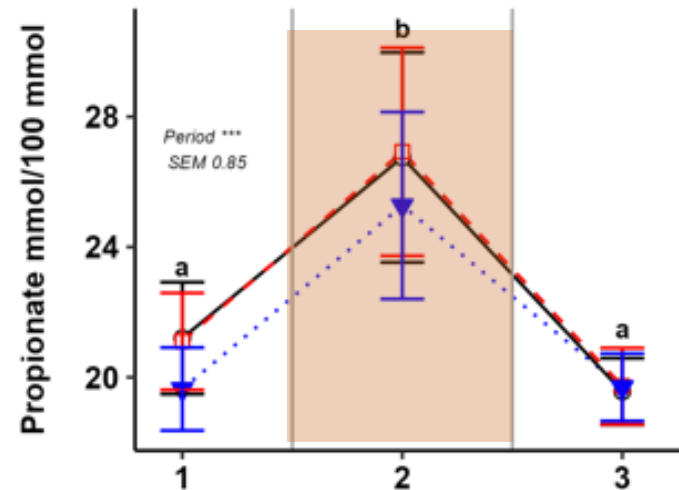
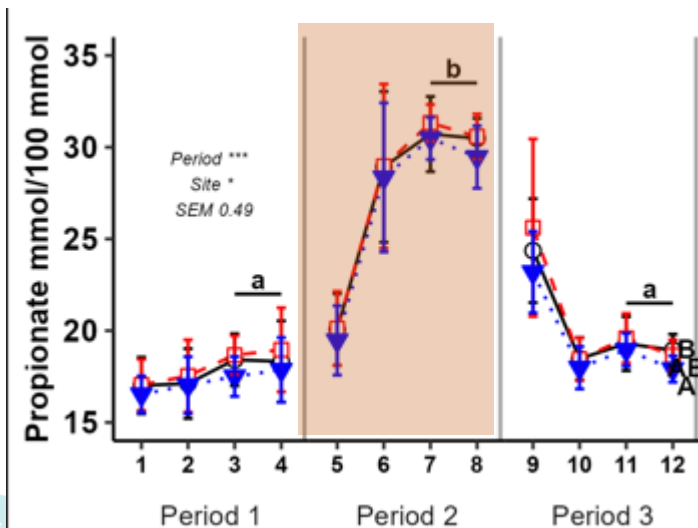
> Dilution by saliva = a probable reason

➤ Molar proportions of VFA: limited effect of the sampling method (at 8h30)



.....▼..... OSS
 —○— Cn R
 - - -□- - - Cn VS

➤ Limited effect of sampling method at 8h30, but at 13h30: higher C2 proportions and lower C3, C4 and minor acids proportions with OSS/Cn

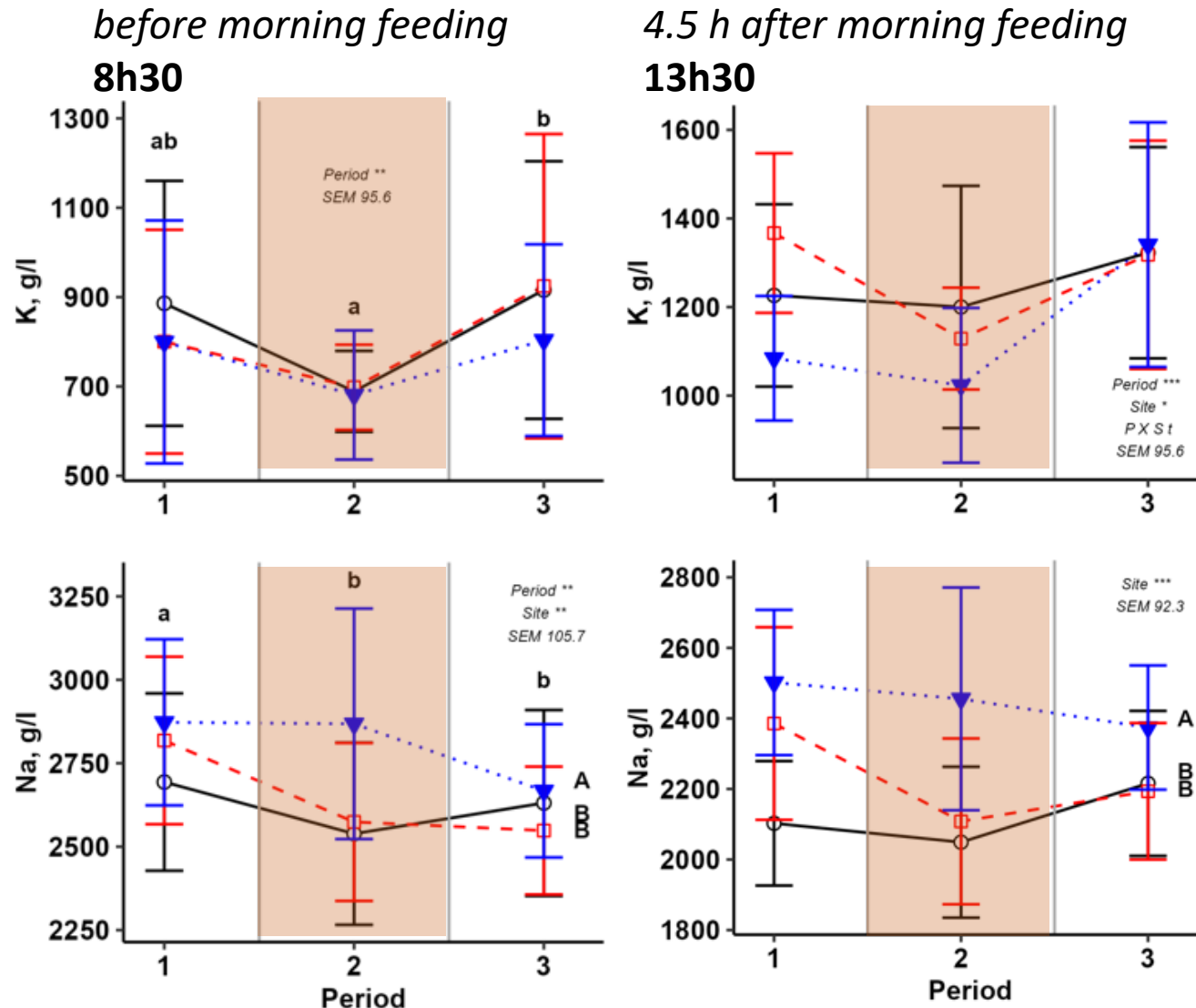


3rd wk of each period

➤ Dilution by saliva may not be the only reason of the sampling method effect?

➤ Different sampling sites ?

➤ Saliva contamination during OSS was likely but may have decreased as the cows become 'trained' to OSS sampling (P3)



.....▼..... —○— - - - □ - - -
 OSS RCn VSCn
 3rd wk of each period

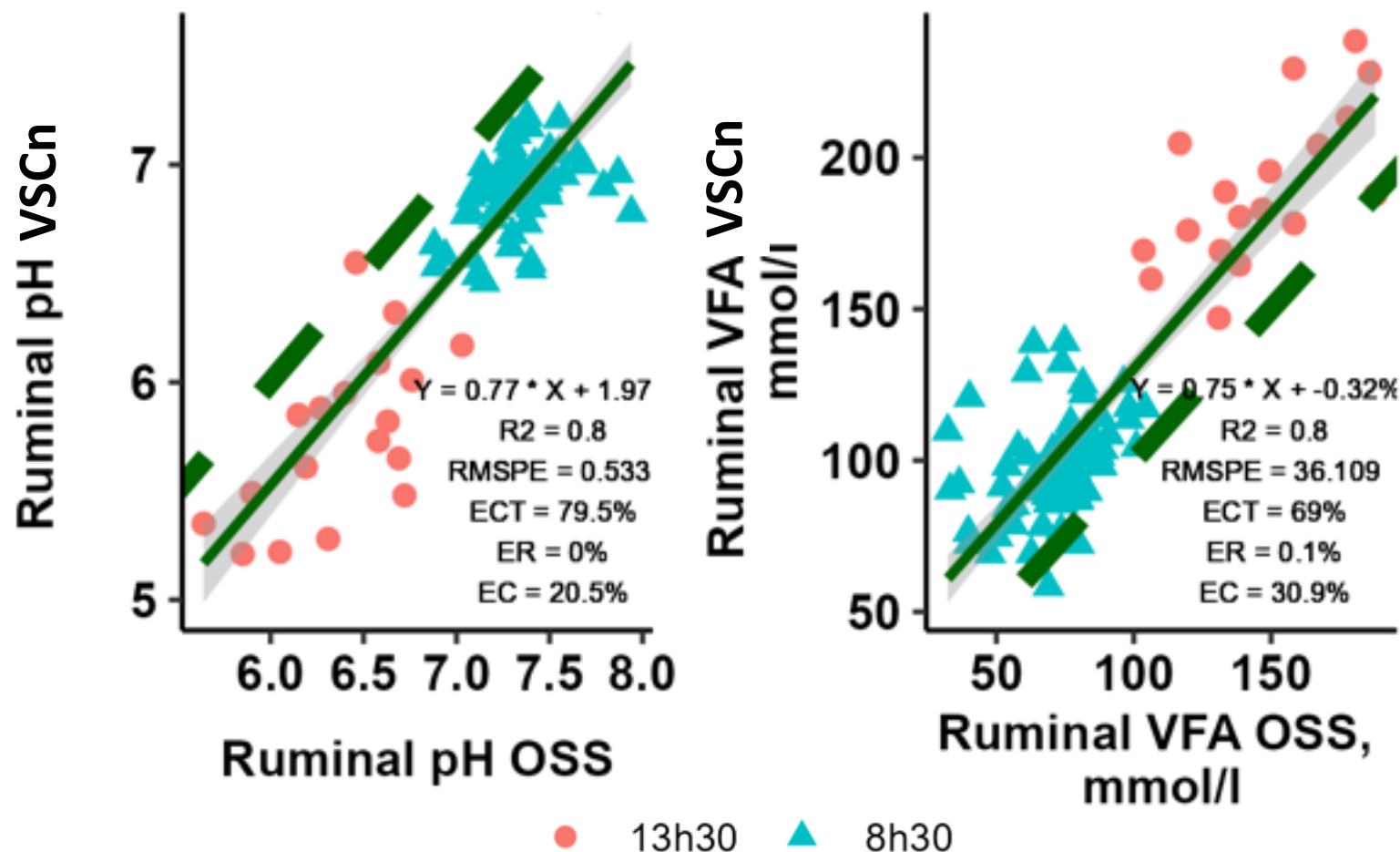
Na and P : saliva > rumen fluid,
K : Rumen fluid > saliva ([Bailey, 1961](#)).

→ Dilution of samples by saliva with OSS

→ Clearer à 13h30 (sampling more difficult with a full rumen)

→ At 13h30 with OSS, less saliva contamination in P3 than in P1 and P2 ?

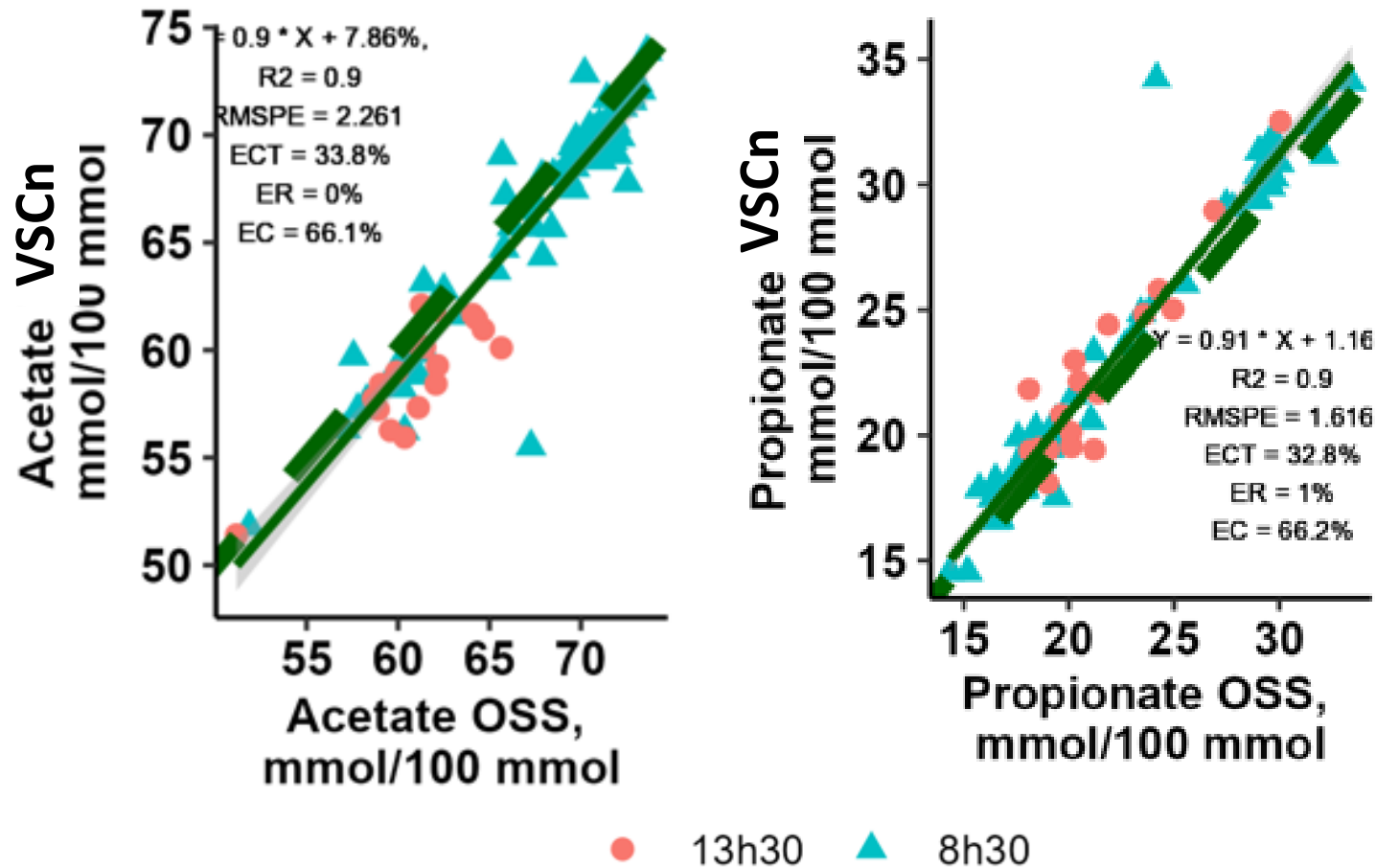
- Can OSS be an alternative to fistulated ruminants to obtain representative samples of ruminal fluid?
For pH and VFA concentrations?



- a strong correlation between OSS or Cn (VS)
- a non-negligible but fixed bias
- noisy predictions of Cn with OSS
- the predictive value of OSS sampling was even quite low within sampling time

The predictive character of OSS is only guaranteed for large variations in pH and VFA (average prediction errors of OSS/Cn of about 0.8 for pH and 36 mmol/l for VFA conc)

➤ For molar proportions of VFA?



➤ OSS prediction remained generally satisfactory even within the sampling times

*A solution under experimental conditions:
combining telemetric ruminal boluses (Villot et al., 2018) for pH measurement with OSS sampling for the quantification of VFA molar proportions?*

> Conclusion

- > Oral-stomach sampling = a relevant alternative to the use of fistulated cows for:
 - **the quantification of VFA molar proportions** in rumen fluid
 - measuring **relative variations in ruminal pH and VFA concentrations**
but, provided that the variability to be quantified is important enough.
- > Procedure and recommendations for OSS still need to be refined,
 - by considering the **use of trained animals**,
 - by specifying the recommendations for probe insertion depth
- > **Coming soon**: relevance of OSS to quantify the effect of acidogenic conditions
 - on the quality of inoculum for gas test,
 - on the microbiota characterisation,
 - & evaluation of the benefit of animal training on animal welfare during OSS.





INRAE

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Thank-you for your attention
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