Effect of an early life antimethanogenic treatment on methane emissions in growing lambs

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INTRODUCTION

Microbial colonization after birth can affect rumen function and microbiota structure later in life. Rumen development provides an opportunity for manipulation ruminal microbial ecosystem.

The **objective** of this study was testing whether methane emissions in growing lambs could be modulated by a non toxic antimethanogenic treatment administered in early life.

METHODS

Treatment (T)

-1.6 mL/kg BW/day linseed oil

-3 µL/kg BW/day garlic essential oil

Control (C): sugar-beet molasses (same volume as treated lambs)

Both administered with a drencher

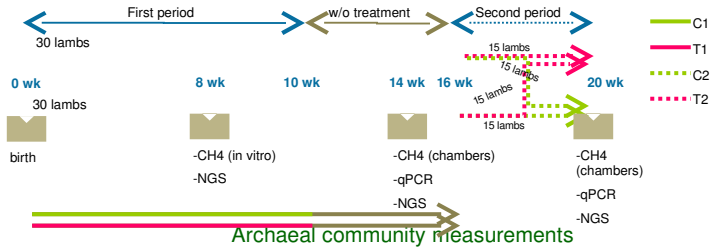
Experimental design

60 lambs

Two treatment periods:

-From birth to week 10: T1

-From week 16 to week 20: T2



Methane measurements

-8 weeks → *Ex situ* measurement (animals too small for chambers) Ruminal fluid incubated in batch fermentors

-14 weeks, **-20 weeks** → Open-circuit respiration chambers (2-3 lambs/chamber) Emissions per kg of dry matter intake (DMI)

Archaeal community measurements

-Abundance of mcrA gene at **14** and **20 weeks** (qPCR)

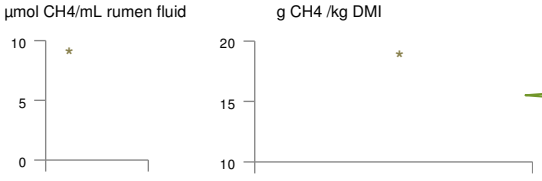
-Next generation sequencing (NGS; Illumina) of archaeal amplicons (primers 349F and 806R) at **8**, **14** and **20 weeks**

-Sequencing data processing QIIME and mothur

-UniFrac distances were calculated from OTU tables as a measure of dissimilarity between samples and its PCoA was represented into biplots

RESULTS

Methane measurements

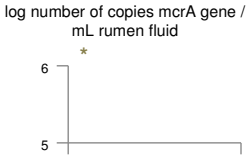


-At **8 weeks** *in vitro* methane production was 24% lower in treated lambs

-At **14 weeks** there was no difference between treatments in methane emissions

-At **20 weeks** methane emissions were 13.7% lower in treated lambs. No difference was observed within the groups between the lambs treated or not in the first period

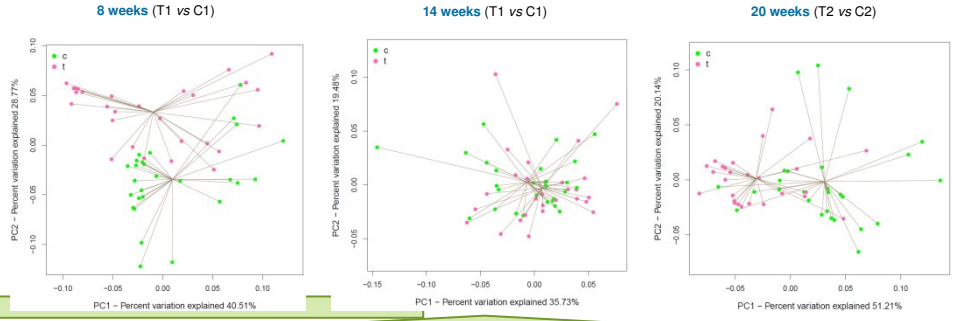
qPCR



-Lower abundance of mcrA gene was observed at **14 weeks** in treated lambs (T1)

-No difference was observed in **week 20**

Principal coordinate analysis of weighted UniFrac distances



Archaeal community structure was particularly affected by treatment at **8** and **20 weeks**

The treatment with garlic essential oil and linseed oil, although effective for reducing methane when applied to young lambs, was not able to have a lasting effect on methane emissions.

There was an effect on archaeal community abundance four weeks after the end of the treatment, but it was not reflected in methane emissions.

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