



HAL
open science

Dietary nitrates decrease methane emission by inhibiting rumen methanogenic archaea without influencing nitrate reducing bacteria

Jessie Guyader, Mathieu Silberberg, Milka Popova, Ahmad Reza Seradj, Diego Morgavi, Cécile Martin

► To cite this version:

Jessie Guyader, Mathieu Silberberg, Milka Popova, Ahmad Reza Seradj, Diego Morgavi, et al.. Dietary nitrates decrease methane emission by inhibiting rumen methanogenic archaea without influencing nitrate reducing bacteria. *Gut Microbiology: From Sequence to Function*, Jul 2014, Aberdeen, United Kingdom. 1 p. hal-02801678

HAL Id: hal-02801678

<https://hal.inrae.fr/hal-02801678>

Submitted on 5 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Résumé Rowett_Inra (communication orale acceptée)

Dietary nitrates decrease methane emission by inhibiting rumen methanogenic archaea without influencing nitrate reducing bacteria

J. Guyader^{*}, M. Silberberg^{*}, M. Popova^{*}, A. R. Seradj^{*†}, D.P. Morgavi^{*} and C. Martin^{*}

^{*}INRA, UMR1213 Herbivores, F-63122 Saint-Genès-Champanelle, France

^{*}Clermont Université, VetAgro Sup, UMR1213 Herbivores, BP 10448, F-63000, Clermont-Ferrand, France

^{*}Université de Lyon, VetAgro Sup, UMR1213 Herbivores, F-69280 Marcy l'Etoile, France

[†]Departament Producció Animal, Universidad de Lleida, ETSEA, Alcalde Rovira Roure 191, 25198, Lleida, Spain

Nitrate supplementation in diets is a promising strategy for reducing enteric methane emissions from ruminants. In this work, we focused on rumen methanogens and nitrate-reducing bacteria (NRB) in order to better understand the effects of this additive on these microbial populations.

Four dry Holstein cows were randomly assigned to four dietary treatments in a 4 x 4 Latin square design: 1) control (CON, 50% hay and 50% concentrate), 2) control with 3% calcium nitrate (NIT), 3) control with 4% linseed oil (LIN), and 4) control with 3% calcium nitrate and 4% linseed oil (NITLIN). At each experimental period, methane was quantified in open chambers (week 4) and rumen content was sampled 3h postfeeding (week 5). DNA and RNA were co-extracted and used in qPCR for microbial quantification and genes expression analysis. Targeted genes were: *rrs* (total bacteria), *mcrA* (methanogens) and *narG*, *napA*, *nirk* (NRB).

Compared to CON, methane yield decreased by 21%, 17% and 32% with NIT, LIN and NITLIN, respectively ($P < 0.01$). Quantities of total bacteria and NRB were unaffected by treatments ($P > 0.05$) whereas methanogens numbers were reduced by 6.6%, 5.6% and 4.7% with NIT, LIN and NITLIN ($P = 0.01$). Expression of *mcrA* was reduced by 66% with NIT and 56% with NITLIN compared to CON or LIN ($P = 0.04$). The *narG* activity was similar among treatments ($P = 0.86$) and expression of *napA* and *nirk* was never detectable. These results show that methane mitigation by dietary nitrates could be attributed to a partial inhibition of methanogens without influencing the population of NRB.