



HAL
open science

Ruminal bacterial community change in response to diet-induced variation of ruminal trans-10 fatty acids

Asma Zened, Sylvie Combes, Laurent Cauquil, Francis Enjalbert, Annabelle Troegeler-Meynadier

► **To cite this version:**

Asma Zened, Sylvie Combes, Laurent Cauquil, Francis Enjalbert, Annabelle Troegeler-Meynadier. Ruminal bacterial community change in response to diet-induced variation of ruminal trans-10 fatty acids. 4. Congress European Microbiologists, FEMS, Jun 2011, Genève, Switzerland. 1p, 2011. <hal-02809835>

HAL Id: hal-02809835

<https://hal.inrae.fr/hal-02809835v1>

Submitted on 6 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.



HAL Authorization

Ruminal bacterial community change in response to diet-induced variation of ruminal *trans*-10 fatty acids

A. Zened, S. Combes, L. Cauquil, F. Enjalbert and A. Troegeler Meynadier

UMR 1289 Tandem, INRA / INPT-ENSAT / ENVT, Castanet-Tolosan, France

a.zened@envt.fr

Background and Objective

Trans fatty acids (FA) are produced during the biohydrogenation of linoleic acid in the rumen. Because of their health-promoting properties, *trans*-11 isomers, which are usually the most abundant biohydrogenation intermediates, are most desirable⁽¹⁾. However, in high yielding dairy cows, when high concentrate diets containing fat are fed to cows, a shift from *trans*-11 to *trans*-10 FA can occur, therefore, *trans*-10 isomers can become the predominant biohydrogenation intermediates, inducing milk fat depression in dairy cows⁽²⁾ and having possible detrimental effects on human health⁽³⁾.

The aim of this work was to study the bacterial community dynamics in response to diet-induced *trans*-10 FA shift.

Methods

Four cannulated dairy cows were used in a 4x4 arrangement. Each period comprised **15 days** with a control diet (**C diet**, 20% of starch) followed by **14 days** with either **C diet**, a 40% starch diet (**S diet**), a 5% sunflower oil diet (**O diet**) or a 40% starch plus 5% oil diet (**SO diet**).

During each period, rumen fluids were taken on **days 15, 25, 27 and 29**.

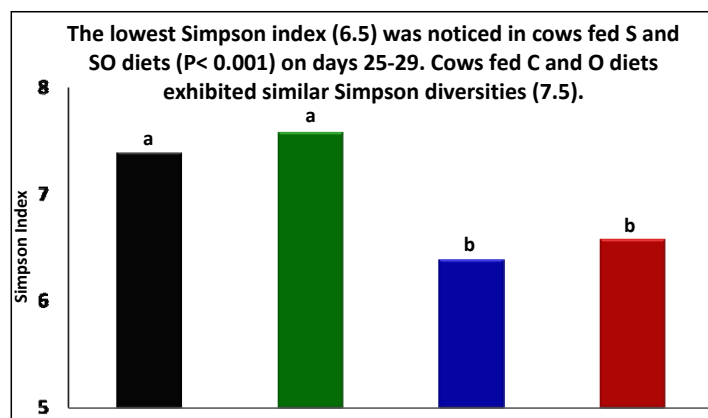
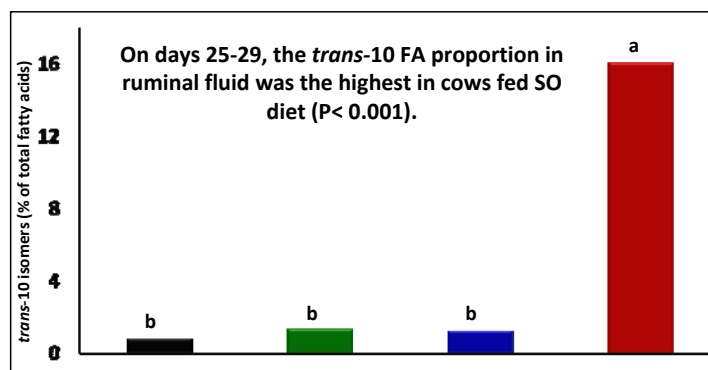
The bacterial communities were assessed using **PCR-CE-SSCP** of the V3 region of the 16S rRNA genes.



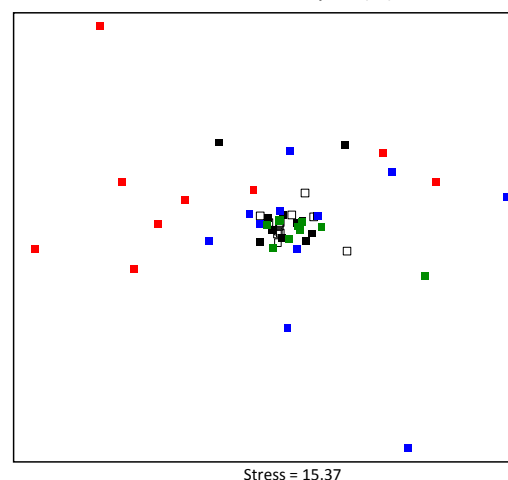
The CE-SSCP data processing was computed with StatFingerprints package used in R software⁽⁴⁾. The bacterial communities were compared using the pairwise Euclidean distances of the CE-SSCP profiles. To explore this distance matrix, nonmetric multidimensional scaling (**nMDS**) was carried out. Pairwise analyses of similarities (**R-ANOSIM**) were performed on the distance matrix to test the effect of the diet ($R > 0.75$: well separated groups; $0.50 < R < 0.75$: separated but overlapping groups; $0.25 < R < 0.50$: separated but strongly overlapping groups).

Results & Conclusions

On day 15, *trans*-10 FA proportion and Simpson index values were similar among the 16 cow x period combinations (0.9 % of total FA and 7.7 on average, respectively).



No differences in the structure of the bacterial community was noticed on day 15 (□).



On days 25-29 (full symbols), the structure of ruminal bacterial community of cows receiving SO diet differed from those receiving C and O diets, and S diet resulted in an intermediate structure.

R-Anosim (d25-29)	C diet	O diet	S diet	SO diet
C diet		0.01	0.14	0.44
O diet			0.25	0.51
S diet				0.18

The increase in *trans*-10 FA proportion was noticed in the rumen only with the starch + oil diet. Starch + oil addition to the diet of cows modified the structure of the microbiote and both starch alone and starch + oil addition reduced its diversity. Oil addition in a low starch diet did not affect bacterial community.

- Kritchinsky D (2000) Antimutagenic and some other effects of conjugated linoleic acid. *Br. J. Nutr.* 83, 459-465.
- Shingfield KJ and Grinari JM (2007) Role of biohydrogenation intermediates in milk fat depression. *Eur. J. Lipid Sci. Technol.* 109, 799-816.
- Tricon S, Burdge GC, Kew S et al. (2004) Opposing effects of *cis*-9,*trans*-11 and *trans*-10,*cis*-12 conjugated linoleic acid on blood lipids in healthy humans. *Am. J. Clin. Nutr.* 80, 614-620.
- Michelland, R., S. Dejean, S. Combes et al. (2009) StatFingerprints: a friendly graphical interface program for processing and analysis of microbial fingerprints profiles. *Mol. Ecol. Resour.* 9, 1359-1363.