



Effect of live yeast on ruminal biohydrogenation. A preliminary in vitro approach

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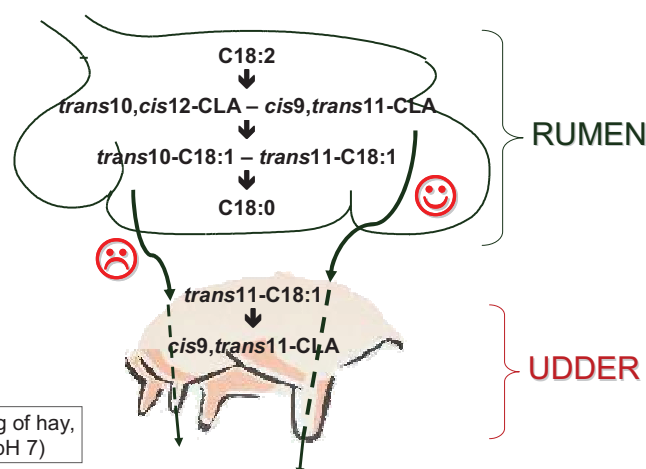
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Background and Objective

- Live yeast used on field: a better diet utilisation
- Ruminal biohydrogenation (BH): interesting fatty acids (FA), like conjugated linoleic acids (CLA), are synthesised by ruminal bacteria, and then could be transferred into milk after desaturation of a part of vaccenic acid (*trans*11-C18:1) in CLA by the mammary gland (Figure 1)
- References are scarce about live yeast diet supplementation and BH of dietary lipids in dairy cows
- A preliminary *in vitro* approach of the effect of live yeast on BH with a high forage diet, which allows a high biohydrogenating ruminal activity

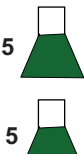
Figure 1. Linoleic acid (C18:2) biohydrogenation in rumen and transfer in milk



Material and Design

A rumen fistulated dry dairy cow receiving a **hay-based diet** (57%)

10 flasks containing 1.6 g of starch, 1.6 g of hay, 0.23 g of urea and a buffer solution (pH 7)



+ 0.15 g *Saccharomyces cerevisiae* (10¹⁰ CFU/g DM, BIOSAF® Sc 47, Lesaffre Feed Additives, France)

Incubation 6 h, 39°C, darkness

FA extraction and quantification

Results and Discussion

- No strong difference of FA composition in incubated media (Table 1):
- The percentage C16:1+C17:0 *anteiso* twice higher ($P < 0.01$) with live yeast : live yeast contains large amount of C16:1
- The percentage of C15:0 *anteiso* lower with live yeast ($P = 0.03$), possibly due to a decrease of *Ruminobacter amilophilus*³ induced by yeast¹
- No effect on C18:2 BH intermediates like *trans*-11 or *trans*-10 CLA
- No effect in such conditions on the extent of C18:2 ($P = 0.566$) or α -linolenic acid (C18:3) BH ($P = 0.838$), 51% and 54% on average, respectively

Table 1. Fatty acids (FA) composition of incubated media

FA, % FAME	Control	Live Yeast	SEM	P-value
C12:0	0.21	0.17	0.023	0.384
C13:0	0.05	0.04	0.005	0.461
C14:0	0.61	0.76	0.078	0.382
C15:0	0.57	0.54	0.008	0.121
C15:0 <i>anteiso</i>	0.47	0.43	0.008	0.026
C15:0 <i>iso</i>	0.26	0.25	0.005	0.646
C16:0	12.04	11.82	0.151	0.484
C16:1 + 17:0 <i>anteiso</i>	0.36	0.73	0.011	<0.001
C17:0	0.38	0.36	0.006	0.166
C17:0 <i>iso</i>	0.12	0.12	0.003	0.215
C18:0	20.78	21.20	0.525	0.703
<i>cis</i> -9 C18:1	13.13	13.46	0.237	0.515
Total <i>trans</i> -C18:1	7.50	7.18	0.636	0.812
<i>trans</i> 10-C18:1	0.24	0.23	0.030	0.881
<i>trans</i> 11-C18:1	5.26	5.27	0.536	0.989
<i>cis</i> 9, <i>cis</i> 12-C18:2	17.30	17.75	1.034	0.834
Total CLA	1.99	1.81	0.204	0.682
<i>trans</i> 10, <i>cis</i> 12-CLA	0.05	0.04	0.004	0.617
<i>cis</i> 9, <i>trans</i> 11-CLA	1.56	1.43	0.160	0.709
<i>cis</i> 9, <i>cis</i> 12, <i>cis</i> 15-C18:3	7.16	7.10	0.532	0.955

■ Rates and efficiencies of the three reactions of C18:2 BH (Table 2) :

- An efficient ruminal BH in all media certainly because of pH 7 and presence of hay in the fermentative substrate
- No significant modification by live yeast

Table 2. Rates and efficiencies² of the three reactions of C18:2 biohydrogenation

	Control	Live Yeast	SEM	P-value
v1* (mg/L/h)	64.24	59.77	3.711	0.564
E1 (%)	52.39	48.79	3.011	0.566
v2* (mg/L/h)	59.15	54.37	3.342	0.495
E2 (%)	90.74	89.34	0.852	0.437
v3* (mg/L/h)	22.86	27.94	2.062	0.253

* 1 refers to the isomerisation of C18:2 into CLA; 2 refers to the reduction of CLA into *trans*-C18:1; 3 refers to the reduction of all C18:1 in C18:0.

Conclusions

- No clear effect of live yeast on C18:2 and C18:3 BH with a high forage diet

Perspectives

- Live yeast effect on BH with high concentrate diets ?
- Effect after adaptation of cows to live yeast ?

¹Pinloche et al., 2008 6th INRA-RRR Symposium. Gut Microbiology. 18-20 June 2008. Clermont-Ferrand, France.

²Troegeler-Meynadier et al., 2006. Repr. Nutr. Dev. 46:713-724.

³Vlaeminck et al., 2006. J. Dairy Sci. 89:2668-2678.