

# An unprotected conjugated linoleic acid (CLA) supplement reduces milk fat synthesis and forage intake in lactating goats

M.A.S. Gama<sup>1</sup>, D.E. Oliveira<sup>2</sup>, D. Fernandes<sup>2</sup>, J. de Souza<sup>2</sup> and J.H. Bruschi<sup>1</sup>

<sup>1</sup>National Dairy Cattle Research Centre, Embrapa, Juiz de Fora, Minas Gerais, Brazil; <sup>2</sup>Santa Catarina State University (UDESC), Chapecó, Santa Catarina, Brazil; gama@cnpqgl.embrapa.br

## Introduction

Supplements containing *trans*-10,*cis*-12 CLA reduce milk fat synthesis in lactating cows, with the magnitude of response being similar to that observed in lactating ewes when the same CLA dose (on a BW basis) is fed (Lock *et al.*, 2006). In contrast, milk fat content of lactating goats was unchanged when similar doses of *trans*-10,*cis*-12 CLA were fed as lipid-encapsulated (Erasmus *et al.*, 2004) or infused duodenally (Andrade and Schmidely, 2006). This suggests that goats are less sensitive to *trans*-10,*cis*-12 CLA than cows and ewes, corroborating data from a recent dose-response study (Shingfield *et al.*, 2009). Besides, the lack or little response to CLA in some of the above-mentioned studies could be related to a short supplementation period (8 d or less), since Lock *et al.* (2008) found similar milk fat reduction when lactating goats received for two weeks about 50% of lipid-encapsulated *trans*-10,*cis*-12 CLA dose used by Erasmus *et al.* (2004). This study was designed to evaluate the effects of an unprotected CLA supplement on feed intake, milk production and milk composition of lactating goats.

## Material and methods

Twenty Toggenburg lactating goats (primiparous, 60 to 110 DIM, average initial milk yield and BW of  $2.8 \pm 0.4$  kg/d and  $40 \pm 3.7$  kg, respectively) were blocked according to milk production and BW and randomly assigned to the following treatments: (a) Control: 30 g/d of calcium salts of soybean oil and (b) CLA: 30 g/d of an unprotected CLA supplement. The experimental design was a cross-over with 14-d treatment periods separated by 6-d washout intervals. The fat supplements were mixed into 1.2 kg of concentrate and fed individually twice a day (0.6 kg per meal) after morning and afternoon milking. The CLA supplement contained about 30% of *trans*-10,*cis*-12 CLA as the methyl-ester. Diet was composed of corn silage and a concentrate mixture which were fed separately. The corn silage was fed *ad libitum* andorts were weighed daily in order to calculate the forage intake. Milk yield was recorded daily and milk samples were collected every 2 days for analysis of its components and SCC. Goats were weighed at the beginning and end of each experimental period (1<sup>st</sup> and 14<sup>th</sup> days, respectively). Data were analysed as repeated measures design using the MIXED procedure of SAS<sup>®</sup> (2000) assuming period and goat within treatment sequence as random effects. The statistical model included treatment, day and interaction treatment vs. day as sources of variation. Differences between treatments were declared significant at  $P < 0.05$ .

## Results and discussion

Least squares means for milk yield, milk composition and forage intake from Control and CLA treatments are presented in Table 1. Milk fat content and yield were reduced by 16.3 and 15.5% in response to CLA, respectively ( $P < 0.01$ ). The temporal variation showed that milk fat yield was gradually decreased by CLA from the 4<sup>th</sup> to 10<sup>th</sup> day of treatment, when it reached a plateau (interaction day vs. treatment,  $P < 0.01$ ). Milk protein content and yield were similar between treatments, but lactose content was lower in CLA than in the Control ( $P < 0.01$ ). Noteworthy, it was observed that CLA reduced forage intake by 6.4% ( $P < 0.01$ ) and tended to increase the milk yield (20 g/d) very slightly ( $P = 0.07$ ).



Table 1. Milk yield, forage intake and milk composition from lactating goats receiving Control or CLA supplement for 14 days.

Variable	Treatments <sup>1</sup>		SE	Effects (P-value)		
	Control	CLA		treatment	day	interaction
Milk yield, kg/d	2.45 <sup>a</sup>	2.47 <sup>a</sup>	0.25	0.07	<0.01	<0.01
Forage intake, kg/d (as fed)	4.50 <sup>a</sup>	4.21 <sup>b</sup>	1.14	<0.01	<0.01	0.88
Milk fat, %	3.00 <sup>a</sup>	2.51 <sup>b</sup>	0.17	<0.01	<0.01	<0.01
Milk protein, %	2.66 <sup>a</sup>	2.68 <sup>a</sup>	0.18	0.17	<0.01	0.07
Milk lactose, %	4.17 <sup>a</sup>	4.14 <sup>b</sup>	0.09	<0.01	<0.01	<0.01
Fat yield, g/d	73.0 <sup>a</sup>	61.7 <sup>b</sup>	5.78	<0.01	<0.01	<0.01
Protein yield, g/d	63.6 <sup>a</sup>	63.9 <sup>a</sup>	4.13	0.43	<0.01	<0.01
Lactose yield, g/d	102.0 <sup>a</sup>	101.7 <sup>a</sup>	9.85	0.67	<0.01	0.65
Linear score for SCC	5.53 <sup>a</sup>	5.41 <sup>a</sup>	0.79	0.13	0.04	0.89

<sup>1</sup> Control = 30 g of calcium salts of long chain fatty acid; CLA = 30 g of an unprotected CLA supplement.

<sup>a,b</sup> Means within rows with different superscript letters differ significantly ( $P < 0.05$ ).

### Conclusion

It was concluded that dietary supplementation with a source of unprotected CLA reduces milk fat synthesis and forage intake in lactating goats.

### Acknowledgement

The authors thank Fapemig and Agrofuture for financial support.

### References

- Lock, A.L., B.M. Teles, J.W. Perfield II, D.E. Bauman and L.A. Sinclair, 2006. A conjugated linoleic supplement containing *trans*-10, *cis*-12 reduces milk fat synthesis in lactating sheep. *J. Dairy Sci.* 89: 1525-1532.
- Erasmus, L.J., Z. Bester, T. Fourie, R.J. Coertze and L. Hall, 2004. Effect of level of rumen protected CLA supplementation on milk yield and composition in Saanen goats. *S. Afr. J. of Anim. Sci.*, 34 (Suppl.1): 42-45.
- Andrade, P.V.D. and P. Schmidely, 2006. Effect of duodenal infusion of *trans*-10, *cis*-12 CLA on milk performance and milk fatty acid profile in dairy goats fed high or low concentrate diet in combination with rolled canola seed. *Reprod. Nutr. Dev.* 46: 31-48.
- Lock, A.L., M. Rovai, T.A. Gipson, M.J. De Veth and D.E. Bauman, 2008. A conjugated linoleic acid supplement containing *trans*-10, *cis*-12 conjugated linoleic acid reduces milk fat synthesis in lactating goats. *J. Dairy Sci.* 91: 3291-3299.
- Shingfield, K.J., J. Rouel and Y. Chilliard, 2009. Effect of calcium salts of a mixture of conjugated linoleic acids containing *trans*-10 *cis*-12 CLA in the diet on milk fat synthesis in goats. *Br. J. Nutr.* 101: 1006-1019.

# **Ruminant physiology**

**Digestion, metabolism, and effects of  
nutrition on reproduction and welfare**

**edited by:**  
**Y. Chilliard**  
**F. Glasser**  
**Y. Faulconnier**  
**F. Bocquier**  
**I. Veissier**  
**M. Doreau**

**Proceedings of the XI<sup>th</sup> International Symposium on Ruminant Physiology**



**Wageningen Academic  
Publishers**