Diet supplementation with different levels of unprotected conjugated linoleic acid (CLA) progressively decreases milk fat content and yield in dairy ewes

D.E. Oliveira[1], M.P. Soares[1], M.A.S. Gama[2], R. Dresch[1], M. Baldin[1] and L.L. Martelo[1]
[1]Santa Catarina State University (UDESC), Chapecó, Santa Catarina, Brazil; [2]National Dairy Cattle Research Centre, Embrapa, Juiz de Fora, Minas Gerais, Brazil; deolivei2@terra.com.br

Introduction

Conjugated linoleic acid (CLA) can be fed to dairy cows in order to increase CLA concentration in milk fat and to decrease energy requirements during the transition period. In dairy ewes, a ruminally protected CLA supplement has shown to increase milk yield and milk CLA content while reducing milk fat content and yield (Lock *et al.*, 2006). Recently, Oliveira *et al.* (2008) observed some adverse effects on milk yield and composition of dairy ewes by feeding a high dose of an unprotected CLA supplement. However, as far as we know no dose-response study using unprotected CLA has been conducted in dairy ewes. This study was designed to evaluate the effects of CLA levels (fed as an unprotected supplement) on milk yield and composition in dairy ewes.

Material and methods

Twenty-nine Lacaune lactating primiparous ewes (30 to 50 d in milk) were assigned to the treatments according to body weight (BW), lambing date and milk production and randomly allotted to the following dietary treatments: (a) Control: 30 g of calcium salts of long chain fatty acids from soybean oil (BW = 50.1±1.9 kg, n=7); (b) CLA10: 20 g of calcium salts of long chain fatty acids from soybean oil plus 10 g of CLA supplement (BW = 50.1±4.8 kg, n=7); (c) CLA20: 10 g of calcium salts of long chain fatty acids from soybean oil plus 20 g of CLA supplement (BW = 50.6±6.6 kg, n=7); (d) CLA30: 30 g of CLA supplement (BW = 54.7±7.0 kg, n=8). The fat supplements were mixed into the concentrate (1.0 kg/d) and fed individually in two equal meals after morning and afternoon milkings. The CLA supplement had about 30% of *cis*-9,*trans*-11 and 30% of *trans*-10,*cis*-12 as methyl esters. All ewes grazed paddocks of a tropical pasture (*Panicum maximum* Jacq. cv. Aruana) as the only source of forage. The experimental period lasted 28 days: 7d for adaptation, 14 d for milk sampling and 7 days for 'wash-out', where all animals received the Control diet. Milk production was recorded daily and milk samples were taken every two days throughout the study. Milk samples were analysed for contents of fat, protein, lactose and somatic cell count (SCC). One ewe from Control, CLA10, CLA30 and two ewes from CLA20 were excluded from the analysis due to health problems (hoof injuries). Data were analysed as repeated measures design using the PROC MIXED procedure of SAS® (2000). The statistical model included treatment, day and treatment-day interaction as sources of variation. Effect of interaction was removed from the model when not significant. Ewe within treatment was considered as a random effect. Differences between treatments were declared significant at $P<0.05$.

Results and discussion

Least squares means for milk yield, composition and SCC in response to dietary treatments are presented in Table 1. Milk yield, protein and lactose content and protein and lactose secretion were unaffected by treatments. Compared to Control, the milk fat content was decreased by 7.1, 16.1 and 28.6% and milk fat yield by 9.5, 18.5 and 27.5% in response to T10, T20 and T30 treatments, respectively. Milk SCC was unchanged by treatments. The highest dose of CLA supplement (30

g/d) in this study was the same used by Oliveira *et al.* (2008) in which, similar milk fat depression was observed. The inhibitory effect of unprotected CLA on milk fat synthesis even at the T20 dose might be due to the hydrolysis of CLA methyl esters releasing methanol in the rumen which could be toxic for the microorganisms thus decreasing the biohydrogenation.

Table 1. Milk yield and composition in dairy ewes fed 0, 10, 20 or 30 g of an unprotected CLA supplement for 21 days.

Variable	Treatments[1]				SE	*P*-value
	Control	T10	T20	T30		
Milk yield, kg/d	1.6	1.6	1.6	1.6	0.07	0.93
Milk fat,%	5.6[a]	5.2[a]	4.7[b]	4.0[c]	0.16	<0.001
Milk protein,%	4.5	4.6	4.7	4.5	0.06	0.33
Milk lactose,%	4.8	4.7	4.6	4.7	0.05	0.21
Fat yield, g/d	89.1[a]	80.6[ab]	72.6[bc]	64.6[c]	4.7	<0.001
Protein yield, g/d	72.1	70.3	72.1	72.6	4.1	0.97
Linear score for SCC	2.7	3.0	3.3	4.0	0.5	0.31

[1] Control = 30 g of calcium salts of long chain fatty acid from soybean oil; T10 = 20 g of calcium salts of long chain fatty acid from soybean oil + 10 g of unprotected CLA supplement; T20 = 10 g of calcium salts of long chain fatty acid from soybean oil + 20 g of unprotected CLA supplement; T30 = 30 g of unprotected CLA.

[a,b,c] Means within rows with the same superscript letters are not significantly different ($P>0.05$).

Conclusion

It can be concluded that milk fat content and yield in dairy ewes were decreased in a dose-dependent manner in response to increasing levels of an unprotected CLA supplement.

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