S4.12

Kinetics of responses of goat milk fatty acids to dietary forage:concentrate ratio and/or high doses of sunflower or linseed oil, or extruded mixture of seeds.

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Introduction

Milk Conjugated Linoleic Acid (CLA) is almost totally the trans9,cis11-18:2 isomer, rumenic acid (RA). This isomer was shown to have positive health effects in rodents, particularly as related to carcinogenesis (1). Ruminant feeding has a major effect on milk RA content (2, 3), but this content is not stable in dairy cows receiving diets rich in concentrate and/or corn silage and supplemented with plant oils (4, 5). The aim of the present study is to unravel these interactions in dairy goats.

Materials and methods

71 Alpine goats at lactation peak (11-12 goats/treatment group) received 6 alfalfa hay-based diets in a 2x3 factorial design: 2 forage:concentrate ratios (70:30, F or 30:70, C), and 3 lipids supplements (no oil, N; or 180g/d, *i.e.* about 7% of diet DM of sunflower oil, S or of linseed oil, L).

12 other goats received a 7th diet: F with 180 g/d of oil from an extruded mixture of linseeds and sunflower seeds (E).

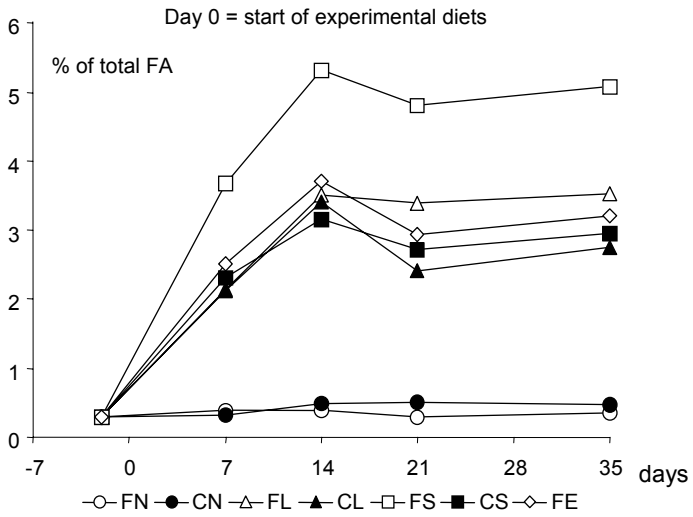
Milk fatty acid composition was measured in each goat before, and 7, 14, 21 and 35 days after lipid supplementation. Cheese was yielded at week 4, from pooled milk of groups FL and FS.

Results

Energy intake, milk yield and lactose content were higher with C than F diets, whereas milk fat content was lower. Lipid supplemented diets increased milk fat and lactose contents (see Session S 4.36).

Milk fat RA was 0.3–0.5% with N diets (Figure 1). It increased as soon as 7 days after lipid supplementation, to reach a plateau from 14 days and was stable until 35 days at least. The values were 3.2-3.7% of total fatty acids with CL, CS, FL and FE diets, and 5.3% with FS diet (concentrate-lipid interaction, $P<0.05$). The two batches of cheese (from FL and FT diets) presented, with this very high levels of lipid supplementation, significant off-flavours (oxidized or fishy taste).

Fig. 1 : Kinetics of rumenic acid in goat milk fat



Discussion/conclusion

The response of milk fat rumenic acid to dietary oils is very rapid in the goat, more marked and more sustainable than in the cow (3, 4, 5). With hay diet, response was higher with the oil rich in 18:2 n-6 than in 18:3 n-3. However, this difference did not occur with concentrate diet. Furthermore, a mixture of extruded seeds added to hay diet allowed to increase rumenic acid more than extruded linseeds alone did (6), probably because of the higher content in C18:2 n-6 of the mixture.

These results were used to select diets in order to yield rumenic acid-rich goat cheese for studies in human volunteers (BIOCLA UE-Programme, in progress).

References

(1) Pariza et al. (2001), Progr Lipid Res. 40, 283-298.
(2) Bauman & Griinari (2003), Annu Rev Nutr. 23, 203-227.
(3) Chilliard & Ferlay (2004), Reprod Nutr Dev. 44, 467-492.
(4) Ferlay et al. (2003), 54th EAAP meeting, p. 120
(5) Roy et al. (2005), 56th EAAP Meeting, SessionN4.6.
(6) Chilliard et al (2004), 55th EAAP meeting., p. 135