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Feeding different lipid supplements through lactation in dairy goats: 1) effects on energy balance and milk production

Eknæs M.[1], Volden H.[1,2] Hove K.[1], Inglingstad R.Aa.[3], Bernard L.[4], Leroux C.[4], Chilliard Y.[4]
[1]Department of Animal and Aquacultural Sciences, Norwegian University of Life Sciences
[2] TINE SA, Norway
[3]Department of Chemistry, Biotechnology and Food Science, Norwegian University of Life Sciences
[4]INRA, UMR 1213 Herbivores, Site de Theix, F-63122 Sant-Genès-Champanelle, France

Milk with high dry matter content, acceptable flavour and good rennet coagulation properties are important when developing new and improving existing goat milk products. To obtain goat milk with acceptable quality throughout the lactation period, it is necessary to secure an adequate supply of energy to the animals. This can be a challenge, especially for high yielding goats in early lactation. Dietary fat supplements can be used to increase the total energy concentration of the diet. The aim of the present study was to examine how supplements of saturated and of unsaturated fat would affect energy balance and milk production in dairy goats.

Thirty Norwegian dairy goats with kidding in February 2011 were fed a control diet with a concentrate mixture of barley, rape seed meal (expro 00SF), soy bean meal, beet pulp, molasses and mineral/vitamin premix until 60 days in milk (DIM). After 60 DIM and until the end of the lactation period (230 DIM), the goats were assigned to three experimental groups (balanced for parity and genotype at the αS1 casein locus) of 10 goats receiving 3 dietary treatments differing in the composition of the concentrate. The 'Saturated' and 'Unsaturated' groups received the control diet, with an inclusion of 8% of saturated (Akofeed Gigant 60; rich in C16:0) and unsaturated (rapeseed oil, rich in cis-9-18:1 and cis-9, cis-12-18:2) fat, respectively. The experiment consisted of three different periods: 1) Spring indoor feeding period from 1 to 120 DIM; 2) Mountain grazing period from 120 to 200 DIM; 3) Autumn indoor feeding period from 200 to 230 DIM. The goats received 0.9 kg/d concentrate until the start of the mountain grazing period, thereafter 0.7 kg/d. During indoor feeding, the goats received silage according to appetite. Silage intake was measured on three subsequent days every week, and milk yield on three subsequent days every second week. Milk analyses, body weight, body condition and BMI (body mass index), body composition (computer tomography) and arterio-venous differences of metabolites across the mammary gland, were collected at seven sampling points from 10-230 DIM. Mammary biopsies were taken at 5 sampling points for gene expression studies.

We report the following findings:

- Generally, the goats lost body weight from kidding to 200 DIM, with a pronounced body fat mobilization during the mountain grazing period (120 to 200 DIM), followed by a body fat deposition towards the end of lactation (230 DIM).

- No effect of lipid supplements was observed on body weight changes, body condition score or amount of body fat during the lactation cycle.

- Milk yield was not affected by inclusion of dietary fat.

- Milk fat content was higher in 'Saturated' group compared to 'Control' and 'Unsaturated'.

- From 90 to 200 DIM daily milk fat yield was lower in the 'Control' group, compared to 'Unsaturated' and 'Saturated', while no difference was observed between the two dietary lipid sources.

- At 230 DIM the daily milk fat yield was generally low, and no effect of fat supplements was observed.

- Milk protein content was not affected by dietary fat supplements.

It is concluded that dietary fat supplements increase milk fat yield in dairy goats. Late lactating goats accumulate large fat deposits in preparation for their next lactation. Dietary lipid supplements had no effect on milk fat yield at this stage.