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Effect of Lipid Supplements on Milk Fat Yield and Composition: A Direct Comparison between Cows and Goats Responses

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Lipid fraction is a major determinant of the nutritional quality of milk and efficiency of production that could be modulated by nutritional factors such as lipid supplementation. However, previous data mainly from indirect comparison among species showed that cows and goats differ in their susceptibility to diet-induced milk fat depression (MFD).

The objective of this study is to characterize, in cows and goats, the effects on milk fat plasticity of 3 types of diets chosen to induce a depression or an augmentation of milk fat content in cows and for which the effects in goats are absent or unknown. Twelve Holstein cows and 12 Alpine goats were fed diets containing forage and concentrate (45:55) (CTL) or the same diet supplemented with corn oil and wheat starch (COS), or marine algae powder (MAP) or hydrogenated palm oil (HPO) according to a 4X4 latin square design with 28-d experimental periods. Milk yield was recorded and milk samples were collected over 4 consecutive milking on d21 and d22 of each experimental period. Data were subjected to ANOVA for a 4X4 latin square design using the Mixed procedure of SAS, with statistical model including period, species, experimental diet and interaction between species and diets, as fixed effects.

Dietary treatments had no significant effects ($P>0.05$) on milk yield in cows and goats. In cows, milk fat content decreased with COS and MAP (-45% and -22%, respectively; $P<0.001$) and increased with HPO (+12%, $P<0.001$) compared with CTL. In goats only MAP decreased (-15%, $P<0.001$) milk fat content. In cows, percentages variation in milk fat yield were of similar magnitude to that for milk fat content with a decrease for COS and MAP (-50% and -26%, respectively; $P<0.001$) and an increase for HPO (+9%; $P<0.001$). Conversely, in goats no significant effect ($P>0.05$) of dietary treatments was observed on milk fat yield.

These results provide evidence of species differences in the response to diets that induced MFD (high-starch diets containing plant oils or addition of marine algae) and milk fat augmentation (hydrogenated palm oil) in cows. This nutritional study which led to contrasted milk fat plasticity responses offers an original model that will be used to decipher the mechanisms underlying the specificities of the lipid metabolism among ruminant species.