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Milk molecular species of triacylglycerols characterized by lipidomic approach in cows and goats fed diets supplemented with various lipid sources

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Lipid fraction is a major determinant of milk nutritional quality and efficiency of production that can be modulated by nutritional factors such as lipid supplementation.

In a comparative study between dairy cows and goats fed similar diets supplemented with various lipids, we characterized the milk composition regarding molecular species of triacylglycerols (TAG) by a lipidomic approach. This study was part of a trial aiming at characterizing animal performances and milk lipid responses to diets inducing either milk fat depression (MFD) or increase in milk fat secretion, with species-specific responses (Fougère *et al.*, 2018). The effects of diets containing no additional lipids (CTL) or supplemented with corn oil (5% dry matter intake (DMI)) and wheat starch (COS), marine algae powder (MAP) (1.5% DMI), or hydrogenated palm oil (HPO) (3% DMI), on milk fat content and composition were studied in cows and goats (n=12 per species). Animals of each species were conducted simultaneously in a replicated 4x4 Latin square design. Milk samples were collected over 2 consecutive milkings on d24 of each experimental period. Individual samples were pooled by period and diet (4 x 4 = 16 subsamples by species) and lipid extracted (Bligh & Dyer, 1959) before TAG determination by LC-HR/MS. Data were subjected to ANOVA using dedicated R software. Animal performances and milk FA composition were reported elsewhere (Fougère *et al.*, 2018); in cows, milk fat content was significantly lowered by COS (-45%) and MAP (-22%) and increased by HPO (+13%) compared with CTL, whereas in goats, only MAP decreased milk fat content (-15%) compared to CTL. Lipidomic analysis revealed 48 molecular species of TAG from TAG (18:0) to TAG (64:3) with differences among the 2 species: 1/irrespective of diets, 16 were more abundant in cows (TAG (48:0) to (64:3)) and 23 in goats (TAG (18:0) to (46:3)); 2/on COS, 28 were modulated in cows compared to CTL, but not in goats and 3/on MAP, 13 were modulated in cows and 8 in goats, compared to CTL. Principal component analysis (PCA) performed with milk TAG molecular species and individual FA strongly suggests that the main FA candidates for MFD (*trans*-10 18:1, *trans*-10,*cis*-12 CLA and *trans*-10,*trans*-12 CLA; Shingfield *et al.*, 2010) are carried by specific TAG molecular species that differ between cows (TAG (52:3), (54:3), (54:4)) and goats (TAG (60:4)). These new data demonstrate the species specificities of molecular species of milk TAG in cows and goats and their nutritional regulation.

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