Prediction of milk fat composition from diets: focus on the duodenal flows of fatty acids.

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Predicting the milk fatty acid (FA) profile from the diet is a challenge due to the complexity of lipid metabolism, mainly in the rumen. Consequently, an essential step is to quantify the duodenal flows of FA.

Previous studies (Schmidely and al., 2008, Glasser and al., 2008) predicted duodenal flows of total FA, medium- and long-chain saturated FA and unsaturated FA with 18 carbons. However, including isomers of C18:1 is necessary to have a better prediction of duodenal FA flows. This abstract highlights the relations between duodenal flows of C18:1 isomers and their dietary precursors (Total C18:1, Total C18:2 and Total C18:3), and some characteristics of the diet and ruminal parameters (level of intake, concentrate:forage ratio, NDF, starch and total FA levels, ruminal pH, acetate:propionate ratio). 239 treatments published between 1970 and 2015 were selected and analyzed in within-experiments. The FA flows were expressed in g/kg dry matter intake.

Predictive equations have been thus established for the trans-isomers (4 to 15) and cis-isomers (9, 11, 12, 13, 15) of C18:1. Total C18:1, (P<0,05) Total C18:2 (P<0,005) and Total C18:3 (P<0,001) intakes were positively correlated with duodenal trans11-C18:1 flow. In contrast, the duodenal trans10-C18:1 flow was not affected by dietary FA. For the duodenal cis9-C18:1 flow, Total C18:1 (P<0,001) and Total C18:2 (P<0,005) intakes have a positive influence, whereas TotalC18:3 intake has no effect (P>0,1).

Concerning the diet and ruminal parameters studied, the acetate:propionate ratio has been associated with a decrease of duodenal trans10-C18:1 and trans11-C18:1 flow, and the concentrate:forage ratio has been associated with an increase of the duodenal cis9-C18:1 flow.

These relations will contribute to a better understanding of ruminal digestion of FA that is necessary to improve the prediction of milk FA.