Milk fatty acids can predict enteric methane emissions from dairy cows fed various diets

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1. Title

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[(1)]This study is part of collaborative project led by INRA and funded by 11 institutes and private companies: Adisseo France SAS (Antony, France), Agrial (Caen, France), APIS-GENE (Paris, France), Deltavit (Janzé, France), DSM Nutritional Products AG (Kaiseraugst, Switzerland), Institut de l'Elevage (Paris, France), Lallemand (Blagnac, France), Moy Park Beef Orléans (Fleury-les-Aubrais, France), Neovia (Saint-Nolff, France), Techna France Nutrition (Couëron, France), Valorex (Combourtillé, France).

3. Abstract

Proxies are needed to develop genetic selection of low methane (CH_4) emitting ruminants and to evaluate at large scale, CH_4 mitigating strategies on farm. Milk fatty acids (**MFA**) have been used as proxies to predict CH_4 emissions from dairy cows because of common rumen biochemical pathways between the two processes. The objectives of the study were (1) to construct a set of empirical models to predict CH_4 emissions using MFA records of individual lactating dairy cows (n =825) fed a wide range of diets, (2) to increase the representativeness of the models by including additional independent variables such as dietary chemical composition [organic matter (**OM**); neutral detergent fiber (**NDF**); crude protein (**CP**); starch; ether extract (**EE**)], milk yield and composition, and animal characteristics [days in milk (**DIM**)

or body weight (**BW**)], and (3) to evaluate the performance of the developed models on two independent datasets (individual measurements and treatment means). Prediction equations based only on MFA [C10:0, *iso* C17:0 + *trans*-9 C16:1, *cis*-11 C18:1, and *trans*-11,*cis*-15 C18:2 for CH_4 production (g/d); *iso* C16:0, *cis*-11 C18:1, *trans*-10 C18:1, and *cis*-9,*cis*-12 C18:2 for CH_4 yield (g/kg of dry matter intake (**DMI**)); *iso* C16:0, *cis*-15 C18:1, and *trans*-10+*trans*-11 C18:1 for CH_4 intensity (g/kg of milk)] have root mean square error of 58.6 g/d, 2.8 g/kg DMI and 3.7 g/kg milk, respectively. The models including DMI, dietary nutrient contents (NDF, EE, starch), and BW had lower root mean square errors of 42.8 g/d, 2.5 g/kg DMI and 3.3 g/kg milk, respectively.

4. Index terms: cattle, methane equation, milk fatty acids

Session 1: technical advances: from genomics to precision agriculture, that will address aspects to measuring and modelling GHG