UMR Herbivores

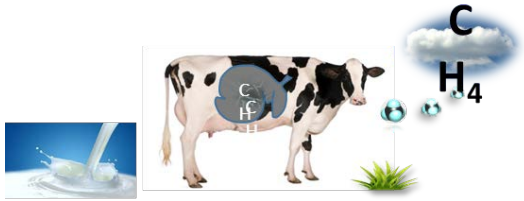
Team Farming Practices, Robustness, Adaptation and Product Quality (Peraq)

Can certain anti-methanogenic rations modify the lipid quality of milk in dairy cows?

In Europe, consumption of animal products is declining while consumers are increasingly demanding high quality products. Ruminant products are also strongly criticised for their high carbon footprint, in particular through their high contribution to greenhouse gas emissions and more specifically to methane (CH4) emissions. Our objective was to verify the maintenance of milk performance, especially the lipid quality of milk in dairy cows ingesting dietary mitigation strategies. A diet based on grass silage and rich in starch (compared to a diet rich in fibre) reduced CH4 emissions but deteriorated the lipid quality of the milk. Diets based on maize silage supplemented with different fatty acids (FA) (C16 :0, *cis*9-C18 :1, C18 :2n-6 (FA) induced similar CH4 emissions. Only the C18:1cis9 diet allowed to increase milk quality by enhancing the omega 3 FA content. Based-maize silage diets supplemented with fatty acids from different origins) induced similar CH4 emissions.

Global demand for dairy products and meat should increase considerably until 2050, due to an increasing demand in developing countries. In contrast, in Europe, animal products consumption is declining due to new eating behaviours (FAO, 2017, Animal Task Force, 2019) but demand for high-quality animal products is growing. Ruminant productions are being criticised because of their high carbon-footprint due to their high contribution to methane (CH4) emissions, which represent 80% from the livestock supply chain, and specifically from feed fermentation in the rumen (Gill et al, 2010). Ruminant nutrition enables the farmers to rapidly improve the dairy performance of their herd, in particular the lipid composition of milk, but also to reduce CH4 emissions, which are decreased by carbohydrate or lipid supplementation of diets, as well as by the nature of these supplements. Our objective was to determine whether these feeding strategies applied to dairy cows also preserved the quality of their milk.

In a first experiment, we compared two grass silage diets: one rich in fibre and the other rich in starch. Dairy cows ingesting starch-rich diet emitted less CH4 than those ingesting rich-fibre diet (-18% g/d and -15% g/kg DM intake). Nevertheless, the lipid quality of their milk was not improved as they produced milk richer in saturated fat (SFA). In a second experiment, we compared diets based maize silage: a control diet, the same diet supplemented with palm oil calcium soaps rich in a SFA (C16 :0), rapeseed rich in a monounsaturated FA (cis9-C18 :1), or sunflower seeds rich in a polyunsaturated FA (C18 :2n-6). Feeding these four diets induced very low milk fat contents and similar CH4 emissions between diets. Only the milk from the diet rich in *cis*9-C18 :1 showed an improved nutritional quality with a higher content of omega 3 FA (C18 :3n-3) and a decrease in omega 6 FA.



A long-term study carried out on the first 6 months of lactation in dairy cows will enable to verify the persistence of these contrasting effects on milk quality with such mitigation feeding strategies.

Publications

Bougouin A., Ferlay A., Doreau M., Martin C. 2018. Effects of carbohydrate type or bicarbonate addition to grass silage-based diets on enteric methane emissions and milk fatty acid composition in dairy cows. J. Dairy Sci. 101:1–13.

A. Bougouin, C. Martin, M. Doreau and A. Ferlay. 2019. Effects of starch-rich or lipid-supplemented diets that induce milk fat depression on rumen biohydrogenation of fatty acids and methanogenesis in lactating dairy cows. Animal, 13:7, 1421–1431.

Contacts : Ferlay Anne, anne.ferlay@inra.fr, Martin Cécile, cecile.martin@inra.fr -_UMR Herbivores, F-63122 Saint-Genès-Champanelle, France.