



**HAL**  
open science

## **Diets supplemented with various lipid sources differently affect selected milk metabolites concentrations in cows and goats**

Laurence Bernard, H el ene Fougere, T. Larsen, Jos e Pires

### **► To cite this version:**

Laurence Bernard, H el ene Fougere, T. Larsen, Jos e Pires. Diets supplemented with various lipid sources differently affect selected milk metabolites concentrations in cows and goats. International Symposium on Ruminant Physiology (ISRP), Sep 2019, Leipzig, Germany. 2019. <hal-02734655>

**HAL Id: hal-02734655**

**<https://hal.inrae.fr/hal-02734655v1>**

Submitted on 2 Jun 2020

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destin e au d ep ot et   la diffusion de documents scientifiques de niveau recherche, publi s ou non,  manant des  tablissements d'enseignement et de recherche fran ais ou  trangers, des laboratoires publics ou priv s.



HAL Authorization

## Diets supplemented with various lipid sources differently affect selected milk metabolites concentrations in cows and goats

Laurence Bernard<sup>1</sup>, H el ene Foug ere<sup>1</sup>, Torben Larsen<sup>2</sup>, Jos e Pires<sup>1</sup>

<sup>1</sup>Universit e d' Auvergne, INRA, Vetagro Sup, UMR12133 Herbivores, St Gen es-Champanelle, France. <sup>2</sup>Department of Animal Science, Aarhus University, Tiele, Denmark

### Abstract

Previous research has shown that animal husbandry factors such as diet composition and intake can alter milk content of selected metabolites (Larsen *et al.*, 2016). Our objectives were to determine the effects of species (cow vs goat) and dietary lipid supplements known to largely impact milk fat content at least in cows, on selected metabolites and enzymes in milk. Twelve Holstein cows and 12 Alpine goats, all multiparous, nonpregnant and at  $86 \pm 24.9$  and  $61 \pm 1.8$  DIM respectively, were fed a basal diet (45% forage + 55% concentrate) not supplemented (CTL) or supplemented with corn oil plus wheat starch (COS; 5% diet dry matter (DM)), marine algae powder (MAP; 1.5% diet DM), or hydrogenated palm oil (HPO; 3% diet DM) in a replicated 4x4 Latin square design with 28-d experimental periods. Data on intake and milk production were reported in Foug ere *et al.* (2018). B-hydroxybutyrate (BHBA), isocitrate, glucose, glucose-6-phosphate, glutamate, cholesterol, choline, free amino acid group, urea, alkaline phosphatase and lactate dehydrogenase were analysed (Larsen *et al.*, 2016, 2017) on morning milk samples collected on d24 of each experimental period.

Production data from this experiment is reported elsewhere (Foug ere *et al.*, 2018). In cows, milk fat content was lowered by COS and MAP (-45% and -22% respectively;  $p < 0.001$ ) and increased by HPO (+13%;  $p < 0.001$ ) compared with CTL, whereas in goats only MAP decreased milk fat content (-15%;  $p < 0.001$ ) compared to CTL. Energy and protein balance were positive for all treatments in both species.

Regarding milk metabolites and enzymes, irrespective of diet, cow milk was richer in alkaline phosphatase and glucose compared to goats (16 and 3 times more respectively,  $p < 0.01$ ), whereas goat milk contained more urea and glucose-6-phosphate compared to cows (1.9 and 5.3 times more respectively,  $p < 0.01$ ). In cows, COS decreased BHBA and choline (-25 and -24% respectively;  $p < 0.001$ ) compared to CTL whereas no effects were observed in goats. COS and MAP increased milk isocitrate compared to CTL in cows, but decreased isocitrate concentrations in goat milk. In cows, milk choline was correlated with milk fat content ( $r = 0.693$ ,  $p = 0.001$ ), and lactate dehydrogenase was correlated with milk somatic cells count ( $r = 0.839$ ,  $p = 0.001$ ) but not in goats.

We provide evidence of different milk metabolite responses according to species and diets. Metabolites or enzymes secreted in milk may be indicators of specificities of lipid metabolism among ruminant species, and may contribute to a better understanding of mechanisms regarding milk fat secretion processes.

Foug ere, H., C. Delavaud, and L. Bernard. 2018. Diets supplemented with starch and corn oil, marine algae, or hydrogenated palm oil differentially modulate milk fat secretion and composition in cows and goats: A comparative study. *Journal of dairy science* 101(9):8429-8445.

Larsen, T., L. Alstrup, and M. R. Weisbjerg. 2016. Minor milk constituents are affected by protein concentration and forage digestibility in the feed ration. *Journal of Dairy Research* 83(1):12-19.