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► To cite this version:

Benoit Graulet, Laurence Bernard, Sophie Laverroux, Milka Popova, H el ene Fougere, et al.. Contrasted status in B vitamins between dairy cows and goats fed various lipid supplements. 11. International Symposium on Ruminant Physiology (ISRP), Sep 2019, Leipzig, Germany. hal-02738156

HAL Id: hal-02738156

<https://hal.inrae.fr/hal-02738156v1>

Submitted on 2 Jun 2020

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Contrasted status in B vitamins between dairy cows and goats fed various lipid supplements

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B vitamin status and metabolism are still known in ruminants in spite of their importance for the nutritional value of dairy products (Coudray et al., 2011), productive performance (Girard & Matte, 2005) and apparent link to feed efficiency (Meale et al., 2017, Li & Guan, 2017). In ruminants, B vitamins are from dietary and ruminal origins except B₁₂, exclusively synthesized by rumen bacteria (Graulet, 2014). A better understanding of the factors modulating B-vitamin status in ruminants would help to improve performance of livestock systems. We compared the B-vitamin status in 12 Holstein dairy cows and 12 Alpine dairy goats receiving the same diets supplemented or not with lipids for 28 d-periods in 2 species distinct (4 × 4) Latin square designs. Diets were based on hay (45 %) plus concentrates (55%) containing no additional lipid (CTL), or supplemented with corn oil and wheat starch (COS), marine algae powder (MAP), or hydrogenated palm oil (HPO) (Fougère et al., 2018). Vitamins were analyzed by liquid chromatography for B₂ and B₆ (Meale et al., 2017 ; Laverroux et al., unpublished) and radioassay for B₉ and B₁₂ (Duplessis et al. 2015) in plasma and milk at the end of each period.

Cows had higher B₂ (x2), B₆ (x2 to 3) and B₉ (x5) plasma concentrations than goats (p<0.001) whereas B₁₂ concentration was 3.4-fold higher in goats (p<0.001). In milk, B₆ concentrations were higher in goats (+21%, p<0.001) than in cows. Riboflavin (B₂) concentration was similar between the 2 species whereas folates (B₉) and vitamin B₁₂ concentrations were 10- and 16-fold higher in cow milk, respectively. The COS diet increased plasma B-vitamin concentrations in both species (p<0.001), and cow milk concentration of B₂ and B₉ (p<0.001). The MAP diet also induced significant increases in plasma B vitamin concentrations, especially B₂ in goats and B₆ and B₉ in cows. Milk B₆ concentrations were lightly reduced and B₉ was increased in cows fed MAP diet. The HPO diet slightly increased vitamin B₁₂ secretion in cow milk. This original study compared plasma and milk B vitamins in dairy cows and goats fed the same diets. Species-specific responses observed in ruminants fed COS or MAP diets vs CTL suggest distinct mechanisms acting on B-vitamin supply, likely their dietary intake and the modulation of rumen bacterial activities. Discrepancies in the pattern of response between plasma and milk also suggest the existence of regulatory mechanisms of vitamin B mammary uptake and milk secretion.

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Comment citer ce document :

Graulet, B., Bernard, L., Laverroux, S., Popova, M., Fougere, H., Girard, C., Girard, C. (2019). Contrasted status in B vitamins between dairy cows and goats fed various lipid supplements.

Presented at 11. International Symposium on Ruminant Physiology (ISRP), Leipzig, DEU

(2019-09-02 - 2019-09-06).