Insight into the genetic background of sialic acid metabolism in bovine milk

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Milk is an important food for human, however, for many reasons, not everyone considers it a healthy food. To contrast this opinion, many studies have been carried out to show the presence of bioactive compounds, with beneficial effects on human health. The improvement of milk quality can be achieved by the use of association studies, to identify genes correlated with the functional compounds, and precision breeding, to accelerate the genetic progress. Sialic acids (N-acetylneuraminic acid (Neu5Ac) and N-glycolylneuraminic acid (Neu5Gc)), play a fundamental role in the protection of proteins from protease activity, cell-cell interactions, in the effector functions of IgG, and also have receptor functions. Humans are not able to synthetize Neu5GC, and its ingestion with food (milk or meat) cause health problems. Neu5Ac and Neu5Gc, were analysed in milk samples collected around 60 and 120 days after calving in 113 cows from four breeds (Holstein; HO, Simmenthal; SM, Simmenthal × Holstein crossbred; SM×HO, and Podolica; POD). POD animals showed a lower level compared to HO, SM×HO and SM. Specific genes of sialic acid metabolism pathways were investigated, through SNP- and gene- based association study. A SNP nearby ST6GALNAC6 and ST6GALNAC4 genes was significant associated with Neu5Gc in SM, and a SNP nearby ST8SIA1 gene and two genes (ST6GALNAC5 and SLC17A5) were suggestively associated with Neu5Gc in POD. A signal on ST3GAL6 gene was significant associated with Neu5Ac content in SM. All the identified signals were part of the conjugation pathway in which sialic acids are transferred to glicoconjugates. These preliminary results can be helpful to understand the sialic acid metabolism in cow, and represent a base for a breeding program focused on milk healthiness. Acknowledgement: this research was funded by MIPAAF in the national research project MIQUALAT (D.M. 16844/7100/2019), and partly supported by CEF Highlander project (INEA/CEF/ICT/A2018/1815462).

Effect of supplementation of dairy cow with fat encapsulated linseed oil on milk fatty acids

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Encapsulating vegetable oils with hard saturated fats can be a strategy to protect polyunsaturated fatty acids (PUFA) from rumen biohydrogenation, increasing its absorption and transfer to milk. This study evaluates dairy cows' supplementation with an encapsulated linseed oil on milk fatty acid (FA) composition. Sixty Holstein cows (30 primiparous and 30 multiparous), with 11±0.3 DIM and fed corn silage-based total mixed ration were allocated to one of the two treatments. The treatments differed in the type of lipid supplement used, palm oil calcium soap as Control (CON) and fat-encapsulated linseed oil treatment NatOmega-3 (NO-3) offered (1.2 kg/d) to the cows through an automatic feeding system (DairyFeed C-8000, GEA Farm Technologies, Bönen, Germany) that registered individual supplement intake. The NO-3 supplement was designed to provide 64 g/d of 18:3n-3. Milk was collected weekly for nine weeks, and its FA composition was determined by gas chromatography. The milk FA data were analysed with a repeated-measures model that included the DIM and supplement (ING) intake as continuous independent variables and parity and treatment as fixed effects and their interactions. The intake of both supplemented differs widely between cows, ranging from zero to the maximum offered. Thus, the treatment effect could only be evaluated by the interaction between the type of supplement and its intake. The treatments did not affect the milk yield (48.6 l/d), but NO-3 increased (6.7%) the milk fat content. Increased intake of NO-3 supplement supplementation of NO-3 increased the proportions of 18:1t9, 18:2c9t15, 18:2t11c15, and 18:3n-3 in milk. For each g of NO-3 intake, the 18:3n-3 increased 0.00055 percent points (P<0.01). The increase of milk 18:3n-3 achieved with NO-3 supplementation had no practical relevance to increase the omega-3 content in milk. Work funded by FCT – Fundação para a Ciência e a Tecnologia through UID/CVT/00276/2021 (CIISA), and Project NATOMEGA3 (PDR2020-101-031461).