Milk natural isotopic composition, feed efficiency, and body mobilization in early lactation

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Early lactation of dairy cows is characterized by body reserve mobilization and increased risk of metabolic disorders. An efficient and robust dairy cow has the ability to produce milk, to reproduce and to maintain good health by consuming less feed resources than other cows. Compared to the ingested diet, body fat reserves are depleted in ^{13}C while body protein reserves are enriched in ^{15}N, thus the milk isotopic signatures may capture the extent of body mobilization in early lactation. Here, we propose a non-invasive proxy based on milk natural abundance of stable isotopes to assess body mobilization in dairy cow, and test whether this proxy can reflect between-animal variation in feed efficiency. The natural abundance of ^{13}C ($\delta^{13}C$) and ^{15}N ($\delta^{15}N$) in milk was then analysed in 27 dairy cows (14 Holstein, 13 Montbéliarde) all fed the same diet. Milk isotopic analyses were performed on weeks 1, 2, 3, 4, 6, 8 and 12 and plasma samples analysed for non-esterified fatty acids (NEFA) at the same times. The results showed a strong link between the changes across time of $\delta^{13}C$, $\delta^{15}N$ and NEFA. As expected, a decrease in milk $\delta^{13}C$ was observed during the first weeks of lactation, and was closely associated to an increase of $\delta^{15}N$ in milk and plasma NEFA concentrations. The areas under the curve (AUC) of $\delta^{13}C$ and $\delta^{15}N$ were strongly correlated ($r=0.76$; $P<0.001$). A correlation between the AUC of $\delta^{13}C$ and plasma NEFA ($r=0.55$; $P=0.03$) was also observed. These results show that time changes in milk $\delta^{13}C$ and $\delta^{15}N$ may reflect body mobilization in early lactation dairy cows. At this stage, no clear link was found between $\delta^{13}C$ or $\delta^{15}N$ and feed efficiency parameters (i.e. milk yield/dry matter intake; residual feed intake; milk energy/energy intake). Further research is underway to analyse these data and model trajectories.

Heart rate of grazing Hereford heifers classified by paternal RFI

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This work aimed to evaluate the effect of sires' efficiency on HR variation along the day and its repeatability in different seasons (fall and spring) in Hereford heifers grazing rangelands (Campos biome). Heifers (n=74; 190.8 and 250.8 months of age and 26,926 and 27,926 kg BW for fall and spring, respectively) classified into three groups according to their paternal EBV for RFI (percentiles≤20% for high, 30-50% for medium, ≥80% for low) were used in this experiment. Heifers grazed native pastures with an average herbage allowance of 35,081,154 kg DM/ha for fall and 20,271,285 kg DM/ha for spring. Individual HR was measured every 5s intervals for at least two periods of 4 consecutive days during each season. Data quality was assessed using sliding window functions and later analysed using repeated measures with a mixed model with the paternal RFI group, the moment of the day (MOD; morning, afternoon, night and the hours corresponding to each time adjusted according to the sunset and sunrise of each season) and their interaction as fixed effects and paternal EBV as a random effect. On both seasons, HR was the lowest at night and the greatest in the afternoon (64, 69 and 74 5 beats/min and 71, 76 and 81 6 beats/min, for night, morning and afternoon of fall and spring, respectively; $P<0.001$). Neither in fall nor spring HR was affected by paternal RFI groups ($P>0.30$) or the interaction between the paternal RFI group and MOD ($P>0.17$). However, if only the progeny of the two most (percentile≤10) and two least (percentile≥80) efficient sires were considered, in fall, HR tended ($P=0.075$) to be greater for the daughters of low-efficiency sires. The Spearman correlation between individual fall and spring HR was 0.379 ($P=0.0019$), suggesting there wasn´t a significant re ranking of the animals: individual HR relative to the group tended to be stable between seasons. These results indicated that HR increased in spring as animal BW and intake increased, that independently of the season varied along the day, probably reflecting grazing activity, and that although a greater number of animals with more divergent paternal EBVs might be needed, HR may be related to feeding efficiency.