

Feed efficiency and responses of plasma and milk isotopic signatures in Charolais beef cows

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Productive and metabolic responses are supported by body reserves changes in beef cows when facing feed restriction (FR). Because dynamics of natural abundance of ^{13}C ($\delta^{13}\text{C}$) and ^{15}N ($\delta^{15}\text{N}$) in milk may reflect body changes in dairy cows, the objectives were: (1) to test if plasma and milk isotope signatures change in response to FR in beef cows; and (2) to study their associations with phenotypic feed efficiency. Twenty-two Charolais cows were studied from calving until wk 21 of lactation. Residual feed intake (RFI) was calculated on wks 1 to 8 of lactation when cows were allowed *ad libitum* intake of the same diet. On wk 9, cows underwent a 4-day FR to meet 50% of net energy requirements, followed by *ad libitum* intake. Individual production (MY) and metabolic (NEFA) responses were monitored from d-10 to d19 relative to FR. The $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ were analysed in plasma [before (d-10, d-2, d1); during (d2-5) and after (d6-d8, d11 and d19) FR] and in milk [before (d-10, d-2, d1); during (d4, d5) and after (d11, d19) FR]. The effects of FR and RFI on plasma and milk $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ were tested using mixed model and Spearman correlations. RFI ranged from -0.01 to -0.69 for negative RFI and from 0.04 to 1.15 kg DMI/d for positive RFI and had no effect on plasma and milk isotopic signatures. Plasma NEFA and $\delta^{15}\text{N}$ increased, and $\delta^{13}\text{C}$ decreased during FR ($P<0.0001$). Accordingly, milk $\delta^{15}\text{N}$ increased and $\delta^{13}\text{C}$ decreased during FR ($P<0.0001$). Plasma NEFA was correlated across the experiment with plasma $\delta^{15}\text{N}$ ($r=0.41$, $P<0.0001$) and $\delta^{13}\text{C}$ ($r=0.40$, $P<0.0001$), whereas no correlation was shown with milk isotopes signatures. Plasma $\delta^{15}\text{N}$ was correlated with milk $\delta^{15}\text{N}$ ($r=0.66$, $P<0.001$), but no relation was observed between plasma and milk $\delta^{13}\text{C}$. These results suggest that only plasma isotope signatures respond to body reserves changes in Charolais cows but correlations with plasma NEFA were moderate. To date, no clear relations with RFI were found. Further work is ongoing to model kinetics of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ to explore links with feed efficiency.