Effects of Dietary Butyrate Supplementation and Oral Non-Steroidal Anti-Inflammatory Drug Administration to Transition Cows on Performance, Plasma Metabolites and Reproduction

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Dairy cows experience negative energy balance in the transition period due to inflammation and high energy demands for milk production. This study evaluated the effects of dietary butyrate supplementation and oral non-steroidal anti-inflammatory drug administration on performance, plasma metabolites and reproduction in transition cows. Eighty-three cows were fed an iso-energetic diet containing calcium butyrate (1.42% of diet dry matter (DM)) or a control (1.04% palm fat and 0.38% calcium carbonate of diet DM) during the calving transition period from -28 to 24 DIM (calving = d 0). The closeup (CUD) diet contained 13.5% starch and 43.0% neutral detergent fiber (NDF), and the fresh diet contained 22.4% starch and 34.6% NDF on a DM basis. Twelve to 24 h post-calving cows also received an oral non-steroidal anti-inflammatory drug (NSAID; 1 mL/15 kg BW Meloxicam in carrier solution) or a placebo (1 mL/15 kg BW food dye in carrier solution). Butyrate supplementation and NSAID administration did not affect postpartum milk yield, serum inflammatory markers, BW or BCS change. However, butyrate-fed cows tended to have lower milk crude protein yield than control-fed cows (1.21 vs. 1.27 kg/d; $P = 0.06$). Cows fed butyrate also had lower plasma glucose on d 4 (64.3 vs. 70.8 mg/dL; $P = 0.04$) when previously administered the placebo drug. On d 7 butyrate cows tended to have lower plasma FFA (825 vs. 993 µEq/L; $P = 0.07$) compared with control cows. Multiparous cows given the NSAID had lower postpartum DMI than placebo cows (16.7 vs. 19.2 kg/d; $P = 0.02$) when on control feed. Cows given the NSAID had higher plasma glucose on d 4 (70.7 vs. 64.3 mg/dL; $P = 0.02$) when fed the butyrate diet. Primiparous cows given the NSAID tended to ovulate later than placebo cows (29.6 vs.18.7 d; $P = 0.09$) when fed butyrate. In the present study dietary butyrate supplementation and oral NSAID administration had no overall positive effects on cow performance or interval to first ovulation.

Blood Metabolomics Phenotyping of Dry Cows Reveals Potential Biomarkers for Susceptibility to Mastitis

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Subclinical mastitis (SCM) is a major disease of dairy cows. Our objective was to identify metabolic alterations in the serum of pre-SCM cows during the dry-off period that can be used for developing SCM lab and pen-side tests. A total of 145 cows were sampled. Mass spectroscopy was used to quantify serum metabolites at -8 and -4 wks pre-calving. Forty-four cows with SCM and another disease and 15 healthy (CON) cows were identified. Metabotyping of those cows revealed a total of 43 and 29 metabolites that differentiated SCM from CON ones at -8 and -4 wks, respectively. Results also showed that there were 4 lipids (LysoPC28:0, C5DC, PC38:0AA, PC36:0AA) and α-aminoadipic acid and 4 phosphatidylcholines (PC36:0AA, PC36:0AE, PC40:2AA, PC38:0AA) and α-ketoglutaric acid that differentiated SCM cows from the CON ones at -8 and -4 wks, respectively. We then selected cows affected only by SCM (n = 10) and compared them with CON (n=15) cows. We identified 59 and 47 metabolites that differentiated the two groups at -8 wks and -4 wks prepartum. Among them, 4 serum metabolites (alanine, leucine, betaine, and ornithine) at -8 wks and 4 metabolites (alanine, pyruvic acid, methylmalonic acid, and lactic acid) at -4 wks were identified as metabolites that can serve as biomarkers for identifying cows susceptible to SCM. In conclusion, data showed that starting from -8 and -4 wks prepartum cows susceptible to SCM alone or SCM and another periparturient disease can be identified by a lab or pen-side test in the future. More research is needed to validate the panels of metabolites identified and develop lab and pen-side tests in the future.

Take Home Messages: Several blood metabolites have been identified by mass spectroscopy at -8 and -4 wks prepartum that can serve in the future as potential biomarkers to identify dairy cows susceptible to mastitis.