

Effects of Prepartum Dietary Starch Content on Rumen Fermentation of Dairy Cows during the Transition Period

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Feeding a low-energy diet during the close-up period has shown to increase dry matter intake and reduce lipid mobilization after calving. However, this feeding approach may increase the incidence of sub-acute ruminal acidosis (SARA) after calving compared with feeding a high-energy close-up diet. Therefore, the objective of this study was to evaluate the effects of prepartum plane of nutrition with different dietary starch content on rumen fermentation during the calving transition period. Eighteen multiparous Holstein dairy cows fitted with ruminal cannulas were fed either a low- (LS, 14.0% starch) or high-starch (HS, 26.1% starch) diet from d 28 prior to the expected calving date until parturition. All cows were fed a common lactation diet until d 21 after calving. A grain challenge was performed on d 7 and 21 after calving by dosing 7 kg (as-fed basis) of finely ground barley and wheat grain (1:1) into the rumen via cannula. Feeding the LS diet during the close-up period reduced the duration (49.2 vs. 369 min/d, $P = 0.02$) and severity of SARA (5.2 vs. 85.1 pH below 5.8 \times min/d, $P = 0.03$) on 10 d before expected calving date. In addition, LS cows tended to have shorter duration (75.7 vs. 177 min/6h, $P = 0.07$) and lower severity of SARA (20.3 vs. 67.8, pH below 5.8 \times min/6h, $P = 0.08$) during a grain challenge on d 7, possibly because of reduced inflammation and less rumen epithelial damage as indicated by a tendency of lower serum amyloid A (SAA) concentration (23.8 vs. 56.0 μ g/mL, $P = 0.06$) compared with HS cows. Rumen pH and serum concentrations of SAA and haptoglobin did not differ between LS and HS cows during a grain challenge on d 21. Plasma insulin concentration increased and plasma free fatty acids concentration decreased after the grain challenges on both d 7 and 21 to a similar extent between the treatment groups, suggesting that the dietary starch content of prepartum diet may not affect insulin resistance after calving.

Implications: Feeding a low-starch diet during the close-up period can reduce the incidence of SARA before calving and may not increase the risk of developing SARA in dairy cows after calving.