
Our objective was to compare the pattern of multiple behavioral, physiological, and performance parameters collected by sensors in Holstein cows diagnosed or not with metritis (MET). Cows underwent clinical examination daily from calving until 28 DIM. Sensor parameters monitored and collected were: physical activity (ACT), rumination (RUM) and eating (EAT) behavior, reticulo-rumen temperature (TEMP), and milk production (MILK) and milk components (fat and protein). Groups of cows were formed as follows: cows diagnosed with MET only (METO; n = 149), cows diagnosed with MET plus another disorder (MET+; n = 78) within 7 d before or after diagnosis of MET, and cows with no evident signs of clinical disease (NCD; n = 824). Data from d −7 to 7 after diagnosis of MET were analyzed by ANOVA with repeated measurements including group, time, and their interaction as fixed effects and controlling by lactation number (1, 2, 3+). The mean DIM at diagnosis of MET was considered study d 0 for cows in the NCD group. Cows within-group was included as random effect and was the subject of repeated measures. MILK was lower (P < 0.01) for cows in METO and MET+ from d −4 to 7. Cows in METO and MET+ had greater (P < 0.01) fat and fat-to-protein ratio than cows in NCD from d −7 to 7. For cows in METO and for MET+, ACT was lower (P < 0.01) than for cows in NCD from d −3 to −1 and from 1 to 7, respectively. EAT was reduced (P < 0.01) for cows in both METO and MET+ compared with NCD from d −6 to 7. Cows in METO had lesser (P < 0.01) RUM than cows in NCD from d −4 to 7 whereas cows in METO had lesser (P < 0.01) RUM than cows in NCD from d −4 to 4. Cows in METO had greater (P < 0.01) TEMP than cows in NCD from d −7 to 7 whereas cows in MET+ had greater (P < 0.01) TEMP than cows in NCD from d −1 to 7. We conclude that cows with metritis only and cows with metritis and another disorder observed within 7 d before or after diagnosis of metritis had specific patterns of behavioral, physiological and productivity parameters which might be used to predict the occurrence of metritis.

Key Words: metritis, sensor, dairy cow


Objectives were to investigate the impact of induced endometritis on performance in early lactation. The hypothesis was that induced endometritis induces localized and systemic inflammatory responses that depress production. Postpartum Holstein cows without any clinical disease in the first 30 DIM and less than 10% polymorphonuclear cells (PMN) in endometrial cytology had the estrous cycle synchronized starting at 29 DIM. Cows were blocked by parity and genomic breeding value for fertility and, metritis and other disorders were analyzed by mixed models with the MIXED and GLIMMIX procedures of SAS. Treatment increased (P < 0.01) the proportion of PMN in the endometrial cytology on d 2 (CON = 3.9 ± 1.1 vs. INF = 39.9 ± 6.6%) and 7 (CON = 8.5 ± 2.2 vs. INF = 19.0 ± 4.3%) after infusion. Using a cut-off of 10% PMN as subclinical endometritis (SCE), 28.7 ± 9.8 of CON and 91.9 ± 5.3 of INF developed SCE (P < 0.001). Rectal temperature did not differ (P = 0.52) between CON and INF and averaged 38.9 and 38.9 ± 0.1°C, respectively. Yield of milk in the 7 d following treatment tended (P = 0.09) to be greater in CON than INF (CON = 44.0 vs. INF = 40.9 ± 1.8 kg/d). Treatment did not affect the yields of ECM (CON = 42.8 vs. INF = 41.9 ± 1.9 kg/d; P = 0.65), fat (CON = 1.45 vs. INF = 1.52 ± 0.07 kg/d; P = 0.45), or protein (CON = 1.22 vs. INF = 1.14 ± 0.07 kg/d; P = 0.20), but lactose yield was greater (P = 0.02) in CON than INF (CON = 2.37 vs. INF = 2.09 ± 0.12 kg/d). The somatic cell score (SCS) did not differ (P = 0.95) between treatments (CON = 2.7 vs. INF = 2.7 ± 0.3). Induction of endometritis induced an influx of PMN, increased incidence of SCE and affected yields of milk and lactose in early lactation cows.

Key Words: dairy cow, endometritis, production

Assessment of the accuracy and test characteristics of a multivariable metabolic index to predict hyperketonemia in early postpartum Holstein dairy cows. Z. Rodriguez1, L. Caixeta1, P. Ferro1, N. Morales1, M. Endres1, K. Nakagawa2, A. Imaiuzumi2, I. Shinzato2, and T. Fujiyada2, 1University of Minnesota, Saint Paul, MN, 2Ajinomoto Co. Inc., Kawasaki, Japan.

Hyperketonemia (HYK) is a prevalent metabolic disorder associated with suboptimal health and performance in dairy cattle. Thus, early detection and prevention of HYK are important to improve animal welfare and decrease economic losses. A multivariable metabolic index (MI) using pre-partum concentration of different amino acids and blood metabolites was developed to predict the occurrence of HYK in Holstein dairy cows. Our objective was to assess the accuracy of this MI and the variability of test characteristics at different MI thresholds. Blood samples were collected from Holstein cows in a commercial dairy in Minnesota at 21 ± 3 d before expected calving date (3 weeks pre-partum) for the measurement of blood metabolites and calculation of the MI. After calving, blood β-hydroxybutyrate (BHB) was measured at 3 ± 1 and 7 ± 1 DIM for diagnosis of HYK. Hyperketonemia was defined as BHB >1.2 mmol/L. Cows were enrolled between February and September 2019. Statistical analyses were performed using R software (version 3.4.4). The area under the receiver operating characteristic curve was calculated as a measure of predictive accuracy. Sensitivity (Se), specificity (Sp), positive predictive values (PPV) and negative predictive values (NPV) at 6 different predictive thresholds were calculated as test characteristics. The prevalence of HYK was 19.0% (95%CI: 15.9 – 22.5). The diagnostic accuracy of the MI to predict HYK was 0.79 (95%CI: 0.73 – 0.85). The best Se and Sp based on Youden’s index were 75% and 76%, respectively based on d 7 (Table 1). In conclusion, the MI was able to predict HYK with high accuracy and acceptable Se and Sp up to 3 weeks before the disease onset in the postpartum period.

Table 1 (Abstr. 41). Test characteristics1 at different metabolic index (MI) thresholds

<table>
<thead>
<tr>
<th>MI Threshold</th>
<th>Se (%)</th>
<th>Sp (%)</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
</tr>
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<td>90</td>
<td>40</td>
<td>92</td>
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<tr>
<td>−1.1*</td>
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<tr>
<td>−2.3</td>
<td>96</td>
<td>10</td>
<td>14</td>
<td>95</td>
</tr>
</tbody>
</table>

*Represents the MI value with the highest Youden’s index.

Key Words: hyperketonemia, prediction, transition period
42 The association of prepartum urine pH, and plasma total calcium at calving in Holstein dairy cows. P. Melendez1, J. Bartolome1, C. Roeschmann1, B. Soto2, A. Arevalos3, and J. Moller4, 1University of Georgia, Tifton, GA, 2National University of La Pampa, Gral. Pico, Argentina, 3University of Chile, Santiago, Chile, 4Fundación Los Laureles, Chahúlico, Chile.

Hypocalcemia is a common metabolic disorder affecting dairy cows around parturition. A successful strategy to prevent clinical hypocalcemia is the use of anionic diets to induce a mild metabolic acidosis, increasing the responsiveness of receptors to PTH. The assessment of urine pH is a quick and inexpensive tool to monitor the degree of metabolic acidosis imposed by the anionic strategy. What urine pH is the ideal for the prevention of milk fever has been very controversial. The aim was to assess urine pH on prepartum Holstein cows fed anionic diets and determine its association with plasma total Ca (tCa), tMg, tP, BHB at parturition. The study was conducted on a grazing dairy in Chile. At 30 d before expected parturition, cows were moved to a prepartum lot receiving 80% of their DM as a mixed ration and 20% from pasture (DCAD = -109 mEq/kg DM). During Fall 2019, 345 prepartum cows were eligible for urine collection. Weekly, about 20% of the group were randomly sampled for urine pH using a portable electronic pH meter. The inclusion criteria of each sampled cow was that they had to stay at least one week in the prepartum group consuming the anionic diet. Within 6 h after calving a blood sample was obtained to collect plasma. At the end, 60 cows were tested for urine pH and blood metabolite concentrations at calving. The concentration of plasma tCa, tMg and BHB at d 1 pp were assessed. Metabolites were analyzed by ANOVA for polynomial regression (PROC GLM, SAS 9.4). Ten cows (16.6%) had a urine pH <6.0, 35 cows (58.3%) had a tCa concentration <2.15 mmol/L. There was a quadratic effect of urine pH on tCa. The concentration of plasma tCa was higher when the prepartum urine pH was between 6.0 and 7.5 (2.24–2.3 mmol/L), while decreased with pH <6.0 and > pH 7.5 (<2.22 mmol/L). No variables were associated with tMg at calving. There was a trend (P = 0.11) for a quadratic effect of urine pH on the concentration of BHB at parturition. BHB was higher when urine pH was <6.0 and >7.5. In conclusion, cows with prepartum urine pH <6.0 and >7.5 had a lower concentration of plasma tCa, and tended to have a higher concentration of BHB. These results indicate that anionic salts should be fed with caution, avoiding underfeeding and overfeeding. The target urine pH should be between 6.0 and 7.0.

Key Words: hypocalcemia, urine pH, anionic diets

43 Association of calcium and energy balance metabolites in the first 3 days after parturition with disease and production outcomes in multiparous Jersey cows. P. R. Menta1, L. Fernandez1, D. Poit1, M. Celestino1, V. S. Machado1, M. A. Ballou1, and R. C. Neves1, 1Department of Veterinary Sciences, College of Agricultural Sciences and Natural Resources, Texas Tech University, Lubbock, TX, 2Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Purdue University, West Lafayette, IN.

Our objectives were to understand the associations of total Ca concentration (tCa) measured at 1 through 3 DIM, and free fatty acids (FFA), BHB and glucose (GLU) measured at DIM 3 with (1) the risk of multiparous Jersey cows being diagnosed with early-lactation diseases and culling using multivariable Poisson regression; (2) milk production in the first 9 wk of lactation using generalized linear mixed models; and, (3) the risk of pregnancy in the first 150 DIM using Cox Proportional hazards modeling. A total of 380 cows were enrolled in a cohort study from one herd in West TX. Total Ca measured at DIM 1 through 3 was not associated with the risk of metritis. Cows with increased FFA and BHB had a higher risk to be diagnosed with metritis (P = 0.05) and clinical mastitis (P = 0.04), respectively. Increased concentrations of GLU (P = 0.007), FFA (P = 0.04), and tCa (P = 0.004) at 3 DIM were associated with the risk of culling. Reduced tCa at both DIM 1 (≤1.84 mmol/L; P < 0.0001; +3.85 kg per d) and 2 (≤1.88 mmol/L; P = 0.03; +1.84 kg per d) were associated with increased milk production across the first 9 wk of lactation compared with herdmates with increased tCa. Total Ca was not associated with milk production at DIM 3, with FFA (≥0.55 mmol/L; P = 0.02) and GLU (≤2.95 mmol/L; P = 0.002) being associated with increased milk production. None of the metabolites measured were associated with the risk of pregnancy in the first 150 DIM. Our results demonstrate that reduced tCa concentrations in the first 2 DIM and reduced GLU at 3 DIM are associated with increased milk production. Increased concentrations of FFA were associated with higher milk production but with increased risk of metritis.

Key Words: calcium, energy balance, milk production

44 Effects of carprofen on inflammation biomarkers and health of transition Holstein cows. S. T. Quanz1, A. R. Rodriguez1, H. A. Bustamante2, L. K. Mamedova3, and B. J. Bradford3, 1Kansas State University, Manhattan, KS, 2Universidad Austral de Chile, Valdivia, Los Rios Region, Chile, 3Michigan State University, East Lansing, MI.

The objective of this study was to analyze the effect of carprofen on transition cow inflammation biomarkers and health. Late-gestation multiparous cows (n = 62) were enrolled at the beginning of the close-up period and randomly assigned to treatments at parturition. Cows received either no treatment (control) or subcutaneous carprofen (1.4 mg/kg BW) 24–48 h postpartum. Cows treated with antibiotics or anti-inflammatory medications during the close-up period were removed from the study (6 treatment, 2 control). Health was observed daily for 21 d postpartum. For the first 120 d of lactation, cows were confined and fed a TMR, and then moved to a rotational grazing system and supplemented. Blood plasma and serum were collected from the coccygeal vein 21 d before expected calving and once weekly for 3 wk postpartum. Serum haptoglobin was determined by enzymatic activity, plasma fibrinogen and total protein concentrations by refractometry, and plasma maresin-1 and adiponectin concentrations by ELISA. Treatment, disease, and time were modeled as fixed effects with parity as a random effect; significance was declared at P < 0.05. Treatment cows had fewer instances of clinical metritis (36% vs. 66%, P ≤ 0.05), but there was no effect on urogenital metritis, displaced abomasum, pneumonia, clinical mastitis, or lameness incidence (P > 0.10). Carprofen had no effect on adiponectin or fibrinogen concentrations (P > 0.10) but increased total plasma protein concentration (P ≤ 0.05) and tended to increase maresin-1 (P = 0.09), a resolving oxylipid. Carprofen had no effect on adiponectin or fibrinogen concentrations (P > 0.10) and increased maresin-1 (P = 0.04), but there were no disease × treatment interactions (P > 0.10). Carprofen tended to decrease plasma haptoglobin (P = 0.07). Cows with clinical metritis had greater concentrations of fibrinogen and haptoglobin (P ≤ 0.05), but there were no disease × treatment interactions (P > 0.10). Carprofen tended to increase adiponectin concentration only among cows with clinical metritis (P = 0.06; disease × treatment interaction P < 0.05).

Overall, carprofen decreased the incidence of clinical metritis while also altering biomarkers in a manner suggesting decreased systemic inflammation, consistent with a more successful navigation of the transition period.

Key Words: metritis, maresin-1, adiponectin