

## ADSA-SAD (Student Affiliate Division) Undergraduate Competition: Original Research

**232 Milk production, calving, and calf health in lines of dairy cattle selected for high versus low dairy form.** M. B. Kron\* and M. M. Schutz, *Purdue University, West Lafayette, IN.*

Dairy form (DF) comprises body condition and strength, with thinner, narrower cows assigned higher linear scores. Over time, DF has increased as a correlated response to selection for milk yield. Two selection lines of Holstein cows are being developed at Purdue University by mating cows to AI bulls with high (H) or low (L) Standardized Transmitting Abilities for DF. Resulting heifers are mated to sires from the same line to develop the divergent lines, HDF and LDF. This study's aim was to examine line effects on production and calving traits of first generation cows and health and growth of their second generation calves. For production and milk composition in first lactation, mixed models including year-season of calving, days in milk, line, and random sire effects did not reveal significant line differences, although LDF cows had a numeric advantage for all traits except milk yield. Heifers in LDF had numerically less dystocia, and significantly fewer cases of retained fetal membranes ( $P < 0.001$ ). For second generation calves; birth weights, weekly heart girth, hip and wither heights, feed consumption, and scores for appearance, fecal consistency, and respiration, were recorded. The LDF calves had lower birth weights ( $40.6 \pm 1.25$  kg) compared to HDF ( $42.7 \pm 1.11$  kg) calves. Mean heart girths in wk 1 and 4 were  $84.3 \pm 1.10$  cm and  $90.7 \pm 0.95$  cm for LDF calves versus  $83.3 \pm 1.25$  cm and  $89.9 \pm 0.38$  cm for HDF calves, respectively. Calves in the LDF line averaged  $81.3 \pm 1.00$  cm for hip height in wk 1,  $76.8 \pm 0.90$  cm for wither height in wk 1,  $81.9 \pm 2.23$  cm for hip height in wk 4, and  $78.0 \pm 0.73$  cm for wither height in wk 4; while calves in the HDF line averaged  $83.1 \pm 1.10$  cm,  $79.3 \pm 1.68$  cm,  $85.7 \pm 0.73$  cm and  $80.0 \pm 0.85$  cm for the same traits, respectively. Scores for feed consumption, fecal consistency, general appearance, and respiration did not differ between LDF and HDF calves. Because of the preliminary nature of this study, numbers in each line were small. However, it does not appear that short term directional selection for low DF adversely affects cows or their calves.

**Key Words:** Dairy Form, Milk Yield, Calf Health

**233 The effect of feeding high protein dried distillers grains on milk production.** K. J. Hubbard\*<sup>1</sup>, A. M. Gehman<sup>1</sup>, P. J. Kononoff<sup>1</sup>, K. Karges<sup>2</sup>, and M. L. Gibson<sup>2</sup>, <sup>1</sup>*University of Nebraska, Lincoln*, <sup>2</sup>*Dakota Gold Research Association, Sioux Falls, SD.*

The objectives of this study were to evaluate the effects of feeding a high protein dried distillers grains (HPDDGS) on milk production and components and dry matter intake. Concentration of CP, NDF, and ether extract of HPDDGS was  $45.4 \pm 0.09$  %,  $22.5 \pm 0.16$  %, and  $4.0 \pm 0.57$  %. Ruminal DM digestibility of HPDDGS was evaluated *in situ* by incubating nylon bags containing 1.0 g of sample in the rumen of two steers for 48 h. Ruminal DM digestibility was observed to be  $80.7 \pm 3.6$  %. Sixteen lactating Holstein cows (12 multiparous and 4 primiparous) averaging  $80 \pm 14$  DIM were randomly assigned to one of two dietary treatments in a  $2 \times 2$  crossover design. A portion of forage and all soy-based protein in the control diet was replaced by HPDDGS (20 % DM). Milk production and dry matter intake were recorded daily and averaged for d 15–21 of each 21-d period. Milk samples were collected on d 20–21 of each period. Milk yield increased ( $P = 0.02$ ) with the

inclusion of HPDDGS ( $33.4$  vs.  $31.6 \pm 2.11$  kg/d), and 3.5% FCM was also higher ( $P < 0.01$ ) for the HPDDGS ration ( $36.4$  vs.  $33.1 \pm 2.21$  kg/d). Percent protein was not affected by treatment (average  $3.03 \pm 0.08$  %), but protein yield increased ( $P = 0.01$ ) with inclusion of HPDDGS ( $0.95$  to  $1.00 \pm 0.05$  kg/d). Milk fat concentration was not different between treatments (average  $3.97 \pm 0.19$  %), but fat yield increased ( $P = 0.01$ ) for the HPDDGS ration ( $1.36$  vs.  $1.20 \pm 0.08$  kg/d). Dry matter intake tended ( $P = 0.06$ ) to be lower for HPDDGS than control ( $21.2$  vs.  $22.6 \pm 0.7$  kg/d). Due to lower dry matter intake and greater milk production, feed conversion was improved ( $P < 0.01$ ) by the addition of HPDDGS ( $1.47$  to  $1.73 \pm 0.09$ ). Milk urea N was greater ( $P < 0.01$ ) for the HPDDGS ration than the control ( $14.6$  vs.  $12.8 \pm 0.66$  mg/dL). This research suggests the dairy rations may be formulated to contain up to 20% DM of HPDDGS and result in increased milk production and efficiency without negatively affecting milk components.

**Key Words:** Dairy Cow, High Protein Distillers Grains, Milk

**234 The relationship between proinflammatory cytokines levels and onset of milk fever in dairy cows.** E. A. Smith\*, K. F. Knowlton, C. S. Petersson-Wolfe, I. K. Mullarky, and D. R. Winston, *Virginia Polytechnic Institute and State University, Blacksburg.*

Parturient paresis, or milk fever, is a common and debilitating disease that occurs at the onset of calving and results in paralysis and death if not properly treated. Current treatment protocols include administration of intravenous calcium (Ca). To date, there are few definite prevention strategies outside of altering cation-anion levels in the diet prior to parturition. Levels of parathyroid hormone (PTH) regulate Ca serum concentrations and may in part be responsible for the decrease in Ca associated with milk fever. Inflammatory mediators, such as tumor necrosis factor (TNF)- $\alpha$  have been shown to decrease secretion of PTH and thereby alter Ca levels at parturition. In order to identify a possible link between TNF levels and onset of milk fever, levels of TNF in animals diagnosed with milk fever as compared with control animals that did not exhibit milk fever symptoms were evaluated. Blood plasma TNF levels were measured by ELISA in samples collected at day -7, -3, -1, 0, 1, 3, and 5 relative to parturition. Results indicate lower levels of TNF- $\alpha$  in milk fever animals both prior to and following parturition as compared to animals without milk fever symptoms. TNF- $\alpha$  may be a regulator of blood Ca and an indicator of onset of milk fever at parturition. Ongoing studies will evaluate levels of PTH in milk fever animals and the mechanisms of TNF- $\alpha$  regulation of Ca homeostasis.

**Key Words:** Milk Fever, Cytokines, Calcium

**235 Effects of a non-steroidal anti-inflammatory drug prior to dehorning on growth and physiological measures in calves.** A. E. Smith\*, A. L. Magliaro, J. R. Werner, and R. S. Kensinger, *The Pennsylvania State University, University Park.*

Dehorning of calves is a routine procedure in the dairy industry; dehorned cattle cause less harm to each other and are safer to handle. Producers are constantly trying to decrease stress in calves in order to improve growth and health while reducing costs. The objective of this

study was to determine whether treatment with Banamine (flunixin meglumine) prior to dehorning would affect growth rate and plasma haptoglobin and cortisol concentrations. Holstein heifer calves ( $n = 52$ ,  $40 \pm 2.3$  d old,  $56.9 \pm 4.9$  kg) were blocked by age and randomly assigned to Banamine (B) or control (C) treatment groups. Calves in group B received 1.1 mg/kg of Banamine intravenously 15 min prior to dehorning. Calves in group C were dehorned without Banamine. All calves were dehorned using an electric hot iron dehorner with a mean contact time of 18.8 s per horn bud. Body weights were measured on d 0, 2, 7, and 14 relative to dehorning using an electronic scale with a weigh-average-hold function. Blood samples were collected on d 0, 2, and 7, and analyzed for hematocrit, plasma protein, haptoglobin, and cortisol. Data were analyzed using PROC MIXED within SAS. Calves exhibited good health, and mortality rate was 0 % during the study. Average daily gains from d 0 to d 2 were 0.68 and 0.52 kg for groups B and C, respectively, and were not affected by treatment ( $SE = 0.08$ ,  $P = 0.18$ ). Average daily gains from d 0 to d 7 for groups B and C were 0.69 and 0.68 kg, respectively, and were not affected by treatment. Mean haptoglobin concentrations were 33.0 and 22.9  $\mu\text{g/ml}$ , and mean cortisol concentrations were 2.6 and 2.7 ng/ml for groups B and C, respectively. For all calves, mean hematocrit was 28.7 %, and mean plasma protein was 5.4 %. Blood and plasma measures were not significantly affected by treatment. Treatment with a single dose of Banamine alone 15 min prior to dehorning was not found to be beneficial to growth and did not reduce physiological measures of inflammation in 5-6 week old calves.

**Key Words:** Dehorning, Banamine, Haptoglobin

**236 The effect of milk feeding method on cross-sucking behavior in pasture-based dairy calves fed once daily.** K. A. Jackson\* and S. P. Washburn, *North Carolina State University, Raleigh.*

Cross sucking among group-managed dairy calves increases concerns of udder malformation and mastitis due to irritation of the sucked area. We investigated whether pasture-raised dairy calves differed in cross-sucking activity when fed milk once daily in an open trough (Group 1,  $n = 8$ ) compared to those allowed to suck from a barrel teat feeder (Group 2,  $n = 8$ ). Calves of both genders were used and balanced across groups among Holsteins, Jerseys, and crossbreeds. Each group received one 30.5 L milk meal a day and had free-choice access to a calf starter and water on adjacent pasture paddocks. The hypothesis was that lack of sucking during eating might lead trough-fed calves to increased cross-sucking behavior. Calves were observed during 13 periods over 8 wk from the time they reached pasture until after weaning. Scan sampling using direct observation began upon delivery of milk and continued at 5-min intervals until 60 min after milk was fed. Additional observations were made during the same time post weaning. Data recorded by visual observation included general postures of calves (standing, lying head up, or lying head down) as well as specific activities such as, drinking or sucking milk, self-grooming, licking another calf, licking or nibbling on object, cross sucking, eating, or inactivity. The average number of observations per calf was  $12.3 \pm 0.02$  per period. Incidence of cross sucking at and just after feeding time within the trough-fed group averaged  $2.2 \pm 0.4$ , whereas the teat-fed group averaged only  $0.15 \pm 0.05$  incidences of cross sucking. This behavior accounted for 18% of total activity for trough-fed calves and 1% of activity for teat-fed calves. In contrast, during post weaning the trough-fed group reduced cross-sucking behavior to  $0.8 \pm 0.3$  incidences but the teat-fed average increased to  $0.6 \pm 0.3$  incidences. Although trough-fed calves had higher cross-sucking behavior before weaning, occurrences of cross sucking

were similar for both trough-fed and teat-fed groups post weaning so long-term effects may be minimal.

**Key Words:** Calves, Cross-Sucking, Teat-Fed

**237 Comparison of circulating progesterone and metabolic profiles in Holstein heifers and lactating cows.** W. A. Smith\*<sup>1</sup>, D. H. Keisler<sup>2</sup>, W. Silvia<sup>3</sup>, and L. E. Davis Rincker<sup>1</sup>, <sup>1</sup>*Eastern Kentucky University, Richmond*, <sup>2</sup>*University of Missouri, Columbia*, <sup>3</sup>*University of Kentucky, Lexington.*

Reproductive efficiencies in lactating dairy cows have steadily declined during the last several decades while milk production has increased. In contrast, conception rates in dairy heifers have remained fairly constant. Declining fertility in lactating cows is likely due to a combination of genetics, management, and physiological factors. Our objective was to compare concentrations of circulating progesterone and metabolic hormones in one complete estrous cycle of heifers and lactating cows. Postpubertal, nonpregnant heifers ( $n = 15$ ) and lactating, nonpregnant cows ( $n = 15$ ;  $< 65$  DIM) were synchronized using the following protocol: insertion of an intravaginal progesterone device (CIDR<sup>TM</sup>) with an injection of 100  $\mu\text{g}$  GnRH (Factrel<sup>®</sup>) on d 0, an injection of PGF2 $\alpha$  (Lutalyse<sup>®</sup>) and removal of the device on d 7, and an injection of GnRH on d 9. Starting on d 10 of the synchronization protocol, 10 ml of blood were taken every other day for 24-d. All animals were scored for body condition and milk data was collected for cows. Statistical analysis used the GLM procedure of SAS. Body condition scores were different and averaged 3.19 and 2.37 for heifers and cows, respectively ( $P < 0.01$ ). Progesterone and metabolic hormone analyses are ongoing. Correlations between factors measured for both heifers and cows will be performed to better understand the potential relationships between parameters.

**Key Words:** Fertility, Progesterone, Leptin

**238 Evaluation of rumen microbial digestion of corn stover with cellulose treatment.** B. Bosma\*, R. Jimenez-Flores, and J. Howard, *California Polytechnic State University, San Luis Obispo.*

The bulk of feed consumed by dairy cattle is digested by microbes in the rumen. The efficiency of microbial digestion has a direct effect on rate and extent of cellulose breakdown from the diets they consume. Microbes begin the process of digestion by attaching to feed particles by secreting a sticky, mucous-like envelope onto the feed. Microbial cells then multiply to form colonies at the site of attachment and begin to release digestive enzymes, such as cellulase, which break down the feed. Previous research has indicated a milk cow ration treated with cellulase has increased the efficiency of cellulose digestion, therefore increasing milk production. For further research in this area, an in-vitro model system was developed in which dried corn stover in rumen fluid was inoculated with *Trichoderma reesei* cellulase and growth as related to CO<sub>2</sub> production was measured. The CO<sub>2</sub> production was doubled with the addition of 50  $\mu\text{L}$  of cellulase and more than tripled with the addition of 500  $\mu\text{L}$  of cellulase. The addition of *Trichoderma reesei* cellulase improved the fermentation profile of corn stover during in-vitro fermentation.

**Key Words:** Corn Stover, In Vitro Fermentation, *Trichoderma Reesei*

**239 Change in the prevalence of mastitis pathogens in an organic dairy farm as it transitioned from a conventional dairy farm.** W. M. McMahan\* and L. K. Larry, *Washington State University, Pullman.*

The objectives were to collect aseptic composite milk samples from all cows before (Phase I), during (Phase II), and after (Phase III) the transition to organic status on two dairies and to culture milk samples for isolation of mastitis pathogens. Cows enrolled were those at parturition, dry off, and clinical mastitis. During Phase I antibiotics were used in dry cow therapy and were eliminated in Phases II and, III. Staphylococcus species mastitis increased at parturition samples from 31% Phase I, 35%

Phase II, and 49% in phase III. At parturition prevalence of Streptococcus species was 8% in Phase I and 23% in Phase III. The prevalence of Streptococcus species at dry off changed from 6% in Phase I to 4% in Phase III. The prevalence of cows without mastitis pathogens at parturition was 53 percent in Phase I, 39 percent Phase II, and 30 percent Phase III, indicating mastitis at parturition had increased over time in the transition to organic. The data also show that the number of cows without mastitis pathogens is 60% at dry off in all three phases. Data suggests cows under organic management freshen with more mastitis but that the increased prevalence subsides such that at dry off the prevalence is very similar to that of the conventionally managed cows.