782 An evaluation of residual feed intake estimates obtained with computer models versus empirical regression. C. B. Williams*, C. L. Ferrell, and T. G. Jenkins, USDA, ARS, U.S. Meat Animal Research Center, Clay Center, NE.

Data on individual daily feed intake, bi-weekly BW, and carcass composition were obtained on 1,212 crossbred steers, in Cycle VII of the Germplasm Evaluation Project at the U.S. Meat Animal Research Center. Within animal regressions of cumulative feed intake and BW on linear and quadratic days on feed were used to quantify average daily feed intake (ADFI) and ADG over a 120-d period. Residual feed intake (RFI) was estimated from predicted values of expected feed intake obtained by, a) empirical regression of ADFI on BW and ADG for 0.75 (RFI_Eleg, b) Cornell Value Discovery System (RFI_EVDSS, c) National Research Council 2000 beef model (RFI_ERC), and d) Decision Evaluator for the Cattle Industry (DECI, RFI_DEC). Observed data on growth and carcass composition were used as input to the 3 computer models. Phenotypic correlations (r = 0.95, 0.87, 0.78) for RFI_Eleg with RFI_EVDSS, RFI_ERC, and RFI_DEC, respectively, suggest that RFI_DEC may be a different trait from RFI_Eleg. Additionally, RFI_Eleg, RFI_EVDSS, RFI_ERC, and RFI_DEC, respectively, were correlated with ADG (r = 0.00, -0.20, -0.41, -0.48), and ADFI (r = 0.58, 0.50, 0.27, 0.09). These results show further differences between RFI_Eleg and RFI_DEC and similarity between RFI_EVDSS and RFI_Eleg within and between animals that eat very little and grow slowly were identified as efficient based on their RFI_Eleg values, but ranged from less efficient to inefficient based on their RFI_EVDSS, RFI_ERC, and RFI_DEC values, respectively. These results may be due to the fact that computer models predict performance on an individual animal basis in contrast to empirical regression. Also, the formulation of maintenance in DECI results in increasing maintenance requirements with increasing BW and ADFI. Animals with very low ADFI have lower maintenance requirements with DECI and in some cases, this results in expected feed intake being lower than ADFI. Finally, the results suggest that selection for RFI_DEC would tend to increase ADG with no change in ADFI.

**Key Words:** computer models, feed efficiency, beef cattle


Earlier studies identified large between-herd variation in lactation curve parameters in Ragusa province. The objective of this study was to identify sources of variation that explain these differences between herds in milk production curves, by estimating effects of animal breed (Holstein Friesian vs Brown Swiss), feeding system (separate feeding vs TMR), and TMR chemical composition on milk and milk components yield herd curves. Data for test day (TD) milk (Kg), fat (g), and protein (g) production from 1,287,019 TD records of 148,951 lactations of 51,489 cows in 450 herds, recorded from 1992 through 2007 were processed using a random regression TD model. Random herd curves (HCUR) for milk, fat, and protein yield were estimated for each herd per year from the model using 4-order Legendre polynomials. Information on herd management practices was monthly collected from 37 farms in Ragusa province from March 2006 through December 2007. TMR samples were collected every 3 months and analyzed for dry matter (DM), ash, crude protein (CP), soluble nitrogen (SN), acid detergent lignin (ADL), sequential NDF (NDFD), sequential acid detergent fiber (ADFS), and starch. The traits used to describe the curves were: peak, DIM at peak, persistency, and mean. Influence of feeding system and animal breed on herd curve traits was investigated using the GLM procedure of SAS. Influence of TMR chemical composition on HCUR traits was investigated using multivariate analysis with SAS REG and stepwise option. Feeding system had the largest influence (P<0.05) on HCUR peak and mean for all traits and parities, with higher values for TMR. Animal breed had the largest influence (P<0.05) on HCUR persistency, with higher values for Brown Swiss herds. Results from multivariate analysis showed that CP had the largest impact on HCUR peak and mean for all traits and for all parities, whereas the interaction between CP and DM had the largest impact on persistency for all traits and for all parities.

**Key Words:** herd curve, feeding management, test day model


The objective of this study was to examine the effects of programmed growth with deferred supplementation on BW gain and body composition of yearling Brangus and Angus heifers consuming Tifton 85 bermudagrass round bale silage (RBS; CP=7.9%, IVDMD=45.5%). Sixty heifers (n=30, Angus; n=30, Brangus) were stratified by initial BW, breed, and age and randomly allocated to 12 pens. Pens were randomly assigned to one of two treatments: 1) RBS and dried distillers grains (DDG) supplemented 3 d/wk for duration of experiment (174 d, CON) or, 2) RBS ad libitum for the first 88 d and RBS and DDG supplemented 3 d/wk from d 89–174 (L–H). CON heifers were provided supplement to gain 0.75 kg/d. When supplemented, L–H heifers were supplemented to gain 1.5 kg/d. Full BW and hip heights (HH) were obtained on d 0, 89, and 174. Ultrasound measurements of ribeye area (REA) and rump fat were obtained on d 16, 89, and 174. Data were analyzed using the MIXED procedure of SAS. Total DDG intake was greater (P<0.05) for L–H (1,662 kg) compared to CON (1,442 kg). Total RBS offered was greater (P<0.05) for CON (7,966 kg) compared to L–H (6,606 kg). ADG for the first 89 d of the trial was greater (P<0.05) for CON (0.57 kg/d) compared to L–H (0.003 kg/d). The ADG for the last 85 d of the trial tended (P=0.07) to be greater for the L–H (0.74 kg/d) compared to CON (0.61 kg/d). HH on d 174 was greater (P<0.05) for CON (122.8 cm) compared to L–H (119.6 cm). The CON had greater (P<0.05) REA compared to L–H on d 89 (18.4 vs 13.8 cm2) and on d 134 (20.6 vs 17.8 cm2), respectively. Rump fat was greater (P<0.05) for CON (0.42 cm) compared to L–H (0.31 cm) on d 89 but were similar (P>0.10) for CON (0.43 cm) compared to L–H (0.38 cm) on d 174. Programmed growth with deferred supplementation of yearling heifers fed low–quality forage and supplemented with DDG had negative effects on growth patterns and body composition.

**Key Words:** beef heifers, supplementation, growth
The objective of this study was to examine the effects of programmed growth with deferred supplementation on the onset of puberty, estrous synchronization response, and pregnancy rates of yearling Brangus and Angus heifers consuming hermanda grass round bale silage (RBS, CP=7.9%, IVDMD=45.5%). Sixty heifers (n=30, Angus; n=30, Brangus) were stratified by initial BW, breed, and age and randomly allocated to 12 pens. Pens were randomly assigned to one of two treatments: 1) RBS and dried distillers grains (DDG) supplemented 3 d/wk for duration of experiment (174 d, CON) or 2) RBS ad libitum for the first 88 d and RBS and DDG supplemented 3 d/wk from d 89–174 (L–H). Blood samples were collected on d –2, 8, 79, and 89 to determine plasma progesterone concentrations and onset of puberty. Weekly blood samples were collected from d 89–174 to determine plasma progesterone concentrations to determine onset of puberty. Heifers were synchronized for AI on d 174 with a CIDR concomitant with GnRH (100 ug; i.m.) with CIDR removal and PG (25 mg; i.m.) 7 d later. Estrus was detected using HeatWatch for 72 h after PG, and heifers were AI 8–12 h after the onset of estrus. Heifers not exhibiting estrus by 72 h were timed–AI + GnRH. Estrous detection and AI continued for 30 d after synchronization. Heifers were divided by breed and exposed to clean–up bulls for 30 d. Pregnancy was diagnosed by ultrasonography 31, 62, and 95 d after PG. Percentage of heifers that attained puberty on d 89 (13 vs 3%) and at initiation of breeding (33 vs 77%) was greater (P<0.01) for CON compared to L–H, respectively. Estrous response (73 vs 40%), 30–d AI pregnancy rates (83 vs 56%), and overall pregnancy rates (93 vs 66%) were greater (P<0.05) for CON compared to L–H, respectively. Synchronized pregnancy rates (46 vs 33%) and conception rates (50 vs 53%) were similar (P>0.05) between CON and L–H, respectively. Programmed growth with deferred supplementation of yearling heifers fed low-quality forage and supplemented with DDG had negative effects on reproductive performance.

**Key Words:** beef heifer, supplementation, reproduction

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### 787 Does fertility-associated antigen on sperm collected from Nellore (Bos indicus) bulls affect fertility at first-service timed AI?

J. C. Dalton*, L. Deragon, J. L. M. Vasconcelos, and A. Ahmadzadeh

The objective was to determine whether the presence of fertility-associated antigen (FAA; a 31 kDa heparin binding protein) on sperm collected from Nellore bulls can be used to assess potential fertility of sperm for use at first-service timed AI (TAI). Following determination of FAA status by use of a lateral flow cassette, 6 Nellore bulls (4 to 7 yr old) were selected based on FAA status (FAA-negative: n = 3; FAA-positive: n = 3) and their ability to produce neat semen with characteristics equal to or greater than 70% morphologically normal sperm and 60% estimated progressive motility before cryopreservation. Ejaculates were collected by artificial vagina and were extended to 120×10^6 sperm/mL. The extended semen was packaged and cryopreserved in 0.25-mL straws (30×10^6 sperm). Multiparous lactating Nellore cows (n = 835) at a commercial beef farm in Mato Grosso do Sul, Brazil, were evaluated for body condition score (BCS;1-5 scale) and enrolled in a first-service TAI program. On d 0 cows began the synchronization protocol with an intravaginal prostaglandin device (CIDR) + an injection of 2.0 mg of estradiol benzoate. On d 9, the CIDR was removed, 12.5 mg of PGF2α + 0.5 mg of estradiol cypionate were administered, and calves were removed for 48 h until TAI. Two technicians performed TAI, with each technician using semen from each bull. Fertility, as measured by pregnancy/TAI (P/TAI), was not different between FAA-positive and FAA-negative bulls (41.5% vs. 39.3%, respectively). There was an effect of AI technician on P/TAI (36.0% vs. 43.9%; n = 375 and n = 460, respectively; P<0.05); however, there was no AI technician on P/TAI (36.0% vs. 43.9%; n = 375 and n = 460, respectively; P<0.05); however, there was no AI technician on P/TAI (36.0% vs. 43.9%; n = 375 and n = 460, respectively; P<0.05). Cows with BCS < 2.5 were three times less likely to become pregnant to first TAI compared with cows with BCS ≥ 2.5. In this study using a limited number of bulls, there was no effect of FAA status on fertility at first-service TAI.

**Key Words:** sperm, timed AI, fertility

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### 788 Mastitis in beef bulls caused by Arcanobacterium pyogenes.


Mastitis in beef bulls caused by Arcanobacterium pyogenes.

**Key Words:** beef mastitis, Arcanobacterium pyogenes, veterinary diagnostics.
of Georgia, College of Veterinary Medicine, Department of Population Health, Athens.

As part of a trial at a university bull test station, data were collected from 101 animals 7 to 10 mo of age including daily weight gain, scrotal circumference, and body frame score. In the process of measuring scrotal circumference, technicians observed that teats of 2 bulls were swollen and leaking a thick pus-like fluid. Upon subsequent culture by university personnel 2 mo later, 14 of 58 bulls sampled (24.1%) were observed to have abnormal, swollen teats, and an examination of teat skin surfaces revealed the presence of scabs and abrasions typical of those caused by horn flies. The culture of teat skin scabs revealed numerous coagulase-negative staphylococcal (CNS) species. No systemic clinical signs were observed, but affected bulls exhibited expressible mammary secretions ranging from a clear, serum-like fluid to a viscous, pus-like secretion. A total of 19 mammary secretion samples were collected for culture, plated on blood agar, and identified following procedures recommended for the diagnosis of mastitis in dairy cows. Results demonstrated the following distribution: Uninfected- 26.3%, Arcanobacterium pyogenes- 52.6%, gram-negative rods- 10.5%, CNS- 5.3%, and dual infections with CNS/ environmental streptococci- 5.3%. Approximately 1 mo later, 21 of 97 bulls (21.6%) were found to have mastitis, and 26 mammary secretion samples were collected with the following distribution: Uninfected-11.2%, A. pyogenes- 57.7%, gram-negative rods- 7.7%, CNS- 7.7%, Staphylococcus aureus- 7.7%, and environmental streptococci- 8%. Although a limited number of A. pyogenes infections was treated, teat infusions with a cephalosporin-based nonlactating cow product was ineffective, but infusion of 2% chlorhexidine digluconate resulted in a cure in one bull. Because A. pyogenes mastitis is known to be initiated by horn flies in dairy cows and heifers, greater control of these insect vectors may be necessary to manage this form of mastitis in beef bulls.

Key Words: Arcanobacterium pyogenes, beef bulls, mastitis

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789 Short-term changes in forage dry matter affect milk production responses in dairy cows. D. R. Mertens*1 and P. Berzaghi2, 1US Dairy Forage Research Center, Madison, WI, 2University of Padua, Italy.

Our goal was to quantify the effect of one-day changes in forage DM on ration imprecision and milk responses. Forty eight cows (days of lactation = 121 ±52d; BW = 591 ±63 kg) were blocked in 12 groups for parity and milk production and two were assigned to a control (CON) or treatment (TRT) group. The TRT consisted of changing forage DM to simulate a rain event on a bunker silo and feeding an imprecise ration based on as-fed ratios of ingredients for one day of each week. The CON ration was adjusted to maintain DM ratios of ingredients on that day. Each period consisted of three days for baseline, one day (d4) with ration differences, and three days of recovery. The ration changes were repeated 5 times by changing DM of corn silage or alfalfa silage or both by 8%-units. Production was recorded and samples were taken at each milking (2 /d) between days 2 and 6 of each period. Milk production and composition during days 4 to 6 were expressed as difference from those of the baseline period. Forages, TMR and refusal were sampled daily and concentrates were samples weekly. Chemical composition (DM, CP, NDF) of samples were determined by NIR after updating in-house calibrations with 58 samples from the experiment. Data were analyzed using Proc Mix of SAS with cow-within-block and TRT group as random variables. The DMI of TRT was reduced (P<0.01) on d4 (-2.2 kg) compared to the baseline, but cows returned to baseline level during recovery. Overall DMI was similar between CON and TRT (25 kg/d). Compared to baseline, milk production, but not composition, of TRT was affected (P<0.001) in the two days following d4 (-0.86 kg/d) compared to an increase (P<0.05) of 0.43 kg/d in the CON group. On d5, TRT milk depression averaged 1 kg and remained depressed (-0.7 kg) on d6. Using DMI change as a covariate (P<0.001), the loss of one kg of DMI on d4 resulted in 0.57kg/d less milk in each of the following two days. We concluded that improving ration precision by adjusting rations for forage DM changes enhances DMI and milk production.

Key Words: dry matter, intake, precision feeding

790 Meta-analysis of influence of dietary NDF on energy partitioning in dairy cows. D. Sauvant*1, O. Martin1, and D. Mertens2, 1Agroparistech-INRA, Paris, France, 2US Dairy Forage Center, Madison, WI.

The objective of this study was to evaluate the influence of dietary NDF on dairy cow energy intake and partitioning. A database of 88 published experiments (nexp) with 219 treatments (n) where dietary NDF was the factor (34.9 ±8.6, min = 28.8, max = 40.0%DM) was compiled. Experiments were selected that measured diet organic matter digestibility (OMD = 70.7 ±5.9, min = 54.6, Max = 83.6%) to predict as accurately as possible dietary metabolizable energy intake (MEI). Milk yield ranged from 9.2 to 45.2 kg/d (27.6 ±7.8). Milk fat content ranged from 2.1 to 5.1% (3.7 ±0.6). Energy secreted in milk (Emilk) and in milk lactose (Elact), protein (Eprot) and fat (Efat) was calculated using 4.0, 5.6 and 9.3 Mcal/kg, respectively. Data were analyzed using GLM to separate inter- and intra-experiment variances. Daily MEI (48.7 ±9.9 Mcal/d) was negatively linked to the dietary NDF (MEI = 72.3 – 0.693 NDF, n = 219, nexp = 88, R2 = 0.90, RMSE = 15.3). Energy secreted as lactose was linearly linked to MEI (Eprot = 1.18 + 0.074 MEI, n = 197, nexp = 78, R = 0.98, RMSE = 0.22), and the regression was similar for Eprot (Eproto = 1.18 + 0.074 MEI, n = 197, nexp = 78, R = 0.98, RMSE = 0.23). The global and inter-experiment regressions were not statistically different, thus, the marginal efficiency of MEI transformation to Efat decreased from 26% (MEI = 25) to – 8% (MEI = 70). Therefore the milk energy response was curvilinear (Efat = – 3.3 – 0.23 MEI – 0.0062 MEI2, n = 219, nexp = 88, R2 = 0.98, RMSE = 0.78). Energy balance (EB) was also curvilinearly related to MEI (EB = –3.3 – 0.23 MEI + 0.0062 MEI2, n = 219, nexp = 88, R2 = 0.94, RMSE = 1.09), and EB of zero was achieved for MEI = 50 Mcal/j. In conclusion, dietary NDF strongly influences energy partitioning in dairy cows through its impact on MEI.

Key Words: NDF, milk energy, energy partitioning