

T158 Effect of GnRH after artificial insemination on conception rates in lactating dairy cows. A. P. Cunha*, A. H. Souza, A. Gümen, E. P. B. Silva, C. M. Peto, J. N. Guenther, D. Z. Caraviello, and M. C. Wiltbank, *University of Wisconsin, Madison*.

This study investigated the effect of multiple GnRH injections after timed artificial insemination (TAI) on conception rates (CR) in high producing dairy cows. Lactating Holstein cows (n=821) underwent the Ovsynch protocol (GnRH-7d-PGF2 α -58h-GnRH-16h-TAI) and 7 days after TAI cows were assigned to one of two groups in a CRD design 1) treatment: received (i.m.) GnRH (100 μ g) injection on days 7 and 14 after TAI; 2) control: received no treatment. Ovarian ultrasound evaluations and BCS were performed on days 7, 14 and 20 after TAI for both groups. Cows without a CL on Day 7 were not used in the study. The macro GLIMMIX of SAS was used to evaluate the different models. The overall CR was not different ($P>0.10$) between GnRH-treated (43%, n=389) and control cows (42%, n=407). A greater ($P<0.01$) percentage of cows ovulated after GnRH on day 7 (78%, n=352) than after GnRH on day 14 (47%, n=311). Ovulation to the GnRH on day 14 did not have an effect ($P>0.10$) on CR. However, cows that ovulated after the GnRH on Day 7 had better CR (47%, n=352) than GnRH-treated cows that did not ovulate (27%; $P<0.01$) or control cows (42%, n=407; $P<0.05$). Control cows had higher CR than GnRH-treated cows that did not ovulate ($P<0.03$). The reason for a lack of ovulation in some cows treated with GnRH on Day 7 is unclear. Lack of ovulation was not related ($P>0.10$) to mastitis rate during the first 20 days after TAI or BCS. There were a greater ($P<0.05$) percentage of cows with follicles larger than 10mm on Day 7 in the GnRH-treated group that ovulated (99%, n=268) than GnRH-treated cows that did not ovulate (93%, n=72) or control cows (96%, n=397); however, this small difference is unlikely to explain the lack of ovulation in some GnRH-treated cows. In conclusion, ovulation to GnRH on Day 7 may increase CR in lactating dairy cows. An alternative explanation for our results is that lack of ovulation to GnRH on Day 7 has allowed selection of a group of less fertile cows.

Key Words: GnRH, Conception Rate, Dairy Cows

T159 Effect of GnRH between Pre-Synch injections and estradiol 17 β during the Ovsynch protocol on conception rates in lactating dairy cows. A. Gümen*, A. H. Souza, A. P. Cunha, E. P. B. Silva, J. N. Guenther, and M. C. Wiltbank, *University of Wisconsin, Madison*.

Anovular cows have reduced conception rates (CR) during Ovsynch in spite of satisfactory ovulation rates. In order to improve CR in anovular cows, two modifications were made in a Presynch-Ovsynch protocol. First, cows were treated with Presynch (2 injections of prostaglandin F2 α (PGF), 14 d apart, PGF1 initiated at 37-43 d postpartum) and half of the cows received a GnRH treatment at 7 d after PGF1 (PGP) or no treatment (PP). Second, cows that did not show estrus after Presynch were synchronized 11 d later with Ovsynch (GnRH-7d-PGF-58h-GnRH-16h-TAI) and half of the cows received 1 mg estradiol-17 β (E2) at 8 h before the second GnRH treatment to increase E2 prior to ovulation. A total of 25% (163 of 654) of cows were anovular with no detectable luteal tissue by ultrasonography between PGF1 and 7 d later. More ($P<0.001$) anovular cows ovulated in PGP (80%) compared to PP (31% spontaneous ovulation). After the second PGF of Presynch 43% of cows (281/654) were detected in estrus and bred (57.4 \pm 0.2 d). Days to estrus were earlier ($P<0.03$) and less variable in anovular cows in PGP (2.9 \pm 0.1 d) compared to PP (3.6 \pm 0.3 d). However, there was no difference in ovular cows. In cows showing estrus, CR was numerically but not significantly greater in PGP than PP in anovular (18%; 3/17 vs. 33%; 8/24) but not ovular (36%; 40/110 vs. 38%; 48/128) cows. After Ovsynch, treatment with E2 increased expression of estrus in anovular (77% vs. 39%) and ovular (80% vs. 44%) cows. Interestingly, E2 treatment did not alter CR in ovular cows (45% vs. 45%) but increased ($P<0.03$) CR in anovular cows (18%; 10/56 vs. 36%; 24/66) regardless of GnRH treatment during Presynch. Thus, GnRH can be added to the Presynch protocol to induce ovulation in anovular cows and this increases synchrony in cows that show estrus. However, the largest increase in CR occurred in anovular cows that received E2 during Ovsynch suggesting that reduced CR to Ovsynch in anovular cows related to insufficient circulating E2.

Key Words: Presynch, Estradiol, CR

Production, Management and the Environment: Nutrition and Management

T160 Electronic identification of young lambs with mini-bolus and effects on intake and digestibility during fattening. J. J. Ghirardi¹, G. Caja*¹, C. Flores¹, and D. Garín², ¹Universitat Autònoma de Barcelona, Bellaterra, Spain, ²Universidad de la República, Montevideo, Uruguay.

Three types of cylindrical ceramic mini-boluses (B) of different dimensions (o.d. \times length; total weight): **B1** (10.5- \times 51.0-mm; 13.8 g), **B2** (12.2- \times 42.2-mm; 16.2 g), and **B3** (11.2- \times 56.4-mm; 20.1 g) were produced. All B had a specific gravity greater than 3 and contained one 32 mm half-duplex ISO transponder. They were orally administered by a trained operator, as early as possible, to a total of 513 newborn lambs of three sheep breeds used for different purposes: Manchega (dairy, n = 125), Lacaune (dairy, n = 116), and Ripollesa (local meat, n = 272). Lambs suckled from their mothers until wk 5 (dairy) or wk 6 (meat), and were intensively fattened (pelleted concentrate and barley straw ad libitum) thereafter. Growth rate, bolus retention and health status were recorded weekly. Retrieval and forestomachs location of B at slaughter (24 kg BW) were also recorded. Eight male Manchega lambs (45 d of age and 14 kg BW) in metabolic crates were randomly assigned to two experimental groups (**C**, control; and **BA**, mini-bolus applied) to evaluate the effects of B1 on feed intake and digestibility in four periods during fattening. On average, age at administration was lower ($P < 0.01$) in the dairy (B1, 21; B2, 29; and, B3, 20 d) than in the meat lambs (B1, 33; B2, 37; and, B3, 35 d). Body weight at application also differ ($P < 0.05$) between dairy (B1, 9.3; B2, 11.2; and, B3, 9.7 kg) and local meat lambs (B1, 8.9; B2, 11.0; and, B3, 9.1 d). Retention rate varied according to mini-bolus type (B1, 97.7; B2, 98.9%; and, B3, 100%). Lamb growth rate did not vary between B types. Recovery at slaughter was 100%, but three B1 (1.6 %) boluses were recovered from the abomasum. No differences in DM intake, average daily gain, feed conversion rate or nutrient digestibility were found between C and BA. In conclusion, B3 mini-bolus (20.1 g) proved to be an efficient device for the electronic identification of lambs, satisfying the

ICAR requirement (>99% in 6 mo) and allowing the traceability of dairy (up to 21 d and 10 kg) and local meat lambs (up to 35 d and 10 kg) from suckling to slaughter.

Acknowledgements: EU project QLk1-2001-02229

Key Words: Electronic Identification, Rumen Bolus, Transponder

T161 Comparison of half- and full-duplex electronic ear tags and intraperitoneally injected transponders in the implementation of traceability under commercial conditions in pigs. C. Santamarina¹, M. Hernández-Jover², D. Babot^{1,3}, and G. Caja*², ¹Universitat de Lleida, Lleida, Spain, ²Universitat Autònoma de Barcelona, Bellaterra, Spain, ³Centre UdL-IRTA, Lleida, Spain.

A total of 790 Landrace \times Large White \times Pietrain pigs were used to study the traceability from weaning to the end of the slaughter line. Piglets were identified after weaning, reared under intensive conditions and harvested in a commercial slaughterhouse. All piglets were identified in triplicate with: a plastic button ear tag (**C**), in the right ear; an electronic button ear tag (**E**), in the left ear; and, an intraperitoneal (**I**) transponder. Transponders of the two radio frequency technologies complying with ISO 11789 (**H**, half-duplex; **F**, full-duplex **B**) were used. Treatments were: C (n = 790), EH (n = 369), EF (n = 397), IH (n = 392), and IF (n = 387). Readability of electronic devices was checked on the farm and in the slaughterhouse by using full-ISO handheld transceivers. No losses during the on-farm period and transportation were reported for C. Total of losses and electronic failures during the on-farm period and transportation were lower for IF (1.7%; $P < 0.05$) than EH (4.3%), but results for EF (2.3%)

and IH (2.1%) did not differ from the others. Losses during slaughtering did not differ between C (4.3%) and EH (2.9%), and were greater for EF (16.7%; $P < 0.05$). An additional 0.9% of electronic failures was recorded for EH, but no failures were observed in EF. Intraperitoneally injected transponders were not affected by the slaughter process, and 86.6% were recovered in the omentum at evisceration, the rest being lost on the floor. No transponders were left in the carcasses. The greatest values of traceability were obtained with the intraperitoneally injected transponders (98.1% on average), although no significant differences were found between IH (97.9%) and C (95.1%). Electronic ear tags reported the lowest traceability values (EF, 81.0%; and, EH, 91.9%; $P < 0.05$). In conclusion, good quality conventional ear tags and intraperitoneally injected transponders proved to be the most efficient systems for the traceability of pigs under commercial conditions.

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Key Words: Ear Tags, Transponders, Traceability

T162 Struvite crystallizer product as a phosphorus supplement for growing chicks. R. Kincaid^{*1}, J. Harrison², T. Benson¹, K. Bowers³, and D. Davidson², ¹Washington State University, Pullman, ²Washington State University, Puyallup, ³Multiform Harvest Inc., Seattle, WA.

One proposed treatment system for recovery of nutrients from dairy manure slurry involves the addition of Mg and ammonia to precipitate P as struvite ($\text{NH}_4\text{MgPO}_4 \cdot 6\text{H}_2\text{O}$), which contains 12.7% P, 9.9% Mg and 5.7% N from a slurry stream. Recovered product obtained by this method contained 10.4% P, 8.6% Mg, and 3.9% N, by analysis. A study was conducted to determine if the recovered product could be used as a source of inorganic P in diets of growing chicks. Day-old chicks ($n=80$) were assigned to dietary treatments of: 1) no P supplement; 2) 0.05% added P as KH_2PO_4 ; 3) 0.10% added P as KH_2PO_4 ; 4) 0.05% added P as product; and 5) 0.10% added P as product. The control diet contained 0.4% P, by analysis. The design was 4 replicates of 4 chicks per pen per dietary treatment ($n=16$ chicks/treatment). All chicks were fed a standard diet for 5 days, then their respective dietary treatment for 14 days. Feed intakes and growth rates were determined weekly for each group. On d 14, chicks were euthanized and the right tibia removed for bone ash determination. Feed intakes of chicks were increased ($P < 0.05$) when P as KH_2PO_4 was supplemented but were depressed ($P < 0.05$) by the added product. Similarly, growth rate of chicks fed added P as KH_2PO_4 increased ($P < 0.05$) compared to control chicks but was depressed ($P < 0.05$) by the product. In contrast, percent bone ash was greater for chicks fed product than those fed KH_2PO_4 . The depressive effect of the product on feed intake and growth of chicks indicates that a component of the product was noxious to chicks, independent of P bioavailability. These results indicate that the product was not an acceptable ingredient in diets of young growing chicks.

Key Words: Phosphorus, Struvite, Chicks

T163 Multivariate factor analysis of electrical conductivity in dairy cattle. N. P. P. Macciotta^{*1}, M. Mele², R. Steri¹, and P. Secchiari², ¹Università di Sassari, Sassari, Italia, ²Università di Pisa, Pisa, Italia.

Electrical conductivity (EC) of milk is an indicator trait for mastitis and it may be considered as a potential breeding goal for genetic programs, even if an accurate detection of affected animals still represents a problem. Several reasons can be found, one of which is the well known difficulty to quantify variations in multivariate phenotypes. In several research fields the need to copy with complex phenotypes has led to a widespread use of dimension-reduction techniques. The multivariate analysis of factor is a powerful technique able to reconstruct the structure of (co)variance of original variables by a few number of latent variables. Factor analysis was applied to a data set of 234 Holstein cows each having 28 EC traits, represented by the average of test day EC for 28 intervals of 10 days each, recorded by a commercial milk meter. Two factors able to explain 80% of the original variability were extracted. They were corre-

lated with EC in the first part (FAC1) and in the second part (FAC2) of lactation respectively. Factor scores were analysed by a linear model that included the fixed effects of herd (3) parity (1 to 6) calving season (4), udder health status (no mastitis, mastitis within 150 days in milk, mastitis after 150 DIM). Both factors were affected by herd and parity, with heifers showing lowest values of both variables, and to a lesser extent, by season of calving. FAC1 was affected by the udder health status ($p=0.013$): cows that had mastitis in the first half of lactation shows values of FAC1 significantly higher than those of the other two groups. FAC2 was not clearly affected by the health status of the udder probably due to both the small number of animals with mastitis in the second half of lactation and to a confounding effect of the physiological rise of EC in this phase. Results of this study highlight the usefulness of dimension reduction technique in the analysis EC of cow milk during lactation and suggest further research for a possible implementation in automatic detection systems.

Key Words: Electrical Conductivity, Factor Analysis, Mastitis

T164 Effects of pre-weaning management on performance beef steers during a 30-d feedlot receiving period. R. Cooke^{*1}, X. Qiu¹, E. Pereira³, G. Marquezini³, J. Vendramini¹, C. Chase², S. Coleman², and J. Arthington¹, ¹University of Florida, Range Cattle Research and Education Center, Ona, ²USDA-ARS, Brooksville, FL, ³Universidade Estadual Paulista, Botucatu, SP, Brazil.

The objective of this experiment was to evaluate the effects of four pre-weaning management strategies on performance of weaned calves subjected to a 24 h transport. Sixty-four crossbred steers (Brahman x British) were randomly allocated to one of four pre-weaning management strategies (16 steers/treatment): 1) Negative control; weaned directly onto the truck, 2) Creep-fed; provided free-choice access to creep feed for 45 d prior to weaning, 3) Pre-weaned; weaned 45 d prior to shipping, and 4) Early-weaned; weaned at 80 d of age. On day 0, calves were loaded onto a commercial truck, hauled for 24 h, and delivered to the feedyard (d 1). Calves were penned within treatment (4 calves/pen; 4 pens/treatment) and provided free-choice access to hay and commercial grain starter for 30 d. Dry matter intake was measured daily, and BW was obtained on days 0, 1, 4, 8, 15, 22, 29 and 30. Data were analyzed using the MIXED procedure of SAS. Contrasts were made as follows: Control vs. Early-weaned, Creep-fed vs. Pre-weaned, and Control vs. Creep-fed and Pre-weaned. Average BW gain was greater ($P < 0.05$) for Early-weaned vs. Control calves. Average BW gain did not differ ($P = 0.49$, SEM = 0.25) among Pre-weaned and Creep-fed calves, but both tended to be greater ($P = 0.07$, SEM = 0.25) than Control (0.86, 1.08, 1.44, and 1.20 kg/d, for Control, Creep-fed, Early-weaned, and Pre-weaned calves, respectively; SEM = 0.25). Diet DMI was greater ($P < 0.01$) for Early-weaned vs. Control calves. Diet DMI did not differ among Creep-fed and Pre-weaned, but both were greater ($P = 0.02$) than Control calves (2.59, 2.77, 2.99, and 3.01 % BW for Control, Creep-fed, Early-weaned, and Pre-weaned calves, respectively; SEM = 0.09). Feed efficiency (F:G) was greater ($P = 0.01$) for Early-weaned compared to Control calves, but did not differ ($P = 0.13$) among Creep-fed and Pre-weaned vs. Control (average F:G = 9.55, 8.44, 6.25, and 7.90 for Control, Creep-fed, Early-weaned, and Pre-weaned calves, respectively; SEM = 0.69). The adoption of pre-weaning management strategies, as described in this study, may optimize calf performance following transport and entry into a feedyard.

Key Words: Weaning, Beef, Feedlot

T165 Effects of pre-weaning management on the acute phase protein response of transported beef steers during a 30-d feedlot receiving period. X. Qiu^{*1}, R. Cooke¹, E. Pereira³, G. Marquezini³, J. Vendramini¹, C. Chase², S. Coleman², and J. Arthington¹, ¹University of Florida, Range Cattle Research and Education Center, Ona, ²USDA-ARS, Brooksville, ³Universidade Estadual Paulista, Botucatu, SP, Brazil.

The objective of this experiment was to evaluate the effects of pre-weaning management on measures of inflammation in beef steers. Sixty-four crossbred steers (Brahman x British) were randomly allocated to one of four pre-weaning management strategies: 1) Control; weaned directly onto the truck, 2) Creep-

fed; provided free-choice access to feed for 45 d prior to weaning, 3) Pre-weaned; weaned 45 d prior to shipping, and 4) Early-weaned; weaned at 80 d of age. On day 0, calves were weaned and loaded onto a commercial truck, hauled for 24 h, and delivered into the feedyard. Calves were penned within treatment (4 pens/treatment) and provided free-choice access to hay and commercial grain starter for 30 d. Concentrations of acid soluble glycoprotein (ASG), haptoglobin, and ceruloplasmin were measured in blood samples collected on d 0, 1, 4, 8, 15, 22, and 29. Data were analyzed using the MIXED procedure of SAS. Contrasts were made as follows: Control vs. Early-weaned, Creep-fed vs. Pre-weaned, and Control vs. Creep-fed and Pre-weaned. Ceruloplasmin concentrations peaked on d 8 in Control calves and were greater ($P < 0.12$) than Early-weaned calves on day 8, 15, 22, and 29. Ceruloplasmin concentrations did not differ among Creep-fed, Pre-weaned, and Control calves; however, Pre-weaned calves had a lesser ($P < 0.12$) ceruloplasmin concentration on d 22 and 29, compared to Creep-fed calves. Haptoglobin concentrations peaked on d 1 in Control calves and were greater ($P < 0.13$) than Early-weaned calves on day 1, 8, and 22. Haptoglobin concentrations were similar among Creep-fed, Pre-weaned, and Control calves; however, Pre-weaned and Creep-fed calves had a lesser ($P < 0.12$) haptoglobin concentration on d 4, compared to Control calves. The greatest ASG concentration for Control calves was recorded on d 22 and was greater than Early-weaned calves ($P = 0.02$) and Creep-fed and Pre-weaned ($P = 0.02$) on this day. Control calves had a lesser ($P < 0.03$) ASG concentration than Early-weaned calves on d 0 and 1. Early calf weaning may be an effective practice for managing stress resulting from transportation and weaning.

Key Words: Weaning, Stress, Beef

T166 Fiber characteristics of U.S. Huacaya alpacas. C. J. Lupton¹, A. McColl², F. A. Pfeiffer^{*1}, and R. H. Stobart³, ¹Texas Agricultural Experiment Station, San Angelo, ²Yocom-McColl Testing Labs, Denver, CO, ³University of Wyoming, Laramie.

Alpaca farming is a relatively new commercial enterprise in North America. A study was conducted to establish a comprehensive profile of U.S. Huacaya alpaca fiber characteristics that will be useful for educational, promotional, policy, selection, and breeding purposes. Specifically, the means and distributions of BW and all important fiber characteristics of a representative sample ($n = 585$) of U.S. alpacas were measured or calculated using internationally accepted objective test methods. Animals in specified age ranges and of known sex representing six geographical regions in the United States were weighed and sampled in approximate proportion to their population density in the respective regions. Fiber samples were shorn from the mid-side of the alpacas, representing female, male, and castrated male registered animals in the three age categories: one- and two-year-old and adult. Data were analyzed in terms of sex, age, region, color, and their interactions. Average BW (\pm SD) was 65.2 ± 12.5 kg. Fiber data that were measured included diameter (27.9 ± 5.4 μ m), prickly factor ($31.6 \pm 25.1\%$) curvature (33.2 ± 7.0 deg/mm), medullation (white and light fawn samples only, $17.5 \pm 11.0\%$), lab scoured yield ($89.8 \pm 4.5\%$), staple length (116.3 ± 40.0 mm), staple strength (50.2 ± 21.4 N/ktex), and resistance to compression (5.4 ± 0.8 kPa). In addition, yellowness and brightness were measured on the white samples and color differences were measured on the colored samples using a colorimeter. Compared to wool of similar fineness, alpaca was shown to be higher yielding, more heavily medullated (a distinctive feature of alpaca), longer, and considerably stronger. Resistance to compression was invariably lower for alpaca compared to wool of comparable fiber diameter, likely due to the lower levels of crimp in the alpaca fibers.

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Key Words: Alpaca, Huacaya, Objective Fiber Measurements

T167 Evaluation of the nutritive value of ensiled beet pulp for ruminant animals. C. W. Hunt^{*}, J. C. Dalton, and N. R. Rimbej, *University of Idaho, Moscow.*

Beet pulp, which is the solid residue remaining after sugar is extracted from sugar beets, is an excellent source of digestible fiber for ruminant diets. Following sugar extraction the pulp is mechanically pressed to a DM content of approximately 25% and then the pulp is typically artificially dried for storage and feeding. Wet, ensiled beet pulp (WBP) is an alternative that would expend less fossil fuel and may have nutritive characteristics that are superior to dry pulp. Eight growing dairy heifer calves (approximate weight 210 kg) were used in a replicated 4 x 4 Latin square design (two heifers per square) to evaluate dietary treatments containing the following proportions of WBP and corn silage: 0:60, 15:45, 30:30, and 45:15. In addition to the WBP and corn silage, all diets had 40% alfalfa hay to provide adequate degradable protein. Each period of the Latin square consisted of 5 d of diet adaptation, 7 d of intake measurement, and 3 d of fecal sample collection to determine digestibility using AIA. In situ DM disappearance (20-h) of WBP was greater ($P < 0.01$) than corn silage when incubated in cows fed all forage (80.7 versus 65.2%, respectively) and in cows fed an early lactation diet (91.4 versus 71.1%, respectively). Digestibility of NDF increased linearly ($P < 0.01$), but DM intake decreased linearly ($P < 0.01$), as WBP was increased in the diet. Digestibility of DM and GE were not affected by treatment, therefore the DE content of the diets was equal across dietary treatments. These data suggest that WBP has equivalent energy value compared with corn silage as it has a more digestible fiber component. However, reduced intake may become a limiting factor for utilization of WBP for young calves.

Key Words: Energy, Digestion, Intake

T168 Evaluation of substitution value of barley grain for conventional forage on growth and reproductive performance of beef heifers. P. A. Szasz^{*}, C. W. Hunt, A. Ahmadzadeh, R. Manzo, and J. I. Szasz, *University of Idaho, Moscow.*

Metabolizable energy can often be supplied more economically from grain than from forages; however, grains are traditionally not included in wintering beef cattle rations. The purpose of this study was to evaluate the iso-caloric substitution value of barley for conventional forage on growth and reproductive performance of beef heifer calves. Forty crossbred heifers (initial BW 318 kg) were used in a completely randomized design and were allocated to four dietary treatments: a) conventional forage; b) forage with substituted barley provided in the AM; c) same as treatment b except that barley was fed in the PM; and d) barley fed in the AM as a pressed pellet. In all treatments, heifers were fed restricted amounts of their assigned diets to limit ADG to 0.72 kg/d. Following 105 d on these diets, heifers were commingled, fed a common diet, and were synchronized with two injections of prostaglandin F₂ α (PG) 14 d apart. Blood samples were collected on the day of 2nd PG injection. Estrus was observed 3 times daily and heifers received AI upon detection of estrus. Inclusion of barley in the diet reduced ($P < 0.05$) the total feed DM intake required to achieve the prescribed rate of gain; feed:gain was consequently lesser ($P < 0.05$) for barley-containing treatments. Body condition score was not different ($P < 0.05$) across all dietary treatments at the time of AI. Although heifers fed conventional forage tended to have a greater ($P = 0.07$) number of corpus lutea at the time of 2nd PG injection, there was no difference in serum progesterone concentration among treatments. Moreover, estrus behavior was not different between treatments during 4 d following estrous synchronization. Pregnancy rates determined by ultrasound at d 35 and 71 post-breeding were not different among treatments. Results of these studies indicate that substituting barley for forage in limit-feeding regimes is a feasible means of meeting the metabolizable energy requirements without detrimental effect on reproduction.

Key Words: Metabolizable Energy, Beef Heifers, Reproduction

T169 Advantages of complex and chelated forms of zinc fed to bulls in a forage-fed bull test. R. C. Vann^{*1}, F. Holmes², H. Maxwell³, C. G. Beyer⁴, A. Denson⁵, and S. T. Willard⁵, ¹MAFES-Brown Loam Experiment Station, Raymond, MS, ²Mississippi Forage Bull Test, Tylertown, MS, ³Columbia Animal Hospital, Columbia, MS, ⁴Trouw Nutrition, Highland, IL, ⁵Mississippi State University, Mississippi State.

The objective was to compare three different mineral treatments provided to young growing bulls on forages in order to identify possible advantages of complex organic mineral (40% replacement of Zn) vs a chelated proteinate mineral (40% replacement of Zn) vs an inorganic control mineral. Angus bulls (n = 154) grazed ryegrass pastures and were offered free choice hay and water and were allotted to one of three mineral treatment groups balanced for age and weight: control (CT, n = 41), zinc-proteininate (ZP, n = 55) and zinc-complex (ZC, n = 58). Mineral treatments were offered at a target consumption of 0.11 kg/hd/d (4 oz). Bulls were weighed at the beginning (d 0), middle (d 70), and end (d 140) of the study to calculate ADG. Ultrasound measurements for ribeye area, intramuscular fat, back fat, rump fat and gluteus medius depth were taken on d 0 and d 140. On d 140, bulls underwent a breeding soundness exam and serum collected for determination of testosterone. Bull weights at d 0 and 140 were similar for all treatment groups. However, bulls in the CT group had the greatest ($P < 0.001$) ADG (1.21 ± 0.03), followed by the ZC group (1.14 ± 0.02) and the ZP group third (1.08 ± 0.02). There was no significant change (d 140 - d 0) in ultrasound body composition traits for ribeye area, back fat or intramuscular fat, however, the CT group had a greater ($P < 0.0002$) increase in rump fat and gluteus medius depth compared to ZP and ZC groups. There were no differences in scrotal circumference or testosterone concentrations among treatments. However, there were differences ($P < 0.03$) in percent semen motility with values as follows: CT: 74.13 ± 2.60 , ZC: 70.91 ± 2.60 , and ZP: 64.81 ± 2.40 . Bulls in the ZC group had the greatest ($P < 0.011$) number of percent normal cells and the least number of secondary abnormalities compared to the other two treatment groups. Although some advantages seemed apparent, our targeted Zn consumption, 440 mg total/180 mg organic, was not achieved. Actual average consumption was 80 mg total/32 mg organic in this research project. High quality ryegrass pastures contributed to the lack of mineral consumption in this research project.

Key Words: Zinc, Bulls, Forage

T170 Fate of *Fusarium graminearum* on barley grain during in vitro and in situ ruminal incubation. Y. Wang^{*1}, S. L. Scott², D. L. McLaren³, Z. Matic¹, G. D. Inglis¹, and T. A. McAllister¹, ¹Agriculture and Agri-Food Canada Research Centre, Lethbridge, AB, Canada, ²Agriculture and Agri-Food Canada Research Centre, Brandon, MB, Canada.

Survival of *Fusarium graminearum* (FG) in the ruminal environment was studied in vitro and in situ using infected whole barley kernels (WBK). Eight in vitro inocula were prepared using ruminal fluid from two barley grain/barley silage-fed steers. Strained ruminal fluid was autoclaved (ARF) or not (RF), then diluted with 0, 1, 2, or 3 volumes of mineral buffer. The WBK were incubated anaerobically for 6 h at 39°C in duplicate 125-mL serum vials (10 kernels per vial) with 50 mL of inoculum and 150 mg ground barley as substrate. Incubated WBK, as well as uninoculated controls (\pm FG infection), were surface sterilized with 0.3% NaClO, transferred onto selective medium (10 kernels per plate), and incubated 5 d at 22°C. Growth of FG was observed on 2, 4, 16, and 14 of the 20 kernels plated from incubations in 0-, 1-, 2-, and 3-fold dilutions of RF, respectively, and on 6, 14, 10, and 14 kernels from the incubations in similarly diluted ARF. Ruminal fluid exerted a concentration-dependent, heat-resistant activity against FG that was enhanced in the presence of viable ruminal microorganisms. For the in situ study, WBK were processed five ways and ruminally incubated for 0, 6, 12 and 24 h in three barley grain/barley silage-fed steers (three bags per steer per time point). Randomly selected kernels (10 per bag) were plated as above. With no ruminal exposure (0 h), FG grew on 97, 37, 0, 70, and 77% of kernels that were incubated, respectively, as is (control, C), halved longitudinally (H), pressure-treated with steam (SPTW), tempered (2 h, 22°C; TW), or tempered with surfactant (TSW). After a 6-h incubation, FG grew on only 40, 20, and 6.7% of the C, TW and TSW kernels, respectively, all from the same steer. No growth was observed after 12 or 24 h. Steam treatment effectively inactivated FG, as did exposure to the ruminal environment. We conclude that the risk of excretion of viable FG by cattle consuming infected grain is negligible.

Key Words: Barley, *F. graminearum*, Rumen

T171 Effect of feed distribution frequency on intake, water consumption and ruminal pH in finishing beef heifers. V. Robles, L. González*, A. Ferret, X. Manteca, and S. Calsamiglia, *Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain.*

Four rumen fistulated Holstein heifers (385 ± 6 Kg initial BW) were used in a 4 x 4 Latin square design to determine the effects of increasing feed distribution frequency on intake and ruminal pH. Treatments consisted of 1, 2, 3 and 4 times/day feedings (1D, 2D, 3D, and 4D). Concentrate (15.6% CP, 16.0% NDF, and 46.7% NSC, DM basis) was offered individually and ad libitum at 0800 for treatment 1D, at 0800 and 2000 for treatment 2D, at 0800, 1400 and 2000 for treatment 3D, and at 0800, 1200, 1600, and 2000 for treatment 4D. Barley straw was offered ad libitum at 0800. Each experimental period consisted of 14 d, and pH was measured at d 10, during 24 h, every 4 h. Data was analyzed with the MIXED procedure of SAS with animal and period considered as random effects, and orthogonal contrasts were used to test for linear, quadratic and cubic effects. Treatment effects at any given time were analyzed with the slice option. Barley straw to concentrate ratio (10:90) and total DMI (9.79 ± 0.33 Kg/d DM) were not affected by treatments. Water consumption tended ($P < 0.10$) to increase linearly as the feed distribution frequency increased. Daily mean and lowest pH had a cubic tendency, values being 6.47, 6.69, 6.44, 6.67 for mean pH ($P = 0.11$), and 5.88, 6.08, 5.81, 6.07 for lowest pH ($P = 0.15$), for 1D, 2D, 3D and 4D treatments, respectively. Daily highest pH had an increasing linear tendency ($P < 0.10$) when feeding frequency increase. Time in which ruminal pH remained under 5.8 was not affected by treatments, but while pH never fell under 5.8 for treatment 2D, it did for the remaining treatments (0 vs. 1.36 ± 0.71 h). At any sampling time, pH was not affected by treatments except at 12 h after the first feeding, where a tendency ($P = 0.06$) was detected, due to the higher pH for the treatment 2D. Preliminary data suggests that increasing the feeding frequency at twice a day allows to reduce the risk of ruminal acidosis without affecting feed consumption.

Key Words: Beef Heifers, Feeding Frequency, Ruminal pH

T172 The effect of feeding time on tympanic temperature of steer calves during winter. S. M. Holt* and R. H. Pritchard, *South Dakota State University, Brookings.*

The effect of feeding time on tympanic temperature during winter was investigated during a 55d feedlot growing study. Steers were limit-fed a high moisture ear corn diet (1.28 Mcal/kg NEg) at 0900h (AM), 1500h (PM) or 50% at 0900h and 50% at 1500h (SPLIT) to allow for 1.13kg ADG. Calculations of NEg required were derived using NRC equations and tabular values for ingredients. Climatic data were collected at 30 min intervals throughout the study via an on site automated weather station. Tympanic temperatures (TT) were collected every 30 min (5 steers/treatment) for 5d (d44 to d48). Ambient temperature (Ta) during the 55 d growing study ranged from -30.6 to 12.7°C with a mean of -8.2°C. Mean wind chill during the 5d TT collection period was -20.7°C (-33.4 to -2.2°C), while mean Ta was -21.4°C (-30.6 to -12.7°C). After 55d growing period, BW (364, 368 and 364kg), ADG (1.16, 1.21 and 1.14kg) and gain efficiency (215, 222 and 212g/kg) did not differ ($P > 0.10$) between AM, PM and SPLIT respectively, but followed rankings of previous research. Mean and maximum TT differed ($P < 0.05$) between treatments. Mean TT (39.0, 38.5, and 38.7°C) and maximum TT (40.2, 39.1, and 39.6°C) were higher for SPLIT than AM or PM, respectively. Diurnal TT patterns were assessed by separating the day into three periods based on mean hourly wind chills (6.8, -7.9, and -13.6°C) for Period 1 (0800h to 1600h), Period 2 (1630 to 2100h) and Period 3 (2130 to 0730h) respectively. During period 3, mean TT (38.5, 38.7 and 39°C) and maximum TT (40.2, 38.8, and 39.6°C) were higher for SPLIT than AM or PM, respectively. During the warmest period of the day (Period 1), mean TT (38.9, 38.4, and 38.5°C) and maximum TT (40.0, 38.9 and 39.0°C) differed ($P > 0.05$) for all treatment groups (SPLIT, AM and PM). Elevated TT suggests that when SPLIT fed, steers increase metabolic rate to maintain normal TT during extreme cold. Additional research is needed to explain the changes in TT and how feeding times may impact energy partitioning.

Key Words: Tympanic Temperature, Feedlot Cattle, Cold Stress

T173 Performance of Holstein heifer calves fed three different concentrate grower diets with free-choice hay. J. Linn^{*1}, C. Soderholm², R. Larson², D. Ziegler³, and H. Chester-Jones³, ¹University of Minnesota, St. Paul, ²Hubbard Feeds, Mankato, MN, ³University of Minnesota Southern Research and Outreach Center, Waseca.

Heifer calves from 3 dairy farms were used in a 112-d study at SROC to evaluate feed intake and performance from 9 to 25 weeks of-age. Post weaned calves were randomly assigned by farm source and body weight (BW) to 4 replicate pens (6 calves/pen) of three 16% CP concentrates limit-fed up to 2.72 kg/heifer (as-fed) daily with free choice alfalfa hay. Heifers were housed in 7.62 x 3.66 m pens within a frame-steel curtain side-wall naturally ventilated grower barn. Average initial BW, hip height (HH) and body condition score (BCS) across treatments were 86.3 kg ± 0.68 kg, 93.5 ± 0.17 cm and 2.96 ± 0.01, respectively. Treatments were a complete grain-protein mix (GM); whole shelled corn (67.5%) mixed with base pellet (32.5%; WCP) and complete pellet (PEL). Total period and daily DMI of concentrate and hay did not differ across treatments ($P > 0.1$), averaging 476, 2.44 and 1.81 kg/heifer, respectively. Total gain tended to be lower ($P < 0.1$) for heifers fed PEL (118.4 kg) than those fed WCP (124.7 kg) but similar ($P > 0.1$) to heifers fed GM (120.2 kg). Gain/DM feed was lower ($P < 0.02$) for heifers fed PEL (.246 kg) compared to those fed WCP (.263 kg) but not different ($P > 0.1$) from heifers fed GM (.255 kg). Final HH tended to be lower ($P < 0.08$) for heifers fed PEL (113.2 cm) compared to those fed WCP (114.6 cm) but similar ($P > 0.2$) to heifers fed GM (114.5 cm). Final BCS were similar ($P > 0.3$) across treatments averaging 3.98. Results indicated that heifers fed all the concentrate diets performed well. Heifers tended to utilize the PEL less effectively than the WCP diet.

Key Words: Dairy Calves, Grower Concentrates, Performance

T174 The effects of dietary antibiotics on growth performance and morbidity and mortality of pigs from primi-parous and multi-parous dams housed in a commercial wean-to-finish facility. B. A. Peterson^{*1}, M. Ellis¹, C. R. Bertelsen¹, J. M. DeDecker¹, M. J. Ritter¹, B. F. Wolter², J. Lowe², and R. Bowman², ¹University of Illinois, Urbana, ²The Maschhoffs, Inc., Carlyle, IL.

Research was conducted to evaluate the effect of dietary antibiotics on wean-to-finish performance of pigs from either primi-parous (PP) or multi-parous (MP) dams. The PP and MP dams were kept on different farms, and their progeny were segregated during transport and placed in two separate identical wean-to-finish barns on the same site with strict bio-security maintained between the barns. Immediately post-weaning, pigs were allotted on the basis of weight to pens of 205 pigs (103 barrows and 102 gilts), and pens were randomly assigned to antibiotic treatments: 1) antibiotics [400 ppm tilimicosin (Elanco Animal Health, Indianapolis, IN) from weaning to 7 kg, 200 ppm tilimicosin from 7 to 11 kg, 27 ppm carbadox (Phibro Animal Health, Fairfield, NJ) from 11 to 27 kg, and 110 ppm lincomycin (Pfizer Animal Health, New York, NY) from 27 to 44 and from 73 to 84 kg] and 2) no antibiotics. A 12-phase dietary program formulated to meet or exceed NRC (1998) nutrient requirements was used. Pigs were individually weighed at weaning, and wks 2 and 22 post-weaning. Feeding antibiotics had no effect on growth performance, but morbidity and mortality was higher ($P < 0.01$) for pigs not receiving antibiotics. PP pigs were heavier ($P < 0.01$) at the beginning of the study, thus subsequent growth performance measures were adjusted by covariate analysis. MP pigs had less ($P < 0.05$) morbidity and mortality, were heavier ($P < 0.05$) at wk 22, and had higher ($P < 0.05$) ADG and ADFI, but poorer ($P < 0.05$) G:F than PP pigs. These results suggest that dietary antibiotics can effectively reduce morbidity and mortality in growing pigs and that dam parity may impact progeny growth performance and morbidity and mortality levels. However, this result needs to be viewed with caution because of the confounding of parity with the environment in which the pigs were reared.

Key Words: Antibiotics, Pigs, Dam Parity

T175 Performance of Holstein heifer calves fed texturized calf starters varying in molasses content. D. Ziegler^{*1}, H. Chester-Jones¹, B. Ziegler², R. Larson², and J. Linn³, ¹University of Minnesota Southern Research and Outreach Center, Waseca, ²Hubbard Feeds, Mankato, MN, ³University of Minnesota, St. Paul.

Heifer calves from 3 dairy farms were used in a 56-d study at SROC to determine the effect of molasses concentration in calf starters (CS) on performance and health of calves. Upon arrival at SROC at two days of-age, calves were randomly assigned to one of three molasses starter treatments by farm source and body weight (BW). Calves were housed in 2.29 x 1.17 m individual calf pens within a frame-steel curtain side-wall naturally ventilated calf barn. Average BW across treatments at day 2 of-age was 40.5 kg $\hat{\pm}$ 0.47 kg. Treatments were grain, plant protein and processed grain byproduct based calf starters with 6, 9, or 12% molasses (as-fed basis). Calf starters were similar in nutrient content containing approximately 18% CP, 10% ADF, 2.7 Mcals ME/kg, 1.2% Ca, and 0.6% P. All calves were fed a 20% protein, 20% fat milk replacer (MR) at 0.28 kg (as-fed) in 1.96 L water (12.5% DM) twice daily for the first 35 days and then once daily from day 36 to weaning at 42 days. Calf starter and water were offered ad libitum throughout the 56 day study. Dry matter intake of MR (20.2 kg) and CS (49.4, 50.8, and 46.9 kg) were not different ($P > 0.1$) between the 6, 9, and 12% molasses treatments, respectively over the 56 days. Total gain for the 56 days was not different ($P > 0.1$) averaging 39.1, 38.1, and 35.8 kg for calves fed 6, 9, and 12% molasses treatments, respectively. Feed was utilized more efficiently (DM/gain) by calves fed 6% (1.79 kg) compared to those fed 9% (1.87 kg; $P < 0.06$) and 12% (1.89 kg; $P < 0.03$) molasses treatment. Calves were healthy throughout the study. Results indicate there are no feed intake benefits to increasing molasses levels in calf starters above a 6% inclusion rate.

Key Words: Dairy Calves, Growth, Calf Starter Molasses

T176 Effect of feed refusal amount on feeding behavior and production in Holstein cows. P. French^{*1}, J. Chamberlain¹, and J. Warntjes², ¹Oregon State University, Corvallis, ²University of California-Davis.

The aim of this study was to determine the effects of amount of feed refusal on feed intake, feeding behavior, and milk production in Holstein cows. Fourteen multiparous Holstein cows (107±34 DIM) were assigned at random to one of two feedbunk management strategies: 2.5% (as-fed basis) feed refusal at 18 h post-feeding, designated as clean bunk (CB) or 5% feed refusal at 23 h post-feeding, designated as traditional bunk (TB). Cows were grouped housed in freestalls and fed individually via Calan gates. A TMR was offered twice daily at 0730 h and 1300 h. Feeding behavior was monitored continuously by a series of digital scales connected to a computer. Data were analyzed using the mixed procedure of SAS. Daily DMI (25.6 and 26.1 kg/d for CB and TB, respectively) and 3.5% FCM (41.5 and 42.7 kg/d for CB and TB, respectively) did not differ. Feed efficiency, calculated as kg 3.5% FCM per kg DM offered, did not differ (1.57 and 1.56 for CB and TB, respectively). Feed refusal at 18 h (4.4 vs 7.3% for CB and TB, respectively) and 23 h (3.4 vs 5.5% for CB and TB, respectively) post-feeding was less ($P < 0.01$) for CB compared to TB. Although feed disappearance was similar for CB and TB the first 18 h post-feeding, feed disappearance was greater ($P < 0.05$) for TB from 18 to 23 h post-feeding (1.3 vs 2.1 kg/d for CB and TB, respectively). Feedbunk management strategy did not affect number of meals per day (7.7 meals/d) or DMI per meal (3.4 kg DM/meal). However, daily meal-time (263 vs 375 min/d for CB and TB, respectively), meal duration (37 vs 49 min/meal for CB and TB, respectively), and eating time (212 vs 274 min/d for CB and TB, respectively) were less ($P < 0.01$) for CB compared to TB. In addition, eating rate was greater ($P < 0.01$) for CB (123 g DM/min) compared to TB (100 g DM/min). Although feedbunk management strategy altered feeding behavior with CB cows consuming a similar amount of total daily feed in a shorter amount of time, this change in feeding behavior did not affect milk production or milk composition.

Key Words: Feeding Behavior, Feed Refusals, Feedbunk Management