

1074 Effects of calf removal on the diameter of the dominant follicles and on ovulation rates at GnRH and Estradiol Benzoate injections in anestrous Nelore cows. J.L.M. Vasconcelos*, E.R. Vilela, A.H. Souza, M. Meneghetti, and N. Ferreira Jr., *FMVZ-UNESP, Botucatu, SP, Brazil.*

This study was designed to evaluate whether CR (48h) prior to GnRH (100mcg) and/or after PGF_{2α} (25mg) injections in a protocol for synchronization of ovulation (GnRH-7 days-PGF_{2α}-24h-EB-24h-AI) results in larger dominant follicles (DF) and improves ovulation rates at GnRH and EB (1mg) injections. Cows were considered anestrous (n=99) if progesterone (P₄) was under 1.5ng/ml at 10d before and at the time of GnRH and suffered or not CR before GnRH and between PGF_{2α} and AI, in a 2 x 2 factorial. Ovarian morphology was evaluated by ultrasound to determine diameter of the DF and ovulation rates to GnRH and EB. Data were analyzed by logistic regression and ANOVA in SAS. Size of DF at day of GnRH injection was influenced (P<0.05) by CR and BCS (scale 1 to 5) and was 10.5±0.2mm (n=48) and 9.9±0.2mm (n=51) in cows with and without CR, and 9.8±0.3mm (n=37) and 10.5±0.2mm (n=62) in cows with BCS ≤3 or >3. More cows with CR before GnRH ovulated (P<0.01; 83%) when compared with cows without CR (48%). Size of DF in cows that ovulated at GnRH was larger (P<0.05) than cows that did not ovulate (n=66; 10.6±0.2mm vs. 9.6±0.3mm, n=33). Size of DF at time of AI was influenced (P<0.01) by ovulation to GnRH and was 10.8±0.2mm (n=66) or 9.8±0.3mm (n=33) in cows with and without ovulation to GnRH, and by BCS (P<0.05, 9.9±0.3mm, n=37 and 10.8±0.2mm, n=62) in cows with BCS ≤3 or >3. Ovulation to EB was influenced by CR (P<0.05, 77 with vs. 55% without CR), and size of DF at time of AI (P<0.01, 11.1±0.1mm, n=68 and 9.5±0.4mm, n=31) in ovulating and non ovulating cows. Interestingly, BCS did not influence ovulation to GnRH (P>0.10, 59 vs. 73%), but influenced ovulation to EB (P<0.05, 55 vs. 77%) in cows with BCS ≤3 or >3, respectively. These data show that CR is an important tool that may be applied to increase ovulation rates in TAI protocol in anestrous Nelore cows through increases in size and persistence of the DF. In lower BCS (≤3) cows, GnRH had higher efficiency than EB.

Key Words: Calf Removal, Nelore cows, Anestrous

1075 Effect of PGF_{2α} timing on the reproductive performance of beef cows treated with CIDR-B and estradiol benzoate. A.T. Estrada*, J. Walton, K. Bateman, and W.H. Johnson, *University of Guelph, Guelph, Ontario, Canada.*

An effective ovulation synchronization program will result in acceptable conception rates following fixed-time artificial insemination (FTAI). The objective of this study was to compare the effect of PGF_{2α} timing in a FTAI synchronization protocol. Crossbreed beef cows (n= 154) and heifers (n= 71) were randomly assigned to one of two synchronization protocols and managed in spring and fall breeding groups. On Day 0, all animals received a CIDR-B device (Vetrepharm Canada Inc, London, ON) and 1 mg of estradiol benzoate (EB) plus 100 mg progesterone (P₄) (Veterinary Pharmacy, Guelph, ON). Treatment 1 animals received 25 mg of dinoprost (PGF_{2α}, Lutalyse, Pharmacia & Upjohn, Orangeville, ON) on Day 6 and Treatment 2 on Day 7. CIDR-B devices were removed from all animals on Day 7. On Day 8, all animals received 1 mg of EB, and FTAI was performed 52 hrs after CIDR-B removal. Pregnancy diagnosis was determined by ultrasonography at

day 35 after FTAI. Conception rates were analyzed by chi-square test. Conception rates for Treatment 1 in the spring breeding group were; cows 74%(31/42), heifers 48%(10/21) and in the fall breeding group; cows 73%(27/37), heifers 81%(13/16). Conception rates for Treatment 2 spring breeding group were; cows 74%(28/38), heifers 55%(11/20) and in the fall breeding group; cows 68%(25/37) and heifers 57%(8/14). The conception rate for heifers in the spring breeding group was different when compared within Treatment 1 (p<0.05). There were no significant differences among treatments and within Treatment 2. Results indicate that administering PGF_{2α} on Day 6 or Day 7 of the program yielded similar conception rates and are equally effective in synchronizing ovulation for fixed-time artificial insemination. Treatment 2 reduces from 5 to 4 the number of times animals need to be handled.

Key Words: CIDR-B, Fixed-time, Synchronization

1076 Induction of ovulation in dairy cattle with a deslorelin implant. JA Bartolome*¹, JEP Santos², SM Pancarci¹, P Melendez¹, ACM Arteche¹, O Hernandez¹, LF Archbald¹, TE Trigg³, and WW Thatcher¹, ¹University of Florida, Gainesville, Florida, ²University of California, Davis, California, ³Peptech Animal Health, North Ryde, Australia.

Progesterone (P₄) and estradiol influence embryo survival. Objective was to evaluate ovarian function after inducing ovulation with 450, 750 and 1000 µg of Deslorelin in nonlactating cows and heifers. Animals received GnRH (100 µg, im) on d -9, and 2 doses of PGF_{2α} (25 mg, im, 8 h apart) on d -2. Exp. 1: On d 0, cows (n=20) received either 100 µg (im) GnRH (Control, n=6) or Deslorelin implants (sq) of 750 (DES 750, n=7) or 1000 (DES 1000, n=7) µg. Exp. 2: On d 0, cows (n=23) received 100 µg of GnRH (Control, n=8), or a 450 µg Deslorelin implant (DES 450, n=6). In experiments 1 and 2, cows received PGF_{2α} on d 16. Ultrasonography and blood sampling for P₄ were used to monitor ovarian activity. Exp. 3: On d 0, heifers (n=44) received either 100 µg of GnRH (Control, n=22) or 750 µg of Deslorelin implant (DES 750, n=22). On d 16, all heifers received PGF_{2α}. Blood samples were collected on d 7, 13, and 16. Exp. 1: P₄ (ng/ml) from d 0 to d 16 was not different between Control (5.9 ± 0.6), DES 750 (6.4 ± 0.6), and DES 1000 (6.3 ± 0.6). P₄ was higher on d 11 for DES 1000 (11.1 ± 1.0) compared to Control (8.2 ± 1.1; P<0.05) and on d 12 for DES 750 (12.4 ± 1.0) compared to Control (9.0 ± 1.1; P<0.05). The first-wave dominant follicle (mm) was larger (P<0.02) for Control (9.48 ± 1.1) compared to DES 1000 (4.92 ± 1.0) and not different from DES 750 (7.82 ± 1.0). The largest follicle from d 16 to d 20 was greater (P<0.001) in Control (16.1 ± 0.9) compared to DES 750 (6.3 ± 0.8) and DES 1000 (4.7 ± 0.8). Exp. 2: Average P₄ did not differ between Control (5.9 ± 0.80) and DES 450 (7.4 ± 1.0). P₄ tended to be higher (P<0.10) on d 9 in DES 450 (11.4 ± 1.5 > 8.0 ± 1.2) and was higher (P<0.05) on d 10 (13.0 ± 1.5 > 8.2 ± 1.2). The first-wave dominant follicle was larger (P<0.01) for Control (11.4 ± 1.0 > 6.0 ± 1.1 mm) as was the largest follicle from d 16 to d 28 (16.5 ± 1.85 > 9.7 ± 1.85 mm; P<0.001). Deslorelin cows of experiments 1 and 2 failed to ovulate by d 28. Exp. 3: Overall P₄ tended (P<0.07) to be higher for DES 750 (12.9 ± 0.7) compared to Control (11.1 ± 0.7). In conclusion, Deslorelin implants induced ovulation, stimulated development of a normal CL, and delayed follicular growth during diestrus.

Key Words: Ovulation, GnRH agonist, Ovarian function

Ruminant Nutrition Feedlot, Transition Cow, and Silage

1077 Effect of sugar cane level on intake, digestibility, and ruminal fermentation in crossbreed steers fed stargrass. E. Aranda¹, G.D. Mendoza*¹, C. Garcia-Bojalil¹, J.A. Ramos¹, F. Castrejon², and R. Rojo³, ¹Colegio de Postgraduados, Montecillo, Texcoco, Mexico, ²UNAM-FMVZ, Cd. Universitaria Mexico, D.F., Mexico, ³Universidad Autonoma de Guerrero, FMVZ-URCCH, Cuajinicuilapa, Gro. Mexico.

An experiment was conducted to study effects of sugar cane on ruminal fermentation and fiber digestion in crossbreed steers fed stargrass. Sugar cane (SC) and stargrass (SG) were fed together to four crossed (*Bos taurus* x *Bos indicus*) steers (455 kg BW) with ruminal cannulae. A Latin square design experiment was used, and treatments were levels

(0, 1, 2, and 3% of BW) of chopped sugar cane (with 1% urea), whereas stargrass was fed ad libitum. Steers received SC at 0800, SG at 1200 and 2 kg of a high-protein supplement (23.4% CP) at 1300. Intake of SG was reduced linearly (P < 0.05) as SC level increased. Ruminal digestibility of DM, CP, NDF and ADF did not change (P > 0.05), although they tended to increase with higher proportions of SC, which was reflected in a linear increase (P < 0.12) in total DM digestibility (54.0, 53.3, 57.6, 60.9%). In situ digestibilities of SG and SC, VFA, and molar proportions of VFA were not affected (P > 0.05) by treatments. Results indicated that sugar cane can be used as a complementary forage with stargrass,

showing a substitutive effect without altering ruminal fermentation or digestibility of the diet.

Key Words: Sugar cane, Stargrass, Ruminal fermentation

1078 Influence of level and method of supplementation on the utilization of supplemental tallow fatty by feedlot steers. R.A. Zinn¹ and A. Plascencia*², ¹University of California, Davis, ²Instituto de Investigaciones en Ciencias Veterinarias-UABC.

Crossbreed steer calves (n=228; 267 kg) were used in a growth-performance trial to determine the influence of level and method of supplementation on the utilization of supplemental tallow fatty acids (TFA) in high-energy diets for feedlot cattle. Three methods of fat supplementation (fat added directly to the grain, fat added directly to the hay, and fat added as the last step in the batch mixing) were compared at each of three levels of supplementation (3, 6, and 9% TFA). Adding fat directly to the grain, or as the last step in batch mixing had similar (P > 0.10) effects on growth performance. The addition of fat directly to the hay depressed DMI and ADG at the 3 and 9% levels of fat supplementation (fat level x method of supplementation interaction, P < 0.05). Method of fat supplementation did not affect (P > 0.10) dietary NE. Increasing the level of fat supplementation decreased (linear effect, P < 0.01) ADG, DMI, feed efficiency, and dietary NE. Observed/expected dietary NEM was 1.03 with 3% supplemental fat and declined to 0.90 with 9% supplemental fat. We conclude that the feeding value of TFA is proportional to total fatty acid intake. When total dietary fatty acid intake is less than 6%, the NE value of TFA is consistent with tabular values for tallow. At greater dietary fatty acid concentrations, energy intake, ADG, and the NE value of TFA will decrease. The addition of high levels of supplemental fat directly to the forage portion of the diet may depress DMI and hence, ADG.

Key Words: Cattle, Dietary fat, Performance

1079 Effect of exogenous addition of liquid enzyme on performance of feedlot cattle. O.G. Lozano*¹, J. Angulo², V.M. Basurto-Kuba³, P. Frumholtz³, and E. Vazquez¹, ¹Universidad Autonoma de Sinaloa, ²Ganadería Flexi, Culiacán Sinaloa, ³Agribrand Purina Cargill, México.

The objective was to determine the effect of dietary liquid enzyme on ADG and feed efficiency in commercial feedlot. A total of 786 male calves (crossed *Bos taurus* and *Bos indicus*) were used in a 148 d average growing/finishing trial. Cattle were allocated by initial weight; light (173 kg) and medium (208 kg). The treated group (247 head) and the control group (539 head) were placed in a replicated feedlot corrals. The treatment was the application of the enzyme Promote N.E.T. on to the final diet evenly with the liquid sprayed enzyme 2 g d⁻¹ per head (pure salt = 1 g d⁻¹ per head) diluted in water. The diet, 70% steam-flaked corn, was balanced equally and similarly for all animals throughout the experiment. The last 30 d of trial, the application of liquid enzyme was interrupted to all treated groups due to the use of Zilmax (clohydrate of Zilpaterol) in order to diminish the cost of diet. Data were analyzed using SAS as a complete randomized design blocked by weight. The results showed that using the liquid enzyme in commercial feedlot, there are a significant effect (P < 0.01) in ADG and feed efficiency (P < 0.01). The return on investment increased 3.5% for the treated group. Thus, using exogenous spraying of the liquid enzyme Promote N.E.T. on feedlot diets improved ADG and feed efficiency.

Item	Control	Enzyme	P <	SEM
Initial weight, kg	190.5	189.2		
Final weight, kg	390.8	408.8		
ADG, kg	1.318	1.515	0.01	0.02
DMI, kg	6.89	7.47	0.05	0.16
Feed efficiency ^a	5.23	4.92	0.01	0.05

^a Intake/Gain

Key Words: Feedlot performance, enzyme, Promote

1080 Effect of feeding diets containing corn grain with Roundup (event GA21 or NK603), control, or conventional varieties on steer feedlot performance and carcass characteristics. L.L. Berger*¹, N.D. Robbins¹, and E.P. Stainisiewski², ¹University of Illinois-Urbana, ²Monsanto Company, St. Louis, MO.

Two finishing trials were conducted to determine the effect of feeding genetically modified corn containing the Roundup Ready# trait (Trial 1: event GA21; Trial 2: event NK603) on performance and carcass characteristics of feedlot steers. In trial 1, 175 Angus-continental steers were used to compare corn diets, containing grain from DK626 Roundup Ready, DK626 (non-transgenic control), RX826, and RX730. Steers were allotted by weight into one of 25 pens, housing 7 animals/pen in a randomized complete block design. Steers were adjusted to a common finishing diet over a three-week period prior to feeding test corn diets. Final live weight was determined by dividing carcass weight by an average dressing percentage. Steers did not differ (P>0.05) in daily gain, feed intake, or feed efficiency (G:F), due to corn diet. There were no significant differences (P>0.05) in carcass characteristics. A cross section of the longissimus thoracis muscle was analyzed for moisture, protein, ash, and ether extract. Percent moisture was greater (P<0.05) for steers fed DK626 compared with other diets. In Trial 2, 196 Continental-cross steers were utilized to evaluate feedlot performance and carcass characteristics of steers fed a Roundup Ready corn hybrid with event NK603, non-transgenic control or two conventional hybrids, DK647 and RX740. Steers were allotted by weight to one of 28 pens, with 7 animals/pen. Trial 2 was conducted the same as Trial 1. Steers did not differ (P<0.05) in daily gain or feed efficiency due to corn diet. Steers fed RX740 had the highest DMI at 10.49 kg/d which was greater (P<0.05) than steers fed DK647, 9.92 kg/d. Steers fed control, 10.02 kg/d and NK603 corn, 10.18 kg/day, were intermediate. Carcass characteristics were not significantly different (P>0.05). We concluded that both Roundup Ready corn events (GA21 and NK603) had similar feeding value to non-transgenic corn for feedlot steers.

Key Words: Corn, Roundup Ready, Feedlot Performance

1081 Evaluation of a controlled-release capsule of n-alkanes for studies with ruminants. D.E. Oliveira*¹, M.Q. Manella¹, C. Boin¹, D.P.D Lanna¹, J.J.A.A. Demarchi², and G.F. Alleoni², ¹Esalq-USP, ²Instituto de Zootecnia.

The objective of this study was to evaluate the rate of release of n-dotriacontane C₃₂ and n-hexatriacontane C₃₆ n-alkanes from controlled-release capsules used as markers to estimate feed intake. Six ruminally-cannulated Nelore steers weighting 380 kg at 18 months were housed in metabolic cages and received diets with three different proportions of concentrate (20, 40 and 60%) ad libitum. Corn silage was the sole roughage source. Experiment lasted four weeks, with two steers per concentrate level. After one week of adaptation, one capsule containing 8g of each n-alkane (Alkane CRC for 300-650 kg Cattle - Captec, NZ) was administered intra-ruminally. The capsules were attached by a nylon string to the rumen cannula and removed 5 times for measurements on days, 3, 7, 10, 13 and 17 after start of incubation. Rate of plunger travel (mm/day) was determined with calipers and used as an estimate of n-alkanes release into rumen. One capsule from the same batch was opened and tablet thickness measurements taken. Mean tablet thickness was 10.3mm. Plunger travel were 2.55 (± 0.16), 2.52 (± 0.08), 2.59 (± 0.18), 2.56 (±0.17) and 2.91 (± 0.08) on days 3, 7, 10, 13 and 17, respectively. The data were analyzed by simple linear regression using the least-square method, with the model Y= b₀ + b₁X, where Y= plunger travel (PT, mm/day) and X= day after capsule incubation (DAI). There were no effects of diet (P≥0.05) and the model and regression coefficient were linear (P≤0.0001). Coefficient of variation and residual standard deviation were 4.2% and ±0.85, respectively. The equation obtained was PT= 0.19 + 2.49DAI (r²= 0.99 and SEE= 0.049). For the suggested sampling period, the average plunger travel was 2.55mm (± 0.03), equivalent to an alkane release of 396mg/day. The Captec capsule label informs that the daily release of C₃₂ and C₃₆ n-alkanes is 400 mg/day. Based on the disappearance rate of the tablets our results are consistent to that figure.

Key Words: N-alkanes, Release rate, Feed intake

1082 Sites of digestion in steers fed fresh oats and supplement with flint or dent corn grain offered whole or ground. J.M. Grigera¹⁻², F.J. Santini¹⁻², and J.C. Elizalde¹⁻³, ¹Fac. Cs. Agrarias-UNMDP., ²INTA-Balcarce., ³CONICET, Argentina.

The objective of the experiment was to study the effect of supplementation with flint (F) or dent (D), offered whole (W) or ground (G) corn on site and extent of digestion of OM, starch, NDF, ADF and total nitrogen (TN) in steers fed fresh forage of winter oats (WO) (CP 20.4%, NDF 41.1 %). Five Holstein steers (300±30 kg) cannulated in rumen, duodenum, and ileum in a 5 × 5 Latin square design were used. The treatments were: WO = 100 % fresh forage, S = supplemented (1 % of BW) with corn: GD = ground dent, WD = whole dent, GF = ground flint, WF = whole flint. The animals were fed indoors every 8 h. Chromic oxide (Cr₂O₃) was used as external marker for digesta flow estimation. Contrasts were WO vs S, W vs G, F vs D, and GF vs WD. Ruminal digestibility of DM, starch, NDF, ADF, and NT was similar among treatments ($P>0.10$). Total tract OM digestibility was higher ($P<0.10$) for WO than S, for G than W ($P<0.10$), and for D than F ($P<0.10$), and ruminal digestion was higher for WO than S ($P<0.10$). Post-ruminal starch digestion was not affected by treatments ($P>0.10$). Total tract starch digestibility was higher ($P<0.10$) for G than W (89.3 vs 84.8 %), for D than F (89 vs. 85 %), and similar ($P>0.10$) between GF and WD (mean = 86.75). Ruminal pH was higher for WO than S ($P<0.10$), for F than D ($P<0.01$), for W than G ($P=0.08$), and for WD than GF ($P<0.01$). The efficiency of bacterial protein synthesis (g of bacterial N/Kg of OM truly fermented in rumen) was higher ($P<0.10$) for S than WO (23.1 vs 19.4; $P<0.10$) but duodenal flows of NAN nitrogen was similar (145 g/d vs 139.6 g/d; $P<0.10$) because of the lower ($P<0.10$) duodenal flows of dietary nitrogen (26.5 g/d vs 58 g/d) with the S treatments. Ruminal VFA were similar between treatments. Ruminal ammonia-N was lower for S than WO ($P=0.01$) and similar between S. Supplementing with ground corn to steers feed fresh oats slightly increased total starch digestion, and a similar trend was found between dent and flint corn. Consequently, it is possible to improve corn starch utilization by grain processing or by selecting the type of corn better adapted to animal nutrition.

Key Words: Fresh forage, Corn grain, Digestion

1083 Effect of linoleic or oleic acid-rich oils on ruminal fermentation, nutrient digestibility and performance of finishing cattle. A. N. Hristov*, L. R. Kennington, M. A. McGuire, C. W. Hunt, and J. K. Ropp, *Department of Animal and Veterinary Science, University of Idaho, Moscow, ID 83844-2330.*

Two trials were conducted to determine the effect of linoleic (LIN) or oleic (OLE) acid-rich oils on ruminal fermentation, nutrient digestion, and performance of beef cattle. In trial 1, six ruminally and duodenally cannulated Angus steers (573±70.7 kg BW) were fed a 78% steam rolled barley grain:15% wheat silage and alfalfa hay diet (DM basis, same diet was fed in trial 2). LIN (76.5% linoleic acid safflower oil) and OLE (76.5% oleic acid safflower oil) were mixed with the daily ration at 5% (DM basis) and fed in a cross-over design with covariate periods (no oil supplementation). Ruminal fluid samples were analyzed for fermentation variables and protozoal counts. Digestibility was determined using acid insoluble ash as a marker. In trial 2, 16 Angus cattle (423±7.4 kg initial BW) were blocked by BW and sex to two treatments: LIN or OLE (5% of dietary DM). Cattle were gradually adapted to the diet and fed individually for 116 days. Oils were fed during the last 86 days of the trial. Ruminal pH, total and individual VFA, and acetate to propionate ratio were not affected ($P > 0.05$) by oil supplementation or type of oil. Addition of LIN to the diet reduced ($P < 0.05$) protozoal counts and ammonia concentration in the rumen compared to the covariate period (10.6 vs 1.2×10⁵/ml and 9.40 vs 4.68 mM, respectively). Type of oil had no effect ($P > 0.05$) on protozoal counts or ammonia concentration. Compared to LIN, OLE tended ($P < 0.1$) to decrease total tract DM, OM, and ADF digestibility. Compared to the covariate period, OLE reduced ($P < 0.05$) DM, OM, CP, NDF, and starch digestibility (by 15, 14, 18, 31, and 4%, respectively). Similarly, DM, OM, and starch digestibility tended ($P < 0.1$) to be lower when LIN was fed compared to the covariate period (4, 4, and 2%, respectively). DM intake, average daily gain, feed efficiency or back fat thickness and rib eye area did not differ ($P > 0.05$) between LIN and OLE (trial 2). In conclusion, 5% linoleic acid-rich safflower oil added to a finishing, barley-based diet had

beneficial effects on ruminal fermentation but no corresponding effects on nutrient digestibility or cattle performance were observed.

Key Words: Dietary oil, Protozoa, Cattle

1084 Effect of dietary starch level on carcass characteristics and the hematin contents of beef. Kyouko Hodate^{*1}, Yumi Higashiyama¹, Hiroyuki Abe¹, Akihiro Iguchi², Masakazu Kobayashi², Tomoo Mori², Katsumi Kasai³, Yoshihiro Kanbe⁴, Hideto Mashiya⁴, and Tsutomu Asada⁵, ¹National Institute of Livestock and Grassland Science, ²Chiba Livestock Experimental Station, ³Ibaraki Livestock Experimental Station, ⁴Tochigi Livestock Experimental Station, ⁵Gunma Livestock Experimental Station.

Thirty-eight Japanese Black steers were used to determine the effect of dietary starch level on hematin contents of muscle. The steers (initial BW=548kg) were divided into two groups and housed in individual outdoor pens. One group was fed a diet of 47% starch and 18% NDF (HS), and the other group was fed a diet of 40% starch and 23% NDF (LS) from 19 to 27 mo of age. Blood and rumen fluid samples were taken for analysis of iron and volatile fatty acids at 23 mo of age. Upon completion of the trial, all steers were slaughtered for evaluation of carcass data and chemical components of the longissimus thoracis (LT) muscle. HS steers ate greater amounts of starch than LS steers (3.8 vs 3.3 kg/d, $P<0.01$). HS steers showed larger weight gain (0.77 vs 0.67, $P<0.01$) and lower feed conversion (8.68 vs 9.60, $P<0.01$), compared to LS steers. Carcass weights and rib eye areas were larger for HS steers (52 vs 48 cm², $P<0.01$), compared to those for LS steers. The hematin contents of LT muscle in the HS group were higher than in the LS group (21.7 vs 19.0 mg/100g, $P<0.02$). The other characteristics for a carcass grading and chemical component of LT muscle were similar. The concentrations of propionic acid in rumen fluid in the HS group were higher than in the LS group (2.64 vs 2.17 mmol/dL, $P<0.05$). Propionic acid concentrations were positively associated with the hematin contents of LT muscle ($P<0.01$) and the iron concentrations of blood plasma ($P<0.05$). Plasma iron concentrations were also positively associated with the hematin contents of LT muscle ($P<0.05$). These results suggest that in grain-finished steers the high starch diet causes high concentrations of propionic acid in rumen fluid, and high concentrations of iron in plasma. Therefore, the high starch diet produces a darker color of beef.

Key Words: Meat color, Starch, Hematin

1085 Fall and winter supplementation of post-weaning steers of two different mature body weight grazing high quality pastures supplemented with two types of energy source. F. J. Santini, E. Pavan, E. L. Villarreal, and J. M. Grigera, *National Institute of Agricultural Technology (INTA).*

The objective was to evaluate the effect of type of energy fall-winter supplementation on the performance of low and high mature body weight (MBW) of Aberdeen Angus steers: corresponding to 420 (L) and 500 (H) kg MBW breeding female. Equal energy level of high moisture corn grain (G) or corn silage (S) was used as supplement treatment. Forty calves were randomly assigned to four supplement-MBW groups. Supplements were offered daily for 176 days. Pastures (IVDMD= 78.7; DM= 21.2; NDF= 40.2; CP= 17.7%) were grazed under a daily rotational system. Live weight (LW) and subcutaneous backfat (SBF) were measured every 21 days. LW gain (LWG) and SBF deposition rate (SBFDR) were estimated individually by linear regression. Trial was planned to end when each treatment achieved 6 mm of SBF or lasted 13 month in the trial. Data were analyzed as a complete randomized design with a factorial arrangement. L and H steers received 1.9 and 1.7 of G and 2.4 and 2.0 kg DM/an/d of S, which represent 38, 35, 47 and 48% of total DMI. Supplement effect on LWG and SBFDR depended on MBW. However, at the beginning of the summer (L-G ending point), interaction effects disappeared for both variables ($p>.10$). LWG was only affected by MBW (769 and 675 g/d for H and L, $p<.01$), but DFDR was also affected by type of supplement (0.20 and 0.46 for H and L and 0.39 and 0.27 mm/30d for G and S, $p<.01$). It was concluded that G fall-winter supplementation improve LWG and SBFDR relative to S, only when steers reach their end point close to the end of the supplementation period. Otherwise, the supplement effect is lost. With the supplementation offered, H did not reach the 6 mm of DBF within a year.

	H ¹		L		SEM
	G ²	S ³	G	S	
Fattening period, d	405	405	258	365	-
Final					
Body weight, kg ^M	430	433	325	355	9.3
SBF ⁴ , mm ^M	4.6	4.8	7.1	6.6	0.5
Live weight gain, g/d ^{M,S,I}	677	700	692	593	20
SBF deposition rate, mm/30d ^{M,S,I}	0.20	0.19	0.54	0.32	0.30

¹H, high and L, low mature body weight. ²High moisture corn grain. ³Corn silage. ⁴Subcutaneous backfat. ^MMature body weight effect (p<.05). ^SSupplement effect (p<.05). ^IInteraction effect (p<.05).

Key Words: Grazing, Supplement, Mature body weight

1086 Influence of abomasal starch hydrolysate and/or casein on pancreatic exocrine secretion and plasma hormone concentrations in beef steers. J. A. Benson*, K. C. Swanson, J. C. Matthews, and D. L. Harmon, *University of Kentucky, Lexington.*

Eight Angus steers (290 ± 8 kg), surgically prepared with pancreatic pouch-duodenal re-entrant cannulas and abomasal infusion catheters were used in a replicated 4 x 4 Latin square experiment to investigate the effects of abomasal infusion of starch hydrolysate (SH) and/or casein on pancreatic exocrine secretion and plasma concentrations of hormones. Steers were fed a basal diet of alfalfa (1.2 x NE_m) in 12 equal portions/d. Abomasal infusion treatments (6 L total volume infused/d) were water (control), SH [2.7 g/(kg BWd)], casein [0.6 g/(kg BWd)] and SH + casein. Periods were 3 d adaptation and 8 d full infusion. Pancreatic juice and jugular blood samples were collected over 30 min intervals for 6 h on day 11. Weight and pH of pancreatic samples were measured and a 10% subsample composited and frozen until analysis of total protein and pancreatic enzyme activities. The remaining sample was returned to the duodenum. Plasma was harvested and frozen until analyzed. Pancreatic juice (67 mL/h) and protein (1.8 g/h) secretion rates were not affected by nutrient infusion (P > .2). There were SH x casein interactions for all pancreatic enzyme secretions and plasma insulin. SH + casein did not increase secretion of pancreatic enzymes compared to casein alone. Glucose and cholecystokinin octapeptide (CCK-8) were increased by SH, but glucagon was decreased. Casein decreased plasma CCK-8. The data indicate that positive effects of postruminal casein on enzyme secretion were inhibited by SH, however the role of the hormones measured in regulating enzyme secretion is not clear.

Item	Infusion					P <		
	Control	SH	Casein	SH + Casein	SE	SH	Ca-sein	SH Ca-sein
<i>Enzyme (units/h)</i>								
α-Amylase	20,406	20,553	43,486	20,462	4,892	.03	.03	.03
Trypsin	110	173	148	115	26.4	.58	.70	.08
Chymotrypsin	27	36	55	30	7.2	.28	.14	.03
<i>Hormones (pM)</i>								
Insulin	69	103	96	108	6.5	.01	.03	.10
Glucagon	27	25	30	27	1.6	.09	.21	.90
PP ¹	75	79	77	62	6.5	.38	.22	.16
CCK-8	9.6	12.7	8.6	10.3	.09	.02	.07	.47
<i>Glucose (mM)</i>								
	4.06	4.30	4.25	4.26	.064	.07	.27	.11

¹ PP, pancreatic polypeptide

Key Words: Postruminal nutrients, Pancreatic secretion, Hormones

1087 The influence of treating wet distiller's grains and solubles with three levels of preservative (KI-151) on feedstuff stability, intake and performance of finishing steers. K. E. Tjardes*¹, C. L. Wright¹, C. Myers², and M. Martinez², ¹South Dakota State University, Brookings, ²Kemin Americas, Inc., Des Moines, IA.

One hundred fifty-two (152) steers with initial weight of 565 ± 33 kg were weighed and randomly allotted to 8 pens with 7 steers/pen and 8 pens with 12 steers/pen at the Southeast Research Farm, Beresford, SD. Steers were adapted to a finishing diet containing 20% wet distiller's grains and solubles (WDGS), 10% hay, and 68% cracked corn on a DM basis for 15 d before trial initiation. One d before trial initiation, WDGS without or with three levels of a proprietary experimental organic acid based preservative formulation (KI-151) were received and stored in adjacent silage bags. Levels of KI-151 were 2.4, 2.9, and 4.0 kg/t of as-is WDGS. Samples of WDGS for later determination of DM, CP and microbial load (mold and yeast) from each treatment were collected before being placed into silage bags. After adaptation, WDGS without or with KI-151 was fed at 20% of diet DM and offered once daily for 20 d for steers to have ad libitum access. Samples of feedstuffs and diets were taken weekly and analyzed for microbial load, and percentages of DM and CP. Steer weights were taken before feeding on d #15, 0, and 20. On day 21, steers were processed at a commercial processing plant and hot carcass weights were recorded. When WDGS was treated with KI-151 at 4.0 kg/t, mold counts were not detected at any of the 3 subsequent sampling dates and yeast counts were significantly lower at each of the 3 dates when compared to control (average of 3.4x10⁷ vs 460 cfu/g for KI-151 at 0 and 4.0 kg/t, respectively). Feeding WDGS treated with KI-151 at 2.4, 2.9, and 4.0 kg/t did not have an effect (P > 0.10) on steer DMI over the 20 d treatment period (11.6, 11.7, 11.2, and 11.5 kg/d for KI-151 at 0, 2.4, 2.9, and 4.0 kg/t, respectively). Feeding WDGS without or with KI-151 had no effect (P > 0.10) on steer ADG, efficiency of gain, hot carcass weight, or dressing. In conclusion, treating WDGS with levels approaching 4.0 kg/t of as-is WDGS reduced detection of mold and yeast without having any adverse effects on steer intake and performance.

Key Words: distiller's grains, mold inhibition, yeast inhibition

1088 Effect of low calcium diet (Ca) and vitamin D₃ (D₃) on Ca metabolism of finishing steers. G. Aranda-Osorio* and J.J. McKinnon, *University of Saskatchewan, Saskatoon, SK, Canada.*

The objective of this study was to increase serum Ca levels in an effort to improve beef quality by feeding a low Ca diet prior to supplementation with D₃. Nineteen steers (522 ± 34 kg), penned individually, were randomly assigned to four groups. Groups 1, 2, and 3 were fed a 90% barley-based concentrate, 10% barley silage diet (DM basis) with a Ca level of 0.16% (low Ca), while group 4 was fed the same basal ration with a Ca level of 0.62% (normal Ca) for 10 d (d L1-L10). Following this, the cattle were fed the normal Ca diet with groups 1, 2, 3, and 4 supplemented with 0, 1.25, 2.5 and 5 million IU (MIU) D₃/hd/d for 7 d (d S1-S7), respectively. The cattle were then subjected to a 5-d withdrawal period (d W1-W5). Blood samples were obtained every second day by jugular venipuncture. The response variables were total (TCa) and ionized (ICa) serum Ca, plasma D₃, 25-hydroxyvitamin D₃ (25(OH)D₃), 1-25 dihydroxyvitamin D₃ (1,25(OH)₂D₃), parathyroid hormone (PTH) and calcitonin. The data were analyzed by repeated measures analysis and single degree of freedom contrasts. Feeding the low Ca diet decreased (P<.05) serum TCa and ICa and plasma D₃. Supplementation of D₃ increased (P<.05) serum TCa and ICa, and plasma D₃ and 25(OH)D₃ levels. The increase was related to the level of D₃ fed. Maximum TCa and ICa levels in serum for all treatments were achieved on d W3 and W5, respectively. Plasma D₃ increased quadratically reaching a maximum of 352.9 ng ml⁻¹ on d S6 for the 5 MIU D₃ treatment. In contrast, 25(OH)D₃ increased in a linear fashion. On d W1, PTH levels were decreased (P<.05) while 1,25(OH)₂D₃ was increased (P<.05), responses related (P<.05) to the level of D₃ fed. Calcitonin was not altered (P>.05). These results suggest that Ca absorption and resorption mechanisms were activated by the low Ca diet. However, there was no synergistic effect between the low Ca diet and D₃ supplementation on serum Ca levels.

Key Words: Calcium, Vitamin D₃, Beef Quality

1089 Methods for calculating diet energy values from feedlot performance of cattle. F. N. Owens*, M. A. Hinds, and D. W. Rice, *Pioneer Hi-bred Int'l, Johnston, IA.*

Because the California Net Energy (NE) system accurately predicts rate of gain, estimated energy values of diets (EME) should be reliably calculated from animal measurements and feed intake. However, EME varies with specific inherent assumptions. First, some relationship between diet NEm and diet NEg must be chosen. In NRC for Beef Cattle (1970), NEm and NEg were related logarithmically to ME; hence, EME was the solution to a quadratic equation. In later NE versions, NEm and NEg were tied to ME by equations that included quadratic and cubic factors; hence, EME must be solved iteratively. Later versions also adjust diet NEm for ionophore use. Secondly, weighing conditions markedly alter EME. Weights must be as specified (shrunk or empty) for an equation. Final weight can be calculated from carcass weight using a standard dressing percentage (e.g., 63%) to avoid differences in gut fill and fatness ignoring any differences in internal fat removed during evisceration. In earlier NE versions, NEm requirements were related to animal age, gender, or type; in later versions, breed and environment were employed. Finally, having carcass grades simplifies equivalent weight adjustment assuming that choice grades increase from 0% to 100% when mean shrunk weight increases 16 kg (478 vs 462 kg; NRC, 1996). Alternatively, carcass quality or yield grades can be regressed against shrunk final weights to derive an adjustment. To calculate EME for a single diet ingredient, ME contributed by other diet components must be subtracted from diet EME; ENEm and ENeg then are calculated from residual EME. Imprecision of EME can be ascribed to inaccurate estimates of body or equivalent weights, environmental factors, and the NE version employed. All assumptions inherent in EME calculations should be specified in published articles. EME also can differ from the sum of ME from diet components due differences in site or extent of digestion. Spreadsheet and SAS methods for calculating EME based on various NE systems have been developed and will be distributed.

Key Words: Net energy, Feedlot, Cattle

1090 Effects of dietary cation anion balance on blood parameters and performance characteristics of beef cattle during the pre-receiving and receiving phases of the feedlot. J. J. Williams*¹ and L. W. Greene¹, ¹Texas A&M University Agricultural Research and Extension Center, Amarillo TX.

Twenty-seven crossbred heifers, 255 kg, were blocked by weight and randomly assigned to a growing diet containing one of three dietary cation anion difference (DCAD) treatments to determine the effect on urine and blood pH, and performance. The DCAD diets were -100, +75 and +250 mEq/kg of diet, calculated as $(\text{Na}^+ + \text{K}^+ + 0.38\text{Ca}^{2+} + 0.3\text{Mg}^{2+}) - (\text{Cl}^- + 0.6\text{S}^{2-} + .5\text{P}^{3-})$. Heifers were individually fed using Calan electronic gate feeders. During d 1 to 70, heifers were fed to gain 0.91 kg/d. During d 71 to 80 heifers were transitioned to full feed. On d 81, heifers were removed from the DCAD diets and started on a feedlot finishing diet over a 16 d period. This period consisted of an initial diet of 30% steam flaked corn (SFC), 60% cottonseed hulls (CSH) and 10% supplement with a 10 percentage unit increase in SFC and decrease in CSH at 3 d intervals. Urine pH was determined on d 14, 28, 42, 56, 70, 80, 96 and 110, and at 3-d intervals from d 81 to 95. One-third of the heifers were sampled on each day of the 3-d interval. Arterial blood pH, pCO₂ and HCO₃⁻ were determined on d 28, 56, 70, 80, 96 and 110. By d 14, urine pH was lower ($P < 0.05$) for the heifers fed -100 compared to the heifers fed +75 and +250 (6.79 vs 7.94 and 8.13) and remained lower until d 85. When heifers were fed ad libitum (d 70 to 80), urine pH decreased 15% for those fed -100 but not for those fed +75 and +250. It took 5 days for the urine pH of the heifers fed the -100 to equilibrate to those fed +75 and +250. There was no difference ($P > 0.05$) in blood pH due to DCAD treatment. Blood pCO₂ and HCO₃⁻ were lower ($P < 0.05$) on d 80 for heifers fed the -100 compared to those fed +75 and +250. Feed intake and ADG were lower ($P < 0.05$) for heifers fed -100 than for +75 and +250 for d 70-110. Results indicate that consumption of a diet containing -100 mEq/kg DCAD prior to entering the feedlot may decrease feed intake during the start-up period.

Key Words: Dietary Cation Anion Difference, heifer, pH

1091 Effect of high linoleic sunflower oil on growth performance and carcass characteristics of feedlot steers. J. Baah*¹, T.A. McAllister¹, A.N. Hristov², F.H. Van Herk¹, and M. Ivan¹, ¹Agriculture and Agri-Food Canada, Lethbridge, AB, ²University of Idaho, Moscow.

To investigate the effects of high linoleic acid sunflower oil (HLSO) on growth performance and carcass characteristics of cattle, finishing diets including the oil at 0 (control), 3, 6 or 9% (DM basis) were offered for ad libitum consumption to 60 individually fed crossbred steers (450 ± 25 kg BW) in a 112-d study ($n = 15$). Other dietary components were barley silage (11%), mineral/vitamin mix (5%) and rolled barley grain (84, 81, 78 or 75%). Steer weights and DM intake were determined at 28-d intervals. Carcasses were evaluated according to Canadian Beef Grading Standards. Including HLSO in the diet at 9% of DM numerically depressed DMI (by 7.5%, $P > 0.05$) over the course of the study (by 12% in month 3, $P < 0.05$). Treatment did not affect ADG, as compared to controls, although a numerical improvement (13%, $P < 0.05$) in overall ADG was observed in steers fed 6% HLSO. A linear ($P < 0.05$) improvement in feed efficiency (FE) with inclusion of HLSO was observed at d 28, and overall FE was numerically improved when oil was fed (by 5.8, 7.2 and 7.2% with 3, 6 and 9% HLSO, respectively). Feeding HLSO did not affect ($P > 0.05$) warm carcass weight, fat cover, ribeye area or saleable meat yield, but it may have improved marbling, as all 45 carcasses from steers fed HLSO graded AA or AAA, whereas 2 of the 15 from the control group graded A. The added cost of including HLSO in feedlot diets would not be offset by these modest improvements in performance, although it is possible that HLSO could favorably alter fatty acid composition of the beef.

Key Words: Sunflower Oil, Steers, Growth Performance

1092 Substitution of sorghum for citrus pulp on finishing yearlings. I. Mejia-Haro*¹, G. Tirado-Estrada¹, F. Gonzalez-Castaneda², J. Fajardo-Pena¹, J. Mejia-Haro³, and B. Ortiz-de la Rosa⁴, ¹CIGA ITA de Aguascalientes, Mexico, ²INIFAP - Aguascalientes, Mexico, ³Universidad de Guanajuato, Mexico, ⁴CIGA ITA de Conkal, Yucatan, Mexico.

In Mexico, feedlot diets are expensive because production of grains is low and most of them are imported from USA. One way to alleviate the problem is through the use of Agriculture byproducts. Citrus pulp is a byproduct available in Mexico that could be used in feedlot diets and reduce the costs of feed, since the citrus pulp price sometimes is 40% lower than that of sorghum. The objective of this study was to substitute partially sorghum for citrus pulp and observe effects on ADG, feed conversion and carcass weight in finishing yearlings. This study was carried out in Pabellon de Arteaga, Aguascalientes, Mexico in the facilities of INIFAP in 2000. Twenty-four Brahman yearling steers (327 kg BW) were assigned randomly to one of four treatments (inclusion of citrus pulp in diet): T1, 0%; T2, 8%; T3, 16%, and T4, 24%. Yearlings were fed for 98 d after being adapted to the diet for 15 d and weighed every two weeks. Feed intake, feed conversion, ADG and carcass weight were recorded. Data were statistically analyzed by analyses of variance using the statistical package of the University of Nuevo Leon, Mexico. No significant differences ($P > .10$) were found in ADG (T1, 1.094; T2, 1.078; T3, 1.108; T4, 0.986 kg) feed conversion (7.59, 8.17, 7.23, and 8.43 for T1, T2, T3, and T4, respectively). Similarly, no effects were observed ($P > .10$) in feed intake (8.146, 8.655, 7.850 and 8.205 kg/d and carcass weight (58.4, 59.7, 58.2, and 59.1%) for T1, T2, T3, and T4, respectively). Substituting up to 24% of the sorghum for citrus pulp had no effects on animal performance in feedlot.

Key Words: Feedlot, Citrus Pulp, ADG

1093 Effects of Monensin (Rumensin®) and Salinomycin (Salocin®) on Feedlot Performance of Beef Cattle in Northern Mexico. B.I. Giner-Chavez*¹, G.J. Vogel², and M.A. Hernandez¹, ¹Elanco Animal Health, Eli Lilly de Mexico, ²Elanco Animal Health, Eli Lilly and Company, U.S.A.

A study was conducted to evaluate the effects of Rumensin® and Salinomycin on feed intake during the summer months in feedlot cattle. The study was a complete randomized block design with two treatments and four replications of 20 animals per treatment. The study consisted of two periods; period 1 was defined as day 1 of the trial to day 36, and period 2 from day 37 to day 81 or the termination of the feeding period. Animals selected were yearling steers weighing approximately 272

± 17.7 kg. Cattle were Charolais X Brangus crossbreeds of similar origin and sex. In the rations for the Rumensin[®] treatment, two levels of Rumensin[®] were included in a step up approach. Rumensin[®] at a level of 15 PPM was included in the rations of period 1, and at 25 PPM for the rations in period 2. The rations for the Salinomycin treatment contained 10 PPM of Salinomycin. Individual weights were taken on day 1, day 36, and at the conclusion of the trial. Overall weight gain and average daily gain were not significant. The Rumensin[®] fed cattle had an improved feed efficiency ($P < 0.05$) and a lower feed intake ($P < 0.01$) compared to the Salinomycin fed cattle. The improved feed efficiency for the Rumensin[®] treatment demonstrates that feed utilization is improved, as the same gain was realized as compared to the Salinomycin treatment. Carcass weight and yield were not different between experimental treatments. As a result of the improvement in feed efficiency a total benefit of \$8.46 dollars was obtained per animal. This is a return over an investment of 1:9 when using Rumensin[®] in the ration instead of Salinomycin.

Key Words: Cattle, Feedlot, Ionophres

1094 Influence of close-up dry period protein supplementation on full lactation productive and reproductive performance of primiparous Holstein cows. J.M. Moorby*¹ and P.H. Robinson², ¹*Institute of Grassland and Environmental Research, Aberystwyth, Wales, UK*, ²*UCCE, Dept. Anim. Sci., UC Davis, Davis, CA*.

Recent studies report that increased crude protein (CP) levels of close-up rations of heifers, to about 14% of DM, improve their performance in the subsequent lactation. Pregnant Holstein heifers (n=331) were assigned to close-up groups that were offered a low CP (11.7% DM) ration based on corn silage, alfalfa cubes, oat hay, corn and barley grain, or a medium CP (14.4%) ration as the low CP ration plus 1 kg/d/cow of a supplement (60% canola meal or rumen protected (RP) canola meal and 40% others), or a high CP (16.6%) ration as the low CP ration plus 2 kg/d/cow of one of the two supplements. After calving, use of BSt, movement through the high and low production groups, and breeding events were determined by the herd manager. Full lactation production parameters were pooled to means. Time close-up varied (1-19 d) and cows were allotted to 4 time groups for ANOVA. As their time close-up increased, cows tended ($P=0.056$) to produce more milk, 41.5 kg/lactation per day close-up (intercept = 9311 kg/lactation) but source or level of CP had no influence. Full lactation yield of milk fat and protein was not influenced by source or level of CP, or time close-up. Full lactation body condition and locomotion scores were higher ($P=.03$ and $.04$) for cows supplemented with RP canola meal (3.28 vs. 3.22; 1.22 vs. 1.14). Cows were started on BSt 7 d earlier ($P=.01$) if supplemented with RP canola meal and tended ($P=.06$) to stay on BSt 9 d longer. Time in the high and low production groups, day of first breeding and services per conception, were not influenced by any treatment variable. However, as their time close-up increased, cows had a later ($P=.03$) day of conception, 1.87 d/d close-up (intercept = 88.7 d). Increasing close-up ration CP from 11.7% to 16.6%, or changing its rumen degradability, had no substantive impact on full lactation productive or reproductive performance. However, increasing the length of the close-up period enhanced full lactation milk yield, but at the apparent expense of a longer period to conception.

Key Words: Transition, Primiparous, Protein

1095 Influence of close-up dry period protein supplementation on full lactation productive and reproductive performance of multiparous Holstein cows. P.H. Robinson*¹ and J.M. Moorby², ¹*UCCE, Dept. Anim. Sci., UC Davis, Davis, CA*, ²*Institute of Grassland & Environmental Science, Aberystwyth, Wales, UK*.

Recent studies are equivocal in the impact of increased crude protein (CP) levels of close-up rations of multiparous cows, above about 12% of DM, on their performance in the subsequent lactation. Pregnant Holstein cows (n=286), were assigned to close-up groups that were offered a low CP (11.7% DM) ration based on corn silage, alfalfa cubes, oat hay, corn and barley grain, or a medium CP (14.4%) ration as the low CP ration plus 1 kg/d/cow of a supplement (60% canola meal or rumen protected (RP) canola meal and 40% others), or a high CP (16.6%) ration as the low CP ration plus 2 kg/d/cow of one of the two supplements. After calving, use of BSt, movement through the high and low production groups, and breeding events were determined by the herd manager. Full

lactation production parameters were pooled to means. Time close-up varied (1-19 d) and so cows were allotted to 4 time groups for ANOVA. Full lactation production of milk (mean = 11247 kg/lactation), as well as milk fat and protein, were not influenced by source or level of CP, as well as time close-up. Full lactation body condition and locomotion scores were also not influenced by any treatment. Cows were started on BSt 9 d earlier ($P=.01$) if supplemented with RP canola meal but only tended ($P=.11$) to stay on BSt 7 d longer. Cows tended ($P=.07$) to stay on BSt longer as the level of protein increased (149, 155 and 160 d for the 11.7%, 14.4% and 16.6% CP diets). Time in the high and low production groups, day of first breeding and services per conception, were not influenced by any treatment. As ration CP increased, cows only tended ($P=.10$) to have a later day of conception (101, 114, 117 d). Increasing close-up ration CP from 11.7% to 16.6%, or changing its rumen degradability, had no substantive impact on full lactation productive or reproductive performance. Indeed, results do not support the need for a specific close-up period at all, as increasing its length had no substantive impact on full lactation productive or reproductive performance.

Key Words: Transition, Multiparous, Protein

1096 Influence of early dry-off of twin-carrying multiparity Holstein cows on their productive performance in the first 120 days of lactation. P.H. Robinson*¹, J.H. Kirk², and T. Riordan³, ¹*UCCE, Dept. Anim. Sci., UC Davis, Davis, CA*, ²*UCCE, Vet. Med. Teaching Research Centre, Tulare, CA*, ³*Nutri-Systems, Fresno, CA*.

The incidence of twin births on commercial dairies has been increasing in recent years. Twinning percentages of 5 to 8% of total births in multiparity cows are commonly reported, and cows bearing twins have been associated with higher levels of metabolic disease and reduced productivity. Multiparity Holstein cows on a large commercial dairy in California were manually palpated for the presence of twin fetuses at the first pregnancy check over a 12 mo period. Those judged to have twin fetuses were assigned to either a control (C: herd normal dry-off relative to days carried calf) or early dry-off (ED: target dried 14 d earlier than C). A third group, those cows judged to be carrying single fetuses but actually calving with twins, were assigned to a third group (undetected twins: U) at calving. After calving, use of BSt, movement through production groups, and breeding events were determined by the herd manager. A total of 71 cows were judged to be carrying twin fetuses based upon manual palpation, although 14 (20%) aborted prior to calving. Of those cows calving, 9 (16%) calved with single calves. Of the 121 cows calving with twins, only 48 (40%) had been judged to be carrying twins based upon manual palpation, and 18 (15%) were culled or died before 120 d of lactation. Cows that were dried early (ED) only tended to be dry 12 d longer than cows dried normally (C) (68 vs. 56 d; $P=.08$), even though they were actually dried off 15 d earlier (202 vs. 217 days carried calf; $P<.01$). There were no differences in production of milk (avg. = 47.8 kg/cow/d), or its components, among groups C, ED and U in the first 120 d of lactation and milk components were similarly unaffected (avg. fat = 3.74%). Manual palpation of pregnant cows resulted in a relatively low identification rate of cows carrying twins and a relatively high incidence of false positives. Early dry-off of cows carrying twin fetuses had no impact on their performance in the first 120 d of lactation.

Key Words: Twin, Dry-off, Early

1097 Dietary supplementation of polyunsaturated fatty acids affects the immune response in dairy cows during the transition period. N. Gagnon*, H.V. Petit, and M. Lessard, *Dairy and Swine R and D Centre, Lennoxville, Qc, Canada*.

The effects of dietary polyunsaturated fatty acids (PUFA) on the immune response of 21 primiparous and 27 multiparous pregnant Holstein dairy cows were studied during the transition period. Six weeks before calving, cows were randomly allotted to one of three dietary fat treatments: Megalac (MEG), micronized soybeans (SOY) or whole flaxseed (FLA) which are, respectively, rich in saturated fatty acids, n-6 or n-3 PUFA. On week 6 and 3 before parturition, cows were injected subcutaneous with ovalbumine (OVA) to measure the antibody (IgG) response in the serum and colostrum. Colostrum samples were collected at the first milking after calving and blood samples were taken 6, 3, and 1 wk before the expected date of calving and 1, 3, and 6 wk after calving. Mononuclear cells (PBMC) isolated from blood were cultured to evaluate the blastogenesis response to concanavalin A (conA) and the *in vitro*

productions of interferon- γ (IFN- γ), tumor necrosis factor- α (TNF- α), nitric oxide (NO), and prostaglandin E2 (PGE2). Multiparous cows fed SOY had a higher IgG level to OVA in colostrum than those fed FLA ($P < 0.001$) or MEG ($P = 0.06$). The IgG level to OVA in serum was unaffected by dietary fatty acids. The blastogenesis response of lymphocytes to conA was lower in multiparous ($P = 0.03$) and in primiparous ($P = 0.09$) cows on SOY than for those on FLA. Multiparous cows fed MEG had a similar ($P > 0.10$) blastogenesis response than cows fed SOY or FLA. However, primiparous cows fed MEG had a higher ($P = 0.09$) blastogenesis response than those fed SOY. There was no interaction week by diet ($P > 0.10$) for any *in vitro* measurements. The productions of NO and IFN- γ in multiparous cows and the production of TNF- α and IFN- γ in primiparous cows were significantly affected ($P < 0.05$) by week of the experiment. These data suggest that the immune response of primiparous and multiparous dairy cows during the transition period can be affected by dietary fatty acids and parturition.

Key Words: Dairy cow, Fatty acids, Immune response

1098 Energy balance (EB) during the transition period in high producing Holstein cows. M.A. McGuire*, B. Shafii, G. Orthel, and J.G. Giesy, *University of Idaho, Moscow.*

The transition period is associated with many metabolic changes that reflect mobilization of body energy reserves upon initiation of lactation. This period of negative energy balance, as it relates to energy intake and output in the form of maintenance and milk production, is associated with immunosuppression, periparturient disorders, and increased days to ovulation and first breeding. Previous estimates of time to energy balance range from 0 to 16 wk postpartum. Our objective was to determine the pattern of EB in cows during the transition period. Twenty multiparous cows were studied from freshening until 12 wk postpartum. Another 9 cows were followed from 4 wk prepartum to 12 wk postpartum. The cows were fed using Calan gates to measure feed consumption. Daily milk weights (2x) were obtained and milk composition was determined 2x/wk. Body weights and body condition scores were obtained weekly. Energy balance was calculated as the weekly mean of NE_L consumed (DM intake \times NE_L/kg DM) minus NE_L requirement (maintenance and milk). Milk production was 46.3 ± 7.7 kg/d over the 12 wk of lactation with peak yield of about 49 kg/d sustained from wk 4 to 10. DM intake averaged 26.2 ± 4.7 kg/d with maximum intake of 28 kg/d during wk 7 to 12. Energy balance was 11.3 Mcal/d prepartum and declined to #9.2 Mcal/d in the first wk after calving. Thereafter, EB increased after the first wk of lactation reaching positive EB in the fourth wk. Mean EB over the 12 wk of lactation was 2.8 ± 7.3 Mcal/d. Body condition scores declined after calving from 3.6 to 3.0 by wk 5 and did not change thereafter. Simple correlations demonstrated a strong relationship between DM intake and EB ($r = 0.75$, $P < 0.0001$) but no relationship between milk yield and EB whereas EB and body condition score were weakly related. In conclusion, EB can occur early in lactation in high producing cows but body condition score is not a great evaluator of EB. DM intake is the driving force behind the achievement of energy balance in early lactation.

Key Words: Energy balance, Lactation, Transition period

1099 Vitamin B12 metabolism and bioactivity during the transition period in the dairy cows. B. Graulet*¹, A. Desrochers², and C.L. Girard¹, ¹Dairy and Swine R&D Centre, *Agri-culture and Agrifood Canada, Lennoxville,* ²Faculte de Medecine Veterinaire, *St-Hyacinthe, Canada.*

Methionine synthase (MS, E.C. 2.1.1.13) and methylmalonyl-coenzyme A mutase (MCM, E.C. 5.4.99.2) are vitamin B12-dependent hepatic enzymes acting in protein synthesis and neoglucogenesis, respectively, two metabolic pathways which are especially important during gestation and lactation of the cow. The aim of the present study was to explain the decrease in hepatic MCM activity observed previously during the transition period of the dairy cow. Liver biopsies and blood samples were taken repeatedly 3 wk before calving and at 2, 4 and 8 wk of lactation from 12 multiparous cows randomly assigned to a control or a vitamin B12 supplemented diet (500 mg/d). For both treatments, MCM activity assayed spectrophotometrically from purified mitochondrial matrix decreased just after calving (315.92 ± 42.98 to 169.76 ± 21.53 nmol/min/g of fresh liver, $P = 0.0172$) then returned to the level observed before calving. Its holoenzyme fraction increased between wk 2 and 4 of lactation from 40 to 60 %. MS activity quantified chromatographically from purified cytosol raised (19.743 ± 1.976 to 29.161 ± 1.048 nmol/min/g of

fresh liver, $P = 0.0073$) 2 wk after calving in the liver of the vitamin B12 supplemented cows then returned to values observed 3 wk before calving. Its holoenzyme activity was close to 100 % whatever the period or the treatment. During the experimental period, vitamin B12 decreased in plasma (249.5 ± 23.8 to 167.6 ± 12.1 pg/ml, $P = 0.0006$) and milk (2308 ± 587 to 1451 ± 261 pg/ml, $P = 0.0613$) and remained stable in the liver of the control cows (857.41 ± 21.89 nmol/kg), but it increased in plasma (321.4 ± 23.7 to 738.0 ± 80.5 pg/ml, $P = 0.0219$), liver (940.7 ± 59.6 to 1296.6 ± 115.3 nmol/kg, $P = 0.0276$) and was strongly increased but stable in milk (4919 ± 349 pg/ml) of the vitamin B12 supplemented cows. In conclusion, the decrease in MCM activity after calving cannot be explained either by a competition with MS for vitamin B12 utilization, or by a low availability in vitamin B12 in the whole liver but inside the hepatic mitochondria.

Key Words: Vitamin B12, Cow, Liver

1100 Metabolic responses of lactating dairy cows to 14-day subcutaneous infusions of several dosages of glucagon. G. Bobe*¹, B. N. Ametaj², Y. Lu¹, D. C. Beitz¹, and J. W. Young¹, ¹Iowa State University, Ames, IA, ²Purdue University, West Lafayette, IN.

Fatty liver is a major metabolic disease of dairy cows in early lactation. Elevated liver triacylglycerol (TAG) concentrations can be decreased by 14-day continuous intravenous infusions of glucagon beginning at d 21 postpartum. We tested whether 14-day subcutaneous infusions of several dosages of glucagon decrease liver TAG concentrations. Multiparous Holstein cows ($n = 13$) were assigned randomly to 2 groups and received 0 (Normal; $n = 3$) or an extra 5 kg/d of cracked corn during the last 30 d of the dry period (Susceptible; $n = 10$). "Susceptible" cows were assigned randomly to 3 groups and received beginning at d 8 postpartum 0 (Saline Susceptible; $n = 4$), 5 (5 mg/d Glucagon; $n = 3$), or 10 mg (10 mg/d Glucagon; $n = 3$) glucagon in saline by subcutaneous infusions at 10 ml/h for 14 d. "Normal" cows (Saline Normal) received the same treatment as "Saline Susceptible" cows. Blood, liver, and milk samples were taken at d -4 (only blood and liver), 4, 8, 11, 14, 21, 28, 35, and 42 postpartum and were analyzed for plasma β -hydroxybutyrate (BHBA), glucagon, glucose, insulin, NEFA, and urea nitrogen (PUN), liver glucose, glycogen, and TAG, and milk fat, lactose, protein, and urea nitrogen (MUN). Subcutaneous glucagon infusions or feeding extra corn in the dry period affected none of the measured parameters ($P > 0.1$) except for plasma glucagon concentrations. Subcutaneous glucagon infusions increased plasma glucagon concentrations ($P < 0.1$); however, the plasma glucagon responses to glucagon injections were much smaller than during intravenous infusions (10 % of intravenous glucagon response) and not linear to the dosage infused. Furthermore, the plasma glucagon response decreased during the subcutaneous glucagon infusion period because of an inflammatory response and infections near the infusion site. We conclude that feeding an extra 5 kg/d cracked corn 30 d prior to calving are insufficient to induce fatty liver. Furthermore, we conclude that continuous subcutaneous infusions of 5 and 10 mg glucagon in saline at 10 ml/h for 14 d beginning at d 8 postpartum are not an effective treatment of fatty liver because of the small and nonlinear glucagon response to continuous subcutaneous glucagon infusions.

Key Words: Fatty liver, Glucagon, Corn

1101 E. coli O157:H7 intervention strategies for feedlot cattle. T. J. Klopfenstein*¹, D. R. Smith¹, R. A. Moxley¹, G. E. Erickson¹, J. D. Folmer¹, S. Hinkley¹, and C. N. Macken¹, *University of Nebraska, Lincoln, NE.*

E. coli O157:H7 prevalence in feedlot cattle is a major food safety concern. A feedlot study was conducted (May to September, 2001) to evaluate 3 *E. coli* O157:H7 intervention strategies: competitive exclusion microbials (2 *L. acidophilus* organisms, NPC 747 and NPC 750), diet change (starch removal) and pen cleaning. A finishing diet (33% high moisture corn, 20% dry rolled corn and 40% wet corn gluten feed, 7% alfalfa with vitamins, minerals, Rumensin and Tylan) was fed to 432 steers (340 kg) in 54 pens, 8 steers/pen. The design was a 3x2x2 factorial. The competitive exclusion products were fed daily to 18 pens each. Half the pens were cleaned monthly, the other half only at the end. Two weeks prior to slaughter, the diet was changed for half the cattle (corn bran replacing corn). Individual fecal samples were obtained monthly and 0, 1 and 2 weeks prior to slaughter. The samples were analyzed for *E. coli* O157:H7 using primary enrichment, immunomagnetic separation, culturing and confirmation with PCR. Neither the competitive

exclusion products nor pen cleaning affected steer performance ($P > 0.39$). Diet change reduced DMI ($P < 0.001$; 12.8 kg/d vs 11.5 kg/d) during the last 2 weeks and reduced ADG and efficiency for the entire feeding period ($P < 0.001$). Carcass weight was reduced 8.4 kg by diet change. Pen was the experimental unit for detection of *E. coli* O157:H7 and a pen was positive if any of the 8 steers was positive. Overall detection of *E. coli* O157:H7 was low (145/3024 animal-weeks). Pen cleaning and diet change had no effect on *E. coli* O157:H7 prevalence. Feeding the competitive exclusion products numerically reduced *E. coli* O157:H7 positive pens the week of marketing (44% vs 17%; $P = 0.10$). We conclude that pen cleaning and starch removal from the diet did not affect *E. coli* O157:H7 prevalence while feeding competitive exclusion products shows potential to reduce shedding.

Key Words: *E. coli* O157:H7, Diet, Competitive exclusion

1102 Effects of anionic and cationic diets fed in prepartum on blood parameters on peripartum of Holstein cows with different dry periods, associated or not with estradiol injection. L. Teixeira^{*1}, M. Gulay², D. Furtado¹, J. Perez¹, J. Souza¹, M. Liboni², and H. Herbert², ¹Universidade Federal de Lavras, ²University of Florida.

Effects of anionic and cationic diets fed in prepartum on blood parameters on peripartum of Holstein cows with different dry periods, associated or not with estradiol injection. Lucia de F.A.C.Teixeira¹, Mehmet S.Gulay², Daniel Furtadol, Juan R. O. Perez¹, Jose C. de Souza¹, Marcio Liboni², H. H.Head², Universidade Federal de Lavras¹, University of Florida².

The effects of anionic diets, associated or not with estradiol injection were evaluated in 30 days and 60 days dry period on hematocrit (HEMA), plasma protein (PP), glucose (GLU), insulin (INS), non esterified fatty acids (NEFA) changing concentrations were evaluated in plasma of 40 Holstein cows in peripartum. Cows were bled for 27 days in both, before and after calving. Forty cows were assigned randomly to one of six treatments, associated or not with estradiol injection, in a 2x2+2 factorial arrangement for 21 days in prepartum. Anionic or cationic diets were fed to cows in prepartum. After calving a standard dairy diet was fed to all cows postcalving more 21 days. The cows were under two different ranges of temperatures: lower temperatures and calved in autumn and over extreme temperatures and calved in summer. Anionic diets (-136 meq/kg of DCAD) associated or not with estradiol did not affect any blood parameters in any day dry period. The average means of parameter evaluated were under recommended concentrations. Neither higher nor lower temperatures affected the plasma composition evaluated, except to PP, which decreases around the calving, associated with decrease feed intake. However, after calving, a remarkable increasing of PP concentrations, suggesting that the diets supported the protein requirements in onset of lactation, when cows recovered feed intake. Both plasma INS and GLU were reduced around calving, suggesting an intensive utilization of GLU to produce lactose in onset of lactation, and exceeding glucose synthesis and absorption. Although NEFA concentrations were in expected range, they stayed high after first week [487,20; 537,10 ng/ml], even higher feed intakes were observed, but NEFA concentrations can not be considered as ketotic condition, supporting the positive effects of anionic diets on postpartum intake and consequently higher nutrient supplying to the cow.

1103 Effects of feedings soybeans and rumen protected choline during late gestation and early lactation on performance of dairy cows. W. A. Scheer^{*}, M. C. Lucy, M. Kerley, and J. N. Spain, *University of Missouri - Columbia*.

This study was designed to investigate the effects of soybeans and rumen protected choline (RPC; ReashureTM Choline, Balchem, Slate Hill, NY) fed during late gestation and early lactation on intake and production of dairy cows. Sixty-six Holsteins were blocked by parity and expected calving date and randomly assigned within block to one of six diets. Dietary treatments were fed from 25 days prepartum to 100 days in milk. Treatments were arranged as a 3 x 2 factorial design. Cows received no soybeans, soybeans beginning at calving, or soybeans for the duration of the study. Soybeans were fed raw, cracked beans at feeding rates of 1.9 and 2.8 kg DM per cow per day during pre- and postpartum periods, respectively. RPC was top-dressed once daily at a rate of 0 or 15 g dietary choline per cow per day. Cows were individually fed diets as total mixed rations using electronic feeding gates that allowed daily measurement of feed intake. Body weights and body condition scores were measured weekly throughout the study. Cows were milked twice

daily and milk yields were measured electronically. DMI measured during the pre- and postpartum periods were not different. Feed intake of all diets decreased during the last 3 days of gestation, but recovered quickly after calving. Soybeans did not alter milk yield during the first 50 days of lactation. Supplemental choline tended to increase daily milk yield (30.9 vs. 32.9 kg/d; $P < 0.14$). Changes in body weight and body condition score reflected normal changes for lactating dairy cows during these phases of production. Milk fat percentage was not different due to diet. Analysis of milk protein percentage included a significant interaction between the feeding of soybeans and RPC. Cows fed no soybeans prepartum had higher milk protein percentage when fed choline. Cows fed soybeans for the entire duration of the study had lower milk protein percentage when choline was added to the diet. These results indicate that soybeans can be fed during the prepartum period without adverse effects on animal performance. Supplemental choline tended to increase milk yield and improved milk protein percentage when soybeans were not fed prepartum.

Key Words: Transition cows, Soybeans, Rumen protected choline

1104 Body condition replenishment during the dry period and its effects on metabolic status and lactation of dairy cows. D. B. Carlson^{*}, M. S. Laubach, D. E. Schimek, W. L. Keller, J. W. Schroeder, and C. S. Park, *North Dakota State University, Fargo, ND, USA*.

The objective of this study was to examine the effects of replenishing body reserves during the dry period compared to increasing condition during late lactation (LL) on periparturient metabolic status and the subsequent lactation. Seven Holstein cows were stratified by parity, milk production, and body condition score (BCS) and assigned to one of two dietary treatments: 1) Control (C), and 2) Restriction (R). Control ($n = 3$) cows were fed according to NRC (2001) recommendations for ad libitum intake during LL (60 d), the far-off dry period (28 d), and the transition period (28 d prior to expected calving date, ECD). Restriction cows ($n = 4$) were fed an energy-restricted diet during LL to maintain BCS, and were fed a transition diet ad libitum during the entire dry period (56 d prior to ECD) to increase BCS. NE_L intake (Mcal/d) of the R group was 71% of that of C cows (23.9 ± 1.4 vs. 33.6 ± 4.5 , respectively) in the LL period. All cows were fed a common diet for 12 wk after calving. Body weight (BW) was determined twice weekly, while BCS was determined monthly before calving, and bi-weekly after calving. Blood samples were collected monthly prior to ECD, and d -7 to d 7, 28, 42, 56, 70, and 84 with respect to calving date. Dry matter intake (DMI) was determined daily until 28 d after calving. Control cows tended ($P < 0.10$) to gain more BCS in LL compared to R cows, while BCS increased ($P \leq 0.05$) during the dry period for R cows compared to C animals (2.94 to 3.5 vs 3.33 to 3.5). Treatment did not affect BW change ($P > 0.05$). DMI was greater ($P < 0.01$) during LL for C cows, however DMI was similar ($P > 0.05$) during the other periods. Milk and milk component yield was not affected ($P > 0.05$) by treatment. Serum non-esterified fatty acids and glucose were not altered ($P > 0.05$) by dietary treatment. Increasing body condition during the dry period does not affect metabolic status or the subsequent lactation of Holstein cows.

Key Words: Transition, Periparturient, Body condition

1105 The effect of monensin controlled release capsule at dry-off on calving-related disorders and milk yield in Holstein cows. P. Melendez^{*}, C. Risco, and A. Donovan, *University of Florida, Gainesville, FL, USA*.

The objective was to evaluate the effect of a monensin slow-release capsule given at dry-off on the incidence of calving-related disorders and milk yield on Holstein dairy cows. The study was conducted in a 3000-cow commercial Holstein dairy farm (milk RHA of 10,500 kg). Cows were housed in a dry-lot system, fed a total mixed ration and milked 3 times a day. Between July and August 2001, 580 cows dried-off 50 to 70 d before expected parturition were randomly assigned either a treatment or a control group. Treated group ($n=290$) received orally a capsule of monensin (releasing 300 mg of monensin daily for 95 days). Control cows (no capsule, $n=290$) were randomly matched by parity. The outcome variables were incidence of dystocia, retained fetal membranes, metritis, digestive disorders, displacement of abomasum, clinical ketosis and daily milk yield up to 20 d pp. Milk yield was analyzed by repeated measure ANOVA developing a mixed model. Each calving-related disorder was analyzed by logistic regression. Cows treated with monensin

were 2.1 times more likely to develop dystocia than control cows ($p \leq 0.01$). Treated cows correcting by dystocia were 0.2 times less likely to develop metritis ($p \leq 0.01$). There was no treatment effect for retained fetal membranes, displacement of abomasum, digestive disorders and clinical ketosis. For milk yield, within parity 1, treated cows without dystocia produced more milk than control cows without dystocia at d 5, 6, 10, 13, 14 and 19 ($p \leq 0.05$). However treated cows with dystocia produced less milk than control cows with dystocia at d 13 and 15 pp ($p \leq 0.05$). Within parity 2, treated cows produced more milk than control cows at d 3, 12 and 15 ($p \leq 0.05$). Within parity 3 or greater there was no interaction treatment by day effect ($p > 0.05$). It is concluded that although monensin increased milk production in certain days within parity 1 and 2, monensin also increased the incidence of dystocia and indirectly negatively might have affected milk yield within the first 20 d pp.

Key Words: Monensin, Milk yield, Calving-related disorders

1106 Replacing alfalfa silage with chopped alfalfa hay in a coarse barley silage based total mixed ration for dairy cows. M.S. Einarson*¹ and J.C. Plaizier¹, ¹Department of Animal Science, University of Manitoba.

Excess coarseness of barley silage based diets might constrain feed intake and production. The effect of replacing alfalfa silage with chopped alfalfa hay in a coarse barley silage based diet was investigated. Three total mixed rations (A,B,C) contained (DM basis) 34.6% coarse barley silage, 3.5% sunflower seeds, 33.6% commercial energy supplement and 14.7% commercial bypass protein supplement. Diets A, B, C varied in their inclusion rates (DM basis) of alfalfa silage (13.7%, 6.9%, 0%) and chopped alfalfa hay (0%, 6.9%, 13.7%). Diets were fed to 12 lactating dairy cows in 4 3 by 3 Latin squares with 3-week periods. Milk yield, milk composition, dry matter intake (DMI), rumen pH, and particle size (Penn State Particle Size Separator) were determined during the last week of each period. Replacing alfalfa silage with chopped alfalfa hay increased DM and CP contents, slightly increased NEL content and reduced soluble protein (SP) and NDF contents and particle size of the diet. The largest effect was on dietary physically effective NDF (peNDF) content. Replacing silage with hay increased DMI, reduced milk protein content, but did not affect rumen pH and milk yield. Diet B resulted in the highest milk fat content. The effect of replacing silage with fine chopped hay on feed intake can be explained by an array of factors, including dietary peNDF, moisture and fermentation product contents and digestibility. It is believed that the major constraint on DMI was the excess peNDF content of coarse barley silage. Reducing the peNDF content of coarse diets, e.g. by including finely chopped hay, can increase feed intake and, depending on the quality of this hay, also increase production.

	Diet				
	A	B	C	SE	P
DMI (kg/d)	19.1 ^b	20.4 ^{ab}	21.2 ^a	0.43	< 0.0005
Rumen pH	6.52	6.54	6.60	0.04	n.s.
Milk yield (kg/d)	33.3	32.1	32.3	0.68	n.s.
Milk fat (%)	3.02 ^b	3.31 ^a	3.08 ^b	0.07	<0.005
Milk protein (%)	3.04 ^a	2.91 ^{ab}	2.89 ^b	0.05	0.07
PSPSS					
Upper tray (%DM)	20.1	16.8	11.6		
Middle tray (%DM)	32.6	26.7	27.7		
Bottom tray (%DM)	47.4	56.5	60.7		
Upper tray (%As fed)	22.9	15.2	12.9		
Middle tray (%As fed)	30.9	26.2	27.3		
Bottom tray (%As fed)	46.2	58.7	59.8		
DM (%)	45.2	51.1	54.9		
CP (%)	14.1	16.3	15.7		
SP (% CP)	35.9	30.1	27.8		
NDF (%)	49.4	46.0	46.4		
NEI (Mcal/kg DM)	1.56	1.57	1.57		

^{a,b}: significant ($P < 0.05$)

Key Words: fiber, barley silage, dairy cows

1107 Effects of microbial inoculation of alfalfa haylage on milk production of dairy cows. V. J. Magalhaes¹, S. Manginelli¹, P. M. Meyer², and P. H. M. Rodrigues*¹, ¹Faculdade de Medicina Veterinária e Zootecnia, University of Sao Paulo, Brazil, ²Escola Superior de Agricultura Luiz de Queiroz, University of Sao Paulo, Brazil.

The results of using lactic acid bacteria in ensiling alfalfa for cattle has been conflicting. This study was conducted to evaluate the effects of microbially inoculated alfalfa haylage on milk production and composition. Twelve multiparous lactating dairy cows (Holstein, 135 DIM) were assigned to a cross-over design with two periods (12 animals/treatment). Treatments were alfalfa haylage (50% DM and 16.5% CP, on average) control or under inoculation with Silobac[®] product (*Lactobacillus plantarum* and *Pediococcus pentosaceus*). Silobac inoculant was chosen among 3 different inoculants and alfalfa among 5 different crops (corn, sorghum, sunflower, elephant-grass and alfalfa) which underwent a prior fermentation test and a in vivo digestibility assay with wethers and showed the best responses to microbial inoculation. Diet contained 50% roughage and 50% concentrate constituted of corn grain, extruded soybean and minerals. Diet was offered twice daily as total mixed ration. The experimental period extended for twenty-one days; the last five for dry matter intake evaluation and the last three for milk sampling. The inoculation did not influence DMI (inoculated = 17.8 kg/d vs. control = 17.8 kg/d), milk yield (23.0 vs. 22.4 kg/d), 4%-FCM (21.0 vs. 20.4 kg/d), milk fat (3.46 vs. 3.47% or 0.781 vs. 0.769 kg/d), milk protein (2.96 vs. 2.93% or 0.674 vs. 0.649 kg/d), lactose (4.64 vs. 4.67% or 1.073 vs. 1.049 kg/d), total solids (11.88 vs. 11.94% or 2.74 vs. 2.65 kg/d), SCC (5.43 vs. 5.16 log 10x3 cells/mL), MUN (11.65 vs. 12.07 mg/dL) or milk density (1030.08 vs. 1030.04 g/ml). These results do not permit recommendation of microbial inoculation of alfalfa haylage. Financial support: FAPESP (Sao Paulo, Brazil).

Key Words: Milk yield, Lactic acid bacteria, Lucerne

1108 The effect of microbial inoculation of alfalfa haylage on ruminal and total digestibility in dry cows. S. Manginelli¹, V. J. Magalhaes¹, P. M. Meyer², and P. H. M. Rodrigues*¹, ¹Faculdade de Medicina Veterinária e Zootecnia, University of Sao Paulo, Brazil, ²Escola Superior de Agricultura Luiz de Queiroz, University of Sao Paulo, Brazil.

The objective was to evaluate the effects of microbially inoculated alfalfa haylage on ruminal and total digestibility in ruminants. Twelve dry cows (Holstein, 670 kg BW) were blocked by body weight and assigned to two treatments: alfalfa haylage (60% DM and 19.5% CP, on average) control or microbially inoculated with Silobac[®] product (*Lactobacillus plantarum* and *Pediococcus pentosaceus*). Silobac inoculant was chosen among 3 different inoculants and alfalfa among 5 different crops (corn, sorghum, sunflower, elephant-grass and alfalfa) which underwent a prior fermentation test and a in vivo digestibility assay with wethers and showed the best responses to microbial inoculation. Diet contained 50% roughage and 50% concentrate constituted of corn grain, extruded soybean and minerals. Diet was offered twice daily as a total mixed ration. In vivo total digestibility was evaluated using chromic oxide and rumen degradability by the nylon bag technique. The experimental period extended for 21 days, the last 10 for adaptation to chromic oxide and the last 5 for feces collection and incubation of bags. The inoculation did not influence total digestibility of DM (inoculated = 70.0% vs. control = 71.2%), CP (72.3% vs. 73.0%), EE (77.0% vs. 76.8%), NFE (74.4% vs. 77.7%), CF (65.4% vs. 60.4%), NDF (61.2% vs. 55.9%), ADF (66.8% vs. 61.8%), gross energy (72.5% vs. 73.7%), TDN (70.6% vs. 71.8%), and DMI (2.6% vs. 2.4% of BW), but it decreased ruminal effective degradability of DM (54.1% vs. 58.6%), CP (79.9% vs. 82.5%) and NDF (29.8% vs. 34.5%), assuming a passage rate of 0.05 (5%/h). These results do not permit recommendation of microbial inoculation of alfalfa haylage.

Key Words: Digestion, Lactic acid bacteria, Lucerne

1109 Effect of feeding carrot pulp silage on digestibility, performance and immune response of sheep. F.T. Sleiman*, R.K. Sarkis, E.K. Barbour, M.G. Uwayjan, and M.N. Nimah, American University of Beirut.

Evaluation of the nutritive value of carrot pulp silage (CPS) and its effect on immune response was made using 12 Awassi ram lambs (60

kg BW) in a 3-wk digestibility study with 1-wk collection period. The experimental treatments were: I)100% barley silage (BS) as control, II)100% CPS, III) 70% CPS +30% ground yellow corn (GYC) and IV) 60% CPS + 40% GYC. All lambs had ad libitum access to the different silage treatments in addition to 1 kg/h/d of a concentrate mixture (14% CP on DM basis). Furthermore, at the beginning of the study, all lambs were subcutaneously injected with 2cc of 50% concentrated chicken RBC as a source of antigen. Blood samples were collected from all animals on days 1,14 and 21 of the experiment. Silage DMI of treatment III was not significantly different ($p>0.05$) from the control (749 Vs 601g/d) but was significantly ($p<0.05$) higher than that of treatments II and IV (389 and 314g/d,respectively). Apparent DM digestibilities of the CPS treatments were significantly ($p<0.05$) higher than that of the BS (78.7, 81.3 and 76.6 Vs 69.2% for treatments II,III,IV and I, respectively). Treatment II had the highest CF digestibility which was only significantly different ($p<0.05$) from treatment IV (65.7 Vs 44.4%). The ADF and NDF digestibilities were not different ($p>0.05$) among treatments. EE digestibility of treatment III was significantly ($p<0.05$) higher than those of treatments I and II (86.6 Vs 72.6 and 73.4%,respectively). The hemagglutination results indicated that the immune response of treatment I at d 21 was significantly ($p<0.05$) higher than that observed at day 1 and 14 (136 Vs 10 and 18,respectively). The high blood titer of the BS treatment detected at d 21 was not different ($p>0.05$) from that of treatments III and IV (136 Vs 40 and 48, respectively). All experimental lambs gained weight by the end of the study. However, BW change was highest for treatments III and I (257 and 240g/d, respectively) which were significantly ($p<0.05$) higher than treatment IV (71g/d). Results indicate that CPS is acceptable to sheep and is efficiently digested with a favorable immune response when properly ensiled and adequately supplemented.

Key Words: Carrot pulp silage, Digestibility, Immune response

1110 Effects of replacing dietary alfalfa silage with formate-treated alfalfa silage or red clover silage on milk production and nutrient utilization in dairy cows. G. A. Broderick* and W. J. Radloff, U.S. Dairy Forage Research Center, Madison, WI.

Fifteen Holstein cows averaging 256 DIM were blocked by parity and DIM and randomly assigned to 5 squares in a 3x3 Latin square trial and fed TMR containing (DM basis): 40% control alfalfa silage (CAS), 20% corn silage, 33% high moisture corn, 6% soybean meal (18% CP); 40% ammonium tetraformate-treated alfalfa silage (TAS), 20% corn silage, 33% high moisture corn, 6% soybean meal (18% CP); or 54% red clover silage (RCS), 6% dried molasses, 33% high moisture corn, and 6% soybean meal (16% CP). All diets contained 33% NDF and 38 to 40% NFC. Hay-crop silages differed ($P < 0.01$) in NPN and ADIN (% of total N): 49 and 4% (CAS); 45 and 4% (TAS); and 28 and 17% (RCS). Periods were 4-wk long; data were collected during the last 2-wk of each period and analyzed using proc mixed in SAS. Means separated using a protected LSD ($\alpha = 0.05$) are reported below. Replacing CAS with TAS (with lower NPN) increased DMI, yield of milk, FCM, protein, and SNF, and DM- and N-efficiency. Replacing CAS with RCS (with lower NPN but higher ADIN) also increased DMI and N-efficiency but did not increase yield. Replacing CAS or TAS with RCS lowered MUN and milk NPN, increased apparent digestibility, and diverted N excretion from urine to feces.

Item	CAS	TAS	RCS	SE	P ¹
DMI, kg/d	24.0 ^b	25.0 ^a	24.9 ^a	0.8	< 0.01
BW gain, kg/d	0.31	0.44	0.64	0.16	0.37
Milk, kg/d	27.8 ^b	30.2 ^a	28.4 ^b	1.0	0.01
Milk/DMI	1.16 ^{ab}	1.20 ^a	1.15 ^b	0.03	0.05
Milk N/NI, %	21.1 ^b	22.4 ^a	22.3 ^a	0.4	0.01
3.5% FCM, kg/d	30.3 ^b	32.4 ^a	30.0 ^b	1.2	0.04
Fat, %	4.20 ^a	3.96 ^b	3.95 ^b	0.15	< 0.01
Fat, kg/d	1.14	1.19	1.10	0.06	0.08
Protein, %	3.40 ^a	3.43 ^a	3.29 ^b	0.08	< 0.01
Protein, kg/d	0.93 ^b	1.03 ^a	0.92 ^b	0.04	< 0.01
SNF, %	9.05 ^{ab}	9.12 ^a	8.99 ^b	0.12	0.02
SNF, kg/d	2.48 ^b	2.75 ^a	2.52 ^b	0.10	< 0.01
MUN, mg/dl	17.8 ^a	18.0 ^a	13.8 ^b	0.4	< 0.01
Milk NPN, mg/dl	30.5 ^a	30.9 ^a	23.7 ^b	0.4	< 0.01
Dry matter digestibility, %	57.0 ^b	56.6 ^b	63.3 ^a	1.2	< 0.01
NDF digestibility, %	35.5 ^b	35.6 ^b	53.2 ^a	1.1	< 0.01
Fecal N, kg/d	0.298 ^b	0.318 ^b	0.351 ^a	0.015	< 0.01
Urinary N, kg/d	0.232 ^b	0.231 ^b	0.156 ^a	0.011	< 0.01

¹Probability of significant effect of diet. ^{a,b}Means in rows without common superscripts are different ($P < 0.05$).

Key Words: silage, alfalfa, red clover, ammonium tetraformate

1111 Milk from forage as affected by degradability of carbohydrates in the rumen with alfalfa silage-based rations. E. Charbonneau*¹, P.Y. Chouinard¹, G. Allard¹, H. Lapierre², and D. Pellerin¹, ¹FSAA, Université Laval, Qc, Canada, ²AAC, Lennoxville, Qc, Canada.

To optimize the production of milk from forage (MF), previous studies pointed to a better adequacy between the concentrates and the forage served. With alfalfa silage, increasing the rumen degradability of carbohydrates (CD) should lead to a better use of RDP in forages. To evaluate this concept, eight multiparous Holstein cows in early lactation were used in a replicated 4x4 Latin square design with 3-wk periods. Diets were fed as TMR and formulated to provide similar concentrations of NEL and CP while differing in CD. Treatments were: 1) cracked corn (control, low CD), 2) ground corn (medium CD), 3) ground corn plus starch (high CD), 4) ground corn plus dry whey permeate (high CD). Compared to control (22.7 kg/d), DMI increased (24.4 kg/d; $P<0.01$) with ground corn or corn and starch, but dry whey permeate resulted in the highest DMI (25.7 kg/d; $P<0.01$). Milk production with dry whey permeate (35.8 kg/d) was lower than with ground corn or corn and starch (37.5 kg/d; $P<0.01$) but higher than the control (34.0 kg/d; $P<0.01$). Milk fat content was higher with dry whey permeate (3.88%) and lower with corn and starch (3.49%; $P=0.08$); ground corn (3.55%) and control (3.82%) had intermediary values. No changes were observed in protein concentration (3.31%). Treatments had no effects on MF calculated on an energy basis, but ground corn and the corn and starch treatments increased MF calculated on a protein basis (13.2 vs 9.6 kg; $P<0.01$). Overall MF production was higher than control for these last two treatments (7.8 vs 4.7 kg; $P=0.09$). Rumen pH was not affected by treatments. Milk urea was higher with the control diet (13.4 mg/dl; $P<0.01$) compared to the other three treatments (10.1 mg/dl). Increasing CD allowed a better use of N without disturbing ruminal function. Results emphasize the advantages of increasing CD in the rumen to improve the production of milk from forage when feeding silage with high RDP.

Key Words: Milk from Forage, Carbohydrate Degradability, Alfalfa Silage

1112 Effect of different roughages conserved in silage form on the nutrient intake, digestibility and milk production of lactating cows. E.S. Pereira*¹, A.M.V. Arruda¹, L.F. Miranda³, L.F. Silva², I.Y. Mizubuti², A. Kraap¹, J.C. Barreto¹, M.A. Syperreck¹, and A.M. Fernandes⁴, ¹UNIOESTE Universidade Estadual do Oeste do Parana, ²Universidade Estadual de Londrina, ³Universidade Federal de Minas Gerais, ⁴Universidade Federal de Viçosa.

The objective of this study were evaluate the effect of different roughages on the nutrient intake and total apparent digestibility of the dry matter (DM), crude protein (CP), organic matter (OM) ether extract (EE), neutral detergent fiber (NDF), total carbohydrates (TC) and non structural carbohydrates (NEC), milk composition and milk production. There were used 12 holstein lactating cows with mean of 30 kg milk production, feeding with three experimental diets, (first) composed by 50 percent of corn silage and 25 percent of ryegrass silage and 25 percent of barley silage; (second) composed by 50 percent of ryegrass silage and 25 percent of corn silage and 25 percent of barley silage; (third) 50 percent of barley silage and 25 percent of corn silage and 25 percent of ryegrass silage. The experiment followed a change over arrangement in the latin square 3 for 3 with extra period. The DM, OM, EE and NDF intakes were not influenced by the roughages sources. The CP intake and total apparent digestibility of the DM, OM, CP, NDF and TC were higher (0.01 probability percentage) for the diets with 50 percent of ryegrass silage. The corrected milk production, or not, for 3.5 percent of fat, the fat and protein milk level, and the feeding efficiency (milk production kg/DM intake kg) were not influenced by the experimental diets.

Key Words: digestibility, intake, milk production

1113 Ingestive behaviour of lactating cows feeding with different roughages conserved in the silage form. Elzania S. Pereira*¹, Alex M.V. Arruda¹, Lidia F. Miranda³, Leandro F. Silva², Ivone Y. Mizubuti², Andre Kraap¹, Julio C. Barreto¹, Mirna A. Syperreck¹, and Alberto M. Fernandes⁴, ¹UNIOESTE Universidade Estadual do Oeste do Parana, ²Universidade Estadual de Londrina, ³Universidade Federal de Minas Gerais, ⁴Universidade Federal de Viçosa.

The objective of this study was to evaluate the effect of different roughages on the ingestive behavior of lactating Holstein cows. The cows met between second and third lactation and were in individual stalls, like a tie stall. The experiment followed a change over arrangement in latin square 3 for 3 with an extra period. Twelve lactating Holstein cows with mean of 30 kg milk production, were fed three experimental diets, (first) composed by 50 percent of corn silage and 25 percent of ryegrass silage and 25 percent of barley silage; (second) composed by 50 percent of ryegrass silage and 25 percent of corn silage and 25 percent of barley silage; (third) composed by 50 percent of barley silage and 25 percent of corn silage and 25 percent of ryegrass silage, and all treatments were supplemented with concentrate ration. The animals were submitted to the visual observation every 14 days to evaluate the ingestive behavior, during two consecutive days on the four experimental periods. In the first day of observation the animals were evaluated during three periods of two hours (8 at the 10 hours; 14 at the 16 hours; and 18 at the 20 hours), and the average number of chews ruminating per bolus and the average time spent for this physiological process, being used digital chronometer. In the second day, the ingestive behavior of each cow was determined visually, to intervals of five minutes, for 24 hours, for determination of the time spent feeding and ruminating. There was no significant difference (0.05 probability percentage) for time spent on the feeding and rumination (minutes/day), feeding efficiency and rumination (gDM/h and gNDF/h) of the cows in relationship to the experimental rations. There were no significant differences (0.05 probability percentage) for the number of meals/day, as well as for number of rumination periods. The mean number of 8.31 meals/day was observed, with duration of 36.20 minutes on average and mean of 12.67 rumination periods/day. The ingestive behavior of the lactating cows was not influenced by the dietetic roughages sources.

Key Words: ingestive behavior, ruminations chews, silages

1114 Corn silage chop length and long hay effects on intake, chewing activity, and digestion in early lactating dairy cows. J. Couderc*¹, D. Rearte², G. Pieroni², F. Santini², O. Di Marco², and G. Eyherabide², ¹CONICET / PGPA INTA Balcarce-UNMdP, Argentina, ²INTA Balcarce-UNMdP, Argentina.

Five cannulated Holstein cows (24 DIM, initial BW = 575 Kg) in a 5x5 latin square were used to test the effects of two corn silage (CS) chop lengths: 6 mm (FCS) and 23 mm (MCS), and addition of long hay (H) on DMI, chewing, ruminal fermentation, and in situ degradation of CS DM and NDF. Treatments were five TMRs: FCS with H at 0% (F0), 5% (F5), and 10% (F10), and MCS with H at 0% (M0), and 5% (M5). Treatment NDF contents were 32.3%, 32.6%, 38.3%, 33.4%, and 34.7% for F0, F5, F10, M0, and M5, respectively. The DMI tended to be higher in F0 than in M0 ($P < 0.1$), decreased with the H level in FCS diets, and increased with the H level in MCS. Ruminating time tended to be lower ($P < 0.1$) with the addition of 5% H on MCS. Acetic:propionic ratio tended to be higher ($P = 0.11$) in M0. MCS diets had higher ruminal pH ($P < 0.05$) lower NDF degradation Lag time ($P = 0.13$) and higher NDF degradation rate constant ($P < 0.1$). These results suggest that shorter chop length could improve DMI, that the addition of H to FCS has no benefits in ruminal environment and digestion, while depressing the DMI, and that addition of H to MCS could improve ruminal digestion of NDF allowing a high intake, perhaps because of a faster disappearance of NDF from the rumen, which could reduce the filling effect of the diet and the need for rumination.

	Treatments						P value			
	F0	F5	F10	M0	M5	SEM	C ¹	HLF ²	HQF ³	HM ⁴
DMI, Kg x d ⁻¹	25.0	23.1	21.7	22.7	27.1	0.8	0.06	0.01	NS	0.001
Ruminating, min x d ⁻¹	411	430	380	416	432	28.4	NS	NS	NS	0.09
pH, mean	5.7	5.6	5.7	5.8	5.9	0.6	0.02	NS	NS	NS
A:P ⁵ Ratio	2.6	2.9	2.5	3.9	2.8	0.5	0.11	NS	NS	NS
NDF disappearance PD ⁶ , %	51.5	50.2	53.0	53.1	43.5	4.8	NS	NS	NS	NS
K ⁷ , % x h ⁻¹	2.2	2.0	2.9	2.0	4.4	0.8	NS	NS	NS	0.05
Lag, h	8.9	7.8	9.5	3.8	3.2	2.3	0.13	NS	NS	NS

¹C: Effect of CS chop length in diets without H, ²HLF: linear effect of H addition on FCS diets, ³HQF: quadratic effect of H addition on FCS diets, ⁴HM: effect of H addition on MCS diets, ⁵A:P: acetic:propionic. ⁶PD: Potentially digestible NDF. ⁷K: NDF digestion rate constant. NS: $P > 0.15$.

Key Words: corn silage chop length, hay addition, NDF digestion

1115 Corn silage of different chop length as base of mid lactation dairy cows rations 1. Effect on dry matter intake, milk production, live weight gain and body condition score. P. Gregorini*, F. J. Santini, H. H. Fernandez, and D. H. Rearte, *Universidad Nacional de Mar del PLata. INTA, Balcarce, Buenos Aires/ Argentina.*

The objectives were to evaluate the effects of two different chop lengths of unprocessed WPCS as a base of mid-lactation dairy cows rations. The experiment was carried out to assess, DMI, milk production and composition, live weight gain (LWG) and body condition score (BCS). Sixteen multiparous mid-lactation dairy cows were assigned to two treatments in a completely randomized design for a period of 76 days. The treatments were: Fine (FCH) and Coarse Chop Length (CCH), with 6 and 24 mm of theoretical length of cut (TLC) respectively. The TMRs had (DM basis) 60% of WPCS, 19% of sunflower meal, 19% corn grain, 1% of urea and 1% of minerals salts. Their average chemical composition was similar: DM 42.3%, crude protein 16.8%, *in vitro* DM digestibility (IVDMD) 65%, NDF 34.9%, ADF 22.1% and starch 24.4%. Reducing WPCS chop length increased DMI and LWG. However there were not change in BCS and milk production and. These results suggest that in this situation there are not productive advantages, in the short term, about the reduction of UWPCS chop length.

Item	FCH	CCH	SEM	p value
Milk (kg/d)	25.1	24.5	3.35	0.71
Fat (%)	3.6	3.7	0.03	0.63
Protein (%)	3.5	3.5	0.05	0.85
Lactose (%)	4.8	4.9	0.09	0.7
DMI (kg DM/cow/d)	27.3	26.4	0.01	0.001
LWG (kg)	31	13.4	0.2	0.01
BCS (pts)	0.26	0.28	0.2	0.4

Key Words: Corn Silage, Chop Length, Milk Production

1116 Corn silage of different chop lengths as a base of mid-lactation dairy cow rations. 2. Effect on the ruminal environment and chewing activities. P. Gregorini*, F. J. Santini, H. H. Fernandez, and D. H. Rearte, *Universidad Nacional de Mar del Plata, INTA, Balcarce, Buenos Aires/ Argentina.*

The objectives were to evaluate the effects of two different chop lengths of unprocessed whole plant corn silage (WPCS) as a base of mid-lactation dairy cows rations on total chewing time (TCHT), eating time (ET), rumination time (RT), pH, N-NH₃, and volatile fatty acid (VFA) concentration in rumen liquor. Four multiparous mid-lactation dairy cows were used in a 2 x 2 crossover design with two 15-d periods and two treatments. The treatments were: Fine (FCH) and coarse chop length (CCH), with 6 and 24 mm theoretical length of cut (TLC), respectively. The TMR had (DM basis) 60% of WPCS, 19% of sunflower meal, 19% corn grain, 1% of urea and 1% of minerals salts. The average chemical composition was similar: DM 42.3%, crude protein 16.8%, *in vitro* DM digestibility (IVDMD) 65%, NDF 34.9%, ADF 22.1% and starch 24.4%. Reducing WPCS chop length decreased pH and acetic acid concentration, possibly as a consequence of a trend for less RT. These results show the lower physical effectiveness of fine chop WPCS NDF. Nevertheless it could be enough to maintain rumen health and milk fat percentage.

Item	FCH	CCH	SEM	p value
pH	6	6.2	0.09	0.04
NNH ₃ (mg/dl)	31.9	35.9	1.4	0.12
Total VFA (moles/L)	72.9	67.8	3.2	0.62
Acetate (moles/100 moles)	60	62.7	0.08	0.05
Propionate (moles/100 moles)	22.4	19.9	1.34	0.12
Butirate (moles/100 moles)	12.4	12	0.45	0.2
Others (moles/100 moles)	5.2	5.6	0.47	0.43
TCHT (min/d)	793	813	39.5	0.54
ET (min/d)	360	353	12.3	0.64
RT (min/d)	433	465	24	0.15

Key Words: Corn Silage, Chop Length, Rumen Environment

1117 Replacing corn silage with sorghum silage to supplement growing steers grazing high quality pastures: effects on ruminal fermentation and nutrient digestion. L. O. Abdelhadi*^{1,2,3} and F. J. Santini, ¹Fac. Cs. Agrarias-UNMDP, ²INTA EEA Balcarce, ³CONICET - Argentina.

Other studies showed that starch from grain sorghum hybrids was less digestible than starch from corn hybrids, when silage was made without rolling. In order to improve digestibility and to achieve corn silage (CS) responses in beef cattle, grain sorghum silage (SS) must be rolled. The aim of the experiment was to evaluate if replacing CS with SS would affect ruminal fermentation and nutrient digestion of grazing steers. Forty-two British steers (9 months age and 187±26 kg) were assigned to one of three treatments in a randomized design: TP, fresh pasture ad libitum; TCS or TSS, with pasture plus CS or SS, both fine chop and rolled at dough grain stage, representing 40% of the total diet (on a DM basis), respectively. Two paddocks (reps) per treatment and 7 animals per rep were used. All steers grazed in a one-day strips throughout 115 days mixed pastures (70% grass and 30% legumes), with 2975 kg DM/ha availability, 16.0% DM, 22.3% CP, 35.8% NDF and 74.6% IVDMD. Supplements contained 6.1 and 6.7% CP, 50.9 and 42.9% NDF, 13.7 and 22.9% starch, 64.7 and 51.5% IVDMD; and were fed once daily (8h), before steers returned to pasture, for CS and SS, respectively. Four hours after supplementation, fecal (F) and rumen (R) (stomach tube) samples, were taken from all (F) or two (R) steers per rep, twice along the experiment; to determine apparent digestibility and ruminal fermentation parameters, respectively. SS could replace CS without affecting ruminal fermentation, but it reduced starch digestibility. This shows the importance of processing SS if performance similar to CS is expected.

Item	TP	TCS	TSS
Digestibility, %			
DM	72.6 ^a	69.9 ^{ab}	68.0 ^b
CP	83.9 ^a	72.3 ^b	71.7 ^b
Starch	99.6 ^a	98.7 ^a	83.9 ^b
VFA, mmol/L			
Total	100.2	107.2	100.3
Acetate	63.2	68.0	63.7
Propionate	18.4	19.9	18.5
n-Butyrate	10.8	11.7	10.7
A:P ratio	3.51	3.41	3.43
pH	6.74	6.69	6.72
N-NH ₃	24.9 ^a	17.7 ^{ab}	15.9 ^b

^{abc}Means within a row with unlike superscripts differ ($P < .05$)

Key Words: Sorghum Silage, Ruminal Fermentation, Digestibility

1118 Effects of replacing corn silage with superior third of cassava foliage silage on the production of dairy cows. E.C. Modesto¹, G.T. Santos*¹, J.C. Damasceno¹, C.C. Jobim¹, E. Detmann³, and H.V. Petit², ¹Universidade Estadual de Maringa, ²Agri Food Canada, ³Universidade Federal de Vicosa.

The objective of the experiment was to study the effects of replacing corn silage with the superior third of cassava foliage silage (STCFs) on the production of dairy cows. Twelve lactating dairy cows were used in a randomized block design to evaluate feed intake, digestibility, milk production, and milk composition. Substitution levels of corn silage with STCFs were 0, 20, 40, and 60 (%) (DM basis) and all diets were isonitrogenous and isoenergetic. The experiment was conducted at the Experimental Farm of Iquatemi of the State University of Maringá in Brazil. The parameters studied were: intakes of DM, OM (OMI), CP (CPI), NDF (NFDI), total carbohydrates (TCI), non fibrous carbohydrates (NFCl), all expressed in kg per day; intakes (%) of live weight) of DM (DMILW), OM (OMILW), CP (CPIW), NDF (NFDILW), indigestible neutral fiber detergent (INFDILW); apparent digestibilities of DM (ADDM), OM (ADOM), CP (ADCP), NDF (ADNFD), total carbohydrates (ADTC), non fibrous carbohydrates (ADNFC); 4 (%) FCM yield, pH, acidity, density, fat, protein, lactose, total solid and urea in milk. Substitution of corn silage with STCFs had generally no effect ($P > 0.05$) on measurements. However, there was a linear decrease in ADCP ($P < 0.01$), CPI ($P < 0.10$) and milk density ($P < 0.02$) as the level of substitution increased in the diet. The data suggest that superior third of cassava foliage silage is a good replacement for corn silage.

Key Words: Cassava, Milk, Production

1119 Influence of genotype and infestation with European corn borer for nutritive value and quality of fresh and ensiled material from Bt and non-Bt corn hybrids. G. P. Munkvold, M. A. Faust*, and J. A. Schnitzler, *Iowa State University, Ames, Iowa.*

Objectives were to determine mycotoxin levels and composition for fresh and ensiled Bt (MON810 event) and isoline non-Bt corn hybrids. Five replicates of each of four hybrids (Bt and non-Bt for 2 genetic backgrounds) were planted on May 9 and harvested on September 4 when kernels were approximately 1/3 milkline. At harvest, samples of kernels and chopped fresh whole-plant material were evaluated for mycotoxins. Fresh sub-samples of chopped material were frozen for subsequent compositional analyses. Also, 2-3 replicates per sample of chopped whole-plant corn were ensiled using PVC mini silos. After a minimum of 60 d, ensiled material was removed from mini silos and frozen in ziploc bags. Levels of fumonisin B₁ were higher in kernels than in whole plants or silage, and for kernels were lowest for Bt hybrids. Fumonisin B₁ levels did not differ in silage for Bt and non-Bt hybrids, but were higher for silage (6.1 µg/g) than for fresh chopped whole-plant corn (2.7 µg/g). Levels of other mycotoxins were negligible. For silage and fresh samples, presence of the Bt gene was unimportant for most compositional and fermentation measures ($P > .05$). Silage pH was 3.8 ± 0.02 and 3.9 ± 0.02 for samples that were naturally and manually infested with European corn borer larvae, respectively ($P < .05$). Levels for several measures of fermentation products including pH and acetic and iso-butyric acids

were influenced by genetic background of hybrids ($P < .05$). Differences between fresh and ensiled samples for composition generally were not influenced by hybrid genotype or presence of the Bt transgene ($P > .05$). Findings suggest that levels of fumonisin B₁ mycotoxin increased during the ensiling process and further that fermentation end products may be influenced by genetic background of corn hybrids and infestation with European corn borer larvae. Also, the presence of the Bt transgene in corn hybrids did not influence compositional measures and fermentation end products for corn silage.

Key Words: transgenic-plants, fumonisin, *Bacillus-thuringiensis*

1120 Fermentation of non-pasteurized whey with probiotic Lactobacilli for calf feeding. M. Montero*¹, F.I. Juarez¹, B.I. Escudero², and H.S. Garcia², ¹CIRGOC-INIFAP, ²UNIDA-Instituto Tecnológico de Veracruz.

The Lactoperoxidase system (LPS) was used on natural whey to reduce microbial counts. Four different probiotic Lactobacilli species were inoculated and the whey fermented. Analyses of pH, titratable acidity,

fat and protein content and total soluble solids were performed, along with total plate count and coliform count. Whey was obtained from nine small rural cheese plants near the city of Veracruz which manufacture cheese from raw milk. The LPS was activated using ratios of sodium thiocyanate:hydrogen peroxide of 1:1, 1:2, 2:2 and 2:1, using as ratio 1:1 the equimolar concentrations of 0.25 mM of the two reagents. Results were analyzed by one-way ANOVA. Non-pasteurized whey was inoculated with *L. acidophilus*, *L. casei*, *L. reuteri* or *Bifidobacterium sp.*, fermented at ambient temperature and populations were monitored for 72 h. Results showed a variation coefficient between 13 and 4% in composition of the different wheys, with elevated coliform count (ca. 3.3×10^6 cfu/ml). There was no difference between the thiocyanate:peroxide ratios used to activate the LPS, and only a reduction of 1 log cycle of the coliform count was achieved at best. The probiotic strains reached maximum populations (near 107 cfu/ml) between 18 and 36 h; however these populations started to decrease after 48 h and almost disappeared after 72 h. Coliform count decreased to 1×10^3 at 24h and disappeared after 36h. It is concluded that fermented raw whey could be used for calf feeding studies before 48 h post-inoculation.

Key Words: probiotics, lactoperoxidase, whey

Swine Species

1121 Comparing profiles of piglet mortality when administering medium-chain triglycerides, colostrum, oxygen and additional heat. H. Y. Zhang, B. Szkotnicki, M. Z. Fan, V. Osborne, and R. R. Hacker*, *University of Guelph, Guelph, ON, Canada.*

The objective of this study was to reduce piglet mortality during the first 7 d of life by administering medium chain triglycerides (MCT; Ultimate Nutrition, Inc. USA) and bovine colostrum (Col; Zenith Technology Ltd., NZ.) products with supplemental oxygen and/or additional heat. Sows were moved to farrowing crates by d 109 of gestation, and fed a 14% CP corn-soybean meal diet. The farrowing room was maintained at 21C or above and the creep heat zone was maintained above 35C with a 175W IR heat lamp. One hundred and eight sows and respective litters were assigned to an oxygen group (O₂; piglets administered 10-min of 40% oxygen), a heat group with 175W IR heat lamp positioned directly behind the sow (H; the farrowing zone maintained above 31C), or a control group (C). After farrowing, all piglets were randomly force-fed 6 ml of one of following treatment products: (1) water (W), (2) MCT, (3) Col, or (4) MCT plus Col (Mcol). The analysis of variance for 7 d weight gain (WG) was performed with the GLM procedure of SAS. LSD for percentage was used in analyzing the difference in total mortality over the 7 d of life between groups and treatments. The results confirm our earlier discovery that O₂ improved piglet survival whether within litter or between litters ($P < 0.01$). The H reduced piglet mortality by 20% when compared with C ($P > 0.05$). Piglet mortality to 7 d of age with BW under 800 g was different ($P < 0.01$) for the C (83.3%), vs. H (16.7%), and for O₂ (12.5%). MCT and Mcol did not assist in reducing piglet mortality, but Col itself reduced piglet mortality ($P < 0.05$). All piglet treatment products did not influence WG, but H achieved an increase ($P < 0.05$) over the C group. It can be concluded that O₂ is the most effective means for improving piglet survival; an additional heat lamp positioned at the rear of the sow during farrowing is an efficient and practical means for saving small piglets.

Key Words: Oxygen, Heat, Medium-chain triglycerides, Colostrum, Temperature, Piglets, Mortality

1122 Use of a natural carbon-mineral supplement in swine diets: effects on pig growth. S. W. Kim*, F. Ji, and J. J. McGlone, *Texas Tech University.*

A natural, carbon-mineral source (NCM) is a feed supplement that is mined and minimally processed (Promax#, HumaTech, Inc., Houston, TX). Carbon compounds include humic acid, fulvic acid, and other organic compounds and minerals include bioavailable iron and other trace minerals. One hundred twenty pigs, weaned at d 21 of age, were used to determine the effect of NCM on growth performance of pigs from the nursery to growing period. At weaning, pigs were allotted to one of three treatments. Treatments were control, 0.5% NCM supplementation, and 1.0% NCM supplementation. Each treatment had eight replications and each pen-replicate had five pigs. During the nursery period, pigs were

fed based on a three-phase feeding program. Phase 1 was 1-wk post-weaning, phase 2 was 2-wk after phase 1, and phase 3 was another 2-wk after phase 2. Body weight and feed intake were measured weekly. All pigs had free access to diets and water. After a 5 wk nursery period, pigs were moved to a grower facility and two pen-replicates were combined to 4 pen-replicates per treatment. Body weight and feed intake were measured twice during the growing period. Two-phase feeding program was applied to growing pigs. Phase 4 was 48 d after phase 3 and phase 5 was another 15 d after phase 4 until pigs reached 60 kg body weight. There was no difference in average daily gain and feed intake during the phase 1 and 2. However, pigs fed a diet containing 0.5% NCM had a greater ($P < 0.05$) ADG during phase 3 than pigs in other treatments. Average daily feed intake was the same among treatments during phase 3. Gain/feed was greater ($P < 0.05$) in pigs fed a diet containing 0.5% NCM than other treatments during phase 3. There was no difference in average daily gain of pigs among treatment during phase 4 and 5. However, pigs fed the control diet consumed a greater ($P < 0.05$) amount of feed during phase 5 than pigs in other treatments. Gain/feed was greater ($P < 0.05$) in pigs fed a diet containing 0.5% NCM during phase 5 than pigs fed the control diet. This study demonstrated that supplementing NCM at 0.5% level may improve ADG during the late nursery period and efficiency during the late growing period. Further evaluations are required over longer periods.

Key Words: Pigs, Natural carbon mineral, Growth performance

1123 Effects of bromocriptine on immune response of pregnant gilts and foetuses and on foetal development. M. Lessard*, M. Dupuis, and C. Farmer, *Dairy and Swine R and D Centre, Lennoxville, Quebec, Canada.*

To evaluate the effect of prolactin (PRL) on foetal development and on the immune response of pregnant gilts and their foetuses, an inhibitor of PRL synthesis, bromocriptine (BR), was given to 48 crossbred pregnant gilts. These were equally distributed into four groups: controls (CTRL), or 10 mg of BR given per os three times daily for 20 days from day 50 (BR50), 70 (BR70) or 90 (BR90) of gestation. Ovalbumin (OVA) was injected s.c. to all gilts on days 53 and 72 of gestation and serum samples were taken on days 50, 60, 70, 90 and 109. Interferon- γ (IFN- γ) production from blood mononuclear cells isolated from the CTRL and BR50 gilts and stimulated with concanavalinA (ConA) was measured on days 50, 70, 80 and 109 of gestation. Five gilts per treatment were slaughtered on day 110 of gestation and foetal weights were recorded. The spleen and thymus of six foetuses per litter were excised to characterize different lymphocyte populations by flow cytometry and spleens were weighed. The lymphocyte proliferative response to ConA was measured in the spleen of three foetuses per litter from the BR70, BR90 and CTRL groups. No difference was observed in the antibody titers to OVA between the four groups ($P > 0.1$). Production of IFN- γ was greater ($P < 0.04$) in the BR50 than in the CTRL group. Foetal body weights were lower ($P < 0.05$) in the BR50 and BR90 compared to