

181 Matching dietary protein to requirements: Performance and waste management in the feedlot. G. E. Erickson*, C. T. Milton, and T. J. Klopfenstein, *University of Nebraska, Lincoln*.

Calves (96 hd; 246 kg) were used to evaluate the effect of matching dietary rumen degradable (DIP) and undegradable protein (UIP) to requirements on performance and nitrogen mass balance. Degradable intake protein and metabolizable protein requirements were determined using the 1996 NRC. Twelve pens with six runoff collection basins were used to assess N removal, N balance in the top 15 cm of soil, and N runoff. Cattle were fed for 193 d, in pens for 181 d, and were adapted to final diets for 28 d. A dry-rolled corn (DRC) control diet (CON) was formulated to contain 13.4% protein, 7.5% alfalfa, 1.4% feather meal, .2% blood meal and was fed for the entire 165 d finishing phase. A diet matching requirements (BAL) was changed every 14 d for the first 98 d during the finishing period to minimize overfeeding of N. The BAL diet was gradually switched from a DRC based diet containing feather meal and blood meal to a high-moisture corn (HMC) based diet with urea alone. Protein degradability is greater with HMC (60 vs. 40%) than DRC thus providing required DIP and minimizing overfeeding of UIP near the end of the finishing period. Calves gained 1.66 kg/d resulting in gain:feed of .175 and .176 for CON and BAL diets respectively and were not different between the two diets ($P>.70$). N intake (197 and 175 g/d) and N excretion (169 vs. 147 g/d) for CON and BAL diets, respectively, were less ($P<.01$) with BAL than CON; however, N removed in manure was not different ($P>.90$). Nitrogen lost was estimated as 89.4 and 77.0 g/d for CON and BAL respectively, and were not different ($P>.55$) due to dietary treatment. Feeding the BAL diet resulted in greater ($P<.01$) OM excretion; however, OM removal was not affected. These results indicate that using the NRC model to minimize overfeeding of protein does not affect calf performance and decreases N excretion.

Key Words: Protein, Requirement, Waste Management

182 Effects of crude protein level in diets of feedlot steers fed to achieve step-wise increases in rate of gain. J. E. Rossi*, S. C. Loerch, and F. L. Fluharty, *The Ohio State University, Wooster*.

Two experiments were conducted to determine supplemental protein requirements for feedlot steers prescription-fed to achieve step-wise increases in ADG during the feeding period. In Exp. 1, 106 steers (initial BW 285 ± 1.5 kg) were allotted to 12 pens. Treatments consisted of ad libitum consumption of a 12% CP diet throughout the experiment (AL12%), prescription intake of a 12% CP diet (PI12%), or prescription intake of a high crude protein diet (PIHCP). The PIHCP diets were formulated to provide the same grams of CP per day as the AL12% diet. Prescription intake steers were fed to gain 1.13 kg/d for the first 86 kg of gain, 1.36 kg/d for the next 132 kg of gain, and were offered feed ad libitum for the final 54 kg gain before slaughter (at 558 kg). Overall ADG was lower ($P<.05$) for steers fed PI12% and PIHCP than those fed AL12% (1.48, 1.50, and 1.60 kg/d, respectively). Total DM intake was less ($p<.08$) for PI12% and PIHCP than for AL12% (1359, 1370, and 1421 kg, respectively). Days on feed were less ($p<.01$) for AL12% (170d) than PI12% and PIHCP (184d). Dressing percent, backfat, and quality grade were less ($p<.05$) for PI12% and PIHCP than AL12%. In Exp. 2, 142 steers (initial BW 285 ± 1.4 kg) were allotted to 16 pens. System 1 (S1) was ad libitum consumption of a 12% CP diet throughout the experiment. Steers in systems 2, 3, 4, and 5 were subjected to the same prescription intake strategy as steers in Exp. 1. During the 3 phases of growth (1.13 kg/d, 1.36 kg/d, and ad libitum) steers were fed the following CP levels: System 2(12, 14, and 12%); System 3(12, 14, and 14%); System 4(12, 16, and 12%); and System 5(12, 16, and 14%). No differences ($p>.13$) in total trial performance were observed among the systems. No differences ($P>.06$) were observed among systems for carcass characteristics or carcass composition. Increasing the percentage of crude protein in diets of prescription-fed steers to provide the same grams per day CP intake as ad libitum fed steers was not beneficial.

Key Words: Steers, Protein Level, Prescription Intake

183 Performance and carcass traits of early weaned steers receiving either a pasture growing period or a finishing ration at weaning. S. E. Myers*, D. B. Faulkner, T. G. Nash, L. L. Berger, D. F. Parrett, and F. K. McKeith, *University of Illinois, Urbana*.

This study evaluated a 82 d pasture growing period (PAST) compared to a continuous high energy diet (CONC) on the feedlot performance and carcass traits of early weaned steers. Three breed types were used: 1) 3/4 Angus \times 1/4 Simmental (BRI), 2) 3/4 Simmental \times 1/4 Angus (CON), and 3) 1/2 Wagyu \times 1/4 Angus \times 1/4 Simmental (WAG). The CONC steers had 0.17 kg/d higher ADG ($P=.0001$), 1.09 kg/d lower intake ($P=.0001$) and 0.01 units better gain:feed (.190 vs .177, $P=.008$) than PAST steers overall. Growing treatment did not affect total feed consumed ($P=.97$). The BRI steers had 31 fewer days fed than CON steers ($P=.008$), and 23 fewer days fed than WAG steers ($P=.05$) when fed to a constant fat endpoint. The BRI steers exhibited 0.16 kg/d higher ADG ($P=.0003$), tended ($P=.07$) to have 0.49 kg/d higher intake, and exhibited 0.01 units better gain:feed (.189 vs .180) than WAG steers. When compared to CON steers, BRI steers consumed 310 kg less total feed ($P=.0003$). No differences ($P>.38$) were observed between growing treatments for carcass characteristics or sensory attributes except, CONC steers tended ($P=.11$) to improve percent grading average choice or higher by 18% over PAST steers. The WAG steers had a 76 unit higher marbling score ($P=.006$) than BRI steers resulting in 16% more ($P=.09$) steers grading \geq to choice, and 31% more ($P=.03$) grading \geq average choice (1000=Small⁰⁰). Liver ($P=.15$) and rumen ($P=.01$) weights as a % of hot carcass weight were reduced for CONC steers. The CONC steers had higher gain, lower intake, better efficiency, reduced liver & rumen weights, and consumed the same amount of total feed when compared to PAST steers.

Key Words: Weaning Systems, Carcass, Sensory Attributes

184 Effects of age at weaning and implant strategy on growth of steer calves. J. P. Schoonmaker*, F. L. Fluharty, T. B. Turner, S. J. Moeller, and S. C. Loerch, *The Ohio State University, Wooster*.

Sixty-seven Angus \times Simmental crossbred steers (initial BW 154.8 ± 6.2 kg) were used in a 2 \times 2 factorial design to determine effects of weaning age and implant regimen on growth, performance, and carcass characteristics. Steers were either early weaned at 113 d of age (EW) or normal weaned at 204 d of age (NW), and allotted by weight to an aggressive (A) or nonaggressive (NA) implant regimen. Calves were penned individually and fed an 85% concentrate, 14% CP finishing diet. EW-A and NW-A calves were implanted with Synovex-C at 163 d of age, Revalor-S at 204 d of age, and Revalor-S at 295 d of age if BW was < 477 kg. EW-NA and NW-NA calves were implanted with Synovex-S at 204 d of age, and at 295 d of age if BW was < 477 kg. Steers were slaughtered when they reached 544 kg BW. Days on feed were greater ($P<.01$) for EW vs NW (241 vs 173 d, respectively) and tended to be lower ($P<.12$) for A vs NA (201 vs 213 d, respectively). Post-weaning ADG was lower ($P<.03$) for EW vs NW (1.65 vs 1.77 kg/d, respectively), and tended to be higher ($P<.06$) for A vs NA (1.76 vs 1.66 kg/d, respectively). Daily DMI was lower ($P<.01$) for EW vs NW (7.5 vs 8.4 kg, respectively). Gain/feed was improved ($P<.06$) for both EW vs NW (.219 vs .209 kg/kg, respectively) and A vs NA (.219 vs .209 kg/kg, respectively). Final age was lower ($P<.01$) for EW vs NW (353 vs 378 d, respectively). Gain per day of age was higher ($P<.01$) for EW vs NW (1.45 vs 1.35 kg/d, respectively). There were no differences ($P>.37$) in carcass characteristics or final empty body composition between EW and NW treatments. Backfat ($P<.13$) and yield grade ($P<.08$) tended to be lower for A vs NA (1.36 and 3.5 vs 1.56 cm and 3.8, respectively), but no difference ($P>.81$) existed for Quality Grade. Percentage of steers not reaching 521 kg was lower ($P<.02$) for A vs NA (0.0 vs 15.3%, respectively). Placing early weaned calves on an aggressive implant regimen is a viable management option. Early weaned steers convert feed more efficiently and gain faster from birth until slaughter than do NW steers while yielding a desirable carcass.

Key Words: Steers, Early Weaning, Implant Strategy

185 Comparison of three weaning ages on cow-calf performance and steer carcass traits. S. E. Myers*, D. B. Faulkner, F. A. Ireland, and D. F. Parrett, *University of Illinois, Urbana.*

An experiment was conducted to compare three weaning ages on cow-calf performance and steer carcass traits. One hundred sixty-eight (1/4 Angus × 1/4 Hereford × 1/2 Simmental) crossbred steers were randomly assigned to 3 treatments with 8 pens per treatment. Treatments were: 1) weaned at 90 d of age and placed on a finishing diet, 2) weaned at 152 d of age and placed on a finishing diet, and 3) weaned at 215 d of age and placed on a finishing diet. The number of days steers were finished decreased by 55 and 38 d (linear, $P=0.0001$) as weaning age increased when harvested at a constant fat endpoint. Weaning at 90 and 152 d of age improved overall ADG by 0.15 and 0.07 kg/d, respectively, over weaning at 215 d of age (linear, $P=0.005$). Over the entire finishing period, intake increased (linear, $P=0.0006$) and efficiency was poorer (linear, $P=0.004$) as weaning age increased. Due to differences in finishing days and intake, total feed consumed increased (linear, $P=0.03$) as weaning age decreased. No differences ($P>0.21$) were observed for carcass weight, longissimus muscle area, or yield grade. There were numerical advantages in marbling score for steers weaned at 90 d, but no significant differences were observed ($P>0.19$) in marbling score, percent grading greater than or equal to choice or average choice. Cow body condition score improved (linear, $P=0.0001$) as weaning age decreased. Pregnancy rate improved 12% (linear, $P=0.15$) for cows on the 90 d weaning treatment. In this study, weaning at 90 d improved gain and feed efficiency, but required more total feed when compared to steers weaned at 152 or 215 days.

Key Words: Beef Cattle, Weaning Systems, Reproduction

186 Effects of Feeding Whole Soybeans on Feedlot Steer Performance and Carcass Characteristics. E. E. D. Felton* and M. S. Kerley, *University of Missouri, Columbia, MO.*

A 58d experiment was conducted to determine the effects of feeding whole soybeans (WS) as a partial or whole replacement for soybean meal (SBM) and partial replacement of corn (C) in a common C/SBM based feedlot ration. Crossbred steers ($n = 80$, initial wt = 441 kg) were blocked by weight and randomly assigned to one of four dietary treatments. Dietary treatments were 0, 8, 16, and 24% WS. In each dietary treatment, WS replaced 0, 33, 67, or 100% of SBM in the diet and 0, 3, 6, and 9% of the dietary C. All diets were isonitrogenous and contained equal amounts of corn silage, limestone, NaCl, trace-mineral and vitamin premixes, Rumensin[®] and Tylan[®]. No treatment differences ($P>0.05$) were seen for total gain (86 kg), ADG (1.48 kg/d) or final wt (final wt = 528 kg). Likewise, no differences ($P>0.05$) due to treatment were detected in hot carcass weight (315 kg), quality grade (5.1), tenth rib backfat (1.0 cm), ribeye area (82.76 cm²), kidney-pelvic-heart fat (2.05%), or yield grade (2.5). Even though no treatment difference was detected in quality grade, there was a numerical trend towards increasing the number of animals reaching the average and high choice quality grade with the increasing inclusion of WS. Results suggested that WS can replace all of the SBM and some of the corn in conventional feedlot diets. These data also suggested that WS can be included up to 24% of the diet and that this inclusion had no adverse effects on steer performance and may actually be beneficial on carcass characteristics.

Key Words: Soybeans, Cattle, Quality Grade

187 Effects of dietary corn silage proportion on yearling steer performance and economic returns. A. DiCostanzo*, C. M. Zehnder, H. Chester-Jones, D. Ziegler, and R. Greenwald, *University of Minnesota, St. Paul, Southern Experiment Station, Waseca, MN.*

Sixty, medium-frame Angus crossbred cattle (393 kg) were stratified by weight and assigned to one of four dietary treatments. Treatments consisted of feeding increasing proportions of corn silage (forage variety) in corn grain diets; namely 12% (CS12), 24% (CS24), 36% (CS36) or 48% (CS48) of the diet DM. Steers were marketed when it was visually assessed that half of the steers in each treatment reached choice grade. Steers fed CS12 or CS 24 diets were marketed after 128 d while those fed CS36 or CS48 were marketed after 163 d; 73 and 79 d, respectively, after implanting with Revalor-S. Although steer gains were not ($P > 0.05$) affected, DMI increased linearly ($P < 0.07$) with corn silage proportion (1.50, 1.47, 1.44 and 1.35 kg ADG and 10.08, 10.41, 10.63 and 10.49 kg DMI/day for CS12, CS24, CS36 and CS48 treatments, respectively); therefore, DM required/kg gain (6.74, 7.08, 7.46 and 8.18 for CS12, CS24, CS36 and CS48 treatments, respectively) increased linearly ($P < 0.05$) with corn silage proportion. Hot carcass weight (364, 359, 387 and 380 kg for CS12, CS24, CS36 and CS48 treatments, respectively) increased linearly ($P < 0.05$), while ribeye area and proportion of kidney, pelvic and heart fat depot decreased linearly ($P < 0.05$) with increasing corn silage proportion (84.18, 84.5, 81.58 and 81.58 cm² and 2.34, 2.38, 2.21 and 1.94% for CS12, CS24, CS36, and CS48 treatments, respectively). Price of steers fed CS12 and CS24 was affected by carcasses not reaching select grade or dark cutting carcasses, while that of steers fed CS36 or CS48 was affected by heavy carcass discounts or B maturity carcasses. Net return to feeding was similar for steers fed diets containing 12% or 24% corn silage (diet DM) when corn silage was priced relative to corn grain. Net return per acre was similar for steers fed diets containing 12%, 24% or 36% corn silage (diet DM) when corn silage was priced at cost.

Key Words: Corn Silage, Steers, Economics

188 Solvent extracted germ meal, corn steep liquor/distillers solubles blends for finishing steers. D. W. Herold*, M. J. Klemesrud, T. J. Klopfenstein, C. T. Milton, and R. A. Stock, *University of Nebraska, Lincoln.*

Two trials evaluated blends of solvent extracted germ meal (GM) and corn steep liquor/distillers solubles (ST) for finishing steers. In Trial 1, pen-fed steer calves (160 hd, 270 kg) were fed treatments with either dry-rolled corn (DRC), or 9%GM, 19%GM with 19%ST, or 38%wet corn gluten feed (WCGF) replacing DRC DM. Trial 2 used individually-fed yearling steers (60 hd, 354 kg) in a 3×3+1 factorial treatment design. Treatments consisted of a DRC control and blends of either 0, 15, or 30% ST with 15, 30, or 45% GM to replace DRC (DM basis). Steers were adapted to grain using 45, 35, 25 and 15% roughage diets and implanted with Revalor-S. In Trial 1, ADG of calves fed 38%WCGF was higher than other treatments (1.77 kg) ($P<0.05$). Average daily gain for 19%GM with 19%ST (1.66 kg) was higher than 9%GM (1.53 kg) which was similar to DRC (1.53 kg). Dry-rolled corn (.170) exhibited a lower gain to feed ratio than other treatments ($P<0.05$). Feed efficiency for 19%GM with 19%ST (.186) and 38%WCGF (.182) treatments did not differ, whereas 9%GM (.177) was lower than 19%GM with 19%ST. In Trial 2 a GM by ST level interaction was observed for DMI and ADG. Steers fed 0 and 15% ST gained similar across all levels of GM. For 30% ST, ADG numerically declined at the 30 and 45% GM levels. Means for DMI did not differ for 15, 30, and 45% GM treatments within 0 and 15% ST levels. A linear decrease in DMI was exhibited for 30% ST as GM level increased from 15 to 45% ($P<0.05$). Average daily gain of DRC (1.42 kg) was exceeded by 15 (1.80 kg), 30 (1.77 kg), and 45% (1.78 kg) GM levels with 15% ST. No differences were observed among DRC and blends of GM and ST at any level for feed efficiency. Results indicate GM can replace a portion of DRC without diminishing efficiency or gain, and that blending GM with ST may enhance performance up to the 30% ST level.

Key Words: Corn Byproducts, Steers, Wet Corn Gluten Feed

189 Combinations of solvent extracted germ meal, corn steep liquor/distillers solubles and dry corn bran for receiving and finishing calves. D. W. Herold*, M. J. Klemesrud, T. J. Klopfenstein, C. T. Milton, and R. A. Stock, *University of Nebraska, Lincoln.*

Calf receiving and finishing trials assessed combinations of solvent extracted germ meal (GM), corn steep liquor/distillers solubles (ST), and dry corn bran (BR). In the receiving trial (REC), 785 steer calves (226 kg) were randomly assigned to one of two treatments and fed for 28 d. Treatments were combinations of 7%ST, 7%BR, and 7%GM, or 7%ST, and 14%BR (DM basis) in a 31% dry-rolled corn (DRC), 30% alfalfa hay, 15% grass hay, and 3% supplemental protein and mineral diet. Finishing trial (FIN) treatments were: 1)DRC control, 2)67%BR,33%ST, 3)67%GM,33%ST, 4)50%BR,50%ST, 5)50%GM,50%ST, 6)50%ST,25%GM,25%BR, 7)50%ST,25%GM,25%BR+tallow at 3% of diet DM (TAL), 8)33%ST,33%GM,33%BR, 9)33%ST,33%GM,33%BR+TAL. Byproduct combinations were 22.5% of diet DM, replacing dietary DRC. FIN steer calves (306 hd, 299 kg) were implanted twice with Revalor-S, adapted to grain using 45, 35, 25, and 15% roughage diets, and fed for an average of 153 d. ADG and daily DMI for REC calves consuming 7%GM (1.18 kg, 5.96 kg) did not differ from 14% BR treatment calves (1.13 kg, 6.06 kg). Gain to feed ratio (G:F) was higher for 7%GM (.198) than 14%BR (.186) (P=.10). The FIN DRC (1.70 kg) treatment exhibited lower ADG than pooled byproduct blends without TAL (1.76 kg) (P=.10). TAL addition to 50%ST,25%GM,25%BR and 33%ST,33%GM,33%BR increased ADG (P=.05) and G:F (P=.06). BR and GM levels were compared by combining means into high (67 and 50%), medium (33 and 25%), and low (0%) categories. Daily DMI responded quadratically for low (10.4 kg), medium (10.0 kg), and high (10.2 kg) GM levels (P<.01). ADG (P=.01) and G:F (P<.01) increased linearly for low (1.73 kg, .166), medium (1.75 kg, .175), and high (1.80 kg, .176) GM levels. Results indicate ST, GM, and BR combinations can reduce the need for corn in receiving and finishing diets, and that GM may be utilized more efficiently than BR.

Key Words: Corn Byproducts, Cattle, Finishing

190 Performance of calves fed different starters diets aimed at developing the rumen. N. D. Luchini*¹, D. Hefner¹, D. Waterman², and K. Klanderma³, ¹Continental Grain Company ²Milk Specialties Company ³Feed Flavors, Inc.

One hundred twenty Holstein male calves approximately 3 d of age were randomly assigned to one of four treatments: Control (C), fed a starter diet from d 7 to d 84; Flavor (F), as C with the addition of two commercial flavors; Sugar (S), as C with the addition of highly fermentable sugars, and Bolus (B) as C, dosed a bolus of freeze-dried ruminal microorganisms at d 14, 21, 28, 35 and 42. Calves were fed twice a day .227 kg milk replacer d 0 to d 42. Starter diet was provided *ad libitum* from d 7. Body weights were recorded at d 0, 14, 28, 42, 56 and 84. Starter intakes were recorded daily for each calf from d 7 to d 56. Scour scores, treatments and cost per treatment were recorded from d 0 to d 21. Seven calves were randomly selected from each treatment and blood samples were withdrawn at d 0, 14, 28, 42 and 56. Samples were analyzed for glucose, NEFA, and urea nitrogen, concentrations. There were no differences in fecal scores, times calves were medicated or average cost per calf between the treatments. There were no differences in the NEFA, glucose or urea nitrogen concentration among treatments. The overall (d 7 to d 56) daily average dry feed intake was higher for C and F than for S calves (.05 < P < .1). Control and F calves had higher average daily intakes from d 22 to d 28 (P=.08), and from d 50 to d 56 (P=.09). This small difference in the dry matter intake is reflected in the BW of the C and F calves (P < .05).

Body weight [¹] average daily gain (ADG) and starter DMI

Day	Treatments				P
	C	F	S	B	
0	40.17	40.17	40.17	40.17	
42	55.07 ^a	55.56 ^a	51.75 ^b	54.1 ^{ab}	0.03
56	63.74 ^a	63.88 ^a	57.94 ^b	62.37 ^{ab}	0.01
84	88.87 ^a	89.16 ^a	79.34 ^b	85.39 ^{ab}	0.02
ADG from d 0 to d 84	0.58 ^a	0.58 ^a	0.47 ^b	0.54 ^{ab}	0.02
Starter DMI from d 7 to d 56	0.474 ^a	0.459 ^a	0.403 ^b	0.430 ^{ab}	0.09

¹Covariately adjusted by weight at day 0

^{a,b}Means with different superscripts differ (P < .05)

191 Effect of added copper sulfate in calf milk replacer on performance and scouring of calves. H. B. Perry*, T. E. Johnson, B. L. Miller, M. A. Fowler, and R. M. DeGregorio, *Land O'Lakes Research Farm, Webster City, IA.*

Supplemental copper sulfate (CuSO₄), 250 ppm/calf/feeding, was evaluated in a calf milk replacer to determine its effect on performance, scour data and medication cost of Holstein bull calves. A total of 33 calves with an initial weight of 48.5 kg were randomly assigned according to body weight and blood gamma globulin concentration to milk replacers with and without supplemental CuSO₄ (250 ppm/calf/feeding). Milk replacers were formulated to contain 22% protein and 20% fat and were medicated with neo-terramycin. Calves were individually housed in crates and fed 2 times daily at 700 and 1615 hours. No dry calf starter was fed. Weekly weight gains, daily milk replacer consumption, feed efficiency, daily scour scores (1-4 scale; 1=normal; 2=loose; 3=water separation; 4=3 with severe dehydration), duration of scours, and medication costs were calculated weekly and for the 4 week period. Total weight gain, milk replacer DM consumption, feed efficiency, scour severity score, duration of scours, and medication costs of calves fed milk replacer without and with supplemental CuSO₄ were 12.63, 12.75 kg; 21.78, 21.48 kg; 1.83, 1.77; 1.21, 1.28; 4.53, 5.88 days; and \$5.00, \$6.29, respectively (p>.05). Results indicated no effect on criteria measured for the duration of the trial.

Key Words: Copper Sulfate, Milk Replacer, Calves

192 Effect of monensin, laidlomycin, and lasalocid on coccidiosis control, weight gain and feed intake in young calves. E. E. Thomas*¹, J. C. Parrott¹, C. A. Speer², and K. F. Lechtenberg³, ¹Elanco Animal Health, Indianapolis, IN, ²Montana State University, Bozeman, ³Midwest Veterinary Service, Inc., Oakland, NE.

Eighty Holstein male calves were purchased at 1 to 2 d of age and fed non-medicated milk replacer (weaned at 6 wks) and starter feed until 8 wks of age (Trial 1) or 12 wks. Feeding of treatment diets was then initiated that contained monensin (24.4 and 36.6), laidlomycin (12.2), and lasalocid (36.6) ppm DMB. Three days later calves were inoculated orally with approximately 500,000 oocysts (82% *E. bovis*, 10% *E. zuernii*, 9% other *E. species*). Calves remained on treatment 4 wks post challenge, during which daily gain, daily feed intake, and oocyst counts were determined.

	Laidlo	Lasal	Monen	Monen	
Item	Control	12.2 ppm	36.6 ppm	24.4 ppm	36.6 ppm
Feed intake, kg/d	2.61	2.66	2.69	2.73	2.72
Weight gain, kg/d	0.80 ^a	1.00 ^{ab}	1.04 ^{ab}	1.04 ^{ab}	1.14 ^b
Feed/gain	3.26	2.66	2.59	2.63	2.39
Total oocysts ^c	1.80	1.89	1.73	1.56	

^{ab}Least square means with different superscripts are significantly different (P<.05).

^cExpressed as log₁₀ oocysts/g feces. Determined during weeks 3 and 4. No data collected for Laidlomycin because of no claim for coccidia control.

Weight gain was increased by monensin 36.6 ppm (P<.05) compared to controls. Although not significant (P>.05), total oocyst counts tended to be lowest for monensin 36.6 ppm and feed intake was highest for the monensin treatments. Calculated feed/gain was improved most with the monensin 36.6 ppm treatment.

Key Words: Coccidiosis, Ionophores

193 Effects of supplemental rumen protected amino acids on body weight gain and carcass composition of growing lambs. C. R. Barrett* and T. R. Johnson, *Indiana University-Purdue University, Fort Wayne, IN.*

The objective of this trial was to compare different levels of dietary CP, and supplementation with rumen protected amino acids (RPAA) (SMARTAMINE™_{ML}), on BW gain and carcass composition in growing lambs. Eighteen crossbred wethers (avg BW 32.9 ± 1.9 kg) were randomly assigned to 1 of 3 pens, and fed one of 2 pelleted diets. Experimental treatments were 14% CP, 10% CP or 10% CP with 6 g RPAA given daily as a bolus at 0900h. Feed was provided ad libitum, and BW was determined weekly. Carcass processing occurred by pen when a target BW (50 to 52 kg) was achieved. Electromagnetic scanning (TO-BEC) and direct carcass measurements were used to determine carcass composition. Lambs fed 14% CP exhibited a nonsignificant trend towards increased ADG ($P=.15$) and reached target weight before lambs fed 10% CP diet (9 wk vs 11 wk). Treatment did not significantly affect warm carcass weight, total or percent lean, or yield grade. In this study rumen protected methionine and lysine were not first limiting for lean growth in lambs fed a 10% CP diet.

Item	10% (-)	10% (+)	14% (-)	SEM
Avg daily gain, g	259	245	289	20
Warm carcass wt, kg	29.45	27.30	27.75	1.25
Total lean, kg	14.37	13.35	13.63	.67
Percent lean	48.79	48.90	49.11	.63
USDA yeild grade	2.61	2.4	2.17	.23

(+) = 2.4 g L-lysine and .9 g DL-methionine; (-) = No supplemental RPAA

Key Words: Amino Acids, Sheep, Carcass Composition

194 Fresh pulped food waste replaces supplemental protein and a portion of the dietary energy in total mixed rations for beef cows. P. M. Walker, S. A. Wertz, and T. J. Marten*, *Illinois State University, Normal.*

Three trials utilizing 215 crossbred beef cows were conducted over three years to evaluate the efficacy of replacing a portion of the diet with fresh pulped food waste (FPF) collected from university cafeterias. In trial 1 (T1), trial 2 (T2) and trial 3 (T3) 68, 73 and 74 beef cows in the third, second and second trimester, respectively, were blocked by parity (first parity vs two or more parities), then stratified to six treatment pens according to body condition, subject to variation in body weight. The duration of T1, T2 and T3 were 99, 190 and 225d, respectively. Trials were terminated each year following a timed insemination to a synchronized estrus. Control (CTL) cows were fed a corn silage-shelled cornsoybean meal based diet during T1 and T2, and a soybeanlage-shelled corn based diet during T3, according to NRC estimates. Treatment (TRT) cows received similar diets where FPF replaced 50% of the forage (wet weight basis) and all soybean meal. TRT and CTL diets were not designed as isonitrogenous nor isocaloric. Chemical analysis found FPF to contain 46.1±9.6% DM, 20.3±6.8% ADF, 19.5±6.8% Cellulose, .6±1.1% ADL, .27±.23% Ash, 29.4±7.2% CP and 15.8±3.3% EE. EE was higher ($P<.05$) for TRT than CTL diets during T1, T2 and T3. ADF was higher ($P<.05$) for CTL than TRT diets during T3 but did not differ for T1 and T2. CP was higher for TRT than CTL diets during T2 and T3 but did not differ for T1. Body weight and condition score changes were not different ($P>.05$) between CTL and TRT cows for T1, T2 or T3. Similar calf survival rates at birth, weaning rates and conception rates during the subsequent 55d breeding season were observed for CTL and TRT cows during T1, T2 and T3. Milk production (kg:d), and milk fat and protein percent were similar between CTL and TRT cows for T1, T2 and T3. Ending weights and ADG were higher ($P<.05$) for calves nursing cows fed FPF. The data of this study suggests that FPF can serve as an alternative feedstuff in diets of beef cows, however, the Mammalian Protein-Ruminant Feed Ban prohibits the feeding of food waste unless it has been heat processed.

Key Words: Food Waste, Feedstuff, Cows

195 Response of lactating dairy cows to a direct-fed cellulase/xylanase enzyme mixture applied to the forage portion of corn silage/alfalfa hay-based total mixed rations. D. J. Schingoethe*¹, G. A. Stegeman¹, and R. J. Treacher², ¹*South Dakota State University, Brookings,* ²*Finnfeeds International, Marlborough, UK.*

Fifty Holstein cows (20 primiparous and 30 multiparous) were used to evaluate the dose response to a direct-fed cellulase/xylanase enzyme mixture applied to the forage portion (60% corn silage and 40% alfalfa hay) of a total mixed ration. Cows were fed 1 of 5 treatment diets for 12 wk. Diets 1 through 4 were 55% forage:45% concentrate and consisted of untreated negative control, 0.7 L, 1.0 L, or 1.5 L of enzyme concentrate/t of forage DM, respectively. Diet 5 was an untreated positive control of 45% forage:55% concentrate. Production of milk, 3.5% FCM, and energy-corrected milk (ECM: 26.9, 28.8, 29.5, 31.2, and 30.3 kg/d) increased ($P < 0.01$) due to enzyme treatments and was similar ($P < 0.72$) to production of cows fed diet 5. Responses to enzyme-treated forages occurred within 2 to 4 wk after cows started consuming the treated forages and were maintained throughout the remainder of the experiment. Percentages of milk fat (3.70, 3.83, 3.92, 3.84, and 3.86) and protein (3.28, 3.37, 3.43, 3.36, and 3.40) were higher ($P < 0.02$) for cows fed enzyme-treated forages or the positive control diet. Responses were similar ($P > 0.21$) for primiparous and multiparous cows. Dry matter intakes (20.6, 21.4, 20.3, 22.3, 21.9 kg/d) were similar ($P > 0.47$) for cows fed all diets. Cows that started receiving the enzyme-treated forage during the first 100 d in milk (avg = 64 d for 5 cows/trt) produced 9 to 15% more milk ($P < 0.08$), 17 to 24% more 3.5% FCM ($P < 0.01$), and 16 to 23% more ECM ($P < 0.01$) than cows fed diet 1, reflecting improved persistency in production. However, production was not increased ($P > 0.41$) when cows were in mid-lactation at the start of the experiment. Production responses to enzyme-treated forages at 55:45 forage:concentrate were similar to the response of increasing the proportion of concentrates fed with untreated forages to 45:55 forage:concentrate.

Key Words: Forages, Enzyme-treated, Lactating Cows

196 Effects of rate and extent of methionine ruminal degradation on milk production and methionine plasma concentration. A. Bach* and M. D. Stern, *University of Minnesota, St. Paul.*

The objective of this study was to determine the effects of rate of Met ruminal degradation on milk production and Met plasma concentration. Ruminal availability of protected Met was assessed by the in situ technique. The intestinal availability of Met after ruminal incubation was determined in vitro. Four Holstein cows in mid lactation receiving a typical ration (16.5% CP, 1.6 Mcal NE_L/kg) were supplemented with 0, 30, and 60 g of slowly degraded rumen protected Met (SDM), or 60 g of moderately slowly degraded rumen protected Met (MSDM) per day, using a 4 x 4 Latin square design. Blood samples were collected from the jugular vein at 0, 6, 12, 18, 24, and 36 h after feeding the protected Met sources. Ruminal degradation rates of SDM and MSDM were 3%/h and 7%/h, respectively. The amount of Met available for absorption when feeding 60 g of MSDM and 30 g of SDM was 17.6 and 11.9 g, respectively. Milk production increased ($P < .05$) due to Met supplementation, but no differences were found among the different levels of Met and Met rates of degradation. The highest Met plasma concentration (167.4 μM) was observed with 60 g of SDM, followed by 30 g of SDM, and 60 g of MSDM. There was an interaction ($P < .05$) between time after feeding Met and treatment. Met plasma concentration peaked 12 h after feeding SDM, whereas Met plasma concentration peaked between 6 and 12 h after feeding MSDM. Assuming a ruminal disappearance rate of 5.5%/h, and an intestinal disappearance rate of 7%/h, the estimated maximum accumulation of Met in the small intestine after feeding Met was 12 h in the case of SDM and 10 h for MSDM. These two times match those at which plasma Met concentrations were highest. It is concluded that a lower rate of ruminal degradation will result in higher Met plasma concentrations. Also, responses in milk production due to supplementation of protected Met could be expected within two days following supplementation.

Key Words: Methionine, Rumen, Plasma

197 Protein requirements of transition dairy cows. R. Greenfield*¹, S. S. Donkin¹, M. J. Cecava², and T. R. Johnson¹, ¹Purdue University, West Lafayette, IN, ²Consolidated Nutrition, L.C., Fort Wayne, IN.

Feeding strategies of transition dairy cows contribute to the risk factors associated with metabolic disorders that limit production in the ensuing lactation. To investigate the effects of prepartum dietary protein concentration and level of rumen-undegradable protein (RUP) on postpartum health and production, 40 multiparous Holstein cows were blocked by expected calving date and assigned to one of four isocaloric prepartum rations beginning 28 days prior to expected calving date. Prepartum rations were: 12% CP and 26% RUP, 16% CP and 26% RUP, 16% CP and 33% RUP, or 16% CP and 40% RUP on a dry matter basis. All cows received the same postpartum diet (18% CP, 40% RUP) from 1 to 56 days postpartum. Prepartum dry matter intake (DMI) was not different among dietary treatments. Postpartum intakes (kg/d) were higher ($P < .05$) for cows receiving the 12% CP: 26% RUP diet prepartum compared with any of the 16% CP diets (22.0 ± 0.98 vs 19.5 ± 1.04 , 18.8 ± 1.03 , 18.8 ± 1.03 ; 12% CP: 26% RUP vs 16% CP: 26% RUP, 16% CP: 33% RUP, 16% CP: 40% RUP). Cows receiving the 12% CP: 26% RUP diet during the transition period produced more milk for the first 56 days of lactation ($P < .05$) than cows receiving any of the 16% CP diets (22.0 ± 0.98 vs 19.5 ± 1.04 , 18.8 ± 1.03 , 18.8 ± 1.03 ; 12% CP: 26% RUP vs 16% CP: 26% RUP, 16% CP: 33% RUP, 16% CP: 40% RUP). There was a day of lactation \times prepartum diet interaction ($P < .05$) with the greatest effect of the 12% CP: 26% RUP diet evident during the first 35 days of lactation. No significant differences were found among treatments for milkfat, milk protein, somatic cell count, or milk urea nitrogen. Liver triglycerides (mg/g DM) on day 1 postpartum were not different among treatments. Plasma glucose, calcium, urea nitrogen, and nonesterified fatty acids were not significantly different among treatments. The data indicate carryover effects of prepartum dietary protein on postpartum intake and milk production, pointing to beneficial effects of low dietary protein for transition dairy cows.

Key Words: Dairy Cattle, Transition, Protein

198 Effect of a Revalor-G implant and source of supplemental protein on weight gain of steers wintered on dormant tallgrass prairie or old world bluestem. C. J. Ackerman*, S. I. Paisley, H. T. Purvis II, and G. W. Horn, Oklahoma State University, Stillwater.

Four hundred mixed age and breed steers (216 ± 22 kg) were used to evaluate the effects of a single Revalor-G implant and source of supplemental protein on live weight gains of steers grazing either dormant native tallgrass prairie (TP) or old world bluestem (OWB) range from December 16, 1996 through March 31, 1997 (105 d). Steers were randomly allotted in groups of fifty to eight pastures (4 pastures TP, 4 pastures OWB); twenty-five steers in each pasture were implanted and 25 were not. Data were analyzed as a replicated split-plot with a 2 \times 2 factorial arrangement of treatments, type of forage and supplement were the main plots and implant treatment was the sub-plot. Steers were fed either a 41% crude protein cottonseed meal (CON) supplement or a 41% crude protein urea-containing supplement. The urea-containing (UREA) supplement consisted of 65.6% cottonseed meal, 28.5% wheat midds, 2.5% urea, and 3.3% limestone. Urea was added to provide 26% (DM basis) of the degradable intake protein in the UREA supplement. All supplements were fed at a rate of 1.02 kg/day. Diet quality samples of the two forage types were collected January 21 using ruminally cannulated animals. All diet quality samples were analyzed for DM, ash, Kjeldahl N, NDF, ADF and IVDMD. Forage quality of TP and OWB was similar ($P > .05$). Final weights and ADG of steers did not differ ($P > .05$) between the two types of forage or sources of supplement. Therefore, the urea supplement did not decrease ($P = .70$: .14 vs .17 kg/d for CON and UREA, respectively) weight gain of the steers. Supplemental protein with UREA resulted in a feed cost savings of \$2.83 per steer. Daily gains of implanted steers were greater ($P = .01$) than gains of non-implanted steers (.19 vs .14 kg/d). Implanting steers wintered on dormant grass increased weight gains by .05 kg/d while source of supplemental protein and type of forage did not alter performance.

Key Words: Supplementation, Winter, Implant

199 Evaluation of alfalfa leaf meal in receiving steer diets. C. M. Zehnder*¹, A. DiCostanzo¹, J. B. Hall², and L. B. Smith³, ¹University of Minnesota, St. Paul, ²Virginia Tech University, Blacksburg, ³Northwest Experiment Station, Crookston, MN.

Two trials were conducted to study the effects of substituting alfalfa leaf meal (ALM) for soybean meal (SBM) on performance of newly received steers. Medium frame, Angus and Angus cross steer calves were utilized in each trial. In trial 1, 96 calves (BW 227 kg) were allotted to a heavy or light weight block and randomly assigned to one of four dietary treatments for a 29-d receiving trial. Treatments were control, SBM providing 100% of supplemental protein, or ALM providing 33, 66, or 100% of supplemental protein; the balance was SBM. In trial 2, 60 calves (BW 235 kg) were allotted to one of ten dietary treatments for a 29-d receiving period, followed by a 33-d step-up period. Treatments were the same as those for trial 1, an additional treatment included a blend of ALM and blood meal (93% ALM and 7% blood meal) to provide supplemental protein. Each protein supplement was fed in diets consisting of cracked or whole corn. Receiving diets (trial 1 and 2) were formulated to contain 1.19 Mcal NE_g/kg DM, 14% CP, .6% Ca and .3% P. Step-up diet averaged 1.28 Mcal NE_g/kg DM, 11.3% CP, .6% Ca and .3% P. In trial 1, steers fed 100% ALM and 66% ALM diets consumed more ($P < 0.05$) DM than steers fed 100% SBM as the supplemental protein source. Steers fed 100% ALM also consumed more DM ($P < 0.05$) and steers fed 66% ALM tended ($P = 0.06$) to consume more DM than those fed 33% ALM (6.21, 6.45, 7.09, 7.24 kg for control, 33%, 66%, and 100% ALM treatments, respectively). Steers fed 100% SBM had faster ($P < 0.05$) ADG (.84, .62, .70, .64 kg/d for control, 33, 66, and 100 treatments, respectively) and required less ($P < 0.05$) DM/kg gain (7.51, 10.55, 10.19, 11.38 for control, 33%, 66%, and 100% ALM treatments, respectively). In trial 2, protein source did not affect ($P > 0.05$) performance during the receiving or step-up period. However, during the receiving period, steers fed whole corn-based diets consumed more DM ($P < 0.05$) than those fed cracked corn.

Key Words: Alfalfa, Steer, Diets

200 Feather meal as a source of sulfur amino acids for growing steers. M. J. Klemesrud*, T. J. Klopfenstein, and A. J. Lewis, University of Nebraska, Lincoln.

A calf growth study was conducted to evaluate feather meal (FTH) as a source of sulfur amino acids (SAA). A basal diet of 44% sorghum silage and 44% corn cobs (DM basis) was fed to 120 individually fed cross-bred steers (228 kg). Steers were supplemented with urea, meat and bone meal (MBM), MBM plus 1% FTH, or MBM plus 2% FTH. The 1% FTH was formulated to provide MBM with an additional 1.5 g of SAA, while the 2% FTH was formulated to provide MBM with an additional 3 g of SAA. Incremental levels of rumen-protected methionine (the first limiting amino acid) were added to the non-urea treatments to provide an additional 0, 1, 2, 3, 4, or 6 g of methionine. While steers fed the urea control gained 268 g/d, addition of MBM improved gains to 337 g/d. Rumen protected methionine added to MBM further improved gains up to a maximum gain of 404 g/d. Data analysis using the slope-ratio technique indicated that maximum gain was achieved by the addition of 1.5 g of rumen protected methionine. Higher levels of methionine added to MBM did not improve gains, probably because another amino acid became limiting. Addition of 1% and 2% FTH to MBM linearly improved gains (398 and 466 g/d, respectively; $P < .10$). The addition of 1% FTH, which supplied 1.5 g of SAA, resulted in gains similar to the addition of 1.5 g of rumen-protected methionine ($P > .30$). The greater gains achieved by feeding 2% FTH were probably due to its contribution of other essential amino acids in addition to SAA. Inclusion of rumen-protected methionine with the FTH treatments also improved gains. This suggests that the additional metabolizable protein from FTH may be deficient in SAA. Whether this is due to a deficiency in methionine or cysteine is unclear from these data. Although FTH seems to be an effective source of SAA when added to MBM, addition of rumen-protected methionine may further improve performance.

Key Words: Feather Meal, Sulfur Amino Acids, Methionine

201 Wheat middlings in roughage-based or limit-fed, high-concentrate diets for growing calves. J. S. Drouillard, D. A. Blasi*, G. L. Kuhl, and R. H. Wessels, *Kansas State University, Manhattan.*

Heifer calves (n=288; 201 kg BW) were used in a randomized complete block design to compare dry-rolled corn (DRC) and pelleted wheat middlings (WM) in full-fed (FF), silage-based diets or limit-fed (LF), high-concentrate growing diets. Full-fed diets contained 40% sorghum silage, 14.8% CP, and a Ca:P ratio of 2:1. Limit-fed diets contained 15% chopped alfalfa hay, 16.7% CP, and a Ca:P ratio of 2:1. Diets within FF and LF were formulated to provide for 0, 33, 67, or 100% replacement of corn/soybean meal with WM. Heifers were fed a common growing diet for approximately 2 wk prior to obtaining initial BW. Cattle were stratified by BW and randomly allotted, within strata, to each of 48 pens containing 6 heifers each (8 diets, 6 replicates). Heifers were fed once daily for 91 d at ad libitum intake (FF) or at 2.4% of BW (LF). Final BW was determined after feeding all heifers at 2.4% of BW for an additional 10 d. Data were analyzed by regression using percentage WM in the diet as a continuous variable, nested within diet type (FF or LF). Average daily gain (kg/d) decreased linearly with increasing levels of WM in FF diets ($P < 0.01$; $ADG = 1.28 - 0.0027 \times \%WM$), but efficiency of gain ($G:F = ADG/DMI$) was not different ($P > 0.3$; $G:F = 0.156 - 0.00013 \times \%WM$) for FF diets containing varying proportions of corn and WM. For LF diets, ADG (kg/d) decreased linearly as the proportion of WM in the diet increased ($P < 0.01$; $ADG = 1.15 - 0.0025 \times \%WM$), thereby resulting in a linear reduction in feed efficiency ($P < 0.01$; $G:F = 0.209 - 0.00046 \times \%WM$). Wheat middlings can be effectively utilized as the predominant protein/energy source for growing cattle, though their feed value, relative to corn and soybean meal, may be different for FF and LF diets.

Key Words: Wheat Middlings, Cattle, Growth

202 Evaluation of feather meal for cows and calves grazing cornstalks. D. J. Jordon*, T. J. Klopfenstein, M. J. Klemesrud, and J. Gosey, *University of Nebraska, Lincoln.*

Three calf and two cow grazing trials were conducted to evaluate the value of a supplement containing feather, sunflower, and blood meals (FTHM) compared to soybean meal (SBM). Calves were assigned randomly to fields and supplemented with either SBM or FTHM. No year x treatment interactions were found so data were pooled across years 1 and 2. Calf gains were similar for the SBM (.44 kg/d) and the FTHM (.38 kg/d) supplements. Analysis of supplements following grazing showed that the SBM supplement was 44% CP (DM basis) of which 42% was undegradable intake protein (UIP, DM basis), while FTHM contained 41% CP (DM basis) of which 33% was UIP (DM basis). Prior to grazing in year 3, supplemental ingredients were evaluated for degradable intake protein (DIP) and UIP prior to formulation in an attempt to equalize DIP and UIP; therefore, supplements were slightly different in year 3 compared to years 1 and 2. Additionally, residual corn estimates were determined prior to cattle placement in fields. Calf performance in year 3 was similar between SBM (.09 kg/d) and FTHM (.07 kg/d). Likewise, residual corn estimations were not different. Calves assigned to the SBM fields had 39.6 kg/ha of residual corn available, while calves supplemented with FTHM had 32.7 kg/ha available. In each year of cow grazing trials, two and three year old cows (86 hd over two years; 482 kg) were assigned randomly and supplemented with either SBM or FTHM. Supplements were formulated for equal DIP and UIP. No year x treatment interactions were noted; therefore, data were pooled across years. Cows consuming SBM gained .79 kg/d, while cows consuming FTHM gained .76 kg/d. The SBM supplement contained 30% UIP (DM basis) while the FTHM contained 24% UIP (DM basis). Economic analysis showed that the FTHM supplement (as formulated) was \$52 less/ton compared to SBM. This resulted in a savings of \$0.04/hd/d and a total savings over 70 d of \$2.80/hd.

Key Words: Feather Meal, Soybean Meal, Beef Cattle

203 Nutrient composition of distillers grains with added solubles. S. R. Harty*, J.-M. Akayezu, J. G. Linn, and J. M. Cassady, *University of Minnesota, St. Paul.*

The variation in the nutrient content of distillers dried grains with added solubles (DDGS) across and within eight ethanol production facilities was evaluated. Samples from facilities were located in MN (5), SD (2) and NE (1) were collected on the first and third Tuesday of each mo. for 6 mo. Samples (n = 95) were evaluated for nutrient content (means shown below), particle size, and color. Production facility had a significant effect on all nutrient values. The CP ranged from 25.9 to 36.3% across facilities and the largest range within facility was 29.6 to 36.3%. Ether extract ranged from 4.4 to 18.7% across facilities, with similar or lower ranges within facilities. Soluble protein and acid detergent insoluble protein (ADIP) had the highest variability, probably due to differences in amounts of solubles added and in heat treatment of DDGS. The ADIP was poorly correlated with RDP ($r = 0.04$) or with intestinal availability of protein (IAP) ($r = -0.28$). Similarly, the correlation of DDGS color measurements with RDP ($r = -0.03$ to 0.33) or with IAP ($r = 0.09$ to 0.17) was low. Thus, neither ADIP nor DDGS color was a good indicator of damaged protein or protein unavailability. Intestinal availability of protein escaping rumen degradation averaged 77.3% (ranged from 64.2% to 92.2%). Based on these analyses, DDGS appears to be a good source of both RDP and RUP for ruminants.

Item	Effect of Production Facility			
	Mean	CV	Across	Within
DM, %	92.7	1.7	<0.01	0.04
NDF, % of DM	48.8	7.2	<0.01	0.60
ADF, % of DM	15.5	16.9	<0.01	0.21
Ether Extract, % of DM	10.5	16.0	<0.01	<0.01
Ash, % of DM	4.3	12.4	<0.01	0.03
CP, % of DM	30.1	3.7	<0.01	0.13
Soluble CP, % of CP	9.7	28.9	<0.01	0.23
ADIP, % of CP	8.0	36.1	<0.01	0.01
RDP, % of CP	46.5	7.7	<0.01	0.02

Key Words: Distillers Dried Grains, Nutrient Composition

204 Predicting effects of proteolysis on ruminal crude protein degradation of legume and grass silages using near infrared reflectance spectroscopy. P. C. Hoffman, N. M. Brehm*, L. M. Bauman, and J. B. Peters, *University of Wisconsin-Madison.*

Two studies were conducted to assess whether routine applications of near infrared reflectance spectroscopy could predict the effects of proteolysis on crude protein degradation of legume, legume-grass silages. A preliminary study was conducted to assess the effect of laboratory drying method on ruminal crude protein degradation of silages. Thirty legume, legume-grass silages were freeze, oven, and microwave dried and incubated in situ for 24 h. Freeze drying was considered least invasive to crude protein degradation of the silages; therefore, oven and microwave drying were compared to freeze drying. Oven drying for 48 h at 55°C compared favorably ($R^2 = 0.84$) with freeze drying. Microwave drying resulted in a large bias (2.84 g RUP/100 g CP) and was poorly related ($R^2 = 0.48$) to freeze drying. In a second study, alfalfa and timothy were cut at three maturities, allowed to wilt for 0, 10, 24, 32, 48, and 54 h. Forages were ensiled in triplicate experimental mini silos fitted with gas relief valves, and allowed to ferment 120 d. After fermentation, silages were oven dried at 55°C, ground, scanned on a near infrared reflectance spectrophotometer, and incubated in the ventral rumen of three ruminally cannulated lactating cows for 24 h. Forage species, maturity, and wilting time significantly affected 24 h crude protein degradation of the silages. After center and select procedures, a calibration equation was developed using 41 samples. Near infrared reflectance spectroscopy accurately predicted ($R^2 = 0.94$, $SEC = 1.5$ g RUP/100 g CP) 24 h crude protein degradation of the silages. Data suggest near infrared reflectance spectroscopy can accurately assess the effects of forage species, maturity, and wilting time (proteolysis) on 24 h ruminal crude protein degradation of legume, legume-grass silages.

Key Words: Silage, Protein, Proteolysis

205 Development of a laboratory procedure for estimating ruminal availability of protein from grains. C. K. Schoenholz*, J. S. Drouillard, E. C. Titgemeyer, and C. Armendariz, *Kansas State University, Manhattan.*

A series of in vitro experiments were conducted to determine relative ruminal availability of protein from grains. Procedures were based on assumptions that 1) ruminal availability of protein is first-limiting to microbial growth, 2) accumulation of microbial cells accurately predicts ruminal protein availability, and 3) cytosine concentration accurately estimates microbial cell mass. Feedstuffs were incubated in rumen fluid and modified McDougall's buffer and centrifuged to harvest microbial cells. Cytosine content of the resulting pellet was measured by HPLC. In experiment 1, 0.5 g of grain (dry-rolled, steam-flaked, and high moisture) or soluble starch were incubated in vitro for 0, 3, 6, 9, 12, and 24 h to determine optimum incubation interval. Cytosine concentrations reached a plateau by 12 h; therefore, subsequent experiments utilized a 12-h incubation. Cytosine concentration was greater ($P < 0.05$) for soluble starch in comparison to feed grains, suggesting that energy, not protein, was first-limiting to microbial growth. In experiment 2, soluble starch (0.0, 0.25 or 0.5 g) was added to ground wheat and ground grain sorghum. Cytosine concentration increased linearly ($P < 0.01$) as starch level increased. In experiment 3, soluble starch was added to ground wheat and grain sorghum at 0.5 or 0.75 and 1.0 g. Level of starch had no effect ($P > 0.7$) on cytosine concentration, indicating that energy was no longer first-limiting. Sodium caseinate was added to in vitro fermentations (0.0 or 0.05 g) in experiments 2 and 3 to measure the effect of degradable protein on microbial growth. Cytosine content increased ($P < 0.01$) in response to casein supplementation. In experiment 3, cytosine content was greater ($P < 0.01$) for incubations containing wheat compared to grain sorghum, indicating greater ruminal availability of protein from wheat. Measuring cytosine content of in vitro incubations may provide a valuable means of estimating ruminal availability of grain protein. Further evaluations of this procedure are being conducted.

Key Words: In vitro, Cytosine, Protein Degradation

206 Influence of the novel urease inhibitor N-(n-butyl) thiophosphoric triamide (NBPT) on in vitro urea kinetics and substrate digestion. P. A. Ludden*¹, D. L. Harmon¹, B. T. Larson¹, and D. E. Axe², ¹University of Kentucky, ²IMC-Agrico Co., *Bannockburn, IL.*

Methods of retarding excessive NH_3 release from NPN could potentially improve efficiency of supplemental N utilization. Our objective was to evaluate the biological activity of the novel urease inhibitor N-(n-butyl) thiophosphoric triamide (NBPT) on in vitro urea kinetics and substrate digestion. In vitro incubations were conducted in 50 mL test tubes containing .25 g ground fescue hay to which was added 20 mL buffer containing 1g/L urea and 10 mL ruminal fluid obtained from a donor animal fed a 70% forage:30% concentrate diet. A solution containing 25% NBPT (IMC-Agrico Co.) was added to supply 0, 6.5, 13, 26, or 52 μg NBPT per tube. All tubes were incubated in triplicate at 39°C and replicated on consecutive days, with NH_3 and urea concentrations measured at 0, 10, 30, 60, 120, 240, and 360 min. Samples for VFA analysis were collected at 6 h, and incubations were continued through 48 h to estimate true digestibility (based on NDF analysis). Increasing the dose of NBPT linearly depressed the rate of urea hydrolysis and subsequent NH_3 formation. Although total VFA concentration at 6 h increased linearly ($P < .03$), the acetate:propionate and estimated true digestibility decreased with higher levels of NBPT addition. We conclude that NBPT addition reduces the rate of NH_3 release from NPN, and thereby offers the potential to improve NPN utilization.

	NBPT, $\mu\text{g}/\text{tube}$					SE	Lin	Quad
	0	6.5	13	26	52			
NH_3 , mM at 6h	21.67	17.10	13.47	8.11	5.31	3.81	.0317	.1000
Urea, mM at 6h	3.38	5.57	6.77	8.89	10.06	.76	.0029	.0125
NH_3 , h^{-1}	.403	.362	.328	.149	.031	.029	.0004	.0127
Urea, h^{-1}	.377	.151	.105	.043	.016	.111	.1140	.1296
Digestibility, %	76.37	74.34	72.27	58.54	54.37	.851	.0001	.0004
Acetate:propionate	3.67	3.28	3.31	3.32	3.29	.036	.0087	.0035

Key Words: Urease Inhibitor, Ruminal Ammonia, Urea

207 Effect of energy intake level during the growing phase on steer feedlot performance and carcass composition. G. N. Hermesmeier*, L. L. Berger, and T. G. Nash, *University of Illinois, Urbana.*

Two experiments were conducted to evaluate effects of energy intake level during the growing phase on steer performance during the finishing phase and carcass composition. In Exp. 1, Wagyu cross steers were used to compare effects of ad libitum (AL) versus restricted (RS) (70% ad libitum) intakes of a high concentrate diet. In Exp. 2, continental cross steers were used to compare effects of AL versus RS (70% ad libitum) intakes of high concentrate diet versus ad libitum hay on finishing phase performance and carcass composition. Steers were fed until they possessed approximately 1.0 cm s.c. fat cover. In Exp. 1, because AL steers were leaner than RS steers, backfat was used as a covariate for growth performance and carcass composition. For Exp. 1 and 2, steer performance for the finishing phase was adjusted to a common dressing percentage. In the growing phase of Exp. 1, AL and RS steers had similar ($P = .36$) ADGs of 1.20 and 1.04 kg/d, respectively, and similar ($P = .28$) feed efficiencies. In the finishing phase, ADGs were similar ($P = .76$) for AL and RS steers; however, AL steers tended ($P < .12$) to be heavier at time of slaughter. Ribeye area, yield grade, and marbling scores were similar ($P = .23$) for AL and RS steers. All steers received a Choice grade or better. During the growing phase of Exp. 2, AL steers gained faster ($P < .01$) than RS steers, who gained faster ($P < .01$) than hay fed steers. Feed efficiencies were the same for AL and RS, but higher ($P < .01$) than hay steers. Steers fed AL entered the finishing phase 21.9% heavier ($P < .01$) than RS steers, who were 13.9% heavier ($P < .01$) than hay steers. Finishing phase ADGs for RS and hay steers were similar ($P = .22$) but hay steers tended ($P < .07$) to be higher than AL steers. Dressing percentage was lower ($P < .01$) for hay steers compared to AL and RS steers. Backfat, ribeye area, and marbling scores were similar ($P = .20$) for all treatments. All hay and RS steers but only 87.5% AL steers graded Choice or better.

Key Words: Energy Intake, Restriction, Feedlot

208 Dietary management for finishing yearling steers to reach full feed. I. G. Rush*, B. Weichenthal, and B. Van Pelt, *University of Nebraska, Scottsbluff.*

Angus crossbred yearling steers averaging 386 kg initially were implanted with Synovex S and started on feed with diets containing Rumensin and stepped-up in energy (5 diets over 23 days), or were limit-fed the final diet with increases in amounts until they reached ad libitum intake in about two weeks. The final diet dry matter contained 82.75% dry rolled corn, 10% corn silage and 7.25% of a dry pelleted supplement containing 58% crude protein, resulting in dietary crude protein of 12.5%. Limit-fed steers were given 6.8 kg of diet dry matter initially. After reaching full-feed, dietary management for both treatment groups was the same, with the finishing diet fed once daily in amounts that were usually cleaned up by the next feeding. Using 6 pens of 8 steers each per treatment, they were slaughtered after 123 days on feed. Daily gains were not different but dry matter intake was lower and feed conversion improved for the steers limit-fed initially, and they also had greater dressing percent and fat thickness. Limit-feeding of high grain diets can be used to bring yearling steers up to full-feed with minimal problems from acidosis and intake variation, resulting in less roughage needed for the finishing period and improved feed efficiency.

Start-up management	Ad libitum-fed step-up diets	Limit-fed high grain diet	P
Initial wt, kg	380.6	386.0	
Final wt, kg	538.0	545.7	.94
Daily gain, kg	1.32	1.34	.94
Daily DM intake, kg	9.3	8.8	.056
Feed/gain ratio	7.05	6.54	.004
Dressing percent	61.7	62.3	.05
Fat thickness, cm	1.35	1.47	.03
Marbling score ¹	5.53	5.51	.93
Quality grade ²	19.3	19.2	.67
Yield grade (USDA)	3.0	3.0	.91

¹Marbling score: Small = 5.0-5.9.

²Quality grade: Choice- = 19.0-19.9.

Key Words: Step-up, Limit-fed, Finishing Diets

209 Betaine as a dietary supplement for finishing cattle.

C. A. Loest*, E. C. Titgemeyer, J. S. Drouillard, R. D. Hunter, and R. H. Wessels, *Kansas State University, Manhattan.*

Steers (n=175; 409 kg initial BW) were used in a complete block design to determine the effect of betaine, provided either as feed-grade betaine (FGB; Betafin-S6, Finnsugar Bioproducts) or as concentrated separator byproduct (CSB), on animal performance and carcass characteristics. Steers were allotted to one of five blocks based on weight and stratified by breed and weight to one of five pens within each block. The three heaviest blocks had five steers per pen, whereas the remaining two contained 10 steers per pen. The heaviest four blocks were fed a total of 82 d, whereas the lightest block was fed for 113 d. Steers were implanted with Revalor[®]-S 8 d before starting the experiment. Steers were fed finishing diets based on steam-flaked and dry-rolled corn (14% CP, 8% alfalfa on DM basis). Treatments included 0, 10.5, and 21 g/steer daily FGB, and 250 g and 500 g/steer daily CSB (as is). Treatments were top-dressed to the diet at feeding. DMI increased (linear, P=0.09; quadratic, P=0.06) from 9.55 kg/d for control steers to 10.03 kg/d and 9.88 kg/d for steers fed 10.5 and 21 g/d FGB, respectively. CSB also tended to increase DMI linearly (P=0.12) to 9.65 and 9.85 kg/d for 250 and 500 g/d CSB, respectively. Gain (1.70, 1.75, 1.74, 1.65, and 1.72 kg/d for 0, 10.5, and 21 g/d FGB and 250 and 500 g/d CSB, respectively) and gain to feed (0.179, 0.174, 0.175, 0.172 and 0.175 for 0, 10.5, and 21 g/d FGB and 250 and 500 g/d CSB, respectively) were similar among treatments. Carcass weights were not different among treatments, however, dressing percent was linearly increased (P=0.09) by FGB. Twelfth rib back fat increased (quadratic, P=0.06) when steers were fed 10.5 g/d FGB. Marbling scores tended to be increased linearly (P=0.16) by both FGB and CSB, however, differences were not large enough to significantly alter the percentage of carcasses grading USDA Choice. Neither FGB nor CSB markedly altered animal performance, but carcasses did tend to be fatter when either supplement was added to the diet.

Key Words: Betaine, Performance, Steers

210 Encapsulated choline as a dietary supplement for finishing cattle. J. S. Drouillard, G. L. Kuhl, D. J. Bindel*, and E. C. Titgemeyer, *Kansas State University, Manhattan.*

Yearling steers (397 kg initial BW) were used in two experiments to determine the effects of encapsulated choline (EC; Balchem Corporation) on feedlot performance and carcass characteristics. Steers were stratified by weight and allotted to each of 37 pens containing 5 steers each. Steers were implanted with Synovex[®] PlusTM, and fed a common series of step-up diets (40-92% concentrate) prior to initiating experiments. Steers in trial 1 were fed diets based on dry rolled corn (8% alfalfa, dry basis), with 0 or 5% added choice-white grease (CWG), and 0 or 5 g/steer daily of EC. In trial 2, EC was top-dressed onto dry-rolled corn diets (8% alfalfa, 5% CWG) at rates of 0, 2, 3, 4, 6, 7, 8, or 9 g/steer daily. All steers were fed once daily for a period of 87 d. In trial 1, ADG tended (P<0.13) to increase as EC was increased from 0 to 5 g/d (1.48 and 1.56 kg/d, respectively). Gain efficiency tended (P<0.10) to increase when EC was added to the diet (0.150 and 0.160 for 0 and 5 g/d EC, respectively). Including CWG in the diet decreased ADG from 1.57 to 1.47 kg/d (P<0.07), reduced DMI from 10.19 to 9.51 kg/d (P<0.01), and increased carcass yield grade from 1.78 to 2.17 (P<0.05). DMI, yield grade, and fat thickness over the 12th rib were greater for cattle fed 5 as compared to 0 g/d EC when diets included 5% CWG, but were lower when CWG was excluded from the diet (CWG × EC interaction, P<0.05, P<0.08, and P<0.02, respectively). In trial 2, ADG, DMI and feed efficiency increased by 0.039 kg/d, 0.137 kg/d and 0.0018 kg gain per kg DMI for each gram of EC added to the diet (linear, P<0.01, P<0.05, and P<0.10, respectively). Including EC in the diet increased kidney, pelvic and heart fat (0.042%/g EC; linear, P<0.05), fat thickness over the 12th rib (0.060 cm/g EC; linear, P<0.01), and carcass yield grade (0.066 yield grade/g EC; linear, P<0.05). Supplementation of EC increased performance of finishing steers, primarily through increase fat deposition. Responses to choline were modulated by level of fat added to the finishing diet.

Key Words: Choline, Fat, Feedlot Performance

211 Efficacy of chromium yeast supplementation for growing beef steers. K. C. Swanson*¹, D. L. Harmon*¹, K. A. Jacques*², B. T. Larson*¹, C. J. Richards*¹, D. W. Bohnert*¹, and S. J. Lewis*¹, ¹University of Kentucky, Lexington, ²Alltech, Inc., Nicholasville, KY.

To evaluate the biological efficacy of chromium yeast supplementation for growing beef cattle, 24 individually-fed, cross-bred beef steers (253 ± 4 kg) were supplemented with 0, 100, 200, or 400 µg of chromium from chromium yeast per kg of diet DM for 6 wk. Steers were fed a 12% CP diet containing 90% corn silage and 10% soybean meal-based supplement at 2.2% of BW. Intravenous glucose tolerance tests (IVGTT) and insulin challenge tests (IVICT) were conducted at 3 and 6 wk of supplementation at 0800 and 1300, respectively. The IVGTT and IVICT were initiated after an overnight fast by intravenously dosing each steer with glucose (.5 g/kg BW) or insulin (.1 unit/kg BW). Blood samples were collected via jugular catheter at -10, 0, 5, 10, 15, 20, 25, 30, 45, 60, 90, 120, 150, and 180 min relative to dosing. Samples were centrifuged and plasma harvested and frozen. Plasma samples were analyzed for glucose concentration. There were no effects (P > .10) of chromium yeast supplementation on ADG or gain:feed. Plasma glucose concentrations 5 min after glucose dosing increased linearly (P = .03) with increasing chromium yeast supplementation. Glucose clearance rate from 5 to 45 min after glucose infusion increased linearly (P = .09) and glucose half-life decreased linearly (P = .06) with increasing chromium yeast supplementation. Glucose clearance rate from 10 to 30 min after insulin dosing tended to increase linearly (P = .16) and half-life tended to decrease linearly (P = .14) with increasing chromium yeast supplementation. These data indicate that chromium yeast supplementation has no effect on ADG and gain efficiency when fed to growing steers consuming a corn silage-based diet but may influence blood glucose kinetics.

Key Words: Steers, Chromium Yeast, Glucose Clearance

212 Effect of base ingredient in cooked molasses blocks on intake and digestion of prairie hay by beef steers. R. H. Greenwood*, E. C. Titgemeyer, and J. S. Drouillard, *Kansas State University, Manhattan.*

Twelve steers (332 kg) were used in three simultaneous 4×3 incomplete Latin squares to evaluate effects of beet molasses (B), cane molasses (C), or concentrated separator by-product (CSB) as base ingredients in cooked molasses blocks on intake and digestion of prairie hay and ruminal parameters. Cooked molasses blocks were fed at .125% of BW (.42 kg/d, .13 kg CP/d). Steers were provided 20 g/d salt and ad libitum access to water and prairie hay (5.9% CP, 69.4% NDF on DM basis). Periods were 18 d with 12-d adaptation followed by 6 d for measuring intake and fecal output. On d 12 ruminal fluid was collected at 0, 2, 4, 6, 8, 10, and 12 h post-feeding for analysis of NH₃ and VFA. Forage OM, NDF, and N intakes, digestible OM, NDF, and N intakes, and total tract OM and N digestibilities (% of intake) were greater (p<0.05) for steers fed cooked molasses blocks than for control steers. Total tract OM digestibility was greater (p<0.05) for steers fed B (54.0%) than for those fed CSB (52.1%) and tended (p=0.06) to be greater than for those fed C (52.2%). Digestion of NDF (% of intake) was greatest (p<0.05) for steers fed B (51.9%); NDF digestion tended to be greater (p<0.07) for steers fed C (49.3%) and CSB (49.3%) than for control steers (46.9%). Ruminal NH₃ concentrations were greater (p<0.05) for steers fed cooked molasses blocks (average of .89 mM) than for control steers (.21 mM); this was primarily due to increases to 4.6 mM at 2 h for steers fed blocks. Total ruminal fluid VFA concentrations were greater (p<0.05) for steers fed B (92.7 mM) and CSB (88.1 mM) than for control steers (80.3 mM), whereas those fed C (85.4 mM) were intermediate. Steers supplemented with cooked molasses blocks had greater molar percentages of butyrate than did control steers, particularly at times close after feeding. In summary, supplementation with cooked molasses blocks increased forage intake and digestion. Generally, blocks elicited similar responses, although steers fed B tended to have greater OM and NDF digestibilities than those fed C or CSB.

Key Words: Digestibility, Forage, Intake

213 Performance of feedlot heifers fed three levels of *Saccharomyces cerevisiae* (5 X 10⁹ CFU/g; BIOSAF[®]). A. Garcia-Estefan*, M. J. De La Zerde, L. W. Greene, and J. C. Paschal, *Texas A&M University System, Amarillo and Corpus Christi*.

Saccharomyces cerevisiae (5 X 10⁹ CFU/g; BIOSAF[®]) was fed at 0 (CONTROL, n=214), 5 (LOW, n=225), and 20 g·h⁻¹·d⁻¹ (HIGH, n=225) to crossbred heifers (average BW 317 kg) in a commercial feedlot at Gonzales, TX. Heifers were grouped into 3 replications (n=203, 241 and 201 for replications 1, 2 and 3, respectively) and randomly assigned to experimental diets. Treatments were begun on Jan 21, Feb 28, and Mar 7 and continue for 163, 125, and 139 d for replications 1, 2, and 3, respectively. On day 0 of each replication, heifers were weighed, implanted with Implus-H[®], vaccinated with BRSV Vac4, and dewormed with Ivomec[®]. The diet contained steam flaked corn (61%), brewer's grains (18.75%), rice bran (10.25%), cottonseed hulls (3.25%), protein-mineral supplement (2.5%), and molasses (4.25%). Between 65 and 80 d after initiation of the treatments, heifers were weighed and reimplanted with Synovex-H[®]. Heifers were slaughtered by replication when backfat reached a visual estimate between .76 and 1.27 cm. At reimplantation, heifers in the LOW and HIGH treatment groups were heavier (P<.05) than the CONTROL heifers (423.4, 422.9 vs 407.9 kg, respectively). Average daily gain (ADG) from initiation to reimplantation was higher (P<.05) for heifers fed the LOW (1.50 kg/d) and HIGH (1.49 kg/d) diets compared to heifers fed the CONTROL diet (1.29 kg/d). From reimplantation to slaughter, heifers fed the HIGH gained 9.6% more per day than those fed the CONTROL diet and 19.8% more than those fed the LOW diet (P<.05). Overall ADG was greatest (P<.05) for heifers fed the HIGH diet (1.27 kg/d) and lowest (P<.05) for those fed the CONTROL diet (1.12 kg/d) with the LOW treatment group being intermediate (1.18 kg/d). The results of this research indicate that rate of gain during the feedlot period can be enhanced with the addition of *Saccharomyces cerevisiae* (5 X 10⁹ CFU/g; BIOSAF[®]) to the diet.

Key Words: Performance, Yeast, Heifers

214 Effects of protein nutrition during the periparturient period on health status of dairy cows. A. Hayirli*, L. H. Kilmer, and J. W. Young, *Iowa State University, Ames*.

Objective was to investigate effects of level of crude protein (CP), and level and source of rumen undegradable protein (RUP) on periparturient health disorders in dairy cows. Secondary objective was to estimate predisposing and risk factors associated with occurrence of milk fever (MF), retained placenta (RP), displaced abomasum (DA), edema, metritis, mastitis, and ketosis. Forty multiparous and 16 primiparous Holsteins and 8 multiparous Jerseys were utilized during the last 4 wk of gestation and the first 91 d postparturition. Prepartal diets contained 13 or 16% CP and 30 or 33% RUP (expressed as % of CP) provided by blood meal or expeller soybean meal. Postpartal diets contained 19.7% CP, 39% RUP, and 0 or 0.31% rumen-protected methionine. No periparturient health disorders were observed in 21 cows (33.9%). Primary disorders were defined as the first occurring, and secondary disorders as subsequent disorders that were closely related to the primary disorder. Incidences of primary disorders including mastitis, MF, RP, DA, edema, metritis, and ketosis were 15, 11, 10, 8, 8, 8, and 6%. Mean blood urea nitrogen concentration of cows with metabolic disorders (DA, MF, and ketosis) was lower than for healthy cows (17.06 v. 20.92 mg/dl; P<0.03). Jerseys had higher incidence rate of MF (P<0.01) than Holsteins while Holsteins experienced more RP (P<0.001) and metritis (P<0.001). Primiparous cows developed more metritis (P<0.05) and edema (P<0.05) than multiparous cows. Cows fed diets containing a high level of CP, a low level of RUP, and no supplemental rumen-protected methionine had higher incidence rates of DA (P<0.001), metritis (P<0.01), and MF (P<0.04) than their counterparts. Breed, parity, and dietary CP of cows during the periparturient period were predisposing factors for primary periparturient disorders. Primary disorders, such as DA and RP were increasing risk factors for occurrence of secondary disorders, such as ketosis (P<0.003) and metritis (P<0.05).

Key Words: Periparturient Disorders, Protein Nutrition, Blood Urea Nitrogen

215 Differential responses of milk fatty acid composition between Holstein and Jersey cows fed diets containing different amounts of nonstructural carbohydrates and supplemented with mostly saturated fatty acids. J. K. Drackley¹, A. D. Beaulieu^{*1}, and J. P. Elliott¹, *University of Illinois, Urbana*.

Milk fat from Jersey cows contains a greater proportion of de novo-synthesized fatty acids than that from Holsteins. Jerseys also have been suggested to possess lower delta-9-desaturase activity in the mammary gland than Holsteins. Our objective was to determine if differences existed between breeds for the response of milk fat composition to varying dietary contents of nonstructural carbohydrates (NSC) and mostly saturated fatty acids (SFA). Four multiparous Jerseys and four multiparous Holsteins were utilized in a replicated 4 x 4 Latin square design with 28-d periods. Treatments were in a 2 (amount of SFA) x 2 (amount of NSC) factorial arrangement. Diets contained 22.0% corn silage and 22.0% alfalfa silage, and either 36.0% shelled corn (high NSC) or 18.0% corn plus 18.0% soyhulls (low NSC). The SFA (Energy Booster 100; Milk Specialties Co.) were added at 0 or 2.5% of dry matter. De novo-synthesized fatty acids (C6 to C14:0) were greater (P < .01) for Jerseys than for Holsteins (22.0 vs 19.1%) but were decreased similarly by SFA in both breeds. Long-chain high-melting fatty acids (C16:0 + C18:0) were greater (P < .01) for Jerseys than for Holsteins (41.3 vs 38.0%) but were increased similarly by SFA in both breeds. Long-chain low-melting fatty acids (C16:1 + C18:1 + C18:2 + C18:3) were lower (P < .05) for Jerseys than for Holsteins (19.9 vs 25.1%), were increased in both breeds by SFA, and decreased (P < .08) in both breeds by low NSC. The ratio of C18:1 to C18:0 was lower (P < .01) for Jerseys than for Holsteins and was decreased by SFA in Jerseys (1.60 vs 1.71) but not in Holsteins (2.32 vs 2.27; breed x SFA, P < .08). These data support a functional limitation in mammary desaturase activity in Jersey cows compared with Holsteins.

Key Words: Jersey, Holstein, Milkfat

216 Influence of corn hybrid type and planting density on the nutritive value of whole plant corn silage in lactating dairy cows. M. A. Bal^{*}, J. G. Coors, and R. D. Shaver, *University of Wisconsin-Madison*.

Silage (SC) and grain (GC) corn hybrids were planted at 24,000 (low; L) and 32,000 (high; H) plants per acre to evaluate hybrid type and planting density effects on intake, milk production, and digestion by dairy cows. Twenty-four multiparous Holstein cows averaging 75 DIM at trial initiation were assigned to a replicated 4X4 Latin square design in a 2X2 factorial arrangement of treatments with 28 d periods. Diets containing 50% forage (2/3 corn silage, 1/3 alfalfa silage) and 50% shelled corn-soybean meal based concentrate (DM basis) were fed once daily in a TMR formulated to contain 18% CP. Actual plant populations were 24,777, 28,919, 24,812 and 32,200 plants per acre for SCL, SCH, GCL and GCH, respectively. Silages were harvested at half milkline stage of maturity and stored in silo bags. Silages averaged 67.1, 68.1, 64.6 and 63.6% moisture for SCL, SCH, GCL and GCH, respectively. Silages averaged 45.5, 46.5, 44.6 and 45.7% NDF and 27.9, 27.7, 26.8 and 28.0% ADF for SCL, SCH, GCL and GCH, respectively. Twenty-four h *In situ* dry matter disappearance was not different between hybrids or planting densities averaging 57.8%. There was a trend (p<0.10) for higher DMI for GC than SC (27.7 vs. 26.8 kg/d). Milk yield was not different across the treatments and averaged 40.4 kg/d. Milk fat percentage tended (p<0.10) to be higher for SC than GC (3.57 vs. 3.50%). Milk protein percentage was higher (p<0.01) for L than H (3.42 vs. 3.36%). Total tract dry matter digestibility was higher (p<0.01) for GC than SC (60.8 vs. 58.8%). Total tract NDF digestibility was higher (p<.01) for GC than SC (31.2 vs. 27.4%). Although total tract starch digestibility was higher (p<0.01) for SC than GC (94.3 vs. 92.3%), intake of digestible starch was not different between the hybrids. Data show minimal differences in performance of lactating dairy cows fed silage or grain hybrids harvested as whole plant corn silage.

Key Words: Corn Silage, Hybrid, Planting Density

217 Effect of feeding corn hybrids selected for leafiness or grain to lactating dairy cows. C. S. Kuehn*¹, J. G. Linn¹, D. G. Johnson², H. G. Jung^{1,3}, and M. I. Endres⁴, ¹University of Minnesota, St. Paul, ²West Central Experiment Station, Morris, MN, ³USDA-Agricultural Research Service, ⁴ Mycogen Plant Sciences, Eagan, MN.

Sixty-two cows (23 multiparous (M) and 39 primiparous (P)) were used to determine the effect of corn silage variety on milk production. Corn silages were a high-grain (G), leafy (L), or generic-blend (C) variety. Diets were formulated to contain (DM basis) 40.6 % corn silage, 10.2 % alfalfa haylage, 23.5 % corn grain, 7.4 % whole fuzzy cottonseed, 7.2 % soybean meal (48%), 5.3 % dried distiller's grains, 1.3 % blood meal, and 4.5 % vitamin and mineral supplement. Cows were placed on their dietary treatment 3 d after calving and remained on the diet for 154 days. Average DM and nutrient content (DM basis) of the silages during the trial were 36.7 %, 34.6 %, and 38.7 % DM; 43.7 %, 45.6 % and 45.1 % NDF; 23.6 %, 24.3 %, and 24.4 % ADF; and 7.0 %, 6.9 %, and 7.3 % CP for the G, L, and C, respectively. The average *in vitro* digestible DM (IVDMD) and *in vitro* digestible NDF of the silages were 66.8 %, 69.2 %, and 66.7 %; and 34.6 %, 38.0 % and 34.4 % for G, L and C, respectively. Average daily DM and nutrient intakes did not differ between dietary treatments. Intakes of DM and NDF averaged 22.3 and 7.0; 22.4 and 7.2; and 21.8 and 6.9 kg/d for G, L, and C, respectively. Daily intakes of IVDMD material for G, L, and C were 17.0, 17.3, and 16.6 kg/d. Daily milk, 3.5 % fat corrected milk (FCM), fat, and protein production did not differ across dietary treatments. Milk production and FCM averaged 35.1 and 37.1; 35.2 and 37.5; and 36.3 and 38.8 kg/d for G, L, and C, respectively. Corn silage variety had no significant effect on average daily DM and nutrient intakes or milk production parameters.

Key Words: Forage, Corn Silage

218 Nutritional value of high lysine corn or regular corn as grain or silage for lactating Holsteins. S. D. Beek* and R. G. Dado, Southern Illinois University, Carbondale.

Previous *in vitro* studies showed that starch from several different high lysine (HL) corn hybrids was more digestible in the rumen than starch from regular (REG) corn hybrids. Objectives were to evaluate performance of cows fed high lysine corn as grain or silage. Sixteen lactating Holstein cows, averaging 91 DIM, were assigned to one of 4, 4x4 Latin squares based on milk production, DIM, and parity. One square consisted of ruminally cannulated cows used for fermentation measurements and one of primiparous cows. Cows were assigned randomly to treatments in a 2x2 factorial design with main effects of corn silage (CS) or grain (CG) and levels of HL or REG. Periods consisted of 11 d for adjustment and 10 d for collection. Diets contained 46% CS, 16% alfalfa silage, 17% CG, and 21% other ingredients (DM basis). Cows consuming diets containing HL CS had higher DMI ($P < .02$) and produced milk with more lactose ($P < .02$). This 9% increase in DMI could result in a milk production increase, but no significant increase was observed ($P = .41$). Change in BW was not different but gains in body condition were higher ($P < .04$) for REG CS diets. There were no significant effects due to CG. Cows may benefit from carbohydrate changes in high lysine corn fed as silage if DMI remains higher over longer periods.

	REG-CS		HL-CS		Contrast (P > F)			
	REG-CS	HL-CS	REG-CS	HL-CS	SEM	CS	CG	CS*CG
Diet NDF, %	31.5	31.8	28.8	29.1	-	-	-	-
CP, %	19.6	18.6	19.6	19.0	-	-	-	-
DMI, kg/d	23.7	22.7	25.5	25.2	.6	.02	.59	.80
Milk, kg/d	26.6	26.8	27.2	27.0	.8	.41	.91	.51
Protein, %	3.34	3.37	3.39	3.33	.04	.97	.89	.04
Fat, %	4.03	4.00	4.02	3.91	.06	.22	.15	.29
Lactose, %	4.71	4.72	4.75	4.79	.04	.02	.23	.87

Key Words: High Lysine Corn, Starch, Dairy Cattle

219 Effect of using alfalfa leaf meal as a protein supplement in dairy cattle diets. M. A. Jorgensen*¹, J-M. Akayezu¹, J. G. Linn¹, and H. G. Jung^{1,2}, ¹University of Minnesota, St. Paul, ²USDA-ARS, St. Paul, MN.

Alfalfa leaf meal (ALM) is a protein (22.4%), fiber (39.5% NDF, 21.5% ADF) product from the separation of alfalfa leaves from stems. The objective of this study was to determine if ALM could replace SBM (44% CP) on an equal protein basis in diets of lactating dairy cattle. Earlier research had shown ALM to be high in amino acids and have a ruminal protein degradability equal to or greater than SBM. Twenty multiparous Holstein cows (142 ± 55 DIM) were used in a replicated 4 x 4 Latin square design. Periods consisted of 14 d for adaptation and 7 d for sample collection. Alfalfa leaf meal diets were formulated to contain 0 (ALM0), 11 (ALM11), 22 (ALM22), or 33% (ALM33) of the total CP from ALM. The diets consisted of (DM basis) 17.3% alfalfa hay, 32.5% corn silage, and 50.2% grain mix, with ALM being included in the grain mix. Diets contained approximately 16.1% CP, 35.0% NDF, and 37.1% NFC (DM basis). Cows fed the ALM0 diet had a higher DMI ($P < .05$) than those fed ALM22 and ALM33, with cows fed ALM 11 being intermediate. Intake of NDF and ADF was highest for diet ALM22 (9.94 and 5.18 kg/d) and lowest for diet ALM0 (8.78 and 4.20 kg/d). Milk production and component yields were not affected by inclusion of ALM in diets. In this short term study, ALM appeared to be an acceptable and economical protein substitute for SBM in dairy cattle diets.

	Diet					
Item	ALM0	ALM11	ALM22	ALM33	SE	P
DMI, kg/d	27.62 ^a	26.91 ^{ab}	26.36 ^b	25.84 ^b	.44	.05
Milk, kg/d	34.53	33.87	34.14	34.10	.64	.91
Fat, %	3.87	3.84	4.00	3.79	.07	.23
Protein, %	3.18 ^a	3.17 ^a	3.10 ^b	3.14 ^{ab}	.02	.05

^{a,b} Means in same row with no common superscripts differ ($P < .05$)

Key Words: Alfalfa Leaf Meal, Dairy Cattle, Protein Supplement

220 Comparison of forage net energy values by using population dependent equations, *in vitro* digestion kinetics, and the summative approach. M. T. Rodrigues, D. K. Combs*, and D. J. Undersander, University of Wisconsin-Madison.

Legume and grass-legume forage samples (n=108) submitted to the University of Wisconsin Plant and Soil Analysis Laboratory at Marshfield, WI were utilized in this study. Each sample was analyzed by complete wet chemistry. Forage NEL was estimated by the summative approach proposed by Goering and Van Soest, 1970 (USDA- Agric. Handbook. No 379). Energy value was also estimated by the summative procedure of Weiss et al, 1992 (Anim. Feed Sci. Tech. 39:95) and four population dependent linear regression equations that use ADF and NDF as the predictors of forage net energy. (Mertens, 1983. Proc. Cornell Nutr. Conf., Ithaca, N. Y. p. 60; Mertens, 1985 Proc Georgia Nutr. Conf., Univ. of Georgia, Athens. p 1.; DHIA - N.Y, 1993. Forage Analyses Procedures, NFTA, Omaha, NE. pp 154; and Adams, 1994 Dairy reference Manual p 108. The Pennsylvania State University). Rate and extent of NDF degradation was also determined by an *in vitro* procedure and forage NEL estimated. The summative approach proposed by Van Soest was assumed be the method of choice for predicting forage net energy. Pearson linear correlations (r) were made between Van Soest derived NEL values and NEL values from the alternative equations.

Para-meter	V.S. vs. Weiss	V.S. vs. <i>In Vitro</i>	V.S. vs. Mertens	V.S. vs. Mertens	V.S. vs. DHIA	V.S. vs. Adams
r	0.928	0.887	0.583	0.706	0.706	0.706
u.limit	0.947	0.917	0.679	0.778	0.778	0.778
l.limit	0.902	0.846	0.466	0.616	0.616	0.616

Correlation coefficients derived from the population dependent equations were lower ($P < 0.10$) than correlations based on equations of Weiss and the *in vitro* technique. Results suggest that forage NEL values predicted from the equations of Weiss and the *in vitro* method are more reliable than estimates derived from the population dependent equations.

Key Words: Energy Prediction, Forages, In Vitro

221 Efficacy of laidlomycin propionate in low-protein diets fed to growing beef steers. D. W. Bohnert^{*1}, C. J. Richards¹, D. L. Harmon¹, B. T. Larson¹, and M. N. Streeter², ¹University of Kentucky, ²Roche Vitamins & Fine Chemicals, Nutley, NJ.

Ionophores have been shown to decrease ruminal ammonia and increase the duodenal flow of dietary protein resulting in a "protein sparing" effect. The objective of this 91 d growth study was to evaluate the growth and ruminal characteristics of steer calves consuming supplemental laidlomycin propionate (LP) at two levels of dietary CP. The diets consisted of 90% corn silage and 10% supplement (DM basis). Ninety-six steers (255 ± 3 kg; 4 steers/pen; 4 treatments; 6 pens/treatment) were used in a RCB design with a 2 × 2 factorial arrangement of treatments consisting of two levels of dietary CP (10.5 and 12.5% of DM) with and without LP (12.2 mg/kg diet DM). Ruminal fluid was collected via stomach tube on d 91 from one steer randomly selected from each pen. ADG and gain:feed (G:F) increased (P < .02) with LP. DMI, ADG and G:F increased (P < .09) for 12.5% CP. Ruminal pH was greater (P < .02) for 10.5% CP while ruminal ammonia was greater for 12.5% CP (P < .02) and LP (P < .09). The concentration of total VFA was not affected by treatment (P > .12); however, propionate % was increased for 12.5% CP (P < .09) and LP (P < .01). Acetate:propionate decreased (P < .03) for LP. LP did not elicit a "protein sparing" effect based on these data. The increased ADG and G:F observed with LP may be due to a modification in ruminal fermentation that improved the efficiency of dietary energy use.

d 1-91	Control		LP		P-value			SEM
	10.5	12.5	10.5	12.5	CP	LP	CP × LP	
DMI, kg	6.29	6.64	6.51	6.72	.08	.36	.65	.15
ADG, kg	1.04	1.23	1.16	1.34	.01	.02	.90	.04
Gain:feed	.167	.185	.179	.200	.01	.01	.76	.005

Key Words: Laidlomycin Propionate, Ionophore, Protein

222 Estimation of smooth bromegrass undegraded intake protein value with omasal sampling technique. A. Can^{*}, R. A. Mass, and T. J. Klopfenstein, University of Nebraska, Lincoln.

Undegraded intake protein (UIP) estimation of forages is crucial to determine metabolizable protein value of forages and to develop supplement strategies for grazing cattle. Four ruminally fistulated steers, averaging 342 kg, were used to collect diet, omasal and fecal samples when grazing smooth bromegrass regrowth. A constant chromium oxide releasing (1.17 g/d) bolus was placed in the rumen of each animal. First 5-d developed steady-state concentration of marker in the rumen. Omasal and diet samples were collected three times (7, 10, 14 d) and fecal samples were collected daily. All samples were freeze dried. Diet samples were used for in situ escape protein estimation using dactron bags. After incubation, bags were washed with neutral detergent solution to remove microorganisms attached to incubated residue (ISNDFN). Omasal sampling purine technique (OSPT) values was calculated: UIP = (Total N flow to Omasum - (Microbial N flow to omasum + Endogenous N flow to omasum) × 6.25. Microbial N was calculated using purine analysis and endogenous N flow assumed 2.2 g for each kg DM intake. Omasal sampling neutral detergent fiber N (OSNDFN) calculated UIP was: UIP = (Total DM flow to omasum g NDFN / g omasal sample) × 6.25. Estimations of UIP were 1.66 (% DM) for OSPT, 1.58 for OSNDFN and 1.54 for ISNDFN. Average crude protein (CP) and in vitro DM disappearance (IVDMD) value of diet samples were 18.9 ± .15 and 65.8 ± .007, respectively. Omasal sampling UIP techniques were not different (P > .1) than ISNDFN using a passage rate of 3%/h. Variations among animals and sampling days were not different (p > .11). Adequate estimates of UIP for smooth bromegrass regrowth can be achieved using OSNDFN.

Key Words: Forage Protein, Omasal Sampling, In Situ

223 Evaluation of in situ and in vitro techniques for estimating degradable intake protein content in forages. C. P. Mathis^{*}, R. C. Cochran, E. S. Vanzant, I. E. O. Abdelgadir, J. S. Heldt, K. C. Olson, J. Caton, D. Faulkner, T. Klopfenstein, K. Moore, S. Paisley, and C. Sheaffer, Kansas State University, Manhattan and collaborating institutions from the NC-189 regional project.

Seven institutions conducted a collaborative trial to evaluate three methods for estimating effective degradability of forage protein (ED; i.e., degradable intake protein) from alfalfa (ALF; 2.9% N), bermuda (BE; 1.4% N), brome (BR; 0.9% N), forage sorghum (FS; 0.8% N), and prairie (PR; 0.9% N) hay. An *in situ* procedure and two *in vitro* protease procedures estimated the ED. For the *in situ* work, two runs (two steers/run) were conducted at each of four locations. Duplicate polyester bags (10 × 20 cm) of each forage (5 g) were ruminally incubated for 0, 2, 8, or 96-h. Rinsing, drying, and microbial correction procedures were standardized. For the protease work, duplicate forage samples (15 mg N) were incubated (at six locations) in 40 ml of a buffer solution for 1 h. Subsequently, 10 ml of a Streptomyces griseus solution (0.33 units of activity/ml) was added to the buffer plus forage and incubated for 48 h (Roe et al., 1990). In addition, a shorter procedure was evaluated where protease concentration was increased (33.0 units/ml) to compensate for shorter incubation time (4 h). There was a forage by location interaction (p = .04) for *in situ* ED. Rankings of ED within institutions indicated that when large differences existed (e.g. grass vs. legume), rankings were similar. However, when ED fell within a narrower range, some differences in rank existed. The average ED was 79.3, 58.6, 49.2, 57.9, and 64.5 for ALF, BE, BR, FS, and PH, respectively. Estimates of ED from the 48- and 4-h protease procedures were closely related (R² = .85), and accounted for substantial variation in the *in situ* ED (R² ≥ .70). In conclusion, variation among location in estimates of ED suggests the need for increased standardization of *in situ* procedures. Short-term protease procedures appear promising but require additional research to clarify the limits of such techniques.

Key Words: Forage, Protein, Protease

224 Effects of various carbohydrate sources on the utilization of low-quality tallgrass-prairie forage in continuous culture. J. S. Heldt^{*}, R. C. Cochran, C. P. Mathis, T. G. Nagaraja, E. C. Titgemeyer, and E. S. Vanzant, Kansas State University, Manhattan.

Two experiments were conducted to evaluate the effects of various supplemental carbohydrate sources on the utilization of low-quality forage in continuous culture. In experiment 1, eight dual flow continuous culture flasks were used (2 flasks/treatment with 2 runs). In experiment 2, nine flasks were used (1 flask/treatment with 3 runs). In Exp. 1, the four dietary treatments were forage only (NC), and forage plus starch, dextrose, or alkaline hydrogen peroxide treated oat hulls (FIBER). In Exp. 2, the nine dietary treatments were forage only (NC), and forage plus arabinose, xylose, glucose, fructose, galactose, lactose, maltose, or sucrose. In both experiments the same prairie hay was used (5.7% CP and 65.7% NDF). Flasks were fed 16 g DM/d with a forage:supplemental carbohydrate ratio of 4:1 (g DM:g DM). In Exp. 1, there were no differences (P ≥ .49) in true OM digestion among treatments. Starch and dextrose tended (P ≤ .11) to decrease NDF digestion compared to NC and FIBER supplementation. Supplemental starch and dextrose increased (P ≤ .08) total VFA concentration and decreased (P ≤ .10) acetate proportion compared to NC. In Exp. 2, supplemental sugars did not affect true OM digestion, except sucrose increased (P ≤ .10) true OM digestion compared to NC, arabinose, and lactose. Digestion of NDF was decreased (P ≤ .10) by supplemental xylose and glucose compared to NC. There were no differences (P ≥ .10) in NDF digestion between the five carbon sugars or among the disaccharides. However, within the six carbon sugars, glucose decreased (P ≤ .10) NDF digestion compared to galactose. Generally, supplemental sugars increased total VFA concentration and butyrate proportion, but decreased (P ≤ .10) acetate proportion. Results indicate that supplemental carbohydrate source can affect digestion of low-quality forage in continuous culture and that the type of sugar offered may impact this response.

Key Words: Forage, Continuous Culture, Carbohydrates

225 Digestible energy (DE) content of tallgrass prairie hay (TPH). K. C. Olson*, R. C. Cochran, E. C. Titgemeyer, and T. J. Jones, *Kansas State University, Manhattan.*

Experiments were conducted to describe the DE content of TPH. In trial 1, steers (n=13; 277 kg) were used in a 13 x 4 Latin square to measure DE for 13 samples of TPH fed at 1.5% BW. Feeding level, averaged across all forages, was slightly below maintenance. Hays were harvested from a variety of locations in central Kansas and represented an array of harvest dates and storage methods. In trial 2, steers (n=16; 261 kg) were used in a randomized block to assess the effects of TPH intake level on DE. Hay was fed at 1.3, 1.7, 2.1 or 2.5% BW. Estimates based on observed DE values indicated these levels corresponded to 1.1, 1.4, 1.6, and 1.9x maintenance, respectively. Steers in both trials were fed soybean meal in amounts calculated to provide sufficient degradable intake protein (DIP) to maximize digestible OM intake (DOMI; 11% of DOMI). The appropriate level of DIP was determined in a previous study. Hay and supplement were offered at 0700 daily. Fecal output was determined using ADIA as a marker. Samples of TPH were analyzed for N, ADIN, NDF, ADF, ADIA, monosaccharides, and alkali-labile phenolic acids. Correlation analysis was used to identify TPH chemical components potentially useful for predicting DE content. Chemical components related to DE ($P < .2$) were subjected to iterative regression analysis to predict dietary DE. Iterations were ceased when the R^2 and $S_{x,y}$ were optimized. Mean DE of TPH fed near maintenance with adequate DIP was $53.3\% \pm 5.3$. Multiple regressions based on fiber measurements (NDF, ADF) explained significant variation in DE. Digestion of OM and DE decreased linearly ($P < .01$) as TPH intake increased; however, DOMI increased linearly ($P < .01$) with TPH feeding level. As TPH intake increased from 1.3 to 2.5% BW, DE declined 4%. In summary, detergent fiber values were useful indicators of TPH DE content when DIP was adequate. Moreover, increased TPH intake by steers depressed digestion but ultimately increased DE intake. DE varied with TPH intake in a linear manner between approximately 1x and 2x maintenance.

Key Words: Forage, Digestible Energy, Regression Models

226 Estimating forage quality using near infrared reflectance spectroscopy. R. A. Mass*¹, J. Pedersen², and T. J. Klopfenstein¹, ¹*University of Nebraska, Lincoln*, ²*USDA-ARS, Lincoln, NE.*

The use of near infrared reflectance spectroscopy (NIRS) as a predictor of CP, in vitro dry matter disappearance (IVDMD), and protein degradability in forages was investigated. A diverse set of forage masticate samples (n=574) was divided into two subsets (high-quality, n=361; low-quality, n=203) based on forage quality parameters in an attempt to define two different classes of forages commonly grazed in Nebraska. High-quality (>10% CP and 60% IVDMD) and low-quality forages were analyzed for CP by the combustion method, for IVDMD by the Tilley and Terry method, and for undegraded intake protein (UIP) using in situ neutral detergent fiber nitrogen (ISNDFN). The same rate of passage (5%/hour for high-quality; 2%/hour for low-quality) was used for each sample within a subset. Mean wet chemistry estimates (CP, IVDMD, ISNDFN, % of DM) for each set was as follows: 16.61, 66.47, 2.86 for high-quality; 6.83, 54.17, 1.37 for low quality. Calibration equations were developed and validated for both sample sets using NIRS. Prediction of CP and IVDMD by NIRS was highly correlated ($r=.92$ and $.82$ for high-quality and $.92$ and $.80$ for low-quality, respectively) to wet chemistry estimates. However, NIRS overpredicted ISNDFN by 13-30% and the estimates were poorly correlated to ISNDFN ($r<.50$). Mean NIRS estimates (CP, IVDMD, ISNDFN, % of DM) for each set were as follows: 16.91, 67.25, 3.25 for high-quality; 6.89, 54.77, 1.79 for low-quality. Possible reasons for poor NIRS predictions of ISNDFN include the heterogeneity of forage species in the sample sets and the effect that rate of passage has on ISNDFN estimates. Further research is necessary if NIRS is to be used as an accurate predictor of ISNDFN.

Key Words: Forages, Protein Degradability, NIRS

227 Chemical composition and ruminal degradability of corn stover and whole plant corn silage from high oil hybrids compared with their normal hybrid counterparts. J. G. Andrae*¹, C. W. Hunt¹, G. T. Pritchard¹, and P. Feng², ¹*University of Idaho, Moscow* and ²*DuPont Optimum Quality Grain, Des Moines, IA.*

The objective of this study was to determine the effects of high oil (HO) corn pollinators on silage fiber characteristics and ruminal degradability. Two HO top cross parents were compared to a normal check parent across three corn hybrids in a 3 x 3 factorial arrangement of treatments. Chopped stover (S) and whole plant samples (WP) were collected from three plots at each of two Wisconsin locations and ensiled for 30 d in laboratory silos. Samples were dried, ground and analyzed for NDF and ADF content. Samples were also incubated in triplicate to determine 24 h in situ DM (ISDMD) and NDF (ISNDFD) disappearance and 48 h in vitro DM (IVDMD) and NDF (IVNDFD) disappearance. Contrasts were used to determine pollinator effects and hybrid effects were determined using protected LSD. Hybrid affected ($P < .05$) all variables except ISNDFD of WP and IVDMD of S. High oil pollinators did not affect ($P > .10$) NDF of S or WP, but decreased ($P < .01$) ADF of S and increased ($P < .05$) ADF of WP when compared to check parents. High oil pollinators increased S ($P < .05$) and WP ($P < .08$) IVDMD when compared to check parents. Stover of HO pollinated hybrids also had increased ($P < .05$) IVNDFD. Virtually all HO pollinator hybrid degradability values were within 1.5 percentage units of check hybrid values. We conclude that HO silage can be produced without altering stover quality. Sample replication and relatively low variability allowed powerful statistical detection of differences which were not likely to be of biological significance.

228 The effects of diets with low and high energy level on fattening performance and some blood parameters of Holstein bulls. R. Kanat*¹, A. Kanat¹, M. Avci², and Y. Gunerj³, ¹*Harran University, Agricultural faculty*, ²*Harran University, Applied Science Faculty*, ³*Veterinary Nutritionist, Sanliurfa, Turkey.*

In a 56-day trial, 45 medium-framed beef steer, 24 month old, were fed the diets with low, medium and high energy (concentrates in % 1.6, 2.0 and 2.4 of live weight) and constant crude protein (12 %) and were given the straw as roughage freely. The effect of diets on the performance and some blood parameters was studied (the concentrations of total blood lipid, protein, cholesterol, albumine and globuline). In the experiment, feed conversion and feed consumption were affected by diets, the bulls in low energy group consumed significantly more feed per kg live weight gain than high energy group. Treatments did not affect the blood parameters, but at the beginning of experiment, the concentration of cholesterol and albumine of blood have increased significantly at the end of experiment. It is concluded that energy of diet have better the performance, but it have increased the cholesterol of blood in holstein bulls.

Key Words: Diet Energy, Cholesterol, Low-high Energy